

ANNALS
OF
SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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ANNALS OF SURGERY.

MESENTERIC CYSTS.

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CYSTS of the mesentery are among the surgical rarities. Isolated cases, numbering altogether about one hundred, are to be found in surgical literature, and monographs have been written upon this subject, notably by Victor Augagneur, in 1886, and by Jules Braquehay, in 1892. But in surgical text-books, even of the better class, the subject is either omitted altogether or summarily dismissed in a few brief sentences. The longest and by far the best account is given by Treves, in his "System of Surgery," but this description occupies only half a page and makes mention of no more than nineteen cases, in which surgical interference was adopted. The subject, however, is of more importance than this curt treatment of it might lead one to believe.

I. HISTORY.

The history of mesenteric disease has been divided by Braquehay into three periods.

(1) The earliest, beginning with the first case recorded by Benevieni, in 1507, includes observations by Tulpius, Morgagni, and others, and extends up to 1850, a record of cases observed only at post-mortem examinations.

(2) The second period, from 1850 to 1880, was one during which cysts of the mesentery were occasionally operated on, and sometimes successfully, but always after a mistaken diagnosis, usually of ovarian disease.

(3) The third period, from 1880 onward, has seen numerous, accurate observations made, chiefly by the French surgeons, among whom Péan, Millard, Tillaux, and Merklen are especially worthy of mention. During this period accurate diagnosis has been brought within the range of probability, and surgical interference, based upon such diagnosis, has been attended with a swiftly increasing measure of success.

In reviewing the subject of cysts of the mesentery I shall describe first of all the anatomy of the mesentery, briefly emphasizing such points as bear upon the pathology of these cysts. I shall then enumerate and classify the various forms of cysts found in this region, giving, so far as it is possible, their mode of development and their anatomical and pathological characteristics, and finally I shall consider under one heading the various clinical signs and symptoms that may result from their presence in the abdominal cavity.

II. ANATOMY OF THE MESENTERY.

The mesentery consists of two layers of peritoneum, closely approximated, and extends antero-posteriorly from the posterior wall of the abdomen to the intestines. It is attached behind by a very short border, which extends "from the level of the attachment of the transverse mesocolon to the left of the middle line, directly down to the right iliac fossa, where the ileum falls into the cæcum." The depth of the mesentery from the posterior abdominal wall to the intestines is about eight inches. Between the two layers of the mesentery are connective tissue, fat, lymphatic vessels and glands, blood-vessels, and muscular fibres, consisting in part of fibres continued down from the muscle of Treitz, and in part of the radiating muscular fibres of Rouget, derived from the two pillars of the diaphragm, but more largely from the

The lymphatic vessels, usually called lacteals, arise from the intestines, chiefly in two plexuses, one between the muscular coats and one beneath the mucous membrane, and leave the intestine on each side of the arteries. About one and a half or two inches from the intestine they reach the first series of lymphatic glands. From these large efferent vessels pass, with very few communications, to a second series of larger glands, situated on the primary arches of the arteries, and from these again the efferent trunks become closer and larger, and join a third set of glands along the trunk of the superior mesenteric artery. To the glands receiving the more numerous vessels of the jejunum the name "pancreas of Aselli" has been given. The glands number two hundred and twenty.¹ The efferent vessels of the third set of glands unite to form two or three trunks, or perhaps, more often, one large trunk, the *truncus lymphaticus intestinalis*, which joins with a right and left *truncus lymphaticus lumbalis* to form the *receptaculum chyli* of Pecquet, which lies on the front of the second lumbar vertebra between the aorta and the right crus of the diaphragm, and is about one and a half inches long and one-fourth inch in diameter. Contained between the layers of the mesentery are also certain congenital remnants of the Müllerian and Wolffian ducts and bodies, and of the vitelline duct in close relation to the *diverticulum of Meckel*.

From this brief description of the anatomy of the mesentery it will be seen that several varieties of cyst may arise from the structures therein contained. The following contains all the various forms of cysts which have been described as existing there:

(1) Serous cysts; (2) chyle cysts; (3) hydatid cysts; (4) blood cysts; (5) dermoid cysts; (6) cystic malignant disease, —cystic sarcoma.

From this classification I exclude all cases of cyst arising elsewhere and becoming mesenteric only by a later extension. Such cysts arise generally in the ovary or in the head of the pancreas.

In addition to these true cysts are certain pathological conditions of the lymphatics of the mesentery which have been mentioned by Augagneur and others. These are (1) lymphatic varices; (2) lymphatic nævus; (3) lymphangioma cavernosum of Weichselbaum.

(1) *Lymphatic varices* are small localized dilatations of the lacteals, usually seen in the post-mortem room or during the performance of abdominal operations. They are in all respects similar to the varices occurring in other parts of the body, and are of no clinical importance.

(2) *Lymphatic Nævus*.—In this condition a small tumor is formed, partly by the dilatation and twisting of lymph-vessels and partly by the production of new lymphatic channels. When pricked at any point chyle flows freely from the puncture.

(3) *Cavernous Lymphangioma*.—One case of this disease is described at great length by Weichselbaum.² The physi-1). This specimen was removed from the descending mesocolon by Mr. Mayo Robson, during the performance of an abdominal section. The majority of unilocular cysts are small, and, as in this case, are surgically unimportant.

III. CYSTS OF THE MESENTERY.

(1) *Serous Cysts*.—Serous cysts occur not only in the mesentery, but also with moderate frequency in the mesocolon, especially in the descending mesocolon. The cysts may be unilocular or multilocular.

(a) *Unilocular cysts* are very much more common in the mesocolon than in the mesentery. A good example, though a small one, is illustrated in the accompanying drawing (Fig. 1). This specimen was removed from the descending mesocolon, by Mr. Mayo Robson, during the performance of an abdominal section. The majority of unilocular cysts are small, and, as in this case, are surgically unimportant.

(b) *Multilocular cysts* are much more common than unilocular cysts in the mesentery proper. A very excellent example of this I am enabled to quote through the kindness of

Mr. T. R. Jessop. The cyst, as will be seen from Fig. 2, is multilocular and is stretching over its surface the intestine, through which a test-tube has been passed. The history of this case was as follows:

M. J., aged six years; female; admitted to the hospital June 9, 1892. For three months the child had complained of occasional attacks of sickness and vomiting, with pain across the front of the abdomen; there were two such attacks; and altogether

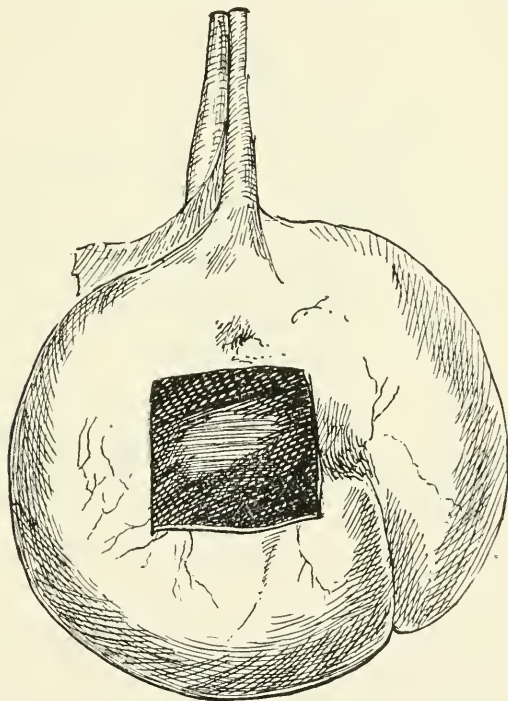


FIG. 1.—Unilocular cyst of the mesentery. Normal size.

there have been about one dozen. Their frequency has latterly been increasing. During the attacks there is much rumbling in the abdomen and "lumpiness." A single attack may last a few hours or a few days. On the whole, she has steadily got weaker and has become considerably thinner.

On examining the abdomen, there is a trilobed tumor situated almost in the middle line of the abdomen. The swelling is

dull, but on two occasions a resonant band has been distinguished running across the middle. The area surrounding the tumor is everywhere resonant. The tumor is unusually movable in all directions, and is capable of being rotated freely round its central point.

Under ether the tumor was removed. It was found to be a mesenteric cyst and multilocular, each loculus containing clear fluid. The mesentery and intestine were removed and the cut ends of the bowel united by Paul's tubes. The patient made a good recovery.

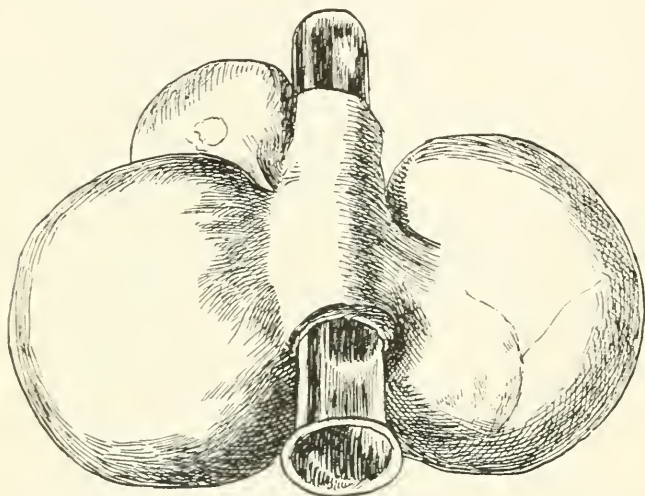


FIG. 2.—Multilocular cyst of the mesentery. One-third natural size.

The case represented in Fig. 3 was under the care of Mr. Edwin Lee, of Dewsbury, who kindly furnished me with the following notes of the case:

A. M., aged seven years; female. There was a history of three weeks' vomiting and of pain in the epigastric region, which the parents treated with small doses of castor oil. The child attended school during this period and seemed to be otherwise in good general health. For a week, until November 14, 1896, there was a cessation of all symptoms, but on this date they commenced with increased vigor. The child vomited everything she took, and complained of acute, almost constant abdominal pains. On

November 15 she was better in the early part of the day, but towards evening the vomiting recurred and continued until the evening of the 16th (Monday), when Mr. Lee was for the first time called in. When seen by him the child was sitting dressed by the fire in a chair, and seemed to all appearances quite well. The temperature was normal, the pulse quiet; the only untoward symptom was the vomiting. The abdomen was not distended in any part, and there was no tenderness. The bowels were opened on this day. The vomiting continued all Monday night and Tuesday. On Tuesday night she was fretful, complained of ab-

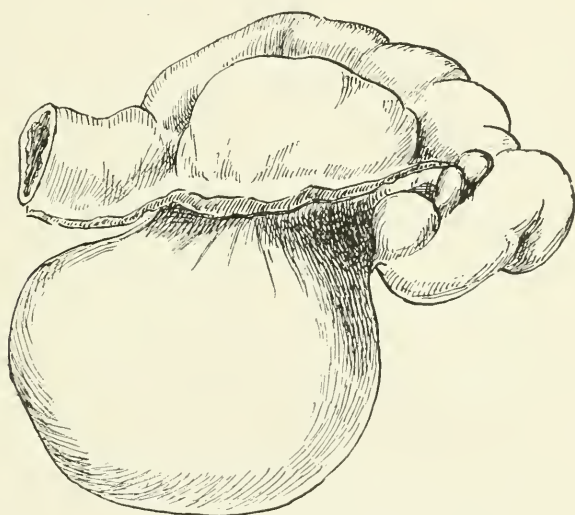


FIG. 3.—Multilocular cyst of the mesentery. One-half natural size.

dominal pains, and was taken to sleep with her mother. Between 1 and 2 A.M. she woke her mother saying that she had a "stomachache," but she soon fell to sleep again. At 4 A.M. the mother woke and the child was dead by her side.

At the post-mortem examination one large cyst and several smaller ones, all containing clear fluid, were found in the mesentery of the ileum, and were lying in the pelvis. The largest of the cysts sprang from the posterior surface of the mesentery and rose over the intestine, falling down in front of it; it had caused pressure and consequent obstruction at this point. The ileum and

jejunum above the cyst were highly congested and engorged. The intestines elsewhere were empty.

A very interesting case, and one of the best recorded, is that of Dr. Robinson, the account of which I quote from the *British Medical Journal* of January, 1891.

A little girl, aged two years, was brought to me on September 7, 1889, owing to the great and increasing size of her belly preventing her from walking and stooping. The enlargement was first noticed three months before. The child was anæmic and had signs of slight rickets (enlarged bone ends, lax joints, and history of sweating of the head); there were nebulæ of the corneæ and a history of severe bronchitis at twelve months of age. The belly was now twenty and a half inches in circumference; the enlargement was most marked on the left side, and was not quite uniform; on palpation the growth could be felt to extend from the left hypochondrium (where there was stomach resonance) to the brim of the true pelvis, into which it did not seem to dip, as the lower rounded end could be mapped out, and from the left loin to the median line, near which was a depression in its inner border; in fact, in shape and position it felt just like a uniformly enlarged kidney. The growth was highly elastic, freely movable, and dull on percussion, but the note varied in different parts of it; the left loin and groin were both dull. Sometimes on very slight percussion some resonance could be made out on the front of the tumor at the upper part. It was impossible to elicit a wave of fluctuation either in the whole or any part of the swelling. Changing the patient's position caused no alteration in the signs. Under chloroform all the above signs were verified, and an examination *per rectum* showed the pelvis was not invaded by the growth. On puncturing the growth with a hollow needle two or three drachms of a straw-colored, limpid fluid, alkaline in reaction, and highly albuminous, were obtained; the needle seemed to traverse a thick wall before the fluid came. On boiling the precipitated albumen with double the amount of strong acetic acid, the precipitate became gelatinous. On standing the fluid deposited a clear gelatinous material. Urine, eight ounces in the twenty-four hours; acid; no albumen, no sugar, no casts.

On the following day I opened the abdomen, Mr. John

Waldy assisting me and Mr. A. C. Waters giving chloroform. The incision was three inches in length in the median line. On dividing the peritoneum, an extremely thin, transparent cyst wall projected through the incision, and on sweeping the finger round the growth numerous soft adhesions were torn through; the growth was felt to be free of the pelvis and adherent behind. On tapping the cyst, two pints of fluid, similar to that obtained the day before, escaped. The mass was then gently drawn through the wound, and the descending colon throughout its entire length and the mesocolon separated from the growth, several double ligatures being used; the peritoneum was stripped off the tumor as this separation was made. Several smaller cysts were punctured, and one large multilocular cyst with thick white fibrous walls was also punctured; the pedicle contained a vessel which proved, post mortem, to be the inferior mesenteric vein. There were several small cysts the size of small marbles in the mesentery an inch or more away from the main growth, which I ruptured by squeezing. Both kidneys and the spleen were felt to be normal. The operation lasted over an hour; extremely little blood was lost, and the child was much collapsed after it.

At 9 P.M. the same night the child was crying as if in pain; there was rattling in the trachea; the lips were natural in color; the pulse was almost uncountable, and the temperature 102.5° F. Drop doses of tinctura opii had been given two or three times. At 2.15 A.M. the next day the child died.

The post-mortem examination, made the same day by Mr. Waters in my presence, showed the growth to have sprung from the upper part of the mesentery. Everything in the abdomen was found to be satisfactory; there had been no oozing of blood; the kidneys, spleen, liver, intestines, pelvic organs, and heart were normal. The lungs showed numerous depressed bright pink patches—to the extent of two-thirds of all the lung substance—which on section were carnified and contained hardly any air, and felt firm (atelectasis). The chest cavity was much encroached upon by the pressure from below, the lower ribs being bulged outward.

The fluid contained in all these cysts has the following characteristics: It is a pale, clear, straw-colored fluid, of specific gravity 1015 or 1016, contains a large amount of

albumen, and is alkaline in reaction. The cysts are therefore distinguished by these characters of the fluid from barren hydatid cysts, with which they might otherwise be confounded.

With regard to the origin of these unilocular and multilocular cysts. It may be twofold,—

(a) From a dilatation of a portion of a lymphatic vessel, occluded as the result, probably, of some inflammatory disturbance.

(b) From hæmorrhages between the layers of the mesentery. Richet³ has insisted especially on this mode of formation of serous cysts. Cases that might well have been taken for serous and not hæmorrhagic cysts will be quoted later under the heading of blood-cysts.

(2) *Chyle Cysts*.—The origin of chylous cysts of the mesentery is probably manifold. They have been described as being formed,—

(a) By a dilatation of the lacteals of the mesentery. An exaggerated condition of lymphatic varix.

(b) Rokitansky⁴ and Virchow⁵ both assert that these cysts originate in degenerated glands, and good evidence has been adduced by Werth, Merklen and Tillaux, and others to support this view. Their observations would agree with those of Brucy⁶ ⁴⁰ as regards the formation of cysts in other parts of the body from degenerated lymphatic glands.

(c) Some few of the chylous cysts, situated at the posterior part of the abdomen and in close contact with the spine, have been attributed in their origin to a dilatation of the receptaculum chyli.

According to Carson³⁹ in eleven cases that he analyzed three were due to dilatation of the lymphatics and eight to degeneration of glands.

Chylous cysts are either unilocular or multilocular. Two very good samples of the unilocular variety are afforded by the following cases which came under my care:

M. R., aged eighteen years; female. When first seen by me,

suffering from symptoms of intestinal obstructions, the following history was obtained: Nine days ago the patient went to an evening party and eat a "great many" nuts. During the following night she woke with severe abdominal pains and vomited twice.

Eight days ago she still had some slight abdominal discomfort, but from that day till three days ago she was comparatively well. On this latter day a slight lump was noticed in the right iliac region. Pain, tenderness, vomiting, and complete constipation were present, and a gradual increase in the size of the swelling was noticed. A few hours before I saw her the severity of the symptoms had swiftly increased.

On examining the abdomen, I found a little distention and slight tenderness everywhere. To the right of the umbilicus was a slightly movable lump, the size of an orange. This was dull on percussion, was surrounded by an area of resonance, and had a fairly well-defined edge, and was very tender.

On opening the abdomen I found a cyst, of the size described, in the mesentery of the lower ileum. I removed it, and stitched the opposing layers of peritoneum at the base together, folding the edge over so that the peritoneal surfaces were apposed. Recovery was uneventful.

On October 4, 1896, I was asked to see a child, E. W., male, aged seven years, by Dr. Churton. The history was as follows:

On October 1 he had taken for dinner some boiled beef and bread, and after dinner had eaten freely of raw turnips. On returning home from school, in the afternoon, he complained of abdominal pain, and he vomited his dinner. From this time until we saw him, on October 4, he was vomiting everything taken by the mouth, and made great complaint of abdominal pain at intervals, crying out loudly, rolling over on his side, and rubbing the abdomen. No flatus or fæces had passed.

On examining the abdomen, there were three distinct coils of intestine, the vermicular contraction of which was readily seen in the upper left quadrant of the abdomen. The right side of the abdomen was noted as being dull "as if from the presence of fluid." On opening the abdomen, I found a large mesenteric cyst holding two pints and two ounces of yellowish turbid fluid. The cyst filled almost the whole of the right side of the abdomen, and, owing to the gravitation of the fluid to the posterior wall, had left the pedicle thin and taut as indicated in Fig. 4. The in-

testine crossing the front of the cyst has been drawn much narrower than normal in order to show this condition of the pedicle. Over a tense band formed by the upper edge of the pedicle a piece of intestine, a loop about eighteen inches long, had passed and had become strangulated. I removed the cyst, cutting through the two layers of peritoneum at (a) Fig. 5.

The child died of shock two or three hours after the operation. A somewhat similar, though less acute, case is recorded by Dr. Syms.⁷ The patient was a young man, nine-

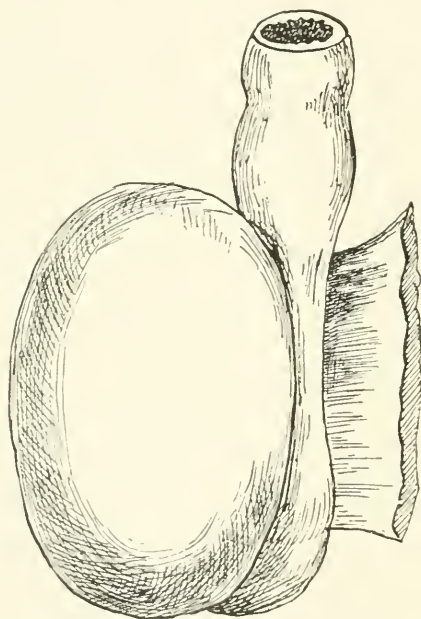


FIG. 4.—Unilocular chylous cyst of the mesentery. One-third natural size.

teen years of age, who had suffered from abdominal pains for about two years, when a tumor was discovered in the abdomen. This tumor was well-defined, very freely movable, elastic, and seemed to be cystic. It was situated in the median line of the abdomen and extended a little above the umbilicus. Median laparotomy was performed, and the cyst removed as described in the last case. The patient made an uneventful recovery.

Dr. Rasch read the report of an interesting case before the Obstetrical Society in November, 1889. This case was claimed by him to be the first case of a chyle cyst in woman on record. The cyst contained pure chyle and was opened, its wall stitched to the parietal peritoneum, and the cavity packed and drained with iodoform gauze. Dr. Rasch refers to the fact that Winiwarter has recorded a case of chyle cyst in the hypochondrium of an infant.

In the multilocular cysts it has been noted and recorded by Ducasset⁸ that one loculus of the cyst may differ as regards its contents from the rest.

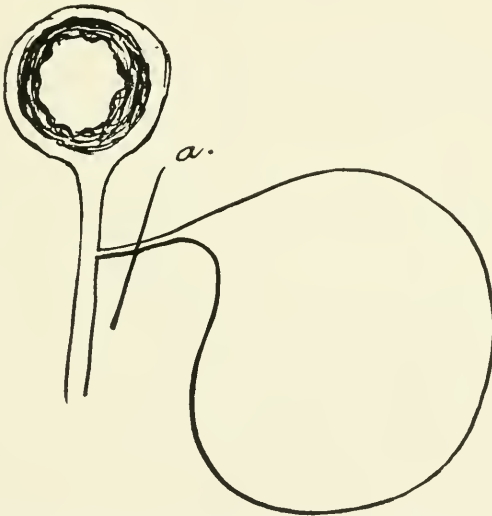


FIG. 5.—Showing the relation of strangulated loop of intestine to the pedicle of the cyst.

The character of the fluid found in chyle cysts is as follows:

It is a creamy white or yellowish liquid, of specific gravity 1012 to 1020, alkaline reaction. Examined microscopically, white corpuscles are seen in abundance, and some immature red ones. There are fat globules in great quantity and a large proportion of very finely granular amorphous material.

(3) *Hydatid Cysts*.—The recorded cases of hydatid cysts

are not very numerous. The largest recorded is that of Dr. Carter. This case was related by the author as one of serous cyst of the mesentery; but the description given of the fluid leaves no doubt that the cyst was a barren hydatid (no hooklets were found). The character of the fluid is given by him in the following words: "The fluid was sixteen pints in quantity, thin, clear, slightly opalescent, alkaline, of specific gravity 1009, containing no albumen, and a large amount of chlorides."

The following account of the case is taken from the *British Medical Journal* of January, 1883:

A. B., aged forty-four years, married twenty-five years, and never pregnant, attended at the Out-patient Department of the Hospital for Women, May 18, 1882, and was seen by Dr. Mansell Moullin, who found the abdomen distended by a tumor which presented all the characteristic marks of an unilocular ovarian cyst. The patient had noticed the abdomen enlarging for two years. She was admitted under my care June 22. With the exception of one brother having died of consumption, her family history presented no marked features. The only illnesses to which the patient referred were one which she called inflammation of the bowels, twenty-five years ago, and a second six years ago, when she had "bilious fever" and a second attack of inflammation of the bowels. Her present illness began two years ago, when she noticed a lump in her abdomen, about as large as a good-sized orange, about the level of the navel; it appeared to move from side to side with the movements of the body; it gradually enlarged, and as it did so it became less movable; it had grown more rapidly during the last six months. She had had no pain till recently, and that only "a bearing down;" no trouble or difficulty with micturition; the bowels were constipated. She was regular every four weeks, but scantily. On examination, the abdomen was distended, and especially on the left side, where there was dulness on percussion far back; on the right side there was resonance up to the line of the insertion of the rectus muscle. Fluctuation could be distinctly felt all over the front of the abdomen in every direction; in the middle line, dulness extended six inches above the umbilicus. The abdominal measurements

were: at umbilical level, thirty-eight inches; three inches above umbilicus, thirty-six inches; three inches below umbilicus, thirty-eight inches. The distance from the ensiform cartilage to the umbilicus was nine inches; from the umbilicus to the pubes eight and a half inches; from the umbilicus to the iliac crest, on each side, ten inches. The vaginal examination showed that the cervix was drawn over to the left side, the fundus lying towards the right foramen ovale; the sound passed two and a half inches; the uterus was movable; nothing of the cyst could be felt by internal examination. The case was diagnosed as an unilocular ovarian cyst, and on July 13 she was operated upon. An incision was made in the middle line, about four inches in length; and the abdominal walls, which were thin, were easily cut through. On opening the peritoneum, a thin-walled cyst was seen covered in all directions with large veins; the hand, passed in, met with no adhesions in front or at the sides, but at the upper part something was recognized as holding the cyst. The cyst was tapped, and about sixteen pints of fluid, with the characters above described, flowed away; as it did so, the cyst was drawn out and was found to have no pelvic attachment and to be unconnected with the ovaries or the broad ligaments; the uterus and the ovaries were found in a natural condition. The cyst was firmly attached to the side of the spine and the left lumbar region; the spleen and the kidney on the left side were recognized as distinct from it, and on drawing up the cyst, its attachment was seen to be closely surrounded by coils of small intestine, which were firmly adherent to it. Seeing it would be impossible to free the cyst from its insertion, an attempt was made to enucleate it by stripping off its peritoneal covering; but this procedure was abandoned, as so many vessels were torn through and the hæmorrhage was free. It was then decided to fasten the cyst to the abdominal wall, cutting away as much as was possible; the circumference of the cyst was tied by six ligatures, and then the cyst was stitched to the abdominal walls by silkworm-gut sutures, and a drainage-tube of India-rubber put into the cavity of the cyst; the peritoneum was sponged out and the abdominal wound closed and dressed with antiseptic gauze. The operation was performed under the carbolic spray.

The patient did well for the first twenty-four hours, and then the temperature rose on the evening of the second day to

101.2° F. and the pulse to 104. On the morning of the third day the dressings were found stained with blood, and there was seen to be a slight oozing from the cyst wall. The pulse and temperature kept up, and the patient began to show signs of septi-cæmia (with some internal hæmorrhage, this continued), and she rapidly sank and died on the sixth day after operation.

The following interesting case is recorded by Portal.⁹

A single woman, aged twenty-two years, was supposed to be pregnant, but the time of expected delivery passed by, and the tumor still increased steadily in bulk until the lower extremities became œdematous, the urine diminished in quantity, and the patient sank and died. At the post-mortem examination a tumor was discovered, having its origin in the mesentery, and consisting of a large number of hydatid cysts.

Sutherland¹⁰ records a case where the cyst attained the size of an adult head. As the result of pressure and interference with the nutrition of the gut a portion of it became gangrenous, and produced a general septic peritonitis, from which the patient died.

Hydatid cysts may here as elsewhere undergo spontaneous degeneration. Of this condition a case recorded by Cimbali¹¹ is a good example. The wall of the cyst was shrivelled and in a state of calcareous degeneration. Similar examples are recorded by Frémy¹² and Laboulbène.¹³ The characters of hydatid fluid are different from those of any other fluid in abdominal cysts. The fluid is clear, watery and thin, of a low specific gravity, 1007--1010, contains no albumen, a large amount of chlorides, and is alkaline in reaction. Scolices are generally present, when found they are quite diagnostic, but occasionally, in what are known as "barren" hydatids, they may be absent.

(4) *Blood Cysts*.—These are almost always traumatic. Bérard¹⁴ has described the slighter forms of hæmorrhage, which occur not infrequently in cases of strangulated hernia. Dr. Gilbert Smith¹⁵ relates a case of death from extensive hæmorrhage into the mesentery, the cause of the hæmor-

rhage being unknown. A large hæmorrhage may develop into a cyst, or there may be hæmorrhage either into a pre-existing cyst or into a tumor of the mesentery, or the greater part of the blood-corpuses may vanish, and cysts which have been described as serous cysts remain, or finally the fluid constituents of the blood may be absorbed and a more or less solid tumor be left.

The origin of serous cysts of the mesentery from hæmorrhage has been, as I have already mentioned, especially insisted upon by Richet.

A hæmorrhage into the mesentery then may result in: (A) A pure blood-cyst. (B) A sero-sanguineous cyst,—serous cyst. (C) A hæmorrhage into a pre-existing cyst. (D) A hæmorrhage into a mesenteric growth. (E) A solid tumor.

(A) *Pure Blood-Cyst*.—A good example of this kind is given by Sir Spencer Wells.¹⁶ The cyst occurred in a girl eight years of age. It was of the size of a hen's egg, and was attributed to an injury received two years before.

The abdomen was opened and the cyst, on being removed, was found to contain pure blood.

The child made a good recovery.

(B) *Sero-Sanguineous Cysts*.—Two interesting cases of this kind are quoted by Dr. Fisher.¹⁷

CASE I.¹⁷—Woman, age not stated; a fluctuating spherical tumor was situated in the umbilical region of the abdomen, but invaded the hypogastric and epigastric regions. It was everywhere surrounded by resonance and was unconnected with the liver or pelvic organs.

On opening the cyst it was found to contain a large quantity of solid, friable material, and the contents were fluid of an ochrey color. The wall of the cyst was lined unequally by stratified layers of blood clot.

CASE II.—Woman, aged twenty years. On the right side of the abdomen was a rounded fluctuating tumor, about the size of a child's head, occupying the right lumbar and hypochondriac regions.

It was very mobile and was not attached above or below. The abdomen was opened and the cyst was stitched to the abdominal wall and drained. It was found to contain sero-sanguineous fluid.

A unique and specially interesting case of blood-cyst is recorded by Mr. Morton, of Bristol.¹⁸ The cyst in this case was the cause of the irreducibility of an inguinal hernia.

The notes given by Mr. Morton are as follows:

A man, aged twenty-one years, was admitted into the Bristol General Hospital on January 20, 1896, with a large scrotal swelling of which he gave the following history: Six months previously, a few hours after falling from a plank, a swelling the size of a hen's egg appeared in the right inguino-scrotal region. At first it disappeared when he lay down at night, but it had not done so for some months, nor had he been able to force it back. It had considerably increased in size. He had never worn a truss. There was a swelling the size of a cocoa-nut occupying the right side of the scrotum and extending up to the region of the external ring. The testicle was quite free. Part of the swelling was easily reduced with the characteristic gurgle, but left a round, fluctuating, smooth, firm mass the size of a large orange. On pressing on the ring so as to prevent the descent of bowel it was found that this mass was free from impulse on coughing. It had apparently no connection with the testicle. It was impossible for him to wear a truss, and Mr. Morton determined to perform a radical operation and remove the irreducible swelling. He thought it might turn out to be an omental cyst. The bowel (when the rupture was down) seemed to surround it too much for a hydrocele of a hernial sac, or rather a collection of fluid shut off by adhesions at the bottom of a hernial sac. He intended to examine it for translucency, but it was inconvenient at the time and was unfortunately omitted. On January 30, Mr. Morton operated for radical cure. After apparent reduction of all the bowel the remaining swelling was quite dull. He opened the sac and found within the upper part some bowel with the wall so thick and so completely empty of gas that its recognition as bowel was at first difficult. It was everywhere adherent by soft adhesions to the sac wall. On breaking down these adhesions

with the finger, and tracing the coil down into the lower part of the sac (where it was equally adherent) he came on a round elastic swelling lying beneath it. After further separation of soft adhesions he was able to distinguish the whole coil with its mesentery, and lying in the mesentery was the swelling. The bowel was so stretched over it as to be considerably flattened. The mesentery where occupied by the cyst was adherent to the sac wall. After withdrawing fluid from the swelling with an exploring needle he made an incision through the layer of the mesentery over the cyst parallel with the bowel, and then with the finger tore off the attachments of the mesentery to the cyst, pulled the cyst out of the mesentery, dividing a tougher band of adhesions here and there with scissors. The cyst did not lie deeply enough in the mesentery to endanger division of the blood-vessels supplying the portion of the coil of bowel stretched over it. Mr. Morton completed the operation by doing a radical cure according to MacEwen's method. The veins of the lower part of the cord seemed varicose, possibly from the pressure of the cyst. The cyst had a dense white wall of fibrous tissue, and on laying it open there were seen some soft partitions of what looked like fibrin stretched across it. On the interior of the wall at one spot there was a vesicle such as one might see on the skin after the application of an irritant. The fluid was slightly blood-stained, a little viscid, and on standing in the enamelled vessel for an hour spontaneously coagulated into a soft jelly. The wall resembled more that of a miniature ovarian cyst than any other kind. Microscopic examination of it only showed dense fibrous tissue.

(C) *Hæmorrhage into a Pre-existing Cyst.*—Demons¹⁹ records one case of a multilocular cyst in which one loculus contained blood and the rest chyle.

The following case is recorded by Giordano.²⁰

Woman, aged sixty-three years. An abdominal tumor in three months attained the size of an adult head. Symptoms, with the exception of slight nausea, were absent. The cyst was enucleated and was found to contain two litres of a brownish fluid, specific gravity 1014, neutral, rich in albumen, containing crystals of cholesterine, fine fat globules, and crenated blood-cells. Giordano concluded that the tumor was a cyst of the mesentery of lacteal origin into which hæmorrhage had taken place.

A case is also recorded by Sir Spencer Wells.

It occurred in a woman of sixty-three years of age who had suffered from an abdominal tumor for thirty years. The tumor had been variously diagnosed by Sedgewick, Baker Brown, and West.

Sir Spencer Wells operated, and found a mesenteric cyst which contained about five pints of fluid with some blood-corpuses and cholesterine.

The patient became jaundiced and died about one month after the operation.

(D) *Hæmorrhage into a Mesenteric Growth*.—The best authenticated case is one related by Hahn,²¹ of Berlin. The patient had a lipoma of the mesentery, which, on removal, was found infiltrated with blood, the result of an injury.

A case of hæmorrhage into an angioma is recorded by Duret.²²

(5) *Dermoid Cysts*.—Cases of dermoid cysts of the mesentery are recorded, among others, by Sir Spencer Wells, Lebert²³ (two cases), Dupuytren,²⁴ Dickinson,²⁵ D'Eppinger, König,²⁶ Bantock,²⁷ and Langton.²⁸

The origin of the cysts is a matter of some doubt. They were described very frequently as being primarily ovarian dermoids, which spreading upward insinuated themselves between the layers of the mesentery. This origin was, however, conclusively disproved in Langton's case, in which he removed a dermoid from each ovary, and a third one from between the layers of the mesentery.

There are congenital remnants in the mesentery from which a cyst might be supposed to develop. These are the remains of the Wolffian and Müllerian ducts and the vitelline ducts in connection with Meckel's diverticulum.

The cysts are more frequent in women, and as a rule do not attain any large size.

The best and most fully recorded case is that of Sir Spencer Wells. I take the following account from the *British Medical Journal* of June, 1890:

The patient was an unmarried girl, aged nineteen years, whom I saw in October, 1888, with Mrs. Garrett Anderson, who was disposed to regard a central fluctuating abdominal tumor as a large hydatid tumor of the liver. Dulness extended from the lower edge of the liver downward for about four inches below the umbilicus. Thence to the pubes there was resonance, and vaginal examination excluded the idea of any pelvic tumor. Both flanks were clear on percussion. The cyst or tumor could be pushed rather freely from side to side, not at all upward or downward. This and the rather doubtful fluctuation, and absence of hydatid fremitus, or any sign of liver-disease, were against the supposition of hydatid disease of the liver, and the history pointed to some congenital tumor of the mesentery or omentum. It was therefore arranged that I should make an exploratory incision, and I did so on October 21, 1888, commencing in the middle line just below the umbilicus, and carrying it downward for about three inches. On opening the peritoneum and pushing aside a coil of intestine, the mesentery appeared in cyst-like form and yellowish-white in color. On dividing the mesentery and holding the edges of the opening carefully forward so that none of the contents could escape into the peritoneal cavity, yellowish semi-solid fat-like matter escaped. More was pressed out, and some bundles of fine hair were also removed by the fingers. Then the cavity, which extended backward quite down to the spine or root of the mesentery, was thoroughly cleansed by fine sponges. On considering the question of drainage, the difficulty of keeping such a large deep cavity thoroughly aseptic, and the doubt whether reaccumulation would or would not take place, it was decided not to drain, but to close the wound, including the opening in the mesenteric sac with the peritoneal edges of the opening in the abdominal wall. The fatty matter removed weighed six pounds. Some of it was kindly examined for me, at St. Thomas's Hospital, by Mr. Shattock, who reported it to be "a mass of flattened epithelial cells with a considerable amount of fatty material among them. There are a few hairs present as well. Treatment with solution of osmic acid turns the substance black from the amount of fat in it. There can be no doubt that it has come from a dermoid cyst."

There is little to remark on the progress after operation except that there was sickness on the first and second day, and

more fever for three or four days than usual after antiseptic abdominal sections, the temperature once reaching 103.2 degrees F., and the pulse 124; but by the seventh day, when the sutures were removed, the general condition was good, and the pulse and temperature hardly above the normal standard. The wound healed perfectly without discharge of any kind, and when the patient left London for Manchester there was no evidence of any refilling of the cyst. Her father wrote to me on November 20 that she had borne the journey well, and I did not hear from him again until June, 1889, when he wrote that there "comes from the wound a very slight discharge of matter." I directed them to use a little iodoform and boracic lint as dressing, and did not hear again until October, 1889, when her father wrote that she "keeps very well," but that on the scar there was "a small portion of flesh, like a very small bladder, with a very small hole, out of which a very little matter comes now." The dressing was continued and a pad and bandage worn. The general health was good.

Schutzer²⁹ records a case where two canines, two incisors, and eight molars were present.

(6) *Cystic Malignant Diseases*.—These are hardly cases of cysts, properly so called, of the mesentery, but they have been so diagnosed, the exact condition being ascertained only by operation or after death. It is for this reason that I include them here. The most noteworthy example of this class is recorded by K. Thornton in the *British Medical Journal* for 1882. I append the history extracted therefrom.

S. M., aged thirty-eight years, wife of a bank clerk, and mother of eight children, was placed under my care at the Samaritan Hospital in May, 1877, by Dr. Peskett, of Leyton.

I found a large cystic tumor in the abdomen, and was able to diagnose extensive parietal and intestinal adhesions, and, by vaginal examination, a nodular mass in or closely connected with the left broad ligament. The nature of the tumor being doubtful, I tapped and removed thirteen pints of curious orange-colored serum. The chemical reactions of this fluid were rather those of a mixed ovarian and ascitic fluid than of a pure ovarian or peritoneal fluid. The microscope did not aid the diagnosis, for I

could find nothing but blood-corpuscles and a few small granular cells, so indistinct in outline that I failed to draw them with the camera.

Careful examinations of the patient, made from time to time during the following three weeks, led to the following diagnosis, entered in the case-book on June 12: "A thin-walled flaccid cyst, with some solid masses, which can be distinctly felt *per vaginam* in the left broad ligament. I cannot feel at all sure whether it is an actual cyst, or only an encysted collection of fluid among the intestines, omentum, and mesentery. If it is the latter, it must be nearly a perfect cyst, as both flanks are clear, and changes of position vary the dulness but little."

An exploratory operation was decided upon, and performed on the following day. A very thin cyst, with unusually large veins in its anterior wall, was separated with difficulty from extensive adhesions to the parietal peritoneum and omentum. A broad vascular pedicle was then discovered, connecting it to the mesentery of a portion of small intestine; this was transfixed and ligatured in two portions. Several smaller adhesions to the intestines, and a broad membranous one to the left broad ligament, were separated, and the left ovary and tube were then found to be adherent to a fringe of solid growths along the lower border of the cyst. I therefore transfixed the left broad ligament, and removed the ovary and tube along with the tumor. This led to its being included among my ovariectomies, where it will be found as Case 33.

The solid portions of the tumor were very vascular, and arranged in fringes along its borders, their edges tapering like the margins of the liver. The solid part weighed six pounds four ounces, and there were nineteen pints of serum like that removed at the tapping. Unfortunately, some portions removed and preserved for microscopic examination were lost, but I have no doubt that it was a cysto-sarcoma, as the solid portions contained numerous small cysts.

IV. GENERAL DESCRIPTION, SYMPTOMS, DIAGNOSIS, OPERATIVE TREATMENT, ETC.

From the cases quoted in this paper, and by an examination of others, not sufficiently interesting to be specially recorded here, the following general facts can be ascertained.

Cystic disease of the mesentery is very much more common in women than in men. The only form of cyst found with perhaps equal frequency in the two sexes is the hæmorrhagic cyst, as one might suppose from the mode of origin. Dermoid cysts have been found only in women. The extremes of life are not exempt from this disease. Cases are recorded at the age of four months (Ducasset and Winiwarter),³⁰ of two years (Robinson above quoted), of six years (Mr. Jessop's case, M. J.), and at the advanced ages of eighty years (Weichselbaum) and seventy-seven years (Sabourin,³¹ Enzmann³²), and seventy-three years (Baker Brown).³³ The size of the tumors is extremely variable. They are sometimes so small as to be of no clinical significance, to cause no symptoms, and to require no treatment. They are sometimes so large as by their mere physical bulk to cause death, as in the case that has been mentioned by Portal.

With regard to the general physical signs of cysts in the mesentery the ensuing particulars must be noted.

The tumor is generally rounded, more or less spherical in form, and may be of an even outline, or may be lobed. The most prominent part of the tumor is generally near the umbilicus, perhaps most commonly is slightly to the right of that point, approaching it more nearly as the cyst enlarges. The umbilicus never becomes protruded. Tillaux³⁴ suggests that "if a mark be made on the skin over the most projecting point of the tumor, it can be noticed that this point travels upward during inspiration and that it is not the tumor itself which moves downward." The most obvious and the most characteristic sign of the tumor is the mobility. A cyst can readily and with great freedom be pushed over from one side of the abdomen to the other, and to a less extent can be moved in a vertical direction. As in the case of M. J., already quoted, the tumor can sometimes be twisted round its central axis to one complete turn. This free mobility can of course be elicited only when adhesions are absent.

Fluctuation is present and is sometimes easily felt, but it may be confounded with the elasticity of a lipoma growing

in the omentum or mesentery. The "frémissement hydatique" has been obtained in a case of hydatid cyst by Meissner.³⁵

On percussion there is a zone of complete resonance all round the tumor. It can be shown that there is no connection with the liver above, the pelvis below, or the spleen or kidneys laterally. On light percussion a resonant band may perchance be made out crossing the tumor. The reason of this is plain on reference to Fig. 1. If a tumor is suspected to be mesenteric, but dulness is noted as extending down to the pubes, it has been suggested that the patient should be inverted, or put into the Trendelenburg position in order to allow the falling away of the cyst from the pelvis. An inferior zone of resonance could then be demonstrated.

Braquehaye designates these signs—(1) resonance below; (2) resonance above; (3) transverse resonance of a band—as the "three diagnostic signs of Tillaux."

Exploratory puncture has been invoked in order to assist in the diagnosis, but it can hardly be necessary now to condemn this old-time procedure. The dangers of it are numerous,—leakage from the cyst or hæmorrhage from any of the large blood-vessels ramifying freely on the cyst wall being the most likely.

Briefly to summarize, the most characteristic signs of the cyst there are,—

(1) Prominence of the fluctuating tumor towards the umbilicus.

(2) Great mobility, especially in the transverse direction, and the possibility of rotation round a central axis.

(3) The presence of a zone of resonance around and a belt of resonance across the cyst.

Clinical Symptoms.—It has been already mentioned more than once that there are cysts of the mesentery, generally of lymphatic origin, discovered either during an operation for some more serious abdominal disease, or during the performance of a post-mortem examination, so small in size and so quiescent as to be of no clinical significance.

The remaining cases, so far as symptoms go, may be most usefully classified under two headings.

(1) Those in which the course is chronic, where complaint is made chiefly of an abdominal tumor.

(2) Those in which the onset of acute intestinal obstruction first draws the attention of the patient and practitioner to the abdomen. I have already quoted cases belonging to each of these groups.

(1) *The Chronic Cases.*—The cyst, whose characteristics have been enumerated, causes by its presence in the abdomen certain symptoms; the chief of these are,—

(a) *Pain.*—Pain is more or less acute, according to the rapidity of growth of the tumor. The more rapid the growth the greater the severity of the pain and *vice versa*. The pain is local, in and around the tumor, and radiating to the flanks, groin, and thighs. As a result of the pressure exerted on the intestine and the consequent partial closure of the canal, there are colicky pains, due to vermicular contraction of the hypertrophied muscular fibres as they attempt to overcome the obstruction.

There may be, but most commonly is not any, tenderness of the abdomen.

(b) *Intestinal Disturbances.*—Constipation is the rule, but the severity and duration of it will of course largely depend on the position, duration, and size of the tumors. There is sometimes vomiting, and very rarely there may be persistent and intractable diarrhœa.³⁶ Braquehay suggests that the compression of the vessels and nerves in the mesentery will cause a diminution in the secretion of the intestine and a consequent palsy of the muscular fibres of the gut, resulting in meteorism.

(2) *Acute Cases.*—As will be readily grasped from the account of my cases given above, the onset of this group is strictly that of acute intestinal obstruction. There are the usual signs,—vomiting, complete constipation, distention of the intestine, and the usual affections of the circulatory and respiratory systems. There is no need of a description of

the clinical symptoms. All are familiar with them, and there are no characteristics which distinguish a case of acute intestinal obstruction due to a mesenteric cyst from acute obstruction due to any other cause. In my own case, E. W., the cause of the obstruction was obviously strangulation over a band,—the band being the tense, sharp, upper edge of the cyst pedicle.

There is, however, just one symptom that is worthy of mention as occurring both when acute and chronic symptoms are manifested. I refer to general wasting,—which is described as occasionally being extreme. This is due presumably to interference with the lacteals of the mesentery.

The causes which have been suggested as bringing about acute obstruction in cases of mesenteric cysts may be briefly stated. They are,—

(1) Irritation of the solar plexus by pedicle of cyst. (Collet.³⁷)

(2) Compression of the intestine, amounting in some cases to gangrene. (Sutherland.)

(3) Formation of adhesions and strangulation by them.

(4) Onset of acute peritonitis, owing to rupture of the cyst or its pedicle. (Charcot and Davaine.)

(5) Strangulation over a band formed by the pedicle of the cyst. (My own case.)

Differential Diagnosis.—Mesenteric cysts are not uncommonly diagnosed as ovarian or parovarian cysts. This has unquestionably been the most frequent error. Mistaken diagnoses of kidney, liver, spleen and pelvic tumors have been made. Cysts of the urachus, pancreatic cysts, and lipoma of the mesentery are forms of disease not unlikely to be difficult of differentiation. But if the signs and symptoms I have before described be borne in mind, little real difficulty in the majority of the cases will be encountered.

A fluctuating tumor of the abdomen which lies at first laterally but which, enlarging, tends to occupy the middle of the abdomen, which, pointing towards the umbilicus, is freely movable, especially in a transverse direction, capable of rota-

tion on its own axis, surrounded by a zone resonant on percussion and crossed by a belt of resonance, can be no other than a mesenteric cyst.

Termination.—Cases not operated upon may terminate in any of the following ways:

(1) The cyst, especially when hydatid, may retrogress, or remain quiescent. (Laboulbène and others.)

(2) Perforation may occur into the intestine and the contents of the cyst be discharged, as is suggested in the unverified cases of Allbutt and Menzies.³⁸

(3) Perforation of cyst or pedicle into the peritoneum, and the onset of acute peritonitis as recorded by Charcot.

(4) Extreme emaciation may end in death,—the result most probably of compression of or other interference with the lacteals.

(5) Acute intestinal obstruction may ensue.

Treatment.—Operative interference is necessary in both acute and chronic cases. As soon as the abdomen is opened two methods of procedure are open to the surgeon. He may—

(1) Stitch the cyst wall to the parietal peritoneum and open and drain the cavity.

(2) He may remove the cyst after aspiration either by cutting through the opening layers of peritoneum in the pedicle, inverting the edges and applying a series of Lembert sutures, draining the peritoneum or not, according as may seem fit; or if no pedicle is found the peritoneum may be incised over the centre of the tumor and the cyst enucleated.

Authorities who have written upon this subject have generally recommended the former method of treatment, and statistics have been compiled comparing, I believe unfairly, the mortality from the two procedures. The great majority of the cases recorded are the isolated experiences of individual surgeons, and it is only reasonable to assume that statistics based upon them are, as guides to our own conduct, wholly and completely worthless and unsatisfactory.

I venture to think, therefore, that the best recommen-

dation that could be given would be this: that the choice of operation to be performed should vary according to the case.

If a case belongs to the chronic group above mentioned, and especially if there has been no serious general wasting, it would be doubtless advisable and more proper to remove the cyst altogether. If the case is very acute, the sooner the operation is completed the better. Even in this class of cases it might, however, be advisable sometimes to remove the cyst, but, as a routine practice, I must give it as my opinion that the less prolonged and the simpler operation would be attended with a larger measure of success.

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- ²⁵ *Dickinson*: Pathological Society Transactions, 1870.
- ²⁶ *König*: Handbuch der Chirurgie.
- ²⁷ *Bantock*: Quoted by Goggans, Journal of the American Medical Association, 1891.
- ²⁸ *Langton*: Lancet, 1889.

- ²⁹ *Schutzer* : Abhand. der Schwed. Akad., Band xx.
³⁰ *Ducasset* : Loc. supra cit.
³¹ *Sabourin* : Bulletin de la Société anatomique, 1876.
³² *Enzmann* : Dissertation Inaugural, Basel.
³³ *Baker Brown* : Lancet, 1858.
³⁴ *Tillaux* : Thèse de Paris.
³⁵ *Meissner* : Schmidt's Jahrbuch, 134 and 152.
³⁶ *Hovrocks* : Medical Press and Circular, 1888.
³⁷ *Collet* : Thèse de Paris, 1884.
³⁸ *Allbutt* : Lancet, 1883.
³⁹ *Carson* : Journal of the American Medical Association, 1889 and 1890.
⁴⁰ *Brucy* : Études sur les Kystes séreux des Ganglions lymphatique, Thèse de Paris, 1876.

THE PLACE OF THE MURPHY BUTTON IN GASTRO-ENTEROSTOMY.¹

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SINCE Murphy has introduced his button into the surgery of the gastro-intestinal tract a large number of cases of gastro-enterostomy have been reported, in which the operators have availed themselves of the advantages of this contrivance. Surely the number is sufficient to enable us to draw definite conclusions as to the advantages and disadvantages of the button in this particular operation. Of special value in this respect are the reports of those surgeons who have used the button rather often. A collective list of single operations done by different men does not prove as much. The opinion as to the value of the device is too greatly influenced by the success or failure of the respective operations. Not a few have condemned the button, because their first and only attempt did not meet their expectations. There are surgeons who have not used the button at all in the lateral anastomosis between stomach and intestines, and yet believe themselves to be sufficiently well informed to take part in a respectful discussion. That in order to succeed, the application of the ingenious instrument also requires personal experience and strict adherence to the rules laid down by its inventor, has frequently been forgotten.

From a former discussion, which took place in the New

¹ Read before the New York Surgical Society, March 10, 1896.

York Surgical Society about two years ago. I have had the impression that the majority of New York surgeons are more or less opposed to the use of the button in performing gastro-enterostomy, even for malignant disease. In the eight patients who have been subjected by me to this operation with the help of the button, all for cancer of the stomach, the instrument has done so much good and has enabled me to extend the line of operability so much further, that I have thought it not amiss again to invite discussion on this very important question.

No doubt every surgeon has reason to complain that patients with cancer of the stomach reach him too late. This is especially distressing in cases with cancer of the pylorus, because it is just here that an early operation has some chance of producing a permanent cure. In the majority of cases we feel that our hands are tied, that we cannot do the good and thorough work we should like to do. We have to satisfy ourselves with giving the patient temporary relief only; we must perform gastro-enterostomy instead of pylorotomy.

The cause of this lamentable condition is partly due to the great difficulty still experienced by the internal physician in establishing an early diagnosis of an existing carcinoma of the stomach. The principal reason, however, is the great lack of confidence that up to the present date the general practitioner has in our operations on the stomach for malignant disease. And yet how much good can still be accomplished with the palliative operation, even in almost hopeless cases! Some time ago a medical man of large experience witnessed one of my operations on a patient who had a marked cancerous stricture of the pylorus. On lifting the stomach out of the abdomen, the head of the pancreas appeared to be densely infiltrated. A large number of cancerous lymphatic glands were visible and palpable. Metastatic growths surrounded the jejunum in the shape of circular rings for a distance of about two feet. "Well, you are going to close this abdomen, aren't you?" he said, on looking at the

ravages of the disease. "No," I answered; "I am going to do gastro-enterostomy with Murphy's button." The anastomosis was accomplished in a few minutes. To-day the patient—then emaciated to a mere skeleton—has gained over thirty-five pounds and works in a shop with his comrades.

To show that with the help of Murphy's button we can materially widen the indication for gastro-enterostomy for malignant disease of the stomach is the object of this paper. My own eight cases are the following:

CASE I.—J. T., male, aged thirty-nine years. Gastric trouble for the last two years. Lately symptoms of pyloric stenosis. Palpable tumor in epigastrium. Hydrochloric acid present; no lactic acid. Marked cachexia. Referred to me for operation by Dr. Max Einhorn, of New York, August 6, 1894: laparotomy (German Hospital): Large infiltrating tumor in pyloric region, involving duodenum, omentum, and hepatic flexure of colon. Gastro-enterostomy (Woelfler). For this purpose stomach, omentum, and transverse colon are lifted out of the abdomen and the small intestine pressed towards the right. Upper portion of jejunum thus rapidly found. Anastomosis is easily perfected with the button. No additional sutures. Proximal end of jejunum then stitched to the fundus of the stomach with five to six interrupted silk sutures. (Fig. 2.) The same was done in all the following operations, except Case III.

Recovery undisturbed. On the sixth day after the operation some pain in stomach and a few attacks of vomiting. Tenth day after the operation patient out of bed. Discharged with firm cicatrix August 25. Button not found during stay at hospital. Slight œdema of left lower extremity. September 10, good appetite; patient able to take all kinds of food. Bowels normal. Button as far as known not yet passed. Leg more swollen; thrombosis of femoral vein. Died suddenly September 24. No autopsy. I believe that in this case the button had dropped into the stomach, probably on the sixth day.

CASE II.—A. D., male, aged thirty-nine years. Suffered from gastric pain and vomiting during nearly all of the last year. No palpable tumor; no gastrectasy; but ischiochymia; lactic acid present; absence of hydrochloric acid; some cachexia.

Diagnosis: carcinoma pylori (Dr. Einhorn). Laparotomy August 23, 1894 (German Hospital). Pylorus overlapped by the liver, but is not adherent to it; is strictured by a tumor. Multiple infiltrated glands in the greater omentum. Upper portion of jejunum easily found, as in the previous case. On gliding with the fingers downward to reach a coil with a long mesentery, a metastatic growth which surrounds the gut in the shape of a circular ring is encountered at a distance of twenty-six inches from the pylorus. A coil about seven inches farther down is selected for anastomosis and easily attached to the anterior wall of the stomach with the help of the button. No additional sutures. Recovery uninterrupted until the eighth day after the operation. Then sudden sharp gastralgia, defined by patient as an oppressive heavy feeling in the region of the stomach. Vomiting of large masses of a thin fluid of slightly faecal odor. No rise of temperature; constipation; no passage of gas. Lavage of stomach; calomel (one-tenth grain in refracta dosi); bowels move. Probable diagnosis of compression of transverse colon excluded. Vomiting and pain continue. Diagnosis: Button has most probably dropped into the stomach. Under careful nursing patient recuperated slowly. Pain disappeared after about eight days and did not return. Patient soon out of bed. Lately frequent coughing spells with expectoration. Examination reveals tubercle bacilli in the sputum (hospital infection). Patient discharged October 10. Appetite good; all kinds of food are taken and relished; no vomiting. Has gained sixteen pounds within the two weeks. Button not yet passed. Improvement does not last long. Frequent attacks of coughing, night-sweats, fever. Readmitted to hospital November 6. Exitus lethalis November 12. Post mortem: No compression of transverse colon; anastomosis round as if punched out with a forceps; appears a little wider than the circumference of the button; border soft; not the slightest contraction; button within the stomach. Gastric mucosa shows no trace whatever that could be referred to the long presence of the button. Acute cheesy pneumonia of the entire right lung.²

CASE III.—D. H., male, aged thirty-eight years. Complains for the last year and a half. Palpable tumor somewhat to the left of the median line. Symptoms of pyloric obstruction. Very emaciated. Operation October 3, 1895. At the pylorus a nodular

growth of about a walnut's size encroaching upon the anterior gastric wall. Stomach contracted. Woelfler's operation impossible. Stomach with omentum and transverse colon are therefore lifted out of the abdomen and raised upward. The mesocolon transversum is bluntly perforated at a spot, somewhat to the left of the spinal column, which showed a rather scanty amount of blood-vessels, and the borders of this wound are fastened to the underlying bowel by a few stitches. It proved very difficult to identify the upper portion of the jejunum on account of multiple metastases within the abdominal cavity and manifold adhesions between the different coils of the intestines. Von Hacker's anastomosis is then perfected with the button. No additional sutures. Patient reached his bed with a pulse of 84; felt comfortable during the first two days. No rise of temperature; pulse never above 100. On the third day after the operation a laxative is administered. Soon after beginning tympanites, which increased on the following day. Repeated vomiting of a small amount of thin fluid with faecal odor. Lavage of the stomach brings no help. Bowels move somewhat. Intravenous saline infusion of 1200 cubic centimetres. Temporary improvement. Died, October 8, on the fifth day after the operation. Post mortem: No peritonitis; button still in place; jejunum and part of ileum greatly distended; stomach exceptionally small; pylorus not entirely obstructed; its lumen irregular, of the size of a small lead-pencil; posterior gastric wall intact. On analyzing the seat of the anastomosis, which is situated to the left of the spinal column, it is found that a communication had been established between the duodenum, right below the pylorus, and a spot of the ileum about twelve inches above the ileo-caecal valve.³ The proper explanation of symptoms observed in this patient after the operation seems to be this: On the third day after the operation the small intestines had, after the laxative, commenced to regurgitate a great mass of their contents through the anastomosis back into the duodenum. This produced the tympanites, and by pressing some of the liquid through the rigid yet passable pylorus into the stomach, also the vomiting of the thin faecal matter. The case illustrates what mistakes can occur through the presence of multiple adhesions within the abdomen and a small-sized stomach. In carrying out this operation I had carefully searched for the upper part of the jejunum in the usual manner, and had been sure that I had

properly performed a posterior gastro-enterostomy and not a duodeno-ileostomy, as was actually the case.

CASE IV.—M. W., male, aged forty-one years. Sick with gastric disturbances for the last eight months. Moderate ischiochymia; hydrochloric acid present; no lactic acid; palpable tumor. Had been very much opposed to operative interference. Fed per rectum for the last eight days on account of persistent vomiting. Patient extremely cachectic. Referred to me for operation by Dr. Einhorn. January, 1896, laparotomy (Post-Graduate Hospital). Narcosis stopped as soon as the abdomen is incised. Anterior gastro-enterostomy with the button. No additional sutures. Feeding by mouth begun as soon as patient had reached his bed. Euphoria for the first six days. On the seventh the first abdominal sutures are removed. During the night a marked sneezing spell. On the following morning the visiting assistant found that a part of the wound had separated and a few coils of the small intestine been pushed out of the abdomen. They had evidently been out for a number of hours and were found to be matted together with the covering gauze and cotton. Immediate reduction and insertion of new sutures seemed imperative. This was done with all aseptic precautions under constant irrigation with saline water. Soon after this procedure the temperature began to rise and the pulse went up. On my arrival at the hospital a large amount of slightly colored water could be pressed out of the abdomen between the additional sutures. In spite of stimulation patient sank and died after twelve hours.

CASE V.—H. B., female, aged thirty-five years. Palpable cancer of the stomach. Moderate emaciation. July 1, 1896, anterior gastro-enterostomy with the button easily and rapidly done (German Hospital). No additional sutures. Died July 3 of septic peritonitis. Post mortem: Perforation at seat of approximation. Button had cut through duodenum in length of about one-half inch. On unscrewing the instrument it could be well demonstrated that the running suture held the tissue well drawn over the edge of the button around the central canal. Probably on account of irregular traction on the coil of the jejunum the gangrene of a part of the latter had rapidly set in and perforation occurred before a thorough agglutination had taken place.

CASE VI.—G. P., male, aged forty-two years. Admitted to German Hospital in July, 1896, on account of extreme anæmia. Intra-abdominal malignant growth suspected, but its existence not diagnosed. Discharged unimproved. Readmitted October 26 with large tumor of the stomach. Frequent vomiting; great pain; and marked anæmia. Patient begged for relief at all hazards. October 31, exploratory laparotomy. Tumor of pylorus involves a greater part of the gastric wall, especially towards the lesser curvature. Gastro-enterostomy still feasible. Is carried out with the button (Woelfler). Additional continuous Lembert suture with silk, bringing in apposition about one-third of an inch more of serous surfaces around the edge of the button. The latter is thus completely buried. Patient stood operation very nicely. Feeding through mouth begun at once; took almost one quart of fluid during the first twenty-four hours. Vomiting on second and third day successfully overcome by repeated lavage. Soon out of bed. Died of exhaustion November 15. Post mortem: No peritonitis; anastomosis firm and wide; button in stomach.

CASE VII.—S. K., male, aged thirty-one years. Stomach trouble for the last six months. Incessant vomiting. Has lost over sixty pounds. Careful analysis of the stomach contents shows ischiochymia, lack of hydrochloric acid, presence of lactic acid. Patient extremely emaciated. Referred to me for operation by Dr. Einhorn. November 7, gastro-enterostomy (German Hospital). Pylorus underneath the liver presents an infiltrating tumor. On lifting it out of the abdomen with omentum and transverse colon a great number of smaller and larger infiltrated lymphatic glands are found; the head of the pancreas is carcinomatous. Upper portion of jejunum for a length of about two feet surrounded by at least ten to twelve circular tumors of the same character as that of the pylorus. Anterior gastro-enterostomy with the button. Additional continuous Lembert suture of silk. Patient reached his bed with a pulse of 80. Uninterrupted recovery. Discharged December 3. Presented to the New York Surgical Society December 23, 1896 (*ANNALS OF SURGERY*, Vol. XXV, No. 3, p. 369), and March 10, 1897. Has gained thirty-seven pounds. Works in a shop for the last four weeks. Button in stomach as proved by the X-rays. (See skiagraph.)⁴

CASE VIII.—J. M., male, aged forty-five years, of New York, has vomited for the last six months soon after meals; has lost forty to forty-five pounds. In the epigastrium a large sausage-shaped hard tumor, painful to the touch. No ectasy of the stomach; no succussion; metastatic growths palpable within abdomen. Solid food does not pass pylorus. Meat, potatoes, and rice are washed out of the stomach eighteen hours after the meal. Patient always hungry. Referred to me for operation by Dr. S. M. Michaelis, of this city. Laparotomy February 5, 1897 (German Hospital). Large tumor, involving pylorus and adjacent parts of the stomach. No visible ectasy. In pushing the hand under the left ribs towards the cardia the fundus, free of cancer, is detected. It is impossible to properly expose the posterior wall of the stomach on account of many adhesions and multiple glandular enlargements. Woelfler's operation alone is feasible. For this purpose the stomach is drawn with difficulty into the wound and kept there through the efforts of an assistant. It requires some skill to expose within the abdominal wound a small portion of the gastric wall about two inches away from the border of the growth, large enough to insert the button. Gastro-intestinal anastomosis by suture, even not more than one inch long, would have been a technical impossibility. Coil of the jejunum with a long mesentery selected. Button closed. Additional continuous Lembert suture (silk) very difficult. As soon as traction on the stomach ceased, the place where the anastomosis had been made disappeared under the left ribs. Aseptic course; vomiting on the second day and third day. Lavage followed by immediate injection into the stomach of one tablespoonful of Epsom salts dissolved in a few ounces of water. Bowels move the following night. Then obstinate singultus, which is successfully overcome with hypodermics of morphine in very small doses. Patient out of bed six days after operation. Left hospital February 26; eats now everything; no vomiting; has gained ten pounds within the last twelve days. Button, as far as known, not yet passed.

Before discussing several essential points, which come up in perusing these histories, a brief review of recent literature on this subject may perhaps be welcome. I shall mainly consider the reports of those gentlemen who have used the button more than once.

In 1894, H. Mynter, of Buffalo, reported three cases, with one recovery and two deaths. The latter was due to exhaustion in one case (twelve hours after the operation). In the other patient, "the smallest size button was used," as the operator had no other at the time. The button was so small that it was impossible for it to hold a sufficient amount of tissue to retain the margin of a thick wall as that of the stomach within its grasp. The wall slipped away from the clasp of the button, the gastric contents escaped into the peritoneal cavity, and caused death.

Lately Theodore A. McGraw, of Detroit, read a paper before the Detroit Medical and Library Association, in which he gives the history of two cases of malignant pyloric obstruction, successfully operated upon by posterior gastro-enterostomy with the help of Murphy's button. A third case, recently operated upon by the same surgeon, with those two published, have been embodied in the table given below.

The following reports come from German clinics. It has been most interesting to me to watch the recognition the button has found by German operators. When I had published in Nos. 37 and 52 of the *Centralblatt für Chirurgie*, 1894, the experience I had had with the Murphy button in the surgery of the gastro-intestinal tract within the first eight months of 1894 (eight cases), Dr. Zielewicz, of Posen, as the first, answered in a rather comical way, by giving the report of an unsuccessful case of gastro-enterostomy, in which the patient had died on the eighth day after the operation, after having swallowed half a pound of sausage that had been smuggled into the hospital. At the autopsy a perforation at the seat of the approximation was found, and the button hanging on the thread of silk, which had been used for tying in the two halves. Zielewicz asked, What caused the death of the patient, the sausage or the button? At the end of his article, he stated that he preferred to stick to needle and thread. In my answer to Zielewicz's article, *Centralblatt für Chirurgie*, 1894, No. 52, I proved that in view of the condition found at the post-mortem the button had evidently been wrongly inserted.

Then in *Centralblatt für Chirurgie*, 1895, No. 4, there appeared a brief note of Professor König, in which he also preferred to stick to the suture. He had not yet made use of the button in an operation, but expressed the fear that the ease in establishing entero-anastomosis with the help of the button might induce inexperienced men to perform an operation which they otherwise would not dare to undertake. These words, coming from one of the most eminent and leading surgeons of Germany, had their weight. Instead of being tried as to its merits everywhere, the button was used by a very few surgeons only. Yet these few (Schede, Czerny, Woelfler, Sieck, Kuenmel, Plettner, Brenner) had such gratifying results, and the experiments with the button they had made by their assistants on animals, showed such ideal macroscopic and microscopic approximation, that they all soon became warm friends of the ingenious instrument.

In 1895 the late R. von Frey, assistant of Professor Woelfler, then in Gratz, published in a brilliant article, on the technique of intestinal suture,⁵ three successful cases of posterior gastro-enterostomy (von Hacker) done with the help of Murphy's button. One patient was operated by von Frey, the other two by Woelfler.

In 1894 I had proposed,⁶ rather to do von Hacker's gastro-enterostomy, in order to put the button in as low a spot of the gastric wall as possible, thus favoring its entrance into the jejunum. I had found at the autopsy of my second case of gastro-enterostomy, carried out according to Woelfler, that the button had dropped into the stomach. (See above list.)

At the last congress of German surgeons at Berlin, 1896, Professor Czerny, of Heidelberg, reported eleven cases of entero-anastomosis with the help of the Murphy button.⁷ In five gastro-enterostomy had been successfully done, four times for cancerous, once for cicatricial stricture of the pylorus. In each of these five cases the anastomosis had been placed on the posterior side of the stomach. Czerny considers the invention of Murphy's button an important step in the evolution of intestinal suture. In his opinion, the

method saves time, which, in many cases, is of great importance. It is also easier in its technique than the exact intestinal suture. He thinks it will come into more common use, but he would like to have the button made of an absorbable material. Perhaps mucilage, hardened in formaline, would answer the purpose.

The most thorough trial the button has so far had abroad was given it in the *Neue Allgemeines Krankenhaus* in Hamburg-Eppendorf by Schede, Sieck, Kuemmel, and Rieder. Two important articles have been published from this source. The one is written by H. Graff, assistant,⁸ the other by Kuemmel himself, the successor to Professor Schede.⁹

Among twenty-five operations mentioned by Graff and done by Schede, Sieck, and Rieder, there were fourteen gastro-enterostomies, five for benign pyloric stenosis, with five recoveries, and nine for malignant, with three recoveries. Besides, Schede often made use of the button in his private practice, always successfully. In none of the fatal cases was death due to the button, as proved by the autopsy. In one the button had indirectly helped in causing the exitus lethalis; too large an instrument had been selected for the anastomosis. It blocked the lumen of the duodenum, causing the gall to flow into the stomach. During the attempt at washing the stomach on the following day the patient suddenly died. Post mortem did not reveal the cause of this accident.

Kuemmel used the button in all fifteen times, within one year (May, 1895, to May, 1896); among these, nine times in gastro-enterostomy,—viz., eight times for cancerous disease, once in a benign case,—with seven recoveries and two deaths. Cause of death was in the one case collapse on the day following operation; in the other, peritonitis induced by an insufficient suture. Here Kuemmel had tried a modified suture. After opening the stomach, he had pushed the button into one corner of the wound and closed the incision with a double continuous suture. He had done this repeatedly before with impunity. After this death, due to this modification, he now strongly advises always to use the purse-string suture, as originally devised by Murphy. Kuemmel con-

siders the button "a specially valuable help in gastro-enterostomy on very weak patients, where every minute less consumed in the operation means a gain for the patient."

In order to be in our work as radical as possible, he also proposes to do pylorotomy in very weak patients, where the pyloric tumor can still be entirely removed by excision, in two times,—viz., first, gastro-enterostomy with the button, and three weeks later extirpation of the carcinoma. The cut end of the divided stomach and duodenum are then closed separately by suture. After successful gastro-enterostomy, these patients generally recuperate so rapidly that they are well able to stand a second operation after about three weeks.

Brentano¹⁰ gives a casuistic report of eighty-one gastro-enterostomies done with the button, with forty-three recoveries and thirty-eight deaths, or a mortality-rate of 46.91 per cent.

Duvivier, of Paris,¹¹ has collected thirty-seven gastro-enterostomies done with the same mechanical means, with twenty recoveries and seventeen deaths, or a mortality-rate of 45.94 per cent.

In a recent tabulation of Dr. J. B. Murphy (not yet published), comprising forty-five cases of gastro-enterostomy performed with his button, and of which I make use with the kind permission of Dr. Murphy, I find twenty-eight recoveries and seventeen deaths, or a mortality-rate of 37.77 per cent.

From answers to a circular sent out by me to American surgeons, I have succeeded in collecting twenty-five cases of gastro-enterostomy, most of them not published, done with Murphy's button. Of these twelve recovered and thirteen died. Adding to these twenty-five my own eight cases, with five recoveries and three deaths, we have a series of thirty-three cases, with seventeen recoveries and sixteen deaths, or a mortality rate of 48.48 per cent.

Patients living less than fourteen days after the operation were counted (without regard to the cause of death) as "not recovered." The cases are specified in the following table.

No.	Operator.	Sex.	Age.	Malignant Stricture.	Benign Stricture.	Anterior Operation (Woolfen).	Posterior Operation (von Hacker).	Were any Additional Interrupted Sutures, or was a Continuous Suture made Around Approximation?	Recovery from Operation.	Died. How many Days after Operation?	Cause of Death.	Still Alive. How long after Operation?	Button passed per Anum. On which Day after Operation?	Button found in Stomach as proved by Autopsy.	Remarks as to Metastases in Abdominal Cavity found at Time of Operation, etc.
1	Oscar H. Al-lis, Philadel-phia.	Male.	40	I	I	I	I	Additional su-ture after clamping the sides of the button; I think contin-uous.	Yes; returned to moderate degree of ac-tivity; gained flesh for a time.	One and a half years.	Extension of disease.	...	...	Yes; but-ton had lain in the stomach up to the time of death.	Whole region about the pylorus in-volved.
2	John Ash-hurst, Phila-delphia.	Male.	Past mid-dle life.	I	I	I	No.	No.	...	One day; three days.	Simple exhaustion from enfeeblement before oper-ation.	...	...	Yes, as placed. Local condition progressing favor-ably.	...
3	John Ash-hurst, Phila-delphia.	Fe-male.	Past mid-dle life.	I	I	I	No.	No.	...	One day; seven days.	Unknown; no autopsy al-lowed.	...	...	...	...
4	Charles K. Bid-don, New York.	Male.	50	I	I	I	No.	No.	Uneventful.	Living six-teen mos. after op-eration.	(?) There was a large mass at last interview in cecum.	Six-teen mos.	Four-teenth day.	...	...
5	Charles K. Bid-don, New York.	Male.	39	I	I	I	No.	No.	Died 19 days after opera-tion; anasto-mosis made too low down in ileum.	Nineteen days.	Inanition.	...	...	...	...
6	A. T. Cabot, Boston.	Fe-male.	41	I	I	I	Lembert	Lembert	stitches of fine silk all way around, interrupted.	Seventeen days.	Starvation. Persistent vom-iting; strength kept up for two weeks by enemata, then rapid failure.	...	...	Sloughs had cut through button ad-herent in	Nodule on an-terior surface of liver and involvement of retroperi-

No.	Operator.	Sex.	Age.	Malignant Stricture.	Benign Stricture.	Anterior Operation (Woolf).	Posterior Operation (von Hacker).	Were any Additional Interrupted Sutures, or was a Continuous Suture made around Ap- proximation?	Recovery from Operation.	Died. How many Days after Opera- tion?	Cause of Death.	Still Alive. How long after Operation?	Button passed per Anum. On which Day after Operation?	Button found in Stom- ach as proved by Autopsy.	Remarks as to Metas- tases in Abdominal Cavity found at Time of Operation, etc.
7	Chas. K. Cole, Fe- Helena, Montana	male.	46	I		I		Neither.	No.	Five days.	Nephritis from ether inhala- tion.		Button in place.	toncal glands.	
8	B. F. Curtis, Male, New York.	Male.	56	I	I	I		Continuous Lembert.		Eleven days.	Chronic intestinal obstruc- tion; old peritonitis.		Button in stomach still adhe- rent to wound.	Death caused by operation because it lessened the <i>vis a tergo</i> necessary to overcome ob- struction; no local perito- nitis; wounds aseptic.	
9	B. F. Curtis, Male, New York.	Male.	66	I	I	I		Continuous Lembert.		Two and a half days.	Inanition from continued vomiting.		Button in place; union good.	Button in Lavage brought up some grape- skins (eaten surprisingly), possibly vomiting due to obstruc- tion of button.	
10	L. W. Hotch-Fe- kiss, New York.	male.	29	I	I	I		Continuous Lembert.	Good.	Twenty- six days.	Exhaustion.		Found, post mor- tem in as- cending colon.		
11	F. Kammerer, New York.	Male.	50	I	I	I		Additional interrupted sutures.		Two days.	Inanition, exhaustion.			<i>In loco.</i>	

12	F. Kammerer, New York.	Female.	36	I	I	Additional interrupted sutures.		Four days.	Inanition, exhaustion.									<i>In loco.</i>
13	F. Kammerer, New York.	Male.	34	I	I	Additional interrupted sutures.		Eleven days.	On eighth day drank much fluid; developed signs of peritonitis and died on eleventh; line of union gave way at one point. Uremic symptoms.									In stomach.
14	F. Lange, New York.	Female.		I	I			Five to six days.			No.							No autopsy made.
15	F. Lange, New York.	Female.		I	I		I	Eight months.	(?)		No.							No autopsy made.
16	F. Lange, New York.			I	I		I	Ten months.			No.							No autopsy made.
17	F. H. Markoe, New York.	Male.	48	I	I			Had re-turned home after gaining flesh and free from symptoms.	Exposure; grippie; pneumonia.									Metastases found in peritoneum, and also on the liver.
18	Theodore A. McGraw, Detroit.	Female.	61	I	I	Continuous Lembert suture.	Yes.	Yes, after arriving at his home.	Unknown.									Whole pyloric extremity of stomach involved and neighboring glands.
19	Theodore A. McGraw, Detroit.	Male.	47	I	I	Continuous Lembert suture.	Yes.											Lymphatic glands involved in all cases.
20	Theodore A. McGraw, Detroit.	Female.	60	I	I	Continuous Lembert suture.		Two days after operation.	Exhaustion.									Lymphatic glands involved in all cases.
21	Thomas S. K. Morton, Philadelphia.	Male.	29	I	I	Six interrupted sutures.	Yes.	Fifty-eight days after operation.	Exhaustion; extreme jaundice came on five weeks after operation.									Everything about pylorus plastered together; pancreas and liver evidently involved; no

No.	Operator.	Sex.	Age.	Malignant Stricture.	Benign Stricture.	Anterior Operation (Wohlfel).	Posterior Operation (von Hacker).	Were any Adhesions or was a continuous Lembert Suture made around Aproximation?	Recovery from Operation.	Died. How many days after operation?	Cause of Death.	Still Alive. How long after Operation?	Button passed per Annum. On which day after Operation?	Button found in Stomach as proved by Autopsy.	Remarks as to Metastases in Abdominal Cavity found at time of Operation, etc.
22	M. N. Richardson, Boston.	Male.	54	I	.	I	.	No.	.	Third day after operation.	Extravasation around button followed by peritonitis.	.	.	.	other extensions or metastases. Nodules in liver.
23	W. W. Van Arsdale, New York.	Male.	37	I	.	I	I	No; simple overhand suture on button.	Yes.	Tenth day after operation.	Unknown; no peritonitis; good union; large anastomosis.	.	.	Yes.	Cancer of pylorus commencing to spread in stomach and duodenum; many lymphatic glands involved.
24	R. F. Weir, New York.	Male.	25	Ulcer of stomach.	.	I	.	No.	.	Twelve hours.	Operation, etc., a secondary one to a gastro-enterostomy, Kocher's method, which resulted in bile contents regurgitating in stomach; egress from stomach by gastro-enterostomy operation being imperfect; then on fifth day a new gastro-enterostomy with Murphy's button done.	.	.	.	
25	Member of the New York Surgical Society (name could not be ascertained,—blank was not signed).	Female.	48	I	.	I	.	No.	Uneventful; poor condition at first, but no worse than before operation.	Forty days.	General asthenia; cachexia marked, increased by second tumor at lower end of descending colon.	.	.	Yes.	

Tabulating the reports of those operators who have done gastro-enterostomy with the button three times or oftener, we arrive at the following result:

	No. of Cases.	Recovered.	Died.
1. Allgemeines Krankenhaus, Hamburg- Eppendorf (Schede, Sieck, Riedel)	14	8	6
2. V. Czerny, Heidelberg	5	5	..
3. J. D. Griffith, Kansas City, Mo. ¹² . . .	4	3	1
4. F. Kammerer, New York City	3	..	3
5. H. Kuemmel, Hamburg	9	7	2
6. F. Lange, New York City	3	2	1
7. Theodore A. McGraw, Detroit, Mich.	3	2	1
8. W. J. Mayo, Rochester, Minn.	5	4	1
9. Willy Meyer, New York City	8	5	3
10. H. Mynter, Buffalo, N. Y.	3	1	2
11. F. Terrier, Paris ¹³	3	1	2
	—	—	—
	60	38	22

This gives a mortality-rate of 36.66 per cent.

Tabulating those cases only which were done with the button by the same surgeons for cancerous obstruction of the pylorus, we get the following result:

	No. of Cases.	Recovered.	Died.
1. Allgemeines Krankenhaus, Hamburg- Eppendorf (Schede, Sieck, Riedel)	9	3	6
2. V. Czerny, Heidelberg	4	4	..
3. J. D. Griffith, Kansas City, Mo.	4	3	1
4. F. Kammerer, New York City	3	..	3
5. H. Kuemmel, Hamburg	8	6	2
6. F. Lange, New York City	3	2	1
7. Theodore A. McGraw, Detroit, Mich.	3	2	1
8. W. J. Mayo, Rochester, Minn.	3	2	1
9. Willy Meyer, New York City	8	5	3
10. H. Mynter, Buffalo, N. Y.	3	1	2
11. F. Terrier, Paris	3	1	2
	—	—	—
	51	29	22

which is equal to a mortality of 43.13 per cent.

Tabulating those operations which were done with the button for benign stricture, we obtain the following result:

	No. of Cases.	Recovered.	Died.
1. Allgemeines Krankenhaus, Hamburg-Eppendorf	5	5	..
2. V. Czerny, Heidelberg	1	1	..
3. H. Kuemmel, Hamburg	1	1	..
4. W. J. Mayo, Rochester, Minn.	2	2	..
	9	9	..

showing a mortality of 0.00 per cent.

The last collective investigation which I could find in American literature has been published by Murphy in the *Medical News*, February, 1895.¹⁴ He records eighteen cases of gastro-enterostomy, with twelve recoveries and six deaths. In discussing this operation he says, "It is my opinion (and my practice is in accordance with it) that patients who are not in a condition to withstand a pylorotomy should not be operated upon." In accordance with this opinion, he sums up the group "gastro-enterostomy for malignant disease" as follows: "Gastro-enterostomy should never be performed on an extremely cachectic patient."

I do not agree with Murphy on this point. I think we have not the right to deny help to a patient in this deplorable condition, if there is still the slightest hope for a successful operation. If we define the work of the medical man as that of trying to save life and to ameliorate suffering, we ought to operate for obstructing pyloric cancer, even on "extremely cachectic patients," with the same propriety as we do in such patients gastrostomy for obstructing carcinoma of the œsophagus. There is in practice comparatively little difference whether the patient vomits soon after having swallowed or a few hours after his having partaken of food. In both instances the patient starves to death.

I see that Dr. McGraw shares this my opinion. He says in conclusion of his paper alluded to above, "I have briefly described these two cases to call the attention of the

profession once more to the relief, which surgery can give to these hopeless cases which it can rarely cure. It is a mistake for physicians to feel and say that it is not worth while to subject a patient to an operation which can only be of temporary benefit. Many of these patients live one, two, or even three years after a gastro-enterostomy. The most of them recover from the operation. If successful, there follows a long interval of relief and comfort, and death, when it comes, comes in a less terrible form."

Just in these extremely cachectic patients we feel almost the necessity to shorten the time of operation as much as possible, and reduce the handling of the intestines to a minimum, the two factors that combined with the effects of the general narcosis produce in these almost bloodless operations the so-called "shock." It has often seemed to me, in my operations on the stomach for malignant disease, in gastrostomy, as well as in gastro-enterostomy, that we have to fear the effect of general narcosis more than the operation itself. As long as we get the patients in this desperate condition from the hand of the internal physician, we will do wisely to avoid general narcosis as much as possible. This can be accomplished with Schleich's infiltration anæsthesia. So far I have proceeded in this way twice in gastrostomy successfully, but not yet in gastro-enterostomy. In one of the cases recorded (No. 4) general narcosis (chloroform drop by drop after cocainization of the nostrils) was used to cut down through the parietal peritoneum. The rest of the work could be well finished without anæsthesia. Czerny¹⁵ has done a gastro-enterostomy with the button under cocaine anæsthesia.

That Murphy's button enables us to handle the bowels as little as possible in gastro-enterostomy, that it often helps to reduce the time of the operation, and therewith that of the general narcosis, no unbiased man will deny. I believe the time will come, just in operation for cancer of the stomach, when we all can well put mechanical devices aside and only make use of the simplest and best and most surgical method of establishing intestinal anastomosis,—namely, with the help

of needle and thread. But this time, I fancy, will come in a rather roundabout way only. It will never come, unless we surgeons have first succeeded in thoroughly demonstrating to the general practitioner that even in remarkably emaciated patients surgery can still bring help; that even cases with multiple metastasis within the abdomen do recover from the operation, and gain in weight and strength and moral courage. This time, I fear, will never come, unless the general practitioner has repeatedly seen that his patients, previously starving to death under his eyes, are enabled by the operation to return to his care after two or at the latest three weeks from the surgeon's hand, sometimes for many months of treatment equally satisfactory to patient and physician, and that although after months many of these patients must pass away by the effect of the continuous existence of the original disease, most of them die without ever again having been troubled by a single attack of vomiting. That such successful operating can be best accomplished in the majority of these cases with the help of Murphy's button, I am fully convinced. I am also certain that if of two equally good surgeons, operating on equally cachectic patients the one does all his gastro-enterostomies for carcinoma of the stomach with the help of the button and the other only with needle and thread, then he who uses the button will have a smaller percentage of deaths through the operation, and will bestow the benefit of the anastomosis on more patients than the one who refuses to work with the button. The same holds good for pylorotomy for cancer. If favorable personal statistics of gastro-enterostomy, more yet of pylorotomy, for cancer come from all quarters of the globe; if the exploratory incision, which is still so often a mere autopsy *in vivo*, becomes less frequent, and a far-reaching beneficial effect is oftener than now the result of our operations in malignant disease of the stomach, then the general practitioner will gain more confidence in these operations than he has today; then he will consider the recovery of his patient in the surgeon's hands to be the rule rather than the exception; then he will, I hope, at last begin to send these cases to the

surgeon as soon as he has made the diagnosis or probable diagnosis. And then, if we can operate at a sufficiently *early* stage of the disease, we may indeed dispense with Murphy's button. It will be of little difference *then*, whether the operation last ten to twenty minutes longer or not.

Of course, I do not lose sight of the necessity that in order to get so far the progress in medical and chemical research must first give us the means to diagnosticate the presence of gastric carcinoma in its incipiency. If this were accomplished—and why should it not be accomplished soon?—cancer of the pylorus may as well be considered a curable disease as cancer of the breast may now be so regarded by making use of improved methods of operation.

The advantages of Murphy's button in carrying out gastro-enterostomy are so striking and manifold that I ask your kind permission to enumerate them here very briefly, although they are well known to every one of you.

(1) The anastomosis is made very rapidly. Six to eight minutes is the time generally used for this purpose. There is no surgeon living who can work equally quick with the suture. I am sure that almost every surgeon who used the button in gastro-enterostomy for the first time has been struck by the rapidity and simplicity of the method. If he had properly timed his work, the difference in comparing the time used with the button with that consumed in applying the suture, must have been at least ten to twelve minutes, often more. If surgeons should have been unable to save time in doing gastro-enterostomy with the button, the observation simply means: lack of experience in handling the ingenious instrument. To insert the button properly and rapidly, requires practical experience as every other method.

That the saving of time is of very great importance in gastro-enterostomy for malignant disease on extremely cachectic patients, that here really every minute counts, I have mentioned above at length. It is true, the actual time for properly finishing the anastomosis with the button has been somewhat increased lately, since it has been found advisable

in gastro-enterostomy to add a continuous Lembert suture, or a number of interrupted Lembert stitches, around the seat of approximation. In gastro-enterostomy I deem this suture very essential, and would strongly advise to add it in every case of this operation.¹⁶ My patient No. 5 died from perforative peritonitis. Had I taken the little trouble and used five minutes longer in applying the suture, I do not see why my patient should not have recovered. Patient had reached the bed with a pulse of 84. The operation went on without an accident, and the usual asepsis had been preserved. Every one of the authors mentioned above favors this additional suture in gastro-enterostomy as an important safe-guard. Of thirty-nine patients mentioned above, in whom additional sutures were put in after the insertion of the button, twenty-nine recovered and ten died. Of course, the additional suture as such did not save the patient's life. But in none of the ten cases that succumbed was the cause of death perforation at the seat of approximation with consecutive septic peritonitis.

Murphy himself was in 1895 still opposed to it. In No. 3 of his conclusions¹⁷ he says, "A supporting suture outside of the button is not necessary, except for the relief of tension." In the text of this chapter, he has thus expressed himself, "A few interrupted sutures, half an inch from the button, between the intestines and stomach may be necessary when there is great traction of the coil of intestine approximated, but I have so far not found a case in which I considered it indicated." This tension or traction seems to me is present in almost every case of gastro-enterostomy, especially if we operate according to Woelfler's method. I prefer the continuous suture. It should never be inserted right at the edge of the button, but one-third to one-half inch away from it. This can be well done, if we approximate the surface of the stomach and intestine nearest the button with our left hand, or in case of great tension by the two hands of the assistant. In this way the button is really buried. It makes, then, no difference whether the necrosis of the ring of tissue of the intestine grasped by the button sets in earlier than that of the stomach.

We also need not worry that the wall of the coil of intestine, which had been brought up to the stomach, might be subjected to undue pressure by the button. The wide approximation of serous surfaces around the button prevents leakage with absolute certainty.

(2) The patient can be fed by mouth as soon as he has recovered from the anæsthetic. Perhaps the same could be done when the suture had been used, yet so far no surgeon ever dared to do so.

(3) The anastomosis does not contract.

It has been demonstrated by a great number of autopsies that the opening does contract, sometimes materially, if the approximation had been made with the suture or its substitutes formerly devised. This contraction is the necessary consequence of physiological tissue-repair. We therefore make, in using the suture, an anastomosis of at least three to four inches in length. The button, however, cuts out by necrosis that portion of the tissue which is otherwise held in permanent approximation by the suture or its former substitutes. This hole is as large as the diameter of the button; it is sharp and round as if punched with the forceps. Three years ago I demonstrated before this society a specimen removed from patient No. 2 (see above list) eleven weeks after the operation. The anastomosis was even a little larger than the button.¹⁸ In this case an additional Lembert suture had not been made. Whether this latter will favor contraction has yet to be seen. So far reports do not point in this direction. Graff cites a case, where the additional sutures had been put in. Six months and a half after the operation, at the autopsy "the communication between stomach and jejunum was thorough and wide." The patient in whom I performed pylorotomy for benign stricture, February 24, 1894, and implanted the duodenum in the posterior wall of the stomach, is perfectly well to-day. She has gained seventy pounds and has no trouble whatever.¹⁹ I am certain that if the anastomosis wherever it is made with the button can carry out the function for which its establishment had been planned, it does

not contract. If contraction does occur in an uncomplicated case, it has to be looked upon as an exception.²⁰

(4) On account of the small space needed in order to insert the button gastro-enterostomy can still be carried out, where the operation with the suture is a technical impossibility.

My case, No. 8, nicely illustrates this point, which deserves to be emphasized. Its real existence will be recognized by the surgeon in special cases during the operation.

There seems to be only one drawback to the use of the button in gastro-enterostomy,²¹—viz., it often drops into the stomach.

The first case recorded in literature where this accident had happened, as proved by the autopsy, is my second case on the above list. As mentioned before, I advised on this ground, in 1894, always to use von Hacker's operation when feasible. But also in this position, the button does not always follow the current of the gastric contents. In the three cases of posterior gastro-enterostomy, reported by Frey, the button was voided. In Czerny's five cases, all done according to von Hacker, the button passed four times between the eighth and eighteenth day. Once it had not been found after three and a half weeks. The patient, however, had not complained at any moment; was perfectly well when he left the hospital. There is no reason to assume that the button had slipped into the stomach. In Kuemmel's six cases of posterior gastro-enterostomy the button was not found in a single case. But it could be demonstrated by subsequent post-mortem examination, respectively by subsequent operation (pylorectomy after primary gastro-enterostomy), that the button had left its place and was *not* in the stomach nor in the intestinal tract. Kuemmel concludes, I think with propriety, "that we ought to be cautious in assuming that the button had entered the stomach, if its passage *per vias naturacs* had not been noted." Often the button may have passed unobserved, embedded in hard faecal masses, sometimes it is retained in the ampulla recti for many months without causing symptoms (necessity of digital ex-

ploration!). Continuation of the gastric trouble (pain, etc.) will be due rather to the existence of the original disease than to the presence of the foreign body. In the future, the X-rays will help us to find out whether the button is within the stomach. I repeatedly looked with the fluoroscope through my patient No. 7, who had not had pain after the operation for a single moment, but could not find the button. An exposure of fifty minutes to the rays proved it to be within the fundus of the stomach. The accompanying plate, reproduced from this skiagraph, shows the button in the region of the fundus.²² (Fig. 1.) The negative presents it much more clearly.

In five of my cases, which can be utilized for this question, the button had dropped into the stomach three times, as proved by the autopsy and the X-rays. In two other cases it had not been found in the stool during the three or four weeks the patient had stayed at the hospital. Woelfler's operation had been done in each case.

Among eight surviving cases reported by Graff, the button passed once on the twenty-first day after the operation, in another case on the thirty-fourth day; in five cases it did not pass within thirty-two to sixty days of hospital observation. In one patient it was found within the stomach at the autopsy, six and a half months after the operation. In all these cases also Woelfler's operation had been performed.

In twelve patients, who are mentioned in the above given table and had been observed a sufficiently long time, the button passed twice per anum after the anterior operation and twice after the posterior one; four times it was found within the stomach,—viz., three times after the anterior operation and once after the posterior one; in four patients the discharge of the button had not been noticed during the time of observation. The analysis of these thirty-nine cases seems to prove that the posterior attachment of the intestinal coil greatly favors the passage of the button per anum.

That the button ever finds an exit through the anastomosis after it has once dropped into the stomach, I do not believe. On account of its weight the button always rests at

the most dependent spot of the stomach. It will roll around according to the latter's work and the position of the patient. If Woelfler's operation had been performed, the anastomosis would be made the lowest spot only with the patient lying on his stomach. The approximation, done according to von Hacker, will be more favorable to a later exit of the button. With the patient on his back, the anastomosis certainly is quite often the most dependent place. Still, it seems to me, there is little chance for a discharge of the button. If the stomach be empty, there is lack of the necessary *vis a tergo*; the instrument is too small to be grasped by the gastric wall and pushed forward. If the stomach be full, the button may often reach the hole, embedded in a mass of compact food. But then the diameter of this mass is too large. The softer material will slowly pass on, the button is retained.

It is to be regretted that the authors do not mention whether they fastened the edges of the divided mesocolon, after having drawn them apart, with a few stitches to the posterior wall of the stomach when doing the posterior gastroenterostomy. If this be not done, the wound in the mesocolon will contract. Although it will allow the passage of fluid, it may easily hold back a foreign body of the size of the button, and will force its entrance into the stomach by retrograde peristalsis.

The interesting point in this accident, observed by all authors, is that the presence of the button within the stomach has never caused any trouble, except a rather short subjective one in my case. The mucous lining of the stomach had not been found affected at the autopsy in a single instance.

Still I consider this point a sufficient reason to do the operation for benign stricture of the pylorus with the suture. Although we know that the button does not do harm within months of its presence within the stomach, yet we cannot say what it might do there after many years. In these patients, the element of saving time during the operation is generally of less importance. We also find sufficient room to make a four-inch anastomosis.

Still another point induces me not to use the button in gastro-enterostomy for benign stricture,—viz., the great thickness of the gastric wall, which we are apt to encounter. The malignant pyloric obstruction develops rather rapidly, generally within months. After a short time surgical help is indicated. The muscularis almost always has not had time to become materially hypertrophied. This is different in cases of benign stricture. My last patient, in whom I made use of the suture, operated upon January 5, 1897, waited fully four years after the first appearance of gastric trouble, and three years after a doctor had strongly advised an operation, before she could make up her mind to submit to surgical interference. At the operation the wall of the stomach was found to be more than half an inch thick. The muscularis alone measured fully three-eighths of an inch and the mucosa was as thick as ordinary paste-board. It would have been simply impossible to have the half of the button inserted. In another case of this kind, operated upon with the suture October 22, 1896, the wall was less hypertrophied. My first case of gastro-enterostomy performed with the suture, December 31, 1888, was done for cancer. In none of the eight cases of malignant pyloric stenosis reported above, did I have special trouble in tying the button in place.

With reference to the operation itself, a few points may be worth mentioning. Thorough preparation, if possible, for at least one to two days in weak patients is very valuable. I prefer stimulation per rectum (seven ounces of saline solution, or peptonized milk with somatose, egg, etc., with one ounce of brandy, whiskey, or claret, and one-fifteenth or one-thirtieth of strychnine every four to six hours) besides the fluids the patient can still take by mouth. On the day of the operation the stomach is washed twice, early in the morning and half an hour before the operation. The operating field is carefully disinfected *before* the patient is put on the table. Mixed narcosis is used, morphine (hypodermic, one-fourth to one-eighth grain, thirty minutes before the operation) and chloroform (administered very cautiously

drop by drop, after previous cocainization of the nostrils). In weak patients narcosis is stopped as soon as the peritoneum is opened. In very weak patients the operation is done under cocaine (Schleich). The incision runs from about one inch below the xiphoid process down to the umbilicus. If more room be needed, it is continued around the umbilicus. Within the abdomen the rule is to handle the bowels as little as possible. I therefore do not deem Kocher's method²³ a good one, who grasps a coil in the pelvis and lets it slip through the fingers until he reaches the duodenum. If he happens to do the latter, the procedure may be sometimes short. But if he had first travelled down over the fifteen feet of small intestines towards the ileo-cæcal valve, he has to return the entire distance, and then proceed to the duodenum. In all my cases I found it time-saving and always easy to lift omentum and transverse colon out of the abdominal wound, and by pushing the small intestines towards the right of the patient, to see the plica duodeno-jejunalis and see and feel that part of the duodenum which is attached to the spinal column. (See Fig. 3²⁴.) This having been found, the fingers glide rapidly down to a spot of the jejunum, the mesentery of which is sufficiently long, to allow of its being lifted over transverse colon and omentum, and then being attached to the anterior wall of the stomach with the least tension. This is a very essential point in Woelfler's operation. If we do von Hacker's, the work is simpler. The coil adherent to the spinal column with its proximal end is the one fit for anastomosis.²⁵ The parts lifted out of the abdomen (omentum and transverse colon) are left in place (not returned as in Woelfler's operation), the mesocolon is bluntly divided in a spot, free of blood-vessels, its borders drawn apart, fastened to the stomach by a few stitches (Fig. 4), and now the two halves of the button are inserted.

For this purpose the portion of the jejunum is emptied with the fingers, and kept empty by intestinal clamps (or assistant's hands), or strips of gauze, a piece of silk or catgut pushed through the mesentery. The clamps are pushed over the convexity of the gut down towards the mesentery. The

one nearest the pylorus is always left on the left side of the patient's abdomen, the distant clamp on the right side. By this means, the direction of the gut from above downward is always easily recognized. Now the operative field is well surrounded with sterile gauze and the running suture put in place on the jejunum. The male half of the button is inserted and tied in. The central hole in the button is tempo-

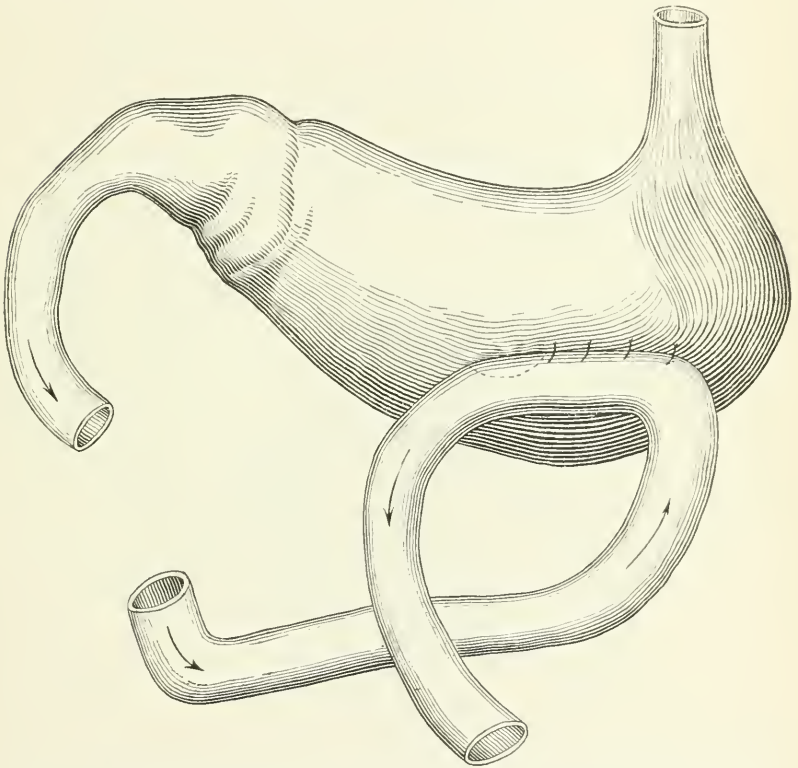


FIG. 2.—Woelfler's operation for anterior gastro-enterostomy. Three to four inches of the proximal end of the gut are stitched to the stomach by a few interrupted sutures.

rarily packed with gauze to prevent the escape of intestinal fluid. In Woelfler's operation it is covered by a large abdominal gauze-sponge, the coil of intestine having been drawn in front of the abdominal wound. In Hamburg they first incise gut or stomach and then place the purse-string suture. This enables one to catch the mucous membrane as closely to the wound as possible, and prevents its protrusion. If the run-

ning suture be primarily inserted, one must pay attention that before closing the button the mucosa is thoroughly pushed back into the cup of the instrument. If it be too redundant and projecting, the prolapse has to be clipped off with the scissors. Now the running suture is put in place in the

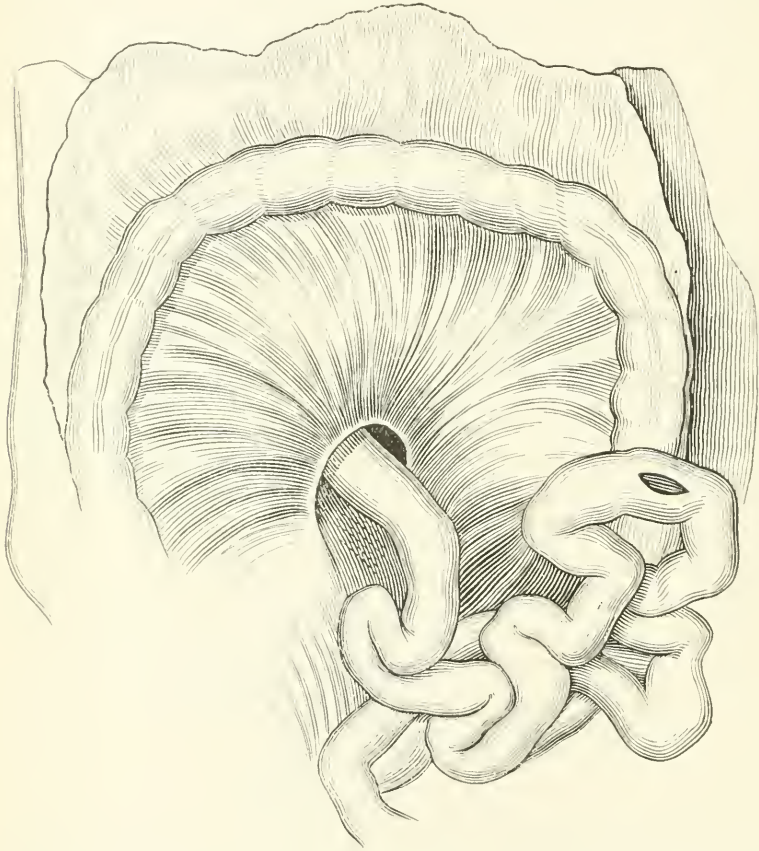


FIG. 3.—Plica duodeno-jejunalis; transverse colon and omentum, turned up to show the plica duodeno-jejunalis.

gastric wall, the incision made within the line of the suture, and the other half of the button passed through the incision and tied into the stomach. The two halves of the button are then pushed together. For the stomach I always take the longer female half, because of the thickness of the gastric

wall. I do not believe that the greater weight of one of the halves influences the direction of the button, when it has become loose. As soon as pressed together the two halves make an entirety. Only if the circular necrosis should progress unequally instead of being uniform and be finished on one side of the circumference sooner than on the other, if,

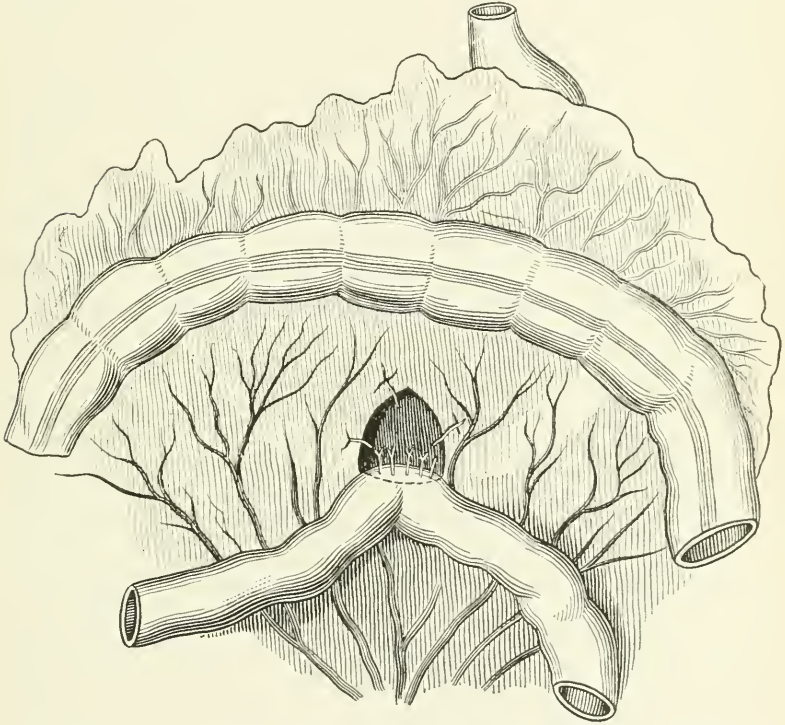


FIG. 4.—Von Hacker's operation for posterior gastro-enterostomy. The wound is bluntly made in the mesocolon, is drawn apart, and its edges fastened to the posterior wall of the stomach, before the anastomosis is established.

in other words, the button would be suspended within the anastomosis on a shred of tissue (which also tears off at last) between the seventh to tenth day, then perhaps a difference in weight of its upper and lower, of anterior or posterior side might have some bearing.

The modification lately proposed by Jonnesco,²⁶ I deem entirely superfluous. He cuts into the stomach and intes-

tines by a one inch incision, and through this hole introduces and presses the half of the button, which is held by a forceps against the wall from within outward. Down upon the central canal, thus well marked, he makes a short cross incision, and then presses the stem through the wall. The edges of this wound are caught by a purse-string suture of silk or tied on the cylinder of the button with a silk thread. Now the button is closed and the two first-made wounds stitched up. Twenty operations of this kind, done on dogs, were all successful. Time: ten to fifteen minutes. Jonnesco's reasons for this modification, which in my estimation are not relevant, are: (1) The incision made in order to insert the button is too large; a special suture to retain the part around the stem of the button is therefore required. (2) It is often difficult, if not impossible, to press both parts of the button together, on account of the thickness of the wall of the stomach, also on account of the risk of injuring the tissue in the clasp of the button by too strong pressure.

In closing the button, one ought to press rather tight. For this manipulation the fingers of the operator should rest on the circumference of the instrument, not inside the same (danger of injuring the intestinal wall by the borders of the drainage holes). Now the running Lembert suture of silk is put in place. At last, in Woelfler's operation, the portion of the jejunum nearest the clamp, on the left side of the patient (proximal end), is fastened to the gastric wall with a few silk sutures for a distance of about three to four inches. This favors the flow of bile as well as that of the gastric contents into the distal end,—in other words, prevents the very annoying entrance of too much bile into the stomach, and that of the food into the proximal end of the implanted jejunum. Fig. 4 (²⁷.) These few sutures should never be omitted. They are for the patient's future condition of paramount importance. I am prone to believe that the symptoms of the so-called "kinking of the gut" after gastro-enterostomy are often due to the omission of these sutures. In none of my eleven cases of gastro-enterostomy (ten by Woelfler's, one by von Hacker's method) did I have this annoying acci-

dent during the after-treatment; in none did I observe a persistent flow of bile into the stomach.

Now sponges and gauze are removed, the parts carefully wiped off with a gauze-sponge, soaked in sterile salt solution, and the abdomen closed. For this latter procedure I prefer braided silk (No. 8), and grasp the entire thickness of the abdominal parietes. The sutures are one-half inch apart. The silk sutures are especially necessary in the board-like hardness of the abdominal wall in the emaciated male. Here buried sutures, layer by layer, are impossible, except one first puts in four to five silver-wire retention-sutures. In female patients, who have borne children, buried sutures with catgut may be made, but never without a few retention-sutures of silkworm gut, silk, or silver wire. After the operation, feeding by mouth is begun as soon as the patient has recovered from the anæsthesia. Rectal stimulation is also again resorted to if necessary, assisted by subcutaneous stimulating injections. So far I have not needed intravenous saline infusions of 1500 cubic centimetres two to three times daily within the first forty-eight to seventy-two hours, as recommended by Kuemmel. All my patients reached their bed with a good pulse. In case of vomiting on the second or third day of larger, thin, darkish-brown, or green masses, regurgitated from the upper portion of the jejunum, lavage of the stomach is the best remedy. I use it always after the second attack of vomiting, and, when through with the same, throw a solution of a tablespoonful of Epsom salts dissolved in two ounces of warm water into the stomach. This rapidly passes the central canal of the button and moves the bowels. In aseptic wound-healing, the vomiting generally ceases after the first evacuation of the bowels.

Summing up I would say,—

(1) For gastro-enterostomy Murphy's anastomosis button is the best artificial contrivance up to date. It hastens and simplifies the operation; it enables the patient to be fed through the mouth right after the operation; the anastomosis is still feasible with its help where proper suturing is impossible. We can thus still do the operation successfully with

the button where otherwise we should have to abandon the same when only using needle and thread. The anastomosis made with it does not contract.

(2) In using the button, posterior gastro-enterostomy (von Hacker's operation) is preferable to the anterior one (Woelfler's), because it favors the progress of the button towards the anus. In both methods, however, the button can drop into the stomach.

(3) The presence of the button within the stomach has so far never done actual harm. This accident is therefore not to be considered a drawback to the use of the button.

(4) In all cases where reduction of time of the operation is of importance the use of the button is indicated and not the suture.

(5) There is no reason borne out by practical experience which should prevent us from making use of the advantages of the button in every case of gastro-enterostomy for malignant disease.

(6) If the button be used, great emaciation of the patient is no more a contraindication to this operation than it is to gastrostomy in cancer of the œsophagus.

(7) On account of the possible entrance of the button into the stomach, gastro-enterostomy in cases of benign stricture of the pylorus should be done with the help of the suture.

REFERENCES.

¹ I believe that this metastatic growth, as well as those in Case VII, have to be explained as caused by direct inoculation (grafting) from a tumor which is situated farther up in the alimentary canal. Cf. Kraske, "Ueber die Entstehung sekundärer Krebsgeschwülste durch Impfung," *Centralblatt für Chirurgie*, 1884, No. 48, p. 801.

² Cases I and II have been published in *Centralblatt für Chirurgie*, 1894, No. 52.

³ I did not see this condition personally. It was so reported to me by a member of the house staff, who had made the post mortem.

⁴ Button presents itself very clearly on the negative with a central hole.

⁵ *Brun's Beiträge zur klinische Chirurgie*, Vol. XIV, 1895.

⁶ *Centralblatt für Chirurgie*, 1894, No. 52.

⁷ *Verhandlungen der Deutschen Gesellschaft für Chirurgie*, 1896, I, p. 94.

⁸ *Langenbeck's Archiv*, Vol. LII, 2te Heft, p. 251.

⁹ *Langenbeck's Archiv*, Vol. LIII, 1te Heft, p. 87.

¹⁰ *Berliner klinische Wochenschrift*, 1896, No. 20, p. 443.

¹¹ *Contribution à l'Étude de la Gastro-Entérostomie avec le Bouton de Murphy*. Paris, G. Steinheil, 1895.

¹² Mentioned in Dr. Murphy's latest tabulation (private communication).

¹³ Duvivier, loc. cit.

¹⁴ Analysis of Cases operated upon with the Aid of the Murphy Button up to the Present Time.

¹⁵ Loc. cit.

¹⁶ In entero-anastomosis, between the smaller intestines, I am rather inclined to follow Murphy's urgent advice and abstain from putting in additional sutures.

¹⁷ Loc. cit., p. 277.

¹⁸ W. J. Mayo found "the opening much larger than the button at the end of the second week after the operation. Patient had died from aspiration pneumonia," *ANNALS OF SURGERY*, 1895, Vol. XXI, p. 39.

¹⁹ Patient was demonstrated before the New York Surgical Society, March 10, 1897.

²⁰ Dr. W. G. Le Boutillier, of New York, has observed such an exceptional contraction in a man, aged sixty-four years, on whom he had done gastro-enterostomy with Murphy's button for malignant pyloric stenosis, June 13, 1896. To my regret his report reached me too late to enter the foregoing table of twenty-five cases. After the operation the patient vomited almost daily, sometimes very large quantities of dark-colored matter, also of blood. At the post mortem, nineteen weeks after the operation, there was found "band of omentum adherent to brim of pelvis; small intestines collapsed. About two feet of intestines immediately after anastomosis, with stomach much thickened and congested. Stomach enormously dilated with fluid food; pylorus occluded. Opening from stomach into intestine much contracted, barely one-quarter of an inch in diameter, but patulous." In reading this report, one is impressed that during life there might probably have been some kind of obstruction two feet below the anastomosis.

²¹ Obstruction of the central canal by pits of grapes (Villard, Curtus), or by that of a plum (Keen), can be avoided by preliminary, thorough, and repeated lavage of the stomach, and by preventing patients from partaking of fruit soon after the operation.

²² Patient has now a burned wound of the third degree, of the size of about the palm of the hand, on his back, corresponding to the fundus of the stomach. He had been put very close to the tube for the examination with the fluoroscope, but for a few minutes only. This picture had been taken with the patient on his back. Three weeks before he had been photographed lying on his stomach. I almost believe that this rather long (forty-five minutes) first exposure caused the burn. It is known to-day that a slough, due to the X-rays, is very slowly pushed off.

²³ *Operative Surgery*, second edition, p. 140.

²⁴ Figs. 2 and 3 have been taken from *Chirurgische Technik*, by Von Esmarch and Kowalzig.

²⁵ Kuemmel takes a coil on the left side of the spinal column and then makes the posterior anastomosis. I believe it will always be a good thing, first to examine the upper part of the jejunum. In two of my patients a number of circular metastatic growths surrounded the upper part of the jejunum for almost two feet. Of course, I had to select a spot below this region for inserting the button.

²⁶ Th. Jonnesco (Bucharest), "Un nouveau Procédé pour l'Application du Bouton de Murphy," reported in *Centralblatt für Chirurgie*, 1897, Vol. VII, p. 199.

²⁷ Woelfler lately takes pains to attach the proximal end of the jejunum to the stomach somewhat above the anastomosis. (Von Frey, loc. cit.)

SOLID MESENTERIC TUMORS, WITH REPORT OF CASE.¹

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HERBERT K., aged five years, German-American, was referred to me in April, 1896. He had been a healthy lad until about a year previous to that time, when he had whooping-cough. Shortly after he recovered from the whooping-cough it was noticed that his abdomen was somewhat enlarged, and an examination revealed a tumor. Nothing was done for it, and the abdomen gradually continued to enlarge until he appeared at my surgical clinic, at the Chicago Policlinic, in April, 1896. The subjective history of the case was entirely negative. To all questions the boy, as well as his mother, gave negative answers.

There had never been any pain; no disturbance of the stomach; no interference with the action of the intestines; no trouble of any kind with the urinary organs. Objectively, the boy was pale and anæmic; while the abdomen was large and prominent, the balance of the body—arms, legs, etc.—was thin and showed emaciation; he was weak and displayed little life or activity. The circumference of the body at the level of the xiphoid appendix measured sixty-two and a half centimetres; midway between the xiphoid and the umbilicus, sixty-two centi-

¹ Read before the Chicago Pathological Society, January, 1897.

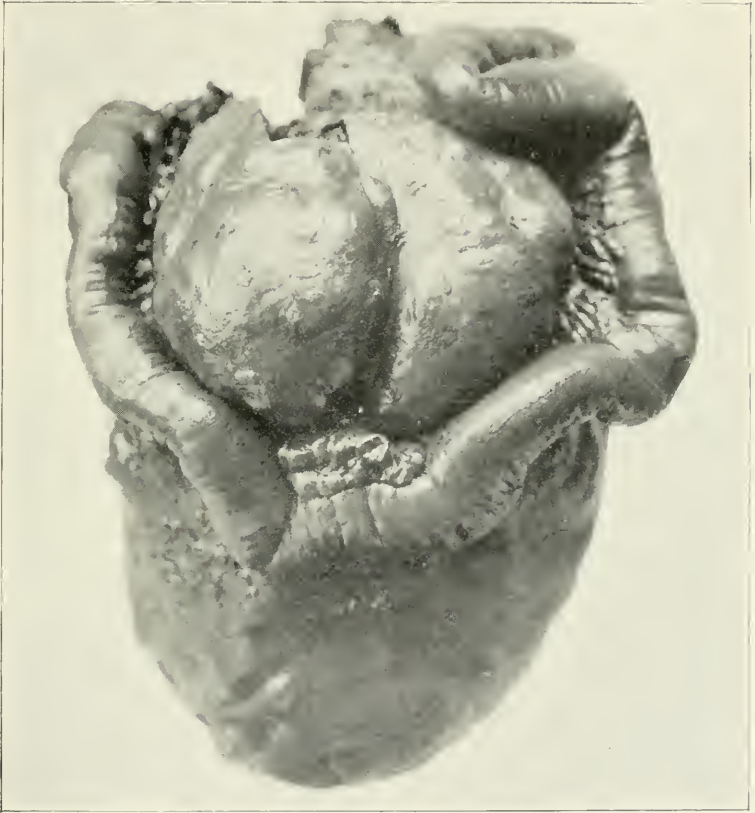


FIG. 1.—Lymphosarcomatous tumor of the mesentery, from a photograph of the specimen after removal. Harris.

metres; at the umbilicus, fifty-nine centimetres; at the crests of the ilia, fifty-seven centimetres. The distance from the xiphoid appendix to the umbilicus was sixteen centimetres, and from the umbilicus to the symphysis pubis twelve centimetres.

A large tumor, easily palpable, was found to fill the greater portion of the abdominal cavity. Its surface was smooth, though somewhat irregular; the entire mass was as movable as the closely-fitting abdominal walls would permit, and to the sense of touch it gave one the impression of being a solid tumor.

The ascending and descending colon occupied each its respective loin, thus excluding either kidney as a probable origin of the growth. The transverse colon encircled the tumor superiorly and demarcated it from the liver and spleen.

In the urine no abnormal constituents, either chemical or microscopical, were discovered. Passing somewhat longitudinally over the upper right side of the tumor could be felt a soft, flat, slightly movable band, which could not be displaced from the anterior surface of the growth. From these data a clinical diagnosis of solid tumor of the mesentery was made, while the anæmic, wasted, and weakened condition of the lad suggested the probability of its being sarcomatous.

It was decided to attempt the removal of the tumor, and the operation was performed April 13, 1896. The patient's arms, legs, and chest were enveloped in cotton and bandaged. This precaution—to diminish shock by restricting the loss of heat—I have adopted with advantage in a number of cases of severe operations upon children. The Trendelenburg position was used to deplete the abdominal organs as much as possible by gravity. Owing to the anæmic condition of the child, the subcutaneous injection of warm, normal salt solution was begun simultaneously with the operation. A free incision exposed the tumor, which was situated in the mesentery of the small intestine, the flattened band that had been felt passing over the mass was found to be a loop of the jejunum. The tumor appeared to have started in the mesentery proper and spread to each side, although it bulged more to one side than it did to the other. The loop of intestine passing over it was attached to it by a narrow, slightly thickened bit of mesentery, from one to two centimetres in width. The point of attachment of the tumor was in the base or root of the mesentery. There were no adhesions about the surface of the growth.

It was very evident that in order to remove the tumor the entire loop of jejunum whose mesentery was involved in the growth would have to be sacrificed. The intestine was consequently cut on each side of the tumor, and the mesentery divided down to the point of attachment of the neoplasm. The point of attachment formed a short, rather thick mass, which might have been ligated as a pedicle. Its location in the root of the mesentery, however, rendered the danger of depriving an extensive area of the intestine of its circulation from such a procedure too great, consequently a circular cuff of peritoneum and capsule was dissected up, the tumor detached in that manner, and the individual vessels entering the mass secured by forceps and ligated. These vessels were of considerable size and secured with difficulty, owing to their great depth. The ends of the divided intestine were then united end-to-end by my invagination method,¹ the edges of the mesentery united by suture, and the abdomen closed.

The operation lasted about forty-five minutes, over thirty of which were occupied in removing the tumor and controlling the hæmorrhage, while less than fifteen minutes were required for the intestinal resection and end-to-end union. The lad's condition, when removed from the table, was quite critical, but he reacted well and made an uninterrupted recovery.

Ten months afterwards he was in excellent health without any sign of recurrence.

The pathology of the tumor has been very thoroughly studied by Dr. Maximilian Herzog, professor of pathology in the Chicago Polyclinic, whose report is as follows:

Very little is to be found in text-books of pathology upon the histology of tumors of the mesentery. This fact was stated about ten years ago by Hahn,² and since then the step-motherly manner in which these morbid growths have been treated by pathologists has not changed at all.

In Ziegler³ and in Delafield and Prudden tumors of the mesentery are practically not mentioned. Klebs⁴ says, "Connective tissue tumors are rare in these places (mesentery and omentum)." Orth⁵ touches upon the subject somewhat more elaborately and says, "Smaller lipomata are not

unfrequently met with in the mesentery, and sometimes a striking difference between the normal atrophied appendices epiploicæ and the prominent well-nourished lipoma presents. Fibromata and fibro-sarcoma, myxomata, and pure sarcomata sometimes likewise spring from the subserous tissue, particularly from the posterior abdominal wall. Among the sarcomata is found sometimes that particular form which Waldeyer has designated angiosarcoma plexiforme, and which, besides a new formation of vessels, sometimes shows a colloid or mucoid degeneration of the vessel wall. From these conditions may arise very peculiarly looking gelatinous tumors occupying large areas of the peritoneum.

Likewise the frequently before-mentioned epitheliomata may occur in the peritoneum alone, more frequently simultaneously with such of the pleura. According to the cœlom theory those endotheliomata have recently been again classified, by a few pathologists, with the epithelial carcinomata, thus establishing the primary occurrence of carcinomata in the peritoneum."

While tumors of the mesentery are by no means common, yet they are not so rare that their morbid anatomy should be entirely omitted from the more extensive textbooks on pathology, much less so, since among those cases of solid tumors reported, a great variety of kind is to be found.

This fact is not at all astonishing since the mesentery contains a variety of tissues,—*i.e.*, endothelial cells, areolar (fat) connective, lymphatic tissue, blood-vessels, and nerves. According to Toldt,⁶ "it is evident that the mesentery is primitively a sheet of mesenchyma covered on both sides by mesothelium. Its endothelial cells have first an epithelial type which is retained in after life."

The question whether the endothelial cells of the mesentery ought to be looked upon as a type of epithelium is still sub judice, it being contested again from both sides. However, it seems to be a fact clinically established that carcinomatous growths do occur in the mesentery. Hahn⁷ besides

cysts speaks of lipomata, fibromata, myxomata, enchondromata, and sarcomata having been found in the mesentery.

It seems that the first account concerning tumors of the mesentery was given by Morgagni,⁸ who speaks of steatomatous tumors of considerable size arising from the mesentery.

More recently tumors of the mesentery were again studied by Portal, who, in 1803, proposed the following classification: tumeurs squirrheuses, steatomeuses, carcereuses, hydatiques. Since the time of Portal, a number of cases of solid tumors of the mesentery have been reported in medical literature, and the following table gives an almost complete list of the cases put upon record:

ABSTRACT OF CASES OF SOLID MESENTERIC TUMORS COLLECTED
FROM LITERATURE.

1. *Reporter*, J. J. Grambs; *sex*, female; *age*, fifty-three years; *tumor and weight*, a monstrous growth, eighteen pounds. *Reference*: Published in 1730 in Frankfort-on-the-Main, Germany.

2. *Reporter*, Leroux; *sex*, male; *age*, twenty-two years; *tumor and weight*, carcinoma, about three pounds; *diagnosis*, tumor of left hypochondriac region; *mode of procedure*, symptomatic treatment; *result*, death. *Reference*: Journal de Médecine, Chirurgie, et Pharmacologie, Paris, 1808, Vol. xv, pp. 3-11.

3. *Reporter*, Brichteau; *sex*, male; *age*, fifty-five years; *tumor*, fibro-cartilaginous tumor; *diagnosis*, tumor of right hypochondrium; *mode of procedure*, symptomatic treatment; *result*, death. *Reference*: Journal complément du Dictionnaire de Sciences médicale, Paris, 1824, Vol. xx, p. 205.

4. *Reporter*, Moynier; *sex*, female; *age*, forty-seven years; *tumor and weight*, lipoma, 315 grammes, found at post mortem. *Reference*: Comptes-Rendus de la Société de Biologie, 1850, Séries 1, Vol. II, p. 139.

5. *Reporter*, Berthelot; *sex*, male; *age*, eighty-seven years; *tumor*, osseous congregations in mesentery; *result*, death from cerebral hæmorrhage; tumor found at post mortem. *Reference*: Comptes-Rendus de la Société de Biologie, 1855, Séries II, Vol. II, p. 29.

6. *Reporter*, Bennett; *sex*, male; *age*, sixty years; *tumor*, carcinoma; *result*, death. *Reference*: Transactions of the Pathological Society of London, 1850, Vol. III, p. 101.

7. *Reporter*, Buckner; *sex and age*, young married woman; *tumor*, large, solid; *diagnosis*, ovarian tumor; *mode of procedure*, operation; *result*, recovery. *Reference*: American Journal of the Medical Sciences, 1852, Vol. xxiv, p. 358.

8. *Reporter*, Laboulbène; *sex and age*, old woman; *tumor*, carcinoma. *Reference*: Comptes-Rendus de la Société de Biologie, 1854.

9. *Reporter*, Harlan; *sex*, male; *age*, thirty-two years; *tumor and size*, carcinoma, 4 x 6 x 1 inches; *diagnosis*, tumor of upper umbilical region; *mode of procedure*, palliative treatment; *result*, death. *Reference*: Proceedings of the Pathological Society of Philadelphia, 1857-60.

10. *Reporter*, Lauderdale; *sex*, male; *age*, thirty-two years; *tumor*, medullary cancer; *diagnosis*, enlargement of spleen with malignant disease; *mode of procedure*, palliative treatment; *result*, death. *Reference*: Medical Independent, Detroit, 1856, I, p. 30.

11. *Reporter*, Weber; *sex*, male; *age*, twenty-nine years; *tumor*, spindle-celled sarcoma; *diagnosis*, abdominal tumor; *result*, sudden death. *Reference*: Chirurgische Erfahrungen, etc., Berlin, 1859.

12. *Reporter*, Duhamel; *sex*, male; *age*, fifty-four years; *tumor*, right lobulated tumor, fibrous elements predominating; *diagnosis*, cirrhosis of the liver; *mode of procedure*, paracentesis abdominis; *result*, death. *Reference*: Gazette hebdomadaire de Médecine, Paris, 1863, Vol. X, p. 383.

13. *Reporter*, Waldeyer; *sex*, female, single; *age*, thirty years; *tumor and weight*, lipo-myxoma, sixty-three pounds; some parts of tumor had a sarcomatous type, found by Waldeyer at post mortem. *Reference*: Virchow's Archives, 1865, Vol. XXXII, p. 543.

14. *Reporter*, Spencer Wells; *sex*, female, single; *age*, forty-three years; *tumor and weight*, lipoma, twenty pounds; *mode of procedure*, operation; *result*, death fifty-eight hours after operation. *Reference*: Transactions of the Pathological Society of London, Vol. XIX, 1867, p. 243.

15. *Reporter*, Cooper-Foster; *sex*, female; *age*, sixty-three years; *tumor and weight*, fibro-lipoma, fifty-five pounds; *mode of procedure*, operation; *result*, death. *Reference*: Transactions of the Pathological Society of London, Vol. XIX, 1867, p. 264.

16. *Reporter*, Church; *sex*, female; *age*, fifty-one years; *tumor and size*, lipoma, size of a cocoa-nut; *mode of procedure*, paracentesis abdominis; *result*, death sixteen hours later. *Reference*: Transactions of the Pathological Society of London, Vol. XX, 1868-69, p. 375.

17. *Reporter*, Arnott; *sex*, male; *age*, advanced in life; *tumor and size*, spindle-celled sarcoma, size of a cocoa-nut; *result*, death from peritonitis. *Reference*: Transactions of the Pathological Society of London, Vol. XX, p. 221.

18. *Reporter*, Broca; *sex*, male; *age*, old man; *tumor and weight*, lipoma, thirty pounds; found at post mortem. *Reference*: Bulletin de la Société anatomique de Paris, 1870.

19. *Reporter*, Dickinson; *sex*, female; *age*, two years; *tumor and weight*, fibrous tissue, fat, cartilage, calcareous material, two pounds five and a half ounces; *result*, death. *Reference*: Transactions of the Pathological Society of London, 1870-71, Vol. XXII, p. 296.

20. *Reporter*, Garreau; *sex*, male; *age*, twenty-nine years; *tumor*, carcinoma; *diagnosis*, tumor of umbilical and hypogastric regions; *mode of procedure*, palliative treatment; *result*, death. *Reference*: Gazette médicale de l'Algérie, 1871, XVI, p. 25.

21. *Reporter*, Hayden; *sex*, male; *age*, forty-three years; *tumor*, scirrhus; *diagnosis*, scirrhus of the mesentery; *result*, death. *Reference*: Irish Hospital Gazette, Dublin, 1873, Vol. I.

22. *Reporter*, Weichselbaum; *sex*, male; *age*, thirty years; *tumor*, chylangioma cavernosum; *result*, death from scorbutus and pneumonia. *Reference*: Virchow's Archives, 1873, Vol. LXIV.

23. *Reporter*, Violet; *sex*, male; *age*, sixty-two years; *tumor*, carcinoma; *diagnosis*, intestinal strangulation; *result*, death. *Reference*: Bulletin de la Société anatomique de Paris, 1873, p. 342.

24. *Reporter*, Canvy; *sex*, male; *age*, fifty-four years; *tumor*, lipoma; *result*, death from septicæmia. *Reference*: Montpellier Médicale, 1874, Vol. xxxii, p. 97.
25. *Reporter*, Ladmiral; *sex*, male; *age*, sixty years; *tumor*, fibroplastic, very large tumor; *diagnosis*, hydatid cyst of liver or spleen; *mode of procedure*, exploratory puncture, then diagnosis of fatty tumor; *result*, death. *Reference*: Bulletin de la Société anatomique de Paris, 1874, p. 635.
26. *Reporter*, Morris; *sex*, female, married; *age*, forty-three years; *tumor*, carcinoma (scirrhus); *diagnosis*, abdominal cancer; *mode of procedure*, palliative treatment; *result*, death. *Reference*: Transactions of the Medical Society of New Jersey, Newark, 1875.
27. *Reporter*, Stobbe; *sex*, female; *age*, thirty years; *tumor and size*, myxosarcoma, size of a man's head; *diagnosis*, tumor of the ovary; *mode of procedure*, palliative treatment; *result*, death. *Reference*: Archiv der Heilkunde, Leipzig, 1876.
28. *Reporter*, Sabourin; *sex*, female; *age*, seventy years; *tumor*, adenolymphocèle. *Reference*: Progrès médicale, 1876, Vol. iv, p. 647.
29. *Reporter*, McReddie; *sex*, male (Hindoo); *age*, sixty years; *tumor*, scirrhous cancer; *diagnosis*, tumor of the mesentery; *result*, death. *Reference*: Indian Medical Gazette, Calcutta, 1879, Vol. xiv, p. 312.
30. *Reporter*, Madelung; *sex*, female, married; *age*, thirty-two years; *tumor and weight*, lipoma oedematosum, thirty-five pounds; *diagnosis*, proliferating cyst of the ovary; *mode of procedure*, operation; *result*, recovery. *Reference and remarks*: Berliner klinische Wochenschrift, 1881, No. 6. A piece of intestine, twenty centimetres long, was resected.
31. *Reporter*, Péan; *sex*, female; *age*, sixty years; *tumor and weight*, lipoma, twenty-four pounds; *mode of procedure*, operation; *result*, death. *Reference*: Péan, Tumeurs, 1881, p. 1129.
32. *Reporter*, Péan; *sex*, female; *age*, sixty-two years; *tumor and weight*, lipoma with calcareous masses, forty pounds; *mode of procedure*, operation; *result*, death. *Reference*: Péan, Tumeurs, 1881, p. 1129.
33. *Reporter*, Péan; *sex*, female; *age*, thirty years; *tumor and weight*, fifty pounds, type not stated; *diagnosis*, tumor of the mesentery; *mode of procedure*, operation; *result*, recovery. *Reference*: Péan, Tumeurs, 1881, p. 1129.
34. *Reporter*, Bozeman; *sex*, female; *age*, forty-six years; *tumor*, cystic sarcoma; *diagnosis*, ovarian tumor; *mode of procedure*, operation. *Reference*: New York Medical Record, 1882, Vol. xxii, p. 72.
35. *Reporter*, Thornton; *sex*, female; *age*, thirty-eight years; *tumor and weight*, cystic tumor; solid part weighed six pounds four ounces; *mode of procedure*, operation; *result*, recovery. *Reference and remarks*: British Medical Journal, 1882, Vol. ii, p. 1242. No microscopic examination.
36. *Reporter*, Allen; *sex*, male; *age*, fifty years; *tumor*, carcinoma; *result*, death. *Reference*: Australian Medical Journal, Melbourne, 1883, New Series v, p. 223.
37. *Reporter*, Homans; *sex*, female; *age*, thirty-nine years; *tumor and weight*, myxo-lipoma, fifty-seven pounds; *mode of procedure*, operation; *result*, death. *Reference*: London Lancet, 1883, Vol. i, p. 449.
38. *Reporter*, Homans; *sex*, female; *age*, sixty years; *tumor and weight*, lipoma, thirty-five pounds. *Reference*: London Lancet, 1883, Vol. i, p. 449.
39. *Reporter*, Nasse; *sex*, male; *age*, forty-eight years; *tumor*, spindle-celled

sarcoma; *result*, death; tumor found at post mortem. *Reference*: Virchow's Archives, 1883, Vol. xciv, p. 473.

40. *Reporter*, Sainsbury; *sex*, male; *age*, thirty-five years; *tumor and size*, spindle-celled sarcoma, size of an infant's head; *result*, death from peritonitis. *Reference*: Transactions of the Pathological Society of London, 1883, Vol. xxxv, p. 343.

41. *Reporter*, Silcock; *sex*, male; *age*, four years; *tumor and size*, malignant lymphoma, size of a cocoa-nut; *result*, death. *Reference*: Transactions of the Pathological Society of London, 1883, Vol. xxxv, p. 348.

42. *Reporter*, Bemis; *sex*, female; *age*, thirteen years; *tumor and weight*, encephaloid cancer, twelve and a half pounds; *diagnosis*, encephaloid cancer of the mesentery; *result*, death. *Reference*: New Orleans Medical and Surgical Journal, 1884-85, Vol. xii, p. 352.

43. *Reporter*, Colas; *sex*, male; *age*, thirty-six years; *tumor and weight*, lipoma, twenty-six pounds; *result*, death from cachexia. *Reference*: Colas, Thèse de Lille.

44. *Reporter*, Zinke; *sex*, male; *age*, five years; *tumor and size*, round-celled sarcoma, size of a goose-egg; *mode of procedure*, exploratory laparotomy; *result*, death from septicæmia soon after operation. *Reference*: Cincinnati Lancet-Clinic, 1884, Vol. xiii, p. 502.

45. *Reporter*, Spencer Wells; *sex*, female, married; *age*, forty years; *tumor and size*, solid tumor, size of an adult head; *mode of procedure*, operation; *result*, recovery. *Reference*: Wells, Abdominal Tumors, Philadelphia, 1885, p. 205.

46. *Reporter*, Fraipont; *sex*, female, married; *age*, twenty-five years; *tumor and size*, tumor of the mesentery, size of a fist; *diagnosis*, deep malignant abdominal tumor; *mode of procedure*, operation; *result*, recovery. *Reference*: Annales de la Société de Médecine et Chirurgie de Liège, 1886, Vol. xxv, p. 451.

47. *Reporter*, Van Bibber; *sex*, female; *age*, twenty-three years; *tumor*, carcinoma; *diagnosis*, abscess of the spleen; *result*, death. *Reference*: Maryland Medical Journal, 1886-87, Vol. xvi, p. 253.

48. *Reporter*, Van Bibber; *sex*, male; *age*, sixty-five years; *tumor and size*, carcinoma harder than cartilage, size twelve by four inches; *diagnosis*, stricture of the rectum; *result*, death. *Reference*: Maryland Medical Journal, 1886-87, Vol. xvi, p. 253.

49. *Reporter*, Van Bibber; *sex*, male; *age*, sixty-eight years; *tumor*, carcinoma; *diagnosis*, before death, cancer of the omentum; *result*, death. *Reference*: Maryland Medical Journal, 1886-87, Vol. xvi, p. 253.

50. *Reporter*, Terrillon; *sex*, male; *age*, thirty-five years; *tumor and weight*, myxo-lipoma, fifty-eight pounds; *mode of procedure*, operation; *result*, death. *Reference*: Archives générales de Médecine, 1886, Vol. i, p. 257.

51. *Reporter*, Bruschini; *sex*, female, married; *age*, fifty-six years; *tumor*, carcinoma; *diagnosis*, cancer of the mesentery; *mode of procedure*, palliative treatment proposed. *Reference*: École de Cliniques, Napoli, 1887, II, p. 129.

52. *Reporter*, Lathuraz; *sex*, female; *age*, forty-two years; *tumor*, weighing forty-two pounds. *Reference*: Sajous's Annual, 1896, Vol. III, C. 96.

53. *Reporter*, Canthorn; *sex*, male; *age*, forty-nine years; *tumor*, sarcoma; *mode of procedure*, operation, forty-three inches of intestine removed; *result*, patient recovered from operation, but died four months after it from intestinal obstruction

brought about by Murphy's button. *Reference*: Sajous's Annual, 1896, Vol. III, C. 96.

54. *Reporter*, König; *tumor*, fibro-myxoma, partially ossified; *mode of procedure*, operation; *result*, death. *Reference*: König's Lehrbuch der Chirurgie, 6th edit., Vol. II, p. 252.

55. *Reporter*, Zirndorf; *tumor*, fibro-sarcoma; *mode of procedure*, operation; *result*, recovery. *Reference*: Quoted from König's Lehrbuch.

56. *Reporter*, Sawers; *sex*, male; *age*, seven years; *tumor and weight*, lipoma, six pounds; *mode of procedure*, operation; *result*, recovery. *Reference*: Quoted from König's Lehrbuch.

57. *Reporter*, Harris; *sex*, male; *age*, five years; *tumor*, lympho-sarcoma with colloid degeneration; *diagnosis*, tumor of the mesentery; *mode of procedure*, operation; *result*, recovery.

The total number of cases reported is fifty-seven. They are divided as to sex: Male, thirty cases; female, twenty-five cases; sex not given in two cases.

As to age the cases may be divided as follows:

From one year to ten years	5 cases.
“ eleven years to twenty years	1 case.
“ twenty-one years to thirty years	8 cases.
“ thirty-one years to forty years	9 “
“ forty-one years to fifty years	9 “
“ fifty one years to sixty years	11 “
“ sixty-one years to seventy years	6 “
“ seventy-one years to eighty years	1 case.
“ eighty-one years to ninety years	1 “
Young woman	1 “
Old woman	1 “
Male, advanced in life	1 “
Old man	1 “
No age given	2 cases.
Total	57

The case occurring in the youngest individual was put upon record by Dickinson (No. 19); it was that of a female child two years old; while the oldest patient in whom a solid tumor of the mesentery occurred was one of Berthelot (No. 5), a male of eighty-seven years. It appears that tumors of the mesentery may occur at any age. Absolutely the largest percentage—eleven cases—occurred between the ages of

fifty-one and sixty years; yet considering the diminished number of individuals alive at the ages between sixty-one and seventy years, six cases reported represent a relatively very large figure.

According to their histological type the tumors reported may be classified as follows:

Carcinomata	16 cases.
Lipomata	10 "
Lipoma with calcareous masses	1 case.
Myxo-lipomata	3 cases.
Fibro-lipoma	1 case.
Fibromata	2 cases.
Fibroma with calcareous degeneration	1 case.
Fibro-myxoma partly ossified	1 "
Osseous tumor	1 "
Fibro-cartilaginous tumors	2 cases.
Chylangioma	1 case.
Adeno-lymphoma	1 "
Malignant lymphoma	1 "
Sarcomata	7 cases.
Fibro-sarcoma	1 case.
Lympho-sarcoma with colloid degeneration	1 "
No data or indefinite	7 cases.
Total	<hr/> 57

From an analysis of this table it appears that the largest percentage of such new growths belonged to the carcinomata (sixteen cases), and this in view of the fact that up to date there are pathologists who, from their view concerning the character of endothelial cells, claim that they do not belong to the epithelia, and consequently could not give rise to a true carcinomatous growth. However, it must be conceded that of those cases reported as carcinoma some are certainly not, but probably belong to a sarcomatous type. The diagnosis of carcinoma, as far as the record of the cases shows, has always been made only clinically or macroscopi-

cally. There is not, as far as we have been able to ascertain, a record of a thorough microscopic examination upon which the diagnosis of carcinoma rests. Next to carcinomata, the table shows that lipomata and sarcomata are the solid tumors most commonly found in the mesentery. Of secondary degenerations we find osseous, cartilaginous, myxoid, and colloid.

As far as the diagnosis is concerned, the vast majority of the cases reported were not diagnosticated at all, some were diagnosticated in a very indefinite manner, such as tumor of the upper umbilical region, deep abdominal tumor, etc., in others the most varied mistakes in diagnosis were made. Nothing stated as to the diagnosis or no diagnosis attempted in thirty-three cases; an indefinite diagnosis was given in eight cases. Some of the cases were diagnosticated as ovarian tumor (three times); enlargement of the spleen with malignant disease; cirrhosis of the liver; hydatid of the liver; intestinal strangulation, stricture of the rectum, abscess of the spleen. *Intra vitam* and before an operation were correctly diagnosticated the cases of Hayden (Table No. 4), McReddie (Table No. 29), Péan (Table No. 33), Bemis (Table No. 42), Brushini (Table No. 51), and our own case (Table No. 57).

In the majority of cases reported there is either nothing at all said about the treatment or this has been purely symptomatic or palliative (thirty-four cases),—death was invariably the outcome in these cases. Paracentesis abdominis was made four times and a radical operation, laparotomy with removal of the tumor, performed eighteen times. Once an exploratory laparotomy was made (Zinke's Table No. 44), followed speedily by death from septicæmia. As far as the final result is concerned the table shows the following figures:

Death reported in	40 cases.
No data given in	7 “
Recovery after operation	10 “

These latter ten cases are those of

Buckner, large tumor(?)	Table No.	7
Madelung, lipoma	“ “	30
Péan, tumor fifty pounds(?)	“ “	33
Thornton, cystic tumor	“ “	35
Wells, solid tumor	“ “	45
Fraipont, tumor(?)	“ “	46
Canthorn, sarcoma	“ “	53
Zirndorf, fibro-sarcoma.	“ “	55
Sawers, lipoma	“ “	56
Harris, lympho-sarcoma	“ “	57

Of these ten cases, including our own, only three were malignant tumors. One of these three cases (that of Canthorn) succumbed four months after the operation, death being due to an intestinal obstruction brought about by a Murphy button.

While most reporters of cases of tumors of the mesentery go more or less into the clinical features of their respective cases, comparatively few details have been given concerning the microscopic anatomy of these neoplasms. However, some observers take up more minutely the morbid histology of their tumors.

One of the earlier cases in which a microscopic examination was made is that of Bennet,⁹ who describes the mesenteric tumor which he removed in the following manner: "The mass had a lobulated character and consisted of clusters of smaller masses. . . . On cutting into them they presented a medullary appearance and consistence, and when examined under the microscope were found to be composed of globular, distinctly nucleated cells, intermingled with fatty matter."

This case, while reported as one of cancer of the omentum and mesentery, was, as appears from the above description, probably one of sarcoma and not carcinoma.

Waldeyer,¹⁰ who reported a lipo-myxoma of the mesentery, weighing sixty-three pounds, does not go very minutely into the microscopic anatomy of his tumor, but states that it was on the whole a lipo-myxoma, while in some places it presented a sarcomatous structure. This enormous tumor had

given rise to metastases in the lungs and liver. Arnott¹¹ gives the following as the results of the microscopic examination of the tumor he removed: "Microscopic examination showed that the former portions of the large abdominal tumor consisted almost wholly of spindle-cells with large oval nuclei and bright nucleoli arranged generally in some definite order; many of the cells remarkably long and delicate, their slender, fine tails bristling out from the edges of the microscopic sections."

Dickinson¹² describes his tumor as follows: "Weight two pounds five and a half ounces, measuring four by four by five inches, nearly spherical. The growth was hard and rigid; on section it was of a very irregular hardness, cutting as if bits of bone were interposed among softer tissues, the structure was coarsely cellular or porous, resembling, except in hardness, very light bread or a section of a coarse sponge. The solid portions consisted of fibroid tissue, fat, cartilage, and calcareous or bony masses. Intermingled with this was much fat. All these elements form together a hard but spongy framework, thickly beset with round or ovoid cavities which varied in size. These were filled with a stringy translucent fluid, such as is found in myxomatous growths. . . . Under the microscope the fluid displayed numerous large granular bodies, large nucleated cells, smaller corpuscles, like mucus or pus, but neither nucleated like pus nor coherent like mucus, fragments of fatty tissue, and plates of cholesterine."

Weichselbaum,¹³ who reported a chylangioma or lymphangioma cavernosum, says that on section this tumor looked like a lipoma, and discharged, when open, a white, milky fluid. The stroma of the tumor, in which numerous small cysts were situated, was made up of small round cells. In the case reported by Bozeman¹⁴ the pathologic examination was made by Welch, who states, "The tumor was composed chiefly of cysts, but contained some solid parts. . . . The solid masses consisted almost wholly of spindle and round cells, without any regularity in the arrangement of the

cells. These parts are, therefore, sarcomatous in structure,—the partitions between the cysts consist chiefly of fibrous tissue, containing blood-vessels and large lymph-spaces. The outer surface of the tumor is covered in smooth places by a layer of endothelial cells. Probable diagnosis: cystic fibrosarcoma.”

Silcock¹⁵ reports that his tumor, which he styles a malignant lymphoma, consisted of lymphoid corpuscles set in a restiform stroma.

A somewhat strange microscopic as well as clinical report is that of Bemis,¹⁶ who not only claims the credit of having diagnosticated *intra vitam* the case which came under his observation as one of tumor of the mesentery, but who states, “The case was diagnosticated as one of encephaloid cancer of the mesentery.” On the post-mortem report it is laconically stated, “The microscope confirms the diagnosis” (of encephaloid cancer).

The above is probably about all to be found concerning microscopic examinations of mesenteric tumors.

Our own case, the clinical features of which have been detailed above, presents the following, concerning its pathologic anatomy.

The tumor in its general outline is egg-shaped. The periphery of its longest axis measures fifty-seven centimetres; the periphery of the axis drawn perpendicularly through the middle of the long axis is equal to forty centimetres; the periphery of the thickest part of the case being forty-five centimetres. The tumor weighed two thousand five hundred and sixty grammes (five pounds).

The base of the growth is directed upward, the apex downward. A capsule of thickened mesentery surrounds the neoplasm completely, and this envelope is nowhere broken through nor had the tumor formed any adhesions. At its base there is a somewhat kidney-shaped projecting mass, directed upward; it is surrounded to about three-fourths of its circumference by jejunum, which, however, always remains distant from the new growth from one to

two centimetres, this margin being formed by mesentery which does not present any marked changes. The gut surrounding the protruding mass of the tumor winds around it in a tortuous manner to an extent of about forty centimetres. Total length of intestine removed with the new growth fifty-one centimetres. The surface of the tumor is smooth as a whole, yet not perfectly even, but coarsely and irregularly nodulated. On section it is seen that the tumor is made up of round and ovoid partitions, varying in size from a millet seed to a diameter of one-half centimetre. These cavities are filled with either a pretty solid or with a gelatinous material or with coagulated grumous blood, some of the partitions are partly filled with blood, partly with the gelatinous material; the two different kinds of materials remaining distinct and their mutual boundaries well defined.

Microscopic Examination.—The capsule of the tumor consists of the mesentery. Externally the endothelial lining is preserved in a number of specimens; in others it is more or less missing, this being most probably due to loss in manipulation during preparation. Where the endothelial cells are preserved externally, they present themselves in a single layer. Underlying the external endothelium is a layer of connective tissue and elastic fibres, besides these all the other tissues normally found in the mesentery—viz., areolar, blood-vessels, lymphatic vessels, and lymphatic glands—can be easily recognized and demonstrated in the capsule of the tumor. The veins are numerous and very much enlarged, filled with well-preserved blood-corpuscles. (The tumor having been hardened in Müller's fluid.) In the substance of the tumor more or less distant from the capsule are found large blood-vessels containing in their interior colloid material. The fibres of the middle coat of these vessels are not as sharp in their outlines as should be expected; they are always more or less indistinct and appear to be in a state of colloid degeneration. It appears that the neoplastic changes, which have given rise to the formation of the tumor, have started from the lymphatic glands of the mesentery. These are densely infiltrated with small round lymphoid corpuscles, and while in some glands the difference between the central proliferating centre of Flemming and the

peripheral cortical layer can still be noticed, in other sections the infiltration is so dense that no distinction between a peripheral and a central portion of the follicles can be made out. In places where these conditions prevail we can also observe that the trabecular bands of connective tissue dividing the interior of the lymphatic glands into follicular compartments have either entirely disappeared or at least become infiltrated with small round cells. It can also be seen that the original connective tissue of the mesentery has undergone a great deal of proliferation and that it is infiltrated in many places with small round cells. The latter have also broken into the veins and venous sinuses. In some places it can be distinctly seen that these small round cells have infiltrated the vessel-coats, while in other locations they are found lying inside of the lumen of very thin-walled venous sinuses. This picture is presented as well in vessels which have been divided transversely as in those which have been cut longitudinally. In other places conditions are seen which point to the following changes: Blood-vessels traversing a lymphatic gland in which a proliferation of small round cells had been going on, were broken into by these cells, in consequence of which occurrence there was a hæmorrhage into the gland.

All throughout the tumor there are spaces—oval in outline—filled with colloid material. Some of the oval compartments show nothing but the homogeneous colloid material; some are partly filled with blood, and where this is the case the latter is sharply defined and the border-line between blood and colloid is clear and distinct. In other places a number of small round and also spindle-shaped cells which have taken the nuclear stain well (hæmatoxylin) are seen scattered in the colloid material.

Anatomical Diagnosis.—Lympho-sarcoma plexiforme with colloid degeneration.

When the above account (illustrated by the tumor and a number of microscopic specimens) was read before the Chicago Pathological Society some doubts were thrown upon the colloid nature of the homogeneous material found in the tissues, particularly in the interior of blood-vessels. A number of additional sections were, therefore, made and exhibited at a subsequent meeting of the society. These sections were stained with orcein, according to Van Gieson's¹⁷ method.

The homogeneous material under these stains behaved typically like colloid, and showed, subjected to the action of the acid fuchsin, picric acid stain a beautiful orange-red color. It was then conceded that the homogeneous material did answer in all particulars to the character of colloid.

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¹⁰ Loc. cit. ¹¹ Loc. cit. ¹² Loc. cit. ¹³ Loc. cit.
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SURGICAL TREATMENT OF TUMOR OF THE LIVER, WITH THE REPORT OF A CASE.¹

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CASE. *Excision of a Portion of the Liver for Alveolar Sarcoma.*—The patient, a woman, aged forty years, entered the Massachusetts General Hospital in March, 1896. Six months before entrance she complained of a pain radiating from the groin; and four months before entrance noticed a tumor in right side just below the ribs. She had lost weight, strength, and appetite; had never been jaundiced.

She was thin and of a whitish-yellow color, but in fairly good condition. In the right side was a hard tumor extending from the right lobe of the liver down nearly to the crest of the ilium and over to the median line. It was movable from side to side, but less so up and down. There was doubt as to its following the respiratory movements. It seemed to be adherent to the abdominal wall, but the skin was not involved. It was very hard but not tender. With one hand in the loin and the other in front the tumor could be grasped and moved about. The upper line of liver dulness was normal, but the lower line could not be determined on account of the tumor. Diagnosis was not definite, but lay between a sarcoma of the kidney and a tumor of the liver.

March 11.—Operation. Longitudinal incision from tenth intercostal space downward. The growth was found infiltrating the abdominal wall and proved to be an enlargement of the right lobe of the liver near the gall-bladder. It was adherent to intestines and omentum. After freeing it from adhesions the tumor, the size of two fists, was cut off from the liver at its base with the thermo-cautery. The gall-bladder with gall-stones was intimately connected and was removed with it.

¹ Read before the American Surgical Association, May 6, 1897.

The part removed seemed to be about one-fifth of the whole liver. The wound surface was five inches long and two inches broad. Bleeding was profuse, but was controlled by pressure-forceps and gauze pressure. The cystic duct and most of the vessels were tied with silk; a few clamps were left *in situ*. The pedicle was dropped and the liver wound was "walled off" from the peritoneal cavity by pads of sterilized gauze; iodoform gauze being packed down against the liver wound. The abdominal wound was left open on account of the gauze packing.

The patient did well, and on the fourth day all the gauze was removed. Adhesions had formed so that the liver wound was shut off from the general peritoneal cavity. This wound was then dressed with iodoform gauze daily. Bile flowed freely from a large duct. The wound healed rapidly and the patient sat up on the fifteenth day, and was discharged on the twenty-first day. Before leaving the hospital it became evident that the disease was extending on the intestinal walls which had been separated from the growth. The disease did not return in the liver, but the patient died in three months after leaving the hospital.

The following pathological report is from Dr. W. F. Whitney, of the Harvard Medical School:

The alcoholic specimen consists of an oval mass of new growth, measuring ten by nine by six centimetres, with rough, irregular surface of firm consistency and pale-whitish aspect. Intimately blended with different surfaces of the tumor are portions of the liver, remains of the gall-bladder, and fibrous and muscular tissue (from the abdominal wall). A study of the relations shows that the growth started in the region of the fissure of the gall-bladder, invading it from the fundus downward, leaving a small, relatively intact part towards the cystic duct filled with biliary concretions. It had also grown into the liver, destroying a portion of it, but separated by a very sharp line, to the eye, from its substance.

The section surface at first sight is homogeneous with a softened area in the centre of about three centimetres in diameter. On closer examination, however, it is seen to be finely mottled with small, irregular, opaque portions alternating with more translucent ones; in places there are suggestions of fibrous bands cutting it up into illy-defined lobules.

Microscopic Examination.—The structure is an alveolated

one, the spaces being filled with large cells, composed of a transparent body, and large vesicular nucleus. Many of the cells have recently divided and karyokinetic figures are abundant. The septa between the alveoli is formed of a loose connective tissue, prolongations of which can be traced as fine filaments between the cells. In places it is infiltrated with blood, and in others the corpuscles lie in a clearly-defined opening, but without any wall that is differentiated from the surrounding tissue.

An occasional vessel is met with, but such could be referred to a resistant portal vein. Everywhere, to within a short distance of the edge, the growth is marked by small areas of diffusely-stained cells filled with very small, deeply-colored masses of chromatin (anæmic necrosis and fragmented nuclei).

The cells of the liver, at the boundary-line, are atrophied and compressed, but could be traced until they gradually disappeared in the new growth. This can be detected for only a few millimetres inside of the intact liver tissue, and there in spaces in the connective tissue of the portal system. Nowhere is there any evidence of active participation of the liver-cells or those of the gall-ducts in the new growth; but everywhere their rôle is entirely a passive one.

Diagnosis.—An alveolar sarcoma, which from its anatomical relation started in the connective tissue about the gall-bladder.

General Remarks and Analysis of Reported Cases.—Great progress has been made in the last few years in the technique of resecting tumors of the liver, and the immediate results of such operations have been astonishingly good. The organ is so friable, so full of gaping vessels, and so evidently incapable of being sutured that it has always seemed impossible to successfully manage large wounds in its substance. In fact, Elder,¹ in 1886, gives the mortality of liver wounds as 62 per cent. The new departure is based on the results of experiments on animals by Glück² (1883), Ponfick³ (1890), Meister,⁴ and others.

These well-known experiments showed that large pieces of liver could be removed from rabbits without destroying the animal. That in cats and dogs the removal of more than three-quarters of the liver was not followed by any serious

consequences. That not only could the animals bear the loss of a large part of the liver, but that the organ had the power of regeneration. Meister found that after three-quarters of the liver had been resected the regeneration was so rapid that it regained its normal weight in thirty-six days. The growth was by hypertrophy, and by hyperplasia of the hepatic cells. The bile-ducts and the blood-vessels take part in the new formation.

It was found that the urea diminished in proportion to the amount of liver substance removed, but that within eleven or fifteen days the quantity of urea rose until it became normal again. Ponfick observed that the same process took place in men, but more slowly; that when the right lobe was destroyed by an echinococcus cyst there was an increase in the size of the other lobes.

Bruns,⁵ in the Franco-German war (1870), was the first to resect a small portion of the liver in man. The case was of a soldier who had received a bullet wound in the abdomen through which a piece of liver the size of a nut protruded. This was successfully cut away.

In 1883, Elder⁶ had collected nine such cases, all of which had recovered. Bruns also cut a small cancerous nodule from the edge of the liver. The liver wound was cauterized and the abdominal wound closed. Recovery.

Bruns's third case is even more striking. He removed an echinococcus cyst by excising a part of the right lobe. The tumor was the size of a child's head and occupied the middle of the abdomen. The diagnosis was uncertain. On opening the abdomen the tumor was found to be an echinococcus cyst, which was surrounded by liver tissue of varying thickness. The pedicle was tied in several sections with silk and cut with the thermo-cautery. The bleeding from the tissue, cut by the ligatures, was controlled by sponge pressure. Several vessels were tied separately. The pedicle, twelve centimetres by three centimetres, was disinfected and dropped. The abdomen was closed. The patient was well in nineteen days.

More or less extensive resection of liver substance in the removal of echinococcus cysts was done by Landouzy and Segon,⁷ Loretta,⁸ Pozzi,⁹ and Ruggi,¹⁰ all of whom stitched the liver wound to the abdominal wound. Also less extensive resections by Vohtz¹¹ and Tansini,¹² who stitched the liver wound together and closed the abdomen. Terrillon¹³ operated in two stages, bringing the cyst outside the abdomen and strangulating the pedicle with an elastic ligature and cutting it away at a later operation. Strange to say, all these cases recovered; although the resection of liver substance was quite extensive; notably in the cases of Loretta and Pozzi.

Lius¹⁴ was the first to remove a large, solid tumor of the liver, which proved to be an adenoma with a fibrous capsule. He found that ligation of the large pedicle did not control the hæmorrhage. He therefore applied an *écraseur* and cut with the thermo-cautery. There was no excessive hæmorrhage, but the *écraseur* cut deeply into the tissue. He therefore tried to fasten the pedicle to the abdominal wound, but the stitches tore out of the friable liver tissue and he was forced to let it drop into the abdominal cavity. He closed the abdominal wound, and the patient died in six hours from hæmorrhage from the liver wound.

Langenbuch¹⁵ (1887) was the first to successfully remove a solid circumscribed tumor of the liver. The patient, a woman thirty years old, had suffered pain for eight years. A tumor, the size of a fist, appeared in the centre of the epigastric region. It was continuous with the liver and moved with respiration. The diagnosis lay between tumor of the mesentery or pancreas, echinococcus of the liver, and, possibly, a lobe of liver separated by lacing. It proved to be a constricted portion of the left lobe, weighing 370 grammes. Its ligamentous base was divided into several portions and ligatured. This stump was dropped and the abdomen closed. A few hours after the operation the abdomen had to be reopened for hæmorrhage. The vessels were tied and stump returned. Recovery in four months.

Since Ponfick's article, in 1890, a number of operations for various kinds of hepatic tumors have been done, and these operations have been done by various methods. I have found forty-six reported cases where more or less liver substance was resected for tumor, and my conclusions are based on an analysis of these cases. Nine cases were for echinococcus cysts, and have already been referred to. There are several other cases not included here. They were all successful, and this fact suggests that the proper treatment of echinococcus is its excision with the invaded liver substance.

Nine cases were for syphilitic nodules. They were done by Wagner, Lauenstein, Tillmans, Hochenegg, J. B. Schmidt, Bastainelli, Mikulicz, Abbe, and Albert. Two died, one by Wagner,¹⁶ from hæmorrhage, and one by Lauenstein,¹⁷ from sepsis. On account of these two deaths, and the favorable results from constitutional treatment, Segond and Bergmann advise against operating on syphilitic tumor of the liver. The other cases, however, were very satisfactory, especially Bastainelli's, referred to by Kousnetzoff.¹⁸ His patient, a woman of thirty-seven years, had complained of pain for eight months. The liver was normal in outline. A tumor on the right side seemed connected with the kidney, could be easily moved to the right, and followed the respiratory movements. The diagnosis was a new growth of the kidney. The operation revealed a tumor as large as two fists, fixed by a base, three fingers thick, to the under surface of the liver. The pedicle was tied with an elastic ligature and fastened into the abdominal wound with stitches and two long needles. The tumor was removed and hæmorrhage controlled by pressure and the thermo-cautery. The tumor weighed 750 grammes. The elastic ligature was removed on the fourteenth day. The patient was in perfect health one year after the operation.

It will appear later that the deaths reported by Wagner and Lauenstein were due to a faulty technique, and should not, therefore, be used as a final argument against operating on syphilitic tumors. From an examination of the other

cases, it appears that old, troublesome, syphilitic nodules, which have resisted constitutional treatment, are proper cases for operation, because it offers a fair chance of relief.

Eight cases have been operated on for cancer: they were done by Bruns, Hochenegg, Lüke, Küster, Jacobs, Watson, M. Robson, and Heidenhain. One case by Küster¹⁹ died from septicæmia. In Watson's²⁰ case the disease recurred in two months. In Jacob's²¹ case recurrence in seven months. In Hochenegg's²² case there was no recurrence after eighteen months.

In Lüke's²³ case there was no recurrence after two years. The patient was a woman thirty-one years old. The tumor, size of a fist, started two fingers below the xiphoid process. It was quite movable. Diagnosis of probable liver tumor was reached. At the operation a cancer of the left lobe of the liver appeared. It was connected with the liver by a pedicle twenty centimetres in circumference. This pedicle was fastened into the abdominal wound and surrounded by iodoform gauze, over which was placed an elastic ligature to strangulate the tumor. Three days later a tighter ligature was put on. After nine days the remaining pedicle was cut with thermo-cautery.

Of course, only primary cancer in a single nodule is suitable for operation: also primary cancer of gall-bladder which has extended to liver substance. Such were the cases of Hochenegg, Watson, Robson, and Heidenhain.²⁴ The latter excised a cancerous gall-bladder with a wedge-shaped piece of infected liver ten by twelve centimetres. The liver wound was packed with gauze. Recovery. Lüke's case is astonishingly favorable, and I think should lead to a further trial of excision of primary cancer of the liver.

Four cases were for sarcoma. They were by Bardeleben, Sklifossowsky,²⁵ Israel,²⁶ and Elliot. Israel removed a sarcoma, weighing 1225 grammes, from a girl of fifteen. Israel's and Elliot's cases died in four months with recurrence.

Bardeleben's²⁷ case was known to be well two years after

the operation. If, then, we consider all the malignant cases together, we have twelve cases operated on, with one death, and two patients were known to have no recurrence of the disease after two years. This is certainly a more encouraging beginning than could have been expected.

There are four cases of adenoma operated on by Lius, Bergmann,²⁸ Tricomi,²⁹ and Goubé.³⁰ Bergmann's case was of a man, sixty-one years old, who had noticed an abdominal tumor for one month, which was evidently growing. He suffered loss of appetite and from a feeling of pressure. The tumor could be felt in the middle of the abdomen. It was hard and smooth and of about the size of a child's head. It was quite movable, especially from side to side. The diagnosis lay between an echinococcus cyst and a tumor of the kidney. At the operation it was found connected with the left lobe of the liver by a pedicle twelve centimetres broad and two centimetres thick. A part of the pedicle was cut and an attempt made to sew Glisson's capsule, but the stitches cut out. The large vessels were therefore secured separately with much trouble. The bleeding from the small vessels was controlled by gauze pressure and thermo-cautery. The liver was dropped into the abdomen and the wound surface packed with strips of iodoform gauze, the ends of which were brought out through the partly closed abdominal wound. Good recovery.

The tumor proved, on examination, to be a rare specimen of adenoma, which is on the border-line of cancer. Goubé's case returned eleven months after the operation with every appearance of cancer of the liver.

Six cases of cysts of the liver have been operated on by König, Müller, Keen, and, according to Bergmann, Terrillon, North, and Lius. König's³¹ patient was a girl eleven years old. There was an enormous abdominal tumor which fluctuated and pushed the liver up. The operation disclosed a cyst, containing three litres of brown fluid (cholesterine), growing from the liver and partly covered with liver substance. The large liver wound was closed by sutures. The

patient was known to be well one year later. The tumor consisted of numberless cysts, large and small, lined with cylindrical epithelium.

Keen's³² case was a woman thirty-two years old, who had had a lump in the right side of the abdomen for two years. It had increased rapidly since pregnancy, three months previous. Pain, excessive discomfort, and general bad health. Tumor size of fist, in right side, in the situation of the kidney, separated from liver dulness by an area of tympanitic resonance. Tumor quite movable and moderately tender. Diagnosis, floating diseased kidney. At operation a cystic tumor of the liver was found involving its extreme right border. It was removed by thermo-cautery and enucleation with fingers, the large vessels being tied separately. The liver wound was closed with sutures and the abdomen closed with drainage-tube. Recovery. Tumor consisted of cysts of various sizes lined with cylindrical epithelium, originating from the bile-ducts. It was called an adenoma.

Besides the above groups there are a few cases which cannot be classified. Tiffany³³ removed a nodule, containing a small amount of fine biliary calcareous matter, from the convex surface of the liver. Cavity cauterized. Recovery.

Eiselberg³⁴ operated on a cavernoma hepatis, a unique case. The patient, a woman of fifty, had had a tumor near the ribs, on the right side, for five years, which had become painful in the last few months. It was the size of two fists. It was movable, especially from right to left. It was continuous with the liver (by palpation), but the percussion showed a zone of tympany between the liver and the tumor. Diagnosis uncertain, but thought to be a kidney.

At the operation an attempt to cut across the base of the tumor had to be abandoned on account of dangerous hæmorrhage from the porous tissue. Section was finally made in the sound tissue of the liver with the thermo-cautery. The vessels were tied separately and the flaps of the wound were stitched so as to greatly diminish the wound surface.

The wound was packed with iodoform gauze. Recovery. The tumor weighed 470 grammes, and was composed of spongy hepatic tissue full of blood.

Dr. Keen (case not reported) has successfully removed an angioma by elastic constriction, external to the abdominal wall.

Rosenthal,³⁵ according to Kousnetzoff, operated successfully on an angioma fibromatodes of the lobus spigelii. Pedicle secured by an elastic ligature held by a needle.

From an analysis of these forty-six cases it appears that only four died, giving a mortality of less than ten per cent. The tumors have varied in size from a small nut to three fists. In Israel's case the tumor weighed 1125 grammes.

Symptoms and Diagnosis.—The symptoms were not usually characteristic or suggestive. The patients were often in a debilitated condition, and many complained of pain in the region of the tumor. They often noticed a sense of weight and fulness in the right side. Several suffered from gastric disturbances and even vomiting, probably due to pressure on or adhesions to the stomach. The tumor varied considerably in its situation according as it arose from the different liver lobes. A tumor of the right lobe being found in the right loin, in the kidney region, while a growth from the left lobe appeared in the middle of the epigastric or umbilical region.

The tumors were quite movable, even when connected by a broad base, and usually more so in a lateral direction than up and down. They almost all moved with the respiration. By palpation a direct connection with the liver was occasionally made out, but in more than half of the cases percussion showed a tympanitic zone between the tumor and the liver.

The diagnosis was made in only a few cases. These tumors were mistaken for tumor of the pancreas, mesentery, omentum, pylorus, colon, ovary, and kidney. A tumor of the right lobe can often be grasped with one hand in the loin and the other in front and moved about freely; under such circumstances it may feel exactly like a kidney, as in my case,

but when, in addition to this, the urine contains casts, renal epithelium, etc., as in Keen's case, an error in diagnosis is inevitable.

Operative Technique.—In the majority of the cases reported the liver substance was cut with the thermo-cautery and the large vessels tied. In a few cases the knife or scissors were used. Keen enucleated the tumor with his finger-nail. In several cases the stump was strangulated with an elastic ligature or tied in sections with silk. Gauze pressed against the wound was often effective in stopping the general oozing.

Israel, in operating on a large sarcoma, found that gauze pressure did not control the bleeding; he therefore wound an elastic tube twice around the whole right lobe, which completely stopped the hæmorrhage. He then passed three compressing ligatures of stout silk through the whole thickness of the right lobe. This drew the tissues pretty firmly together.

There are four methods of treating the liver wounds.

(1) Closing the abdomen after stopping the bleeding and sewing the liver wound when possible and dropping the stump (intraperitoneal).

This method was followed by Bruns, Langenbuch, Wagner, Lius, Vohtz, Keen, and others. Lius's and Wagner's died of hæmorrhage, and Langenbuch's case was only saved by reopening the abdomen and retying the vessels. This, then, is evidently a very unsafe method, except, possibly, for small tumors.

(2) Operation in two sittings. Extraperitoneal. Tillmans fixed the liver to the abdominal wound and destroyed the growth with the cautery.

Lüke fastened the pedicle into the abdominal wound and surrounded it with an elastic ligature. It was cut away on the ninth day with cautery. Terrillon used the same method.

Lauenstein operated in two stages, and the patient died on the twelfth day of septicæmia. Küster reports a death from septicæmia due to this method.

(3) Fixing the stump into the abdominal wound (extra-peritoneal). In many cases (cited above) the stump, having been tied in sections or even with an elastic ligature, was sewed into the abdominal wound, and allowed to granulate under an iodoform-gauze dressing.

Hochenegg and Rosenthal fastened the stump into the abdominal wound by transfixing it with a long needle resting on the abdominal walls. Hochenegg controlled hæmorrhage by holding gauze into the liver wound by tying stitches over it.

This method has the serious defect that the liver is pulled out of its position, which may injure the organ; it also causes a constant tendency to tear out the stitches,—every respiratory movement pressing directly on the wound.

(4) Liver wound packed with gauze and dropped into abdomen. Abdominal wound partly closed (intra-peritoneal).

Eiselberg³⁶ first practised this method with success, and Bergmann soon followed and insisted on its value. Israel, Mikulicz, and Heidenhain have also used this method with success. My own case was done by this method, carried still further, in that the abdominal wound was left wide open and the liver wound was completely "walled off" from the abdominal cavity with gauze. I had no knowledge of the other cases, but simply proceeded on the now well-established principle of walling off all doubtful wounds of the abdominal viscera.

It has lately been remarked that gauze packing is one of the greatest advances in abdominal surgery, and I feel certain that its use in liver wounds is going to prove of great value. In fact it seems to me to have settled the treatment of these wounds for some time to come, if not for all time.

It appears, then, that it is unsafe to drop a large pedicle and close the abdominal wound on account of the danger of hæmorrhage; that bringing the tumor out through the abdominal wound and slowly strangulating it with an elastic ligature around its base is liable to give rise to septicæmia; that fastening the pedicle into the abdominal wound may in-

jure the liver, and it is liable to pull away on account of the cutting of the stitches.

In my opinion, the best procedure is to use a rubber tube for a tourniquet if necessary, to tie all the large vessels separately, using gauze pressure for the oozing; to close the liver wound as much as possible with sutures; to drop the stump and to completely surround it with sterilized gauze, packing iodoform gauze against the liver wound, and leave the abdominal wound sufficiently open to facilitate dressing the liver wound.

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THE ADVANTAGES OF THE TRENDELENBURG
POSTURE DURING ALL OPERATIONS INVOLV-
ING DIRECTLY OR INDIRECTLY THE CAVITIES
OF THE MOUTH, NOSE, AND THE TRACHEA,
WITH A REPORT OF TWO CASES OF EPITHE-
LIOMA AND SARCOMA OF THE TONSIL.¹

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I DESIRE to call attention to the great advantages which may be secured by operating on the tonsil and on adenoid growths in the pharynx in the Trendelenburg position.

But this position has had a very much wider use than merely in operations upon the tonsil. I have repeatedly used it in the removal of pharyngeal tumors, naso-pharyngeal tumors, in extirpation of the tongue, extirpation of the upper and lower jaws, all operations involving the cavity of the nose, in cleft palate, hare-lip, epithelioma, or other tumors of the lips, tumors of the roof of the mouth, etc.

The patient is placed at about an angle of 35 to 45 degrees. Arrangements must be made, of course, by means of shoulder braces to prevent his slipping off the table.

It is impossible, of course, for blood any more than water to run up hill, and in any of these operations mentioned, if the patient is placed in this position, the first advantage is

¹ Read before a joint meeting of the Sections on Otology and Laryngology and on General Surgery of the College of Physicians of Philadelphia, March 12, 1897.

that there is little danger of an aspiration pneumonia following the operation.

The second advantage is that by this means we may generally avoid a preliminary tracheotomy.¹ This is no slight advantage. A tracheotomy wound is always necessarily an infected wound. It adds, therefore, very greatly to the dangers of the principal wound. This of itself is of prime importance, and even if no other advantage were gained would justify the procedure.

Thirdly, there is little difficulty in giving the anæsthetic. After having put the patient under the influence of the anæsthetic by the ordinary Allis inhaler, I lay this aside and give only chloroform, which is administered by means of a good-sized pledget of cotton held in ring forceps. The anæsthetizer must then be on the alert at every possible moment to place the chloroform over the patient's mouth and yet never get in the way of the surgeon. This can be well managed by a skilful anæsthetist. In any other method the anæsthetic must be often interrupted to operate, to cleanse the mouth of blood, etc.

Fourthly, the mouth being gagged open, if the operation is intraoral, the interior of its cavity can be seen very readily, especially if with the gag, as in Dr. Mears's mouth-gag, there is a tongue-depressor to keep that somewhat unruly member out of the way. If not, then the tongue is controlled by a ligature passed through it. The soft palate can be lifted by a blunt hook, and adenoids removed from the vault of the pharynx with the aid of sight as plainly as if they were on the face. The arches of the palate, the tonsils, the posterior wall of the pharynx, the roof of the mouth, the cheek, etc., can always be seen and reached with that certainty which accompanies sight. A forehead electric light (especially that of Nevius) is of great assistance. Even where there is no street current the storage battery promises to enable us to operate anywhere.

Fifthly, there is no spluttering of blood into the face of the operator, and therefore no interruption of the operation,

especially if he wears glasses. no stopping to cleanse them, and then to disinfect his hands afterwards. There is also but little accumulation of blood in the mouth, for if the face is turned a little sidewise the blood runs out of the corners of the mouth very readily, and what does not run out can be sponged out. In removal of the jaws, both upper and lower, this will be especially appreciated as a great advantage. In no operation is it of more value than by the clear view it gives in cleft palate.

In operations on the lips, as in hare-lip, epithelioma of the lip, etc., I have combined with this position, with great advantage also, a method of minimizing hæmorrhage and annoyance from it by not cutting through the whole thickness of the lip at one stroke, but by dividing first the skin, then the muscles by several incisions, till I meet at one level or another the coronary or other blood-vessels, and then I either clamp them or ligate them. To this method I drew attention in the *American Journal of the Medical Sciences* for June, 1894.

I may incidentally allude also to the use of a very slight Trendelenburg position in certain other operations, especially in removal of the breast, Estlander's, Schede's, or other operations on the chest, in all operations about the shoulder, the neck or the head. In operations on the brain I usually elevate the head to diminish the congestion of the brain and so lessen hæmorrhage. In the other cases, I place the table at about an angle of, say five degrees or thereabouts, lifting the foot of the table perhaps three or four inches above the level of the head. This, so far as the patient is concerned, is practically level, but neither the solutions used nor the blood that may flow will run upward towards the waist of the patient. We therefore avoid soiling the night-dress, under-clothes, blankets, or other coverings. This is not only a great advantage in the mere matter of cleanliness, avoiding the need for changing the soiled under- or over-clothes, but also a great advantage in that the patient is not chilled by these clothes becoming wet with solutions, which, though at first warm, very quickly become cold.

In illustration of the value of the Trendelenburg position, I beg to report the following two cases:

CASE I.—*Primary Epithelioma of the Tonsil; Removal in the Trendelenburg Position; no Return at the End of a Year.*—J. G., aged forty-eight years, was kindly referred to me at the Jefferson Hospital by Dr. Muldrige, of Manayunk, on March 26, 1896. His family and personal history are excellent; no malignant disease has occurred in any relative. On January 20, 1896, he was seized with decided rigidity on the left side of the jaw, so that he could scarcely open his mouth. There was also swelling and tenderness at the angle of the jaw, which gradually subsided. About a month ago he noticed an enlargement of the left tonsil, which caused difficulty in swallowing. His voice was weak and hoarse and his throat dry and irritated. Increase in the size of the growth was steady, and was attended with dull, deep-seated pain. Eight days before his admission I removed a portion of the tonsil and referred it to Dr. Kyle for examination, who reported that while the upper layers, on account of the ulceration, showed appearances which might be simply inflammatory or possibly sarcomatous, the deeper layers showed undoubtedly that it was an epithelioma.

On admission the tonsil was found to project nearly as far as the uvula and showed an irregular nodulated growth on its surface. His temperature was normal and general health excellent. Urine negative.

Operation March 25, 1896. I first made the external incision of Cheever from the lobule of the left ear downward and forward to the hyoid bone. The parts were then dissected till I reached a depth at which the finger perceived the tonsil. In order to get better access, however, to the tonsil, I split the cheek from the angle of the mouth to the masseter muscle. I was then able to dissect out the entire growth very thoroughly without the least anxiety about the vessels as my two fingers in the external wound protected the vessels and separated them from the tonsil. The mucous membrane inside the mouth was then closed by a few silk stitches and both external wounds closed. On the seventh and ninth days all the stitches were removed. His temperature was normal till the tenth day, when a slight accumulation of serum in the wound in the neck caused the temperature

to rise to 103° F. As soon as the serum was evacuated the temperature fell in two days to the normal. He left the hospital, the wound entirely well, on the sixteenth day, and now, one year after operation, is still well.²

CASE II.—*Primary Sarcoma of the Tonsil extending to the Pharynx, and attached to the Base of the Skull and the Bodies of the Vertebrae.*—Mrs. G. W., of Johnstown, Pa., was kindly referred to me at the Jefferson Hospital July 3, 1894, by Dr. Huebner, of Johnstown. Her father is living at seventy-six years of age, in fair health; mother died of enteritis at seventy-seven; five brothers and sisters living and in good health. Has had four children, two living and two died in infancy. About ten years ago she first noticed a small pedunculated tumor on the left tonsil. This grew rapidly, and was removed by the forceps in December, 1886. Two months later it began to grow again, but very slowly. During 1888, especially when there was any inflammation of the throat, the tumor enlarged and caused difficulty of swallowing. It was then quiescent until April, 1894, when a portion of the growth was removed. Since that time it has grown very rapidly. For two years past her hearing on the left side has been impaired. She has lost but little in weight. Her appetite is variable; her tongue red and fissured. The growth involves the whole of the left tonsil, about three-fourths of the soft palate, including the uvula, also the posterior pharyngeal wall from and including the basilar process of the occipital bone down nearly to the level of the hyoid bone. With the exception of in the soft palate, the growth does not extend to the right of the middle line. It is firmly attached to the bodies of the vertebrae and the basilar process. Its color is grayish. Several enlarged glands were found behind the left angle of the jaw. Urine 1020, acid, no albumen, no sugar.

Operation July 5, 1894. First, a curved incision was made from the symphysis of the jaw to behind its angle and three enlarged glands were removed. This incision not only enabled me to remove these glands, but, secondly, gave me access to the external carotid, around which I threw a loose ligature ready to be tied if necessary. The submaxillary gland was found normal. The patient was then placed in the Trendelenburg position. This was simply of incalculable advantage during the entire operation. I next split the cheek from the angle of the mouth to the border

of the masseter muscle, the facial artery and vein required ligation, and with one other vessel later, were the only three vessels tied during the operation. The tumor was now explored very carefully by the finger and found to fill up the entire post-nasal space and be attached to the roof of the pharynx and the anterior surfaces of the bodies of the vertebræ down nearly to the level of the hyoid bone. Externally it seemed to be free from large blood-vessels. I first seized the uvula and cut it, and over half the right and the entire left palatal arch free from the hard palate. Next, on the posterior wall of the pharynx, I passed a knife along the right border of the tumor and cut the mucous membrane in front of the vertebræ transversely. Then partly with the finger, partly with the periosteal elevator, and partly with a chisel and gouge (the hammer not being used), I was able to enucleate the entire mass, though with a good deal of difficulty, owing to the adhesions, especially to the base of the skull and bodies of the vertebræ. The hæmorrhage was almost alarming, but no very large vessels seemed to be implicated, and I worked as rapidly as I could to enucleate the whole mass. The instant it was removed I packed the entire space with gauze sponges, wrung out of very hot water. Finally, I trimmed the surfaces left by the removal of the tumor, snipping off any small fragment of tissue which seemed diseased, and packed the entire cavity with a large piece of iodoform gauze, the end of which was fastened at the angle of the mouth by a stitch.

In spite of the very free hæmorrhage, and though necessarily the removal of so extensive a tumor in such a locality required considerable time, the Trendelenburg position allowed me to work continuously without the slightest interruption; the chloroform was given continuously in the manner already described, and the patient kept completely under its influence. Any other position would have required unquestionably a preliminary tracheotomy. An electric forehead light, of course, was indispensable for the proper illumination of the parts. The operation required one hour and twenty minutes.

The next day the iodoform packing was removed; on the fourth day half of the stitches, and on the sixth the remaining half were removed; eleven days after the operation she went home with the external wound entirely healed; the surface from which the tumor had been removed in the throat was in a

healthy granulating condition, and she was able to swallow very well. The highest temperature reached was 100.6° F.

December 1, 1896. I have just learned that she has had an attack of paralysis of the left side of her face.

March 12, 1897. Dr. Huebner writes me that she is still free from recurrence after two years and eight months.

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¹ In this practice I seem to be at variance with Drs. Murray, McBurney, Bridson, and Abbe (*ANNALS OF SURGERY*, June, 1897, p. 742), but I feel quite certain that those who will try both plans will prefer the Trendelenburg posture to the tracheotomy, though, of course, there are a considerable number of exceptions to the rule.

² June 8, 1897. He has just reported again, and is entirely well after nearly fifteen months.

THE GALVANO-CAUTERY IN THE SURGERY OF THE TONSIL.¹

By JOSEPH S. GIBB, M.D.,

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THE vascularity of the tonsils and their adjacent tissues, with the difficulties encountered in controlling hæmorrhage after surgical procedures, have stimulated surgeons to devise means whereby these organs may be attacked with the minimum amount of danger.

The *écraseur* has been used for years in hypertrophied tonsils, and in suitable cases where the tonsil is the seat of a morbid growth. This method, whilst fairly effective, is both slow and painful. A wire heated by the electrical current to a heat sufficient to cut its way through the tissues is much more effective and decidedly less painful. But, up to a recent date, the apparatus devised for this purpose has been of so clumsy and faulty construction as to deter operators from its use.

The faults have been mainly in the inability to use a wire of sufficient thickness and strength. The only wire which can be satisfactorily used in the snares in ordinary use is constructed of the soft platinum or the slightly harder irido-platinum metals, both of which are entirely too soft and pliable to be properly adjusted to morbid growths occurring in this locality.

Dr. Gradle, of Chicago, has given to the profession a snare in which may be used a stout piano-wire, and which may be heated by a good storage battery to any desired heat. This wire may be made to adapt itself to a morbid growth

¹ Read before a joint meeting of the Sections on Otology and Laryngology and on General Surgery of the College of Physicians of Philadelphia, March 12, 1897.

perfectly, and, by a proper regulation of the current, will cut its way through the tissue as easily as cheese is cut with a knife.

In hypertrophy of the tonsils, it removes this organ from its bed in a clean and effective manner. It is much less painful than other surgical measures of excision, and the operation is practically bloodless.

In properly selected cases, this instrument could be applied for the removal of carcinomatous or sarcomatous growths, but it finds its largest field of usefulness in excision of hypertrophied tonsils.

In a paper read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, I pointed out the types of cases which, in my judgment, seemed suitable for the use of the galvano-cautery snare. It will not supersede the use of the tonsillotome, which in the larger number of cases is thorough and effective.

That hæmorrhage from the tonsils, after excision, is not an accident to be ignored is attested by the number of cases which have been published from time to time, and which now make a long list. It is a well-known fact that hæmorrhage is much more apt to occur in the adult, and some writers, notably Bosworth, make the statement that troublesome hæmorrhage follows excision of the tonsil in the larger proportion of cases in adults.

Inasmuch as excision of the tonsil may be attended by alarming hæmorrhage in adult life, where the bistoury or tonsillotome is used, and can be accomplished in a thorough, effective, and safe manner by means of the galvano-cautery snare, preference should be given to the latter method of operating in this class.

Occasionally we see in children tonsils largely hypertrophied, of a distinctly vascular appearance, with large veins coursing across the surface. It has not been my misfortune to have had alarming bleeding from this type of tonsil, but I have often felt as though such an accident were possible. In tonsils of this description, the use of the galvano-cautery renders such an accident remote.

Another class in children are those in which the pillars of the fauces are thinned out and firmly adherent to the underlying and hypertrophied tonsil, and resist all efforts to detach it from the same. Hæmorrhage is exceedingly apt to occur where the pillars are injured.

The galvano-cautery snare cuts its way through both tonsil and pillar in an effective and safe way, and should be employed in cases of this description.

Lastly, there is a class which seems peculiarly fit for the galvano-cautery snare. I refer to those in whom the dread of a cutting instrument seems almost beyond control. Children of older years may be terrified at the thought of having the tonsil cut, but may be persuaded to have their tonsils burned.

Electricity has come to the aid of the surgeon in other ways than through the snare. The use of the galvano-cautery knife has added to our means of attacking growths of the tonsil, which have in former years been regarded as almost inoperable.

In properly selected cases, sarcomatous growths of the tonsil may be thoroughly removed by this means. Unfortunately, the larger number of cases of primary sarcoma of the tonsil have advanced beyond the confines of this organ when first recognized as such. However, I can call to mind at least one case in which a sarcomatous growth was removed by this method. It was in the clinic of Dr. Arthur Watson, at the Philadelphia Polyclinic. The growth was seized by a tenaculum, pulled from its bed, and by repeated touches of the galvano-cautery knife entirely removed from the underlying tissues.

This method is especially applicable in cystic, fibromatous, or papillomatous growths in this locality.

Whilst there can be no doubt of the usefulness of the galvano-cautery in the surgery of the tonsil, we cannot ignore its disadvantages.

Wounds of the tonsil caused by ordinary surgical measures heal rapidly, and are attended with little discomfort to the patient. This is not the case with the galvano-cautery.

It is not always an easy matter to limit the extent of the cauterization. In some cases we find, after the removal of the tonsils, either through some slight movement on the part of the patient or by radiation of the heat, the cauterizing effects have not been confined to the site of the tonsils, and there is a large granulating surface. Hence the wound, after galvano-cauterization, is quite a formidable-looking affair. Seen by one with no knowledge of the previous operation it might easily be mistaken for diphtheria. The wound being covered by a whitish slough, or rather eschar, and the surrounding tissues œdematous.

This appearance persists for several days or a week, and is succeeded by a clean, healthy-looking granulating surface.

In ten days or two weeks the wound has completely cicatrized, the surrounding tissues have assumed a normal appearance, and all symptoms disappear.

The reaction after the use of the galvano-cautery is sometimes severe, much more so than where the ordinary surgical means have been employed. In all cases in which I have used the snare there has been more or less systemic disturbance. In one case, a boy of six years, the day following the excision, there was high fever, heavily coated tongue, anorexia, constipation, and general malaise. These symptoms continued for several days.

The unpleasant symptoms are usually of short duration, lasting from one to three days. The throat is quite sore. The voice in consequence of the œdema is altered in character. All symptoms disappear in a week or ten days.

REPORT OF A CASE OF SARCOMA OF THE TONSIL,
REMOVED BY LATERAL PHARYNGOTOMY.¹

By JOHN CHALMERS DA COSTA, M.D.,

OF PHILADELPHIA.

FREDERICK H., white, aged forty-two years, was admitted to the Philadelphia Hospital, October 6, 1896.

The family history was excellent in regard to constitutional maladies, no evidence appearing that tubercle had existed in any ancestors or relatives. His mother died of "a tumor of the breast."

Personal History.—The patient had always been in good health, until about eight months previous to his admission. At that time he became annoyed by a feeling of fulness in the throat and by a certain amount of difficulty in swallowing. He went to a dispensary, was told he had quinsy, and was put upon treatment, but the condition grew slowly worse. About two months after the origin of the trouble a lump appeared on the right side of the neck externally. The lump was not painful, and increased steadily in size up to the date of admission. During the past eight months he lost thirty pounds in weight.

On admission, his appearance was indicative of distress. His respiration was frequent and difficult. At intervals he was seized with a cough, at which times his face became cyanosed, and he seemed about to suffocate. Swallowing was very difficult and in speaking his voice was muffled, and articulation was laborious and indistinct. The pulse was weak; lungs, heart, and kidneys not diseased. His sleep was much interfered with by cough and a sense of impending suffocation. He took daily a small quantity of fluid food.

On the right side of the neck there was a growth the size of two goose-eggs. The mass was in the anterior triangle, pushed backward beneath the sterno-cleido-mastoid muscle, and had ad-

¹ Read at a joint meeting of the Sections on Otology and Laryngology and on General Surgery of the College of Physicians of Philadelphia, March 12, 1897.

vanced forward almost to the mid-line of the neck. The mass was semielastic and was firmly anchored to the deeper structures, but the skin and superficial structures were not infiltrated, and moved freely over the tumor. This tumor was neither painful nor tender; the skin above it was not discolored; but several large veins were visible tracking across the mass.

On looking into the mouth a large purple mass was at once noticed. It sprang from the tonsil upon the right side and almost filled the pharynx. The tumor had pushed the soft palate and uvula to the left and almost reached the opposite side. Examination with a finger in the mouth and the fingers of the other hand externally pointed to the probability that the mass in the neck was not absolutely continuous with the lump in the tonsil; we seemed to have two tumors, and not a single tumor. The mucous membrane over the tonsillar tumor was purple from congestion, but was not inflamed or ulcerated. The tumor in the mouth, like the tumor in the neck, was semielastic, and was the tumor in the neck, was semielastic, and was neither tender nor painful. The base of the tongue and floor of the mouth were free from disease, and the naso-pharynx was not invaded.

A diagnosis was made of sarcoma of the tonsil. The embarrassment of respiration was so pronounced that relief was urgently necessary, and it was decided to attack the growth through an external incision.

On October 14, 1896, the patient was placed recumbent. A preliminary tracheotomy was not performed, although the surgeon was in readiness to do tracheotomy at any moment during the operation. An incision was made from the mastoid process to below the level of the cricoid cartilage. The tumor was exposed and removed, several large veins requiring ligation. At this stage a ligature was passed around the external carotid artery, but was not tied. The intention was to tie this ligature later if bleeding should become excessive.

The patient was now placed in the Trendelenburg position, in order to prevent blood entering the air-passages.

From the beginning of the first incision a cut was made, which passed forward beneath the body of the jaw. The facial artery was cut and tied. The inferior maxillary bone was exposed and the periosteum was cleared over a small portion, externally and internally, just anterior to the masseter muscle. The cheek and lip were drawn up by retractors. The bone was bored

in two places, and was then sawed through, the line of the saw section passing between the two drill-holes and running from above downward, outward, and forward. The two portions of the jaw were pulled aside by retractors. This exposed thoroughly the entire region of primary disease. The posterior belly of the digastric muscle and the stylo-hyoid muscle were cut. The lateral wall of the pharynx was reached and opened after the great vessels had been retracted. The tumor was removed partly by the fingers, partly by the knife. The sides of the growth were easily detached by a finger in the mouth and a finger externally. Hæmorrhage was not severe, and bleeding points were easily caught and tied. It was not necessary to employ the ligature which had been cast about the carotid.

An attempt was made to suture the mucous membrane with catgut, but the gap was so large that the attempt was only partially successful, the gap reached almost the level of the origin of the œsophagus. The bone was wired. Iodoform-gauze drainage was put into the wound and the skin was sutured. The patient reacted well after the operation.

On the day after the operation he was propped up in bed to favor drainage. The packing was removed on the fifth day.

During the first two days after operation he was fed entirely by the rectum.

During the next two days he was fed partly by the nasal tube and partly by the mouth, when he lay upon his left side with the head hanging over the side of the bed (Semon's plan as mentioned by Cheyne). The nasal-tube produced irritation and discomfort. Swallowing in Semon's posture was difficult and painful. From the end of the fourth day until the fifteenth day the patient was fed through a stomach-tube, when he was allowed to take fluid food naturally. On the eighteenth day he was put on soft diet.

The stitches were removed on the eighth day. The incision below the jaw was entirely healed. The incision upon the side of the neck was largely closed. A fistula existed, which was about half an inch in diameter, and through this mucus and saliva appeared when he attempted to swallow.

On the fifteenth day the fluid injected into the fistula did not enter the throat.

On the eighteenth day the wound was soundly healed.

I wish now to briefly discuss and criticise several points about this case and the operation.

A diagnosis was made of sarcoma because of the rapid growth, the absence of ulceration when the tumor had attained such size, and the absence of induration.

(1) *The Diagnosis.*—The diagnosis was confirmed by Dr. Kyle's examination of the growth. He found it to be a small-celled sarcoma, the intercellular substance being very scantily developed.

The fact that glands were enlarged did not contraindicate a diagnosis of sarcoma and favor one of carcinoma. It is true that in most situations sarcomata do not involve adjacent glands, but a sarcoma of the testicle or a sarcoma of the tonsil does involve adjacent glands.

The harpoon trocar was not used as an aid to a conclusion. Many able surgeons approve of its use and claim to obtain information by its employment. Professor Senn opposes the use of it, and I think wisely so. He says that the greatest blunders in diagnosis have been committed by relying upon "the microscopic examination of fragments of tumor tissue." Tissue removed by the harpoon trocar represents a *part* only of the tumor, and examination of isolated cells is always useless and may be misleading.

There seems to be but little doubt that even considerable sections of tumor can be examined with uncertain results. Syphilomata are very hard to tell from sarcomata, and Es-march has told us that in cases where unlimited granulation tissue has grown around a gumma it is impossible to diagnose this growth from a small-cell sarcoma by the use of the microscope.

(2) *The Avoidance of Preliminary Tracheotomy.*—Many surgeons have urged the advisability of a preliminary tracheotomy and the insertion of a tampon canula.

W. Watson Cheyne, the distinguished professor of Surgery in King's College, has dealt elaborately and ably with the operative technique of these operations, and has spoken with emphasis in regard to preliminary tracheotomy. ("Ob-

jects and Limits of Operations for Cancer," the Lettsomian Lectures for 1896). He says it is an advantage "if we can manage to avoid preliminary tracheotomy, for that adds additional complications in several ways. In the first place it means another wound which must become septic, it means irritation of the trachea by the presence of the tube and the admission of cold air, and it means interference with coughing and the power of expelling any discharges which may have entered the larynx."

A consideration of these reasons leads us to do without the tracheotomy. The Trendelenburg position most satisfactorily prevented blood from running into the air-passages, and the sawing of the jaw enabled the operator to rapidly catch bleeding points. We must be ready to do instant tracheotomy, for even though the blood does not run into the larynx, the intraoral manipulations may seriously interfere with respiration when the tumor is very large or when it involves the larynx.

(3) *The Incision by Cheyne's Method.*—The incision which was carried forward was below the jaw, and the cheek was lifted up to expose the bone. This gives a perfectly satisfactory view, and it is not necessary to split the cheek as is done by von Bergmann, Küster, and others. To split the cheek leaves an unsightly scar, and interferes with the angle of the mouth.

(4) *The Question of Preliminary Ligature of the External Carotid Artery.*—Bleeding was so easily managed that it was not necessary to tie the ligature which had been placed around the carotid. Ligation prevents a free flow of blood and is desirable if the jaw is not split. But when the jaw is split bleeding points can be caught at once and blood need not flow into the air-passages. Besides, the Trendelenburg position enables us to get along more easily without the ligation. Cheyne has shown that this operation is objectionable because the wound becomes septic, very little clot forms between the ligature and the heart, the ligature being in a septic wound is apt to separate too easily and a fatal hæmorrhage can result. In fact, in most reported cases in which the artery

has been tied severe secondary hæmorrhage has arisen, and in several cases it has proved fatal.

(5) *The Splitting of the Jaw*.—This is a distinct advantage. It secures absolute command of the bleeding points.

The jaw should be bored before it is sawn,—that is, it should be drilled when it is solid and when drills can be easily used (Kocher), as the extremity of the posterior fragment has a strong tendency to pass upward and inward. Kocher advises that the sawing be done obliquely, the section being farther front on the outer and lower aspect than on the inner and upper. His rule is, saw from behind, internal and above obliquely forward, outward, and downward. (“Text-book of Operative Surgery,” by Theodore Kocher.)

The fragments of the jaw were approximated by silver wire. This wire still remains in place (five months after operation), and has caused no trouble. It would have been wiser possibly to have used kangaroo tendon, as there is always a possibility of a buried non-absorbable suture giving rise to trouble. Nevertheless, the rigidity of the wire is an advantage in antagonizing displacement.

Of course necrosis can follow this operation, although this result is probably infrequent. But even if necrosis were more frequent, the additional power we obtain over hæmorrhage by section of the jaw should lead to its performance in most cases.

(6) *General Considerations*.—In this case it was not possible to remove the neck tumor and the tonsil in one piece. This would be desirable but is often not feasible. It is always a misfortune to flood the wound with fluid from a sarcoma. This fluid contains cells and these cells may take root in the wound and grow just as a skin-graft may attach itself and grow. The growth of such cells in a wound, of course, leads to recurrence. Cheyne and Keen have set forth interesting cases in which recurrence was so produced.

In cases where the growth is cut across it would be wise to swab out the wound with a solution of chloride of zinc.

The partial enucleation by the fingers was, I believe, a mistake. The proceeding is easy and hence tempting and

it greatly limits hæmorrhage, but I doubt greatly if it is possible by such means to entirely remove the growth.

It is desirable when possible to stitch the mucous membrane in these operations. In this case it could not be completely done. Stitching the mucous membrane might be followed by primary union, and the probabilities are that at least a portion of the mucous incision will rapidly unite. Périer has obtained primary union in two cases of laryngotomy in which he did not do preliminary tracheotomy, and in which he completely sutured the mucous membrane (*Bulletin de l'Académie de Médecine*, June 25, 1895). If we can obtain primary union after laryngotomy, why not after pharyngotomy? It was a mistake to use iodoform gauze. It pushed the sides of the wound apart, did not drain well, and I believe delayed union. I should have used a large drainage-tube for the first week as Cheyne advises.

It will be noted that the patient was fed more readily by the stomach-tube than by the nasal tube, and that swallowing in Semon's position was unsatisfactory.

After this elaborate exordium it might be supposed that the patient was well. Unfortunately, this is not the case.

Six weeks after the operation slight recurrence was noticed internally. The patient was anæsthetized and the cautery used. Two months later it again recurred and now (five months after the first operation) presents itself as a mass in the pharynx the size of an English walnut. It has never recurred in the neck. Further operation is declined by the patient. These operations are very rarely curative. Whether they are worth doing in advanced cases is a matter of opinion. I am certain that this patient would have perished months ago had he been denied operation, and in order to relieve him we were forced to choose between lateral pharyngotomy and palliative tracheotomy,—that is, between an operation which might kill, which might cure, and which would very probably make him comfortable for months, and an operation which could not cure, which might kill, and which could only at best make him relatively comfortable for a short time.

GALL-STONES FORMED AROUND SILK SUTURES,
TWENTY MONTHS AFTER RECOVERY
FROM CHOLECYSTOTOMY.

By JOHN HOMANS, M.D.,

OF BOSTON,

SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

THIS case is interesting, on account of the condition mentioned above, and important, because it settles the question as to the length of time required for the formation of quite large gall-stones. The gall bladder was entirely emptied of stones in April, 1895, and in January, 1897, it contained seven, of which the plates give an exact representation as to size and color.

Mrs. B., the patient, had been an invalid for many years. She was thirty-eight years old, and was referred to me in March, 1895, by Dr. George Spafford, of Cavendish, Vermont. She was the mother of two children, the youngest seventeen years old. She was emaciated and anxious, and suffered much from constant pain in the stomach, backbone, and pelvis. She vomited almost all her food, and had been confined to her bed for many months. She had been treated in many (twenty-five) institutions, and had availed herself of every opportunity to consult gynæcologists who came to Vermont to lecture. She had never been jaundiced. On examination no tumor of the stomach or gall-bladder or any movable kidney was found. The uterus was retroverted and fixed; the ovaries were prolapsed and adherent; there was considerable pelvic tenderness, but still not enough trouble to cause such severe reflex symptoms. For about three weeks her stomach was washed out every morning by Dr. E. A. Pease, my first assistant, and this afforded considerable relief. There was no vomiting for ten days and less nausea, but I decided that an operation



F. BIRNES, DEL.

"GALL-STONES CRYSTALLIZED AROUND SUTURES."

must be done and perhaps the removal of the tubes and ovaries might help her. Accordingly, on April 6, 1895, I opened the abdomen in the pubic region. The uterus was found retroverted, and the ovaries and tubes very adherent. A tubo-ovarian cyst was "dug out" on the left side. The separated rectal adhesions bled so freely and were so difficult to tie, on account of their depth, that finally five pairs of long pressure-forceps were clamped on the bleeding points in the rectal and neighboring parietes, and were left with their handles protruding through the abdominal wound. These were removed forty-eight hours later. As what I had found in the pelvis did not seem a sufficient cause for the gastric symptoms and epigastric pain, I passed my hand and forearm into the abdomen and felt of the gall-bladder; it was full of stones, so I sewed up the pubic incision and made another one parallel with the cartilages of the ribs over the gall-bladder. This I opened and removed all the calculi in it, ninety-seven in number, averaging about one-fifth of an inch in diameter. I put some gauze in the gall-bladder to keep the bile from oozing out while I was sewing it up, having decided not to drain it, and made a seam completely closing the opening, but when I came to count my gauzes I found that there was one wanting, and that I had sewed it up in the bladder. Accordingly I took out the stitches in the gall-bladder, removed the sponge, and sewed the open gall-bladder to the peritoneum, put in a rubber tube and some gauze, and left the bladder to drain. This it did most freely, but gradually closed, and the patient went home at the end of five weeks perfectly well and relieved of all her symptoms. She continued well until December, 1896, when all her old symptoms returned. Her daughter and Dr. Spafford wrote me, and I advised that she come to St. Margaret's again and have the gall-bladder opened, and we should probably find some more stones. On January 18, 1897, an incision was made through the scar of the former operation. The gall-bladder was found to be adherent to the cicatrix which was several inches deep. It was opened and within it were found seven calculi, two of them about the size and shape of lima-beans, of a yellowish-brown color, and attached, in a dumb-bell fashion, to a piece of silk which formed an axis in each stone. Three others were attached to another piece of silk which formed a raphe from which the stones branched. Two others much smaller were independent. The

silk must have been that which united the edges of the gall-bladder to the peritoneum at the first operation. I think that the crystallization of the calculi around the silk is probably accidental, and that the presence of the silk in or on the gall-bladder was not the cause of the formation of the stones, but being there it furnished convenient nuclei for the cholesterine to cling to, just as alum in a hot saturated solution will crystallize, as it cools, around pieces of string suspended in it. From this case it would seem that gall-stones need but a few months for their formation and in that time may become quite large. The largest of these is one inch and a quarter long and five-eighths of an inch wide. The plate gives a very accurate idea of the appearance of the stones and how they have formed around the silk sutures.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 10, 1897.

The Vice-President, ANDREW J. McCOSH, M.D., in the Chair.

CASES OF GASTRO-ENTEROSTOMY AND PYLORECTOMY.

DR. WILLY MEYER presented several patients upon whom he had performed gastro-enterostomy or pylorotomy for stricture of the pylorus.

The first patient was a woman forty years old, who had had trouble with the stomach over three years. A competent physician had recognized a tumor at the pylorus, which he concluded was malignant. He advised operation, and thought that at that stage pylorotomy was feasible. But the patient was absolutely opposed to operation, and for three years she suffered considerably and vomited on partaking of hearty meals. At the end of the three years the tumor had largely disappeared, hydrochloric acid was present, lactic acid was absent, and the doctor then concluded that the stricture was non-malignant. January 4, 1897, Dr. Meyer opened the abdomen at the Post-Graduate Hospital with the intention of doing pylorotomy if it were thought proper, otherwise of doing gastro-enterostomy. She was very weak, but it was remembered that a patient with a benign tumor could withstand narcosis and an operation with more hope of success than one with a malignant growth. The pylorus, which before had been movable, was found adherent to the lower border of the liver, with which it formed one hard mass, which could not have been removed without partial resection of the liver. Therefore it was decided to do gastro-enterostomy. The walls of the stomach were found at least half an inch thick, so that a Mur-

phy's button was not considered suitable to use. The union between stomach and intestine was made by three rows of continuous silk sutures posteriorly and in front. The patient made a good recovery, was discharged within four weeks, and had gained thirty pounds during four weeks' stay at home.

The second patient was a man, forty-three years of age, who, on account of continuous vomiting last summer, the vomit sometimes including blood, and the presence of great pain, had been supposed to have an ulcer of the stomach. By the first of the present year the patient had lost fifty pounds. A sausage-shaped tumor could be felt in the epigastrium. The diet had to be restricted to liquids. The stomach held a quart of water. The man was very much emaciated at the time of the operation, which was performed on February 5. The pyloric end of the stomach which appeared in the wound was found to contain a large tumor. Dr. Meyer was about to close the abdomen when it occurred to him that there evidently must exist a larger cavity of the stomach because, during lavage, a quart of fluid had been held. From underneath the left ribs the fundus free of cancer was pulled into the wound with difficulty. He therefore decided to proceed and try to do gastro-enterostomy. This he did with the Murphy button while the assistant held the stomach up in front of the wound. When dropped it immediately returned to its place under the ribs. The patient vomited greenish fluid for two days, but after the second washing of the stomach vomiting ceased, he got out of bed on the sixth day, and had since gained nine pounds. While the other case was one in which the button could not have been used, this was one in which it would not have been possible to use the suture.

The third patient was a woman whom he had showed about eight weeks before with the statement that he had operated in October, 1896, making gastro-enterostomy for ulcers in the lesser curvature of the stomach. There were then a large number of adhesions around the pylorus, the gall-bladder, and lower aspect of liver. The patient had still to be very careful of her diet, because Dr. Meyer felt sure of the adhesions, and it seemed advisable to do a secondary operation to break these up, provided continued improvement did not soon set in.

The fourth patient was a young man upon whom he had performed gastro-enterostomy on November 7, for malignant

stricture of the pylorus. Other tumors of similar character were present along the upper two feet of the jejunum; also many glands and cancerous infiltration of the head of the pancreas. The anastomosis was made with the button. The man now felt perfectly well, and had gained almost forty pounds.

The fifth patient was a woman, aged forty-four years, who had entered the Post-Graduate Hospital February, 1894, with a movable growth at the site of the pylorus and another small one in the anterior wall of the stomach. Dr. Meyer performed pylorotomy, using the Murphy button, which he found of great aid. The operation was done February 24, 1894. The cut end of the duodenum was implanted into the posterior wall of the stomach, before the gastric wound had been closed, by a double row of continuous silk sutures. The button was passed on the twenty-first day. The patient had since gained seventy pounds, was able to attend to her household affairs perfectly well. The growth was a fibroma.

THE PLACE OF THE MURPHY BUTTON IN GASTRO-ENTEROSTOMY.

DR. MEYER then read a paper with the above title, for which see page 31.

DR. CHARLES K. BRIDGON said that, so far as suture was concerned, his experience with anastomosis by this method had not been such as to impress him with its value. It might have been otherwise if the condition of these patients was not so commonly bad, but they were usually kept under the charge of the physician until they were *in extremis*, and it had rarely been his fortune to meet with cases where the condition could be considered favorable for any operation. Since the Murphy button had come into use, the facility with which it could be introduced rendered gastro-intestinal anastomosis permissible even in advanced cases. While he had made quite a number of anastomoses with the button, he had used it for gastro-enterostomy for cancer in only two cases. He had never used the button in any class of cases with any reason for dissatisfaction except in one instance in which it stayed in the gall-bladder. It was there yet, over two years after operation, but had caused no inconvenience so far as he knew. But anastomosis by suture was exceedingly

tedious, and was, he believed, disastrous on account of the time required. He had always done the von Hacker operation, and thought it was the best. He had not, however, done it in the manner just described by Dr. Meyer, suturing the mesentery to the posterior wall of the stomach. In spite of the means claimed by some as absolutely certain for determining in which direction the intestine ran, in one instance and after considerable search he still made the mistake of getting hold of the lower end of the ileum instead of the jejunum. The patient died of inanition after a few weeks, the mistake was discovered and the button was found in the stomach. The other man on whom he had also done von Hacker's posterior operation he presented to the society a number of months after the operation. The last time he saw this patient was after the lapse of sixteen or eighteen months, when recurrence had taken place in the cæcum and also in the epigastrium.

We could not ignore the value of Murphy's button. He cared not how dexterous a surgeon might be, the operation by suture was exceedingly tedious. Judging by his own experience he did not believe there was much tendency to contraction after use of the button,—not nearly as much as after suture. He could safely say that in some in which considerable time had elapsed after the operation autopsy showed no contraction whatever. There was only a line to indicate the former position of the button. He would emphasize a remark made by Dr. Meyer, that we would be much more successful in operations upon the stomach if the disease were recognized at an earlier period or the patient were brought to the notice of the surgeon earlier. Still, if we could give the patient even a short respite it would be a great gain, for he could conceive of no greater suffering than to be slowly but surely dying of gastric cancer.

DR. R. F. WEIR said he was unable to give much experience with the Murphy button in gastro-enterostomy, but there were two things which he had always thought might constitute objections and which experience had shown to be such. The first related to the button dropping into the stomach and remaining there. Enough cases had been reported to lead us to recognize this as a pretty serious condition, and likely to occur after operation by the most expert. Second, as time had gone by, it had shown that by the original method the persisting suture was not

sufficiently reliable, so that now a row of sutures was placed around it. This takes additional time, yet it remains the quickest operation which could be done.

All operations of gastro-enterostomy were very unsatisfactory, because of one additional trouble which even the Murphy button did not entirely do away with, and that was the regurgitation of the biliary discharges into the stomach. Under the button and under ordinary suture there was such dragging on the intestine and more or less kinking that the ready onflow of bile was obstructed, and it passed into the stomach. He had lost three patients lately in that way. In one he had employed the method of Kocher, making a little valve from the duodenum which it was claimed would prevent regurgitation, but it did not. On the fifth day, the patient being much exhausted, he reopened the abdomen, made a hasty gastro-enterostomy with the Murphy button, and resorted to a little expedient for preventing the button falling into the stomach, consisting in attaching to its lower half a string, on the other end of which, resting in the intestine, was a shoe-button. He thought the downward peristalsis would tend to pull the Murphy button away from the stomach by means of the shoe-button. Unfortunately, the value of this procedure was not proven, because of the death of the patient at the end of forty-eight hours.

In looking back over his experience with anastomosis he found that his best results had been obtained with Abbe's rings. These prevented the ill effects of dragging on the stomach. So far as regurgitation was concerned, he had not seen that the stitching of an additional portion of the intestine to the stomach overcame that objection. In all three of his cases referred to here this had been liberally done. He thought that in his next case he would try a method that had been recommended of making, after the gastrostomy, a second lateral anastomosis between the afferent and efferent legs, or portions of the jejunum, either by the ordinary suture method or by Murphy's button.

DR. ROBERT ABBE said he had had no experience with the Murphy button in gastro-intestinal anastomosis. In intestinal anastomosis he had come to the conclusion that it was of much more limited application than was at first thought. He had himself met with a number of mishaps which were the result entirely of the button. But there were some occasions when its use was

very beautiful. The cases which Dr. Meyer had presented would seem to demonstrate its value in that class. In making gastro-enteric anastomosis by suture he had encountered the difficulty referred to by Dr. Weir, of kinking of the gut in the neighborhood of the anastomosis,—in one case beyond the anastomosis, in another at its site, causing regurgitation which threatened to be fatal, and which, after a second enteric anastomosis made for its relief, did prove fatal. He thought that in the next case he would sever the gut and make a double anastomosis, uniting the distal end with the stomach and the proximal end with the intestine below, thus avoiding any kinking in a loop attached to the stomach. He felt that operation in these cases was not very encouraging unless it were in the hands of one of considerable experience, with a knowledge of the probable disasters, and an acute appreciation of the lay of the land. To determine whether one was proceeding towards or from the stomach, seize the duodenum, and pass ten to fifteen inches of it through the fingers; if the walls became thicker to the feel the finger was approaching nearer the stomach; if the thinner, they were receding from the stomach.

DR. FREDERICK KAMMERER said he had used Murphy's button in three cases of gastro-intestinal anastomosis and all had proven fatal. In one there had been leakage, but in the other two the post mortem showed that the button had done its duty. Union was firm. He had operated a number of times by older methods, using Abbe's rings and Senn's plates, but during the last four or five years he had always used simple suture. He would frankly confess that he had also lost the majority of these cases for reasons pointed out by Dr. Weir and Dr. Abbe, and especially on account of the exhausted condition in which these cases generally came into the surgeon's hands, when, he believed, the choice of methods would not much affect the final result. In most of them a post-mortem examination had been made, and he was able to convince himself that the double row of sutures, which he had been using recently in preference to three rows, had been sufficient to secure perfect union. He thought the whole question of the use of the Murphy button in gastro-enterostomy narrowed itself down to the length of time required for the operation, for if a decided advantage was not gained in this respect, in other points Murphy's button certainly was inferior to simple

suture in gastro-enterostomy. Before passing directly to this point he might say that he did not claim to be as expert as some in the use of the button, although he had also employed it a number of times and with great satisfaction in intestinal anastomosis. He could add his testimony to that of Dr. Briddon, that the line of union in, for instance, ileo-colostomy was a most perfect one, where the walls of the intestines were relatively thin. In such cases he had found not the slightest contraction many months later. But in gastro-enterostomy, where the button had to cut through thick stomach walls, this might be different. He personally had not been able to gain much time by use of the button over that required for anastomosis by two rows of sutures on each side of the incision, especially since, in gastro-enterostomy, he had felt it necessary to supplement the button by one row of sutures, as Dr. Meyer had also recommended. Further, he had found some difficulty in applying that part of the button which was introduced into the stomach, because of the thickness of the walls. Granting that anastomosis by suture required twenty to twenty-five minutes, he did not believe that introduction of the button with one row of sutures could be accomplished by the general operator in less than ten or fifteen minutes. Indeed, it had taken even a longer time in his hands.

The question was, Can this increase of five or ten minutes be of such vital importance for the result of the operation, or are not rather the manipulations common to both procedures,—*i.e.*, narcosis and laparotomy, the sometimes prolonged search for the duodenum,—responsible for the fatal result?

In the speaker's practice it had frequently happened that the patients had borne the operation well, and twenty-four to thirty-six hours later had shown no signs of shock, nor any ill effects from the operative procedure itself, having a normal, perhaps subnormal, temperature and a pulse not more rapid and not weaker than before, giving hope of an ultimate recovery. On the next day the patient was perhaps somewhat more exhausted, had vomited once or twice, and then the end had come very quickly from what appeared to be simply exhaustion. In many of these cases a careful post-mortem examination has failed to reveal anything. More especially no trace of peritonitis was ever found, and careful examination of the anastomosis had always shown the sutures to be absolutely secure. Patients with malignant dis-

ease of the pylorus, in the far advanced stage, at which they generally passed into the surgeon's hands, were unfit subjects for any operation, which was, however, as Dr. Meyer had correctly stated, their only chance. Early laparotomy ought to be more frequently practised in cases in which cancer of the stomach is suspected.

DR. HOTCHKISS mentioned two cases of gastro-enterostomy operated upon at the Manhattan Hospital, the first by himself, the other by his colleague, Dr. Le Boutillier. The first was a case of carcinomatous stricture of the pylorus, and the patient died after a few weeks from extension of the disease. No contraction of opening. In the second case the tumor was also a carcinoma, the patient lived about five months and died of starvation. Autopsy showed that there had been contraction of the opening at the site of anastomosis, made by Murphy's button, until it had practically closed.

DR. B. FARQUHAR CURTIS said that his personal experience with gastro-enterostomy included eight cases, two of which were operated upon by button, the remainder by suture. Four of the latter died, three from exhaustion, one from the establishing of a vicious circle,—the food passing through the pylorus and back again through the gastro-enterostomy opening, so that the man, who had been in very good condition, died of inanition on the fifth day. Of the two button cases one was a man who was in good condition and did very well for about a week after the operation when he began to vomit. It was a case of malignant disease of the pylorus; there had been no previous history of peritonitis nor of any serious illness. It was evident that there was intestinal obstruction. Dr. Curtis opened the abdomen low down, found a distended coil of intestine and the entire lower half of the peritoneal cavity obliterated from the upper by adhesions too extensive for separation. There had evidently been at one time a peritonitis of which the patient had no recollection, and the operation had caused death in a remote way. That is, it had removed the support given by the pyloric sphincter to the peristaltic wave, and the regurgitation into the stomach had been so free that the peristaltic movement had not been sufficient to carry on the contents of the adherent bowel. Death taking place on the eleventh day, autopsy showed the button still in place, grasping one edge of the wound, hanging in the stomach,

the opening too small to allow it to pass through into the intestine. There was no sign of any other disturbance, no local peritonitis. The button, therefore, had done its work properly, but would have been retained in the stomach had the man lived.

The second button case was in an aged man, in rather poor condition, who had vomited a great deal. The operation went nicely and the patient did well until he was given food, thirty-six hours later. He then began to vomit, and it became evident that the obstruction had not been relieved. The stomach, which had been often washed out during his stay in the hospital, was now again irrigated and some grape-skins came up. Where he had gotten the grapes was unknown; he would not confess to having eaten any since the operation. It seemed probable that the lumen of the button had been obstructed by the grape-skins. Washing out the stomach was too late to save him and he continued to sink until death, forty-eight hours later. Union around the button was perfect.

The speaker thought the points given by Dr. Meyer with regard to finding the jejunum, suturing the opening in the mesocolon, also picking up the loop of jejunum and attaching it to the stomach in front of the opening were all very important. With regard to saving time by use of the button, he rather agreed with Dr. Kammerer. Anastomosis made in this manner was not always easy, and it required the average man, as he had seen him operate, ten to fifteen minutes to put in the button and apply the suture. To suture a two-inch opening, or even one of three inches, required from thirty to thirty-five minutes. The rest of the operation required about thirty minutes in both cases. Some cases were very easy, for the stomach could be lifted out of the abdomen, others were very difficult because of the necessity of working at a depth. In the latter class of cases Murphy's button possessed marked advantages, but in ordinary cases he did not think the difference between forty-five and sixty minutes in the total duration of the operation was very important.

DR. MEYER, in closing, mentioned a case which illustrated the difficulty sometimes experienced in determining with just what part of the gastro-intestinal canal one was dealing. There were a great many adhesions, due to metastatic tumors. He performed, as he supposed, von Hacker's operation, attaching the jejunum to the posterior part of the stomach. The patient grew

weaker and weaker without apparent cause until he died of exhaustion on the fifth day, and it was found at autopsy that he had made a duodeno-ileostomy instead of a gastro-enterostomy, the error having arisen from the extremely small size of the stomach and the misplacement of the parts caused by adhesions. The pylorus was on the left side of the spinal column.

With regard to regurgitation of bile into the stomach, he had never seen it for any length of time in any of the eleven cases which he had operated upon. It would certainly soon cease if one began the use of lavage of the stomach not later than the second vomiting, repeating the lavage as might be necessary. By attaching the proximal end of the gut to the stomach, as he advised, there would be less likelihood of regurgitation.

With regard to the button entering the stomach, he had stated before that it did no harm, and need not be considered in reviewing the advantages and disadvantages of the button. Dr. Weir had attached the button by means of a string to a shoe-button in the gut below, with the hope that the latter might drag it down. Dr. Wackerhagen, of Brooklyn, had proposed to tie the button to a small perforated glass ball. He had lately heard of somebody else suggesting to pass a bougie down from the mouth when the stomach was opened and fastening a silk thread to the button with the intention of pulling it out through the cesophagus when it should become detached. In former times he had himself often thought of the propriety of the same procedure. If such expedients as the latter were really brought forward they would injure the reputation of the button and restrict its usefulness.

With regard to Dr. Abbe's suggestion, to divide the small intestine and attached the distal end to the stomach and the proximal end to the small intestine below, making double anastomosis with buttons, Dr. Meyer thought it would be better to divide the duodenum near the stomach, if there was still room beyond the tumor, shut the proximal end off with suture, and implant the distal portion into the posterior wall of the stomach. That would retain the parts in their normal relation and probably also result in saving time.

Regarding the duration of the operation, where the button was used, it was certainly an advantage to insert a Lembert suture, but this required only four or five minutes, whereas to make

entire suture anastomosis he felt that it would be difficult to accomplish it in much less than thirty-five minutes. This additional time would often add much to the gravity of the operation in cases with cancerous disease, and would account for death where there was no other apparent cause than shock. He felt sure that in gastro-enterostomy every minute was of value, and that if all operators would use Murphy's button in gastro-enterostomy for malignant pyloric obstruction there would be better results. One operator had had seven recoveries out of eight cases.

The case mentioned by Dr. Hotchkiss, of contraction of the opening after use of the button, seemed to be unique so far as gastro-enterostomy was concerned. The patient whom Dr. Meyer had presented three years after the operation was to-day able to take meat and other solid food without the slightest trouble. It was his belief that if the canal could carry out its physiological function—that meant to say, as long as the material usually contained in the respective organ continued to pass through it—contraction did not take place. If he remembered correctly, in Dr. Abbe's case of contracted gall-bladder anastomosis, the bile could not flow through the opening on account of the cancer involving the cystic duct.

When the button had been used in malignant disease of the stomach and the patients had died, it was not on account of the button, but in spite of it. No surgeon should hesitate to do gastro-enterostomy for cancer with the button rather than let his patient starve, even though he should survive the operation only a few weeks.

INJURY OF PELVIS WITH INTRAPERITONEAL HÆMORRHAGE.

DR. A. J. McCOSH presented a young man who had fallen off a house a distance of about fifty feet, January 4, and was brought to the hospital in profound shock, the house surgeon not expecting him to live until the next day. A catheter was introduced a few hours after admission and bloody urine flowed. The patient gradually recovered from shock, and after twenty-four hours abdominal symptoms became manifest. The abdomen became very tympanitic, the pulse went up to 130, he commenced to hiccough, vomited occasionally, and looked desperately ill. It

was evident there was hæmorrhage somewhere in the abdominal cavity, and, inasmuch as bloody urine had been withdrawn, it was suspected that there was rupture of the kidney or of the bladder. Accordingly, about thirty-two hours after the injury he was put under the influence of chloroform, the bladder was injected with salt solution, and, inasmuch as the full amount of fluid injected came away clear, rupture of this viscus was excluded. The abdomen was then opened and found to be full of blood, partly clots, partly fluid. It was estimated that there were three pints of blood in the peritoneal cavity. It was scooped out, the cavity was irrigated with hot salt solution, and then it was found that the posterior layer of peritoneum, posteriorly and in the right side, had been dissected up by a blood-clot from the pelvis as high as the last rib, the blood having apparently escaped from a vessel behind the peritoneum, which structure it had perforated. After washing out the abdominal cavity, partially closing the wound and introducing a glass drain, the patient was turned on the right side and a deep incision was made down to the kidney. The patient's condition was desperate, necessitating rapid work. The kidney was found apparently healthy. Some blood-clots were removed from the loin, the cavity was hastily packed with gauze, and the patient was returned to bed. He made a slow convalescence and had been out of the hospital about two weeks. There was a suspicion of bony crepitus at the time he was put under chloroform, and the question of fractured pelvis with rupture of a vessel arose. The diagnosis seemed the more likely at present in view of lameness with a somewhat wabbling gait. There was seeming but not real shortening of the leg and no fracture of the femur.

FIBROLIPOMA OF KIDNEY WITH CALCULUS;
NEPHRECTOMY; WOUND AND SUTURE
OF VENA CAVA; RECOVERY.

DR. R. F. WEIR presented a specimen, consisting of a kidney which had been removed from a woman who had for a number of years intermittent attacks of general malaise with albumen in the urine. It was only the past eight or nine months that she had complained of pain referred definitely to the right lumbar region, intermittent in character, and occasional discharge of a little pus with the urine. A tumor was felt which

seemed to be increasing in size, hard and nodular, and the diagnosis was made of probable multiple cysts. It was mainly through the aid of cystoscopic examinations by Dr. Meyer that disease of the left kidney was excluded. At a time when the right ureter was discharging no fluid whatever the urine was found clear, showing normal function on the part of the left kidney. A curved incision was made, extending from the twelfth rib along the edge of the quadratus lumborum muscle down to the crest of the ilium and forward over this bone. The kidney measured six by four by four inches, was irregular in outline in places, smooth, but nearly everywhere adherent to the torn-out capsule that extended posteriorly. It was not as large as he had expected to find it. It was separated from the surrounding tissues with difficulty, but he was finally able to lift the mass out and removed it after tying the ureter, which was still patent. The pelvis of the kidney contained an irregularly-shaped stone, about one and a half inches long. Outside of the pelvis there was no trace of kidney whatever, its place being taken by fatty and fibrous tissue. The specimen was believed to be, in this respect, a rather rare one.

A second point of interest was the fact that in drawing out the tumor after the ureter had been cut he had the misfortune to make a tear nearly an inch long in the vena cava. The bleeding was not difficult to control with clamps until the rent was brought together by a continuous catgut suture. This was the more readily affected by the liberal operating space afforded by the anterior incision. At the close of the operation the pulse was 86, the patient did well, no complication whatever ensued, and the patient's progress was an uneventful one to recovery.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

A JOINT MEETING WITH THE SECTION ON OTOTOLOGY AND LARYNGOLOGY.

Stated Meeting, March 12, 1897.

W. W. KEEN, M.D., and HARRISON ALLEN, M.D., in the Chair.

THE SURGERY OF THE TONSILS.

DR. JOSEPH S. GIBB read a paper on "The Galvano-Cautery in the Surgery of the Tonsil," for which see page 103.

DR. JOHN B. ROBERTS, in the course of some remarks upon the operation of tonsillotomy, said that it is not necessary to give anæsthetics in young children when the tonsillotome is used, nor is it necessary for the patient to lie down; it is not even necessary to use cocaine. The operation is not painful, as the tissue is rather sensitive. He had never seen serious hæmorrhage after tonsillotomy, but if the tonsil should bleed a hæmostat could be applied.

Tonsillotomy is ordinarily a very simple operation and a very satisfactory one, and one which does not give the disagreeable result which is quite often given by the burning with the galvano-cautery wire, which occasionally burns where we do not want it. Dr. Roberts said his feeling is that he should never adopt the galvano-cautery wire as long as he could use a tonsillotome. In cutting off the tonsils of a child, if the parents are not there to scare the child, it does not become frightened. If the child does not see the blood from the cutting of the first tonsil, it is not then much afraid of the operation of the second gland. If there is difficulty in getting hold of a tonsil in order to cut enough

off behind the arches of the pillars, it is very easy to have an assistant make pressure on the outside of the neck, in order to push the tonsil towards the middle line.

DR. A. A. BLISS thought the tonsillotome useful in the class of tonsils referred to, simple hypertrophied tonsils without enclosing capsules or adhesion to the faucial pillars. Evidently in the hands of Dr. Roberts it has been an efficient instrument. In his own experience it had not been so; he had obtained much better results from the use of scissors, made especially stout so that they would snip away sufficient tissue. By means of forceps masses of the tonsil are grasped, drawn outward, and the mass excised by the scissors, one of the blades being sharp, so as, if necessary, to transfix the tissue beneath the forceps. He thought the class of tonsils requiring removal are almost always so diseased that their thorough removal is necessary. He had not found that the sclerosed tonsil, or the hypertrophied encapsulated tonsil, would engage in the ring of the tonsillotome to such an extent as to allow excision. A few slices may be gashed off, but little more. He had not been able to remove sufficient tissue by this means to be satisfactory, especially the portions of the tonsils lying between the faucial pillars.

Scissors, aided by the crocodile jaw-forceps, enabled one to take away sufficient of that portion of the tonsils which lie between the faucial pillars. The amount of excision to be accomplished can be measured, and the amount of hæmorrhage can be watched. There is no sudden gash and rush of blood as there sometimes is with the tonsillotome. This method can be used equally well with the patient under cocaine or ether.

DR. G. HUDSON MAKUEN said that there are no two tonsils exactly alike, and this is the reason, he thought, why so many instruments have been devised for the surgery of the tonsil. There are two general types of tonsil. The first may be called the normal hypertrophied tonsil,—that is, the normal tonsil hypertrophied in all its parts. This tonsil, as a rule, is found in the adolescent throat; it has a small base and it is unattached to the faucial pillars. Such a tonsil is easily engaged in the ring of a tonsillotome, and it is as easily removed. The instrument he preferred is the Mackenzie tonsillotome, being simple and less cumbersome than the others. This may be held in the hand so as to look like a tongue-depressor, and many a child has lost its tonsil

in the grasp of this instrument while he thought his tongue was being simply depressed.

Another type of tonsil is generally found in the adult throat. It has a large base filling the entire space between the faucial pillars. It is deeply embedded and pressed against, and adherent to the pillars both anteriorly and posteriorly, so that if a probe bent at right angles is passed in between the pillars and the tonsillar mass deep pockets will be found in which are all kinds of foul concretions, a condition that is especially harmful. These pockets or crypts with their retained concretions become hotbeds of infection, setting up various inflammatory conditions, such as acute tonsillitis, peritonsillitis, etc. This broad, flat mass may or may not project beyond the faucial pillars. That is of little importance so far as the indications for treatment are concerned, and these indications are purely surgical, of course. The tonsillotome should not be used because the base is too wide and there is no well-defined pedicle. It is a mistake to suppose that when a tonsil is cut off flush with the edges of the pillars the work is finished, for the truth is, it is only just begun. The surgeon must remove the pockets which have been described, as the last condition may be worse than the first. A probe bent at right angles near the tip may be used to locate the adhesions and pockets. The adhesions should then be separated and the pockets opened by suitable cutting instruments. The parts are thoroughly cleansed and the cut surfaces slightly seared with the cautery. This lessens the following inflammatory reaction and prevents reunion of the surfaces. In about five days the patient should be seen again and other adhesions and pockets looked for, and they should be treated in precisely the same way. This process should be repeated at intervals of five or six days, until there is no possible place left for tonsillar secretions and particles of food to gather and infect the throat. If there are small projecting threads of tissue left they may be clipped off with suitable scissors, and these edges seared with the cautery as before. This may not be tonsillotomy, but it is far better. It has reduced the tonsil to very satisfactory dimensions and has given the parts perfect drainage, and removed the chief cause of recurrent attacks of acute tonsillitis.

There is another condition which is nearly as bad as the hypertrophied tonsil,—that is the atrophied tonsil. A tonsil that

is allowed to atrophy does harm for the reason that the atrophied tonsil generally atrophies as the result of repeated inflammatory conditions, which leave numerous adhesions and pockets for the collection of secretions. There is also in this condition a large fibrous band which was originally the capsule of the tonsil, and which seems to grow out of the upper portion of the posterior surface of the palato-glossal fold. It is sometimes half an inch in width, and it runs downward and backward in front and a little inside of the remnants of the tonsillar mass, and is inserted in the lower portion of the anterior surface of the palato-pharyngeal fold. Dr. Harrison Allen described this band some years ago, and he called it the opercular fold. This fold forms a shelf for the retention of secretions, and it also encroaches upon the oropharyngeal space and interferes with articulation.

DR. HARRISON ALLEN said that this opercular fold often forms the anterior border of a pocket that is created between it and the tonsil. It is very vascular and irritable. The pockets, Dr. Allen thought, were confined to the upper half of the tonsil, and were so figured by him in a paper published in the *American Journal of the Medical Sciences* for January, 1892. Dr. Allen agreed with Dr. Makuen in the tenets held by that speaker, and he thought it interesting that two observers working independently of one another should arrive at the same conclusion.

DR. VAN SANT said that any discussion upon the various enlargements of the tonsils is not quite complete without drawing attention to the fact that hypertrophy of the tonsil as a separate and distinct disease is rather the exception than the rule. Those who are familiar with laryngeal work are fully aware that in a very large percentage of patients with hypertrophied conditions of the tonsil there are present at the same time adenoids, enlargement of the glands at the base of the tongue, and enlargement of the glands at the angle of the jaw; indeed, in a number of cases he has examined he has found the glands also enlarged in the axilla and enlargement of the glands at the elbow. In other words, when we speak of adenoids or chronic hypertrophy of the tonsils it is something like giving a name to a peak of a chain of mountains. The general physician unfamiliar with the use of the laryngoscope and rhinoscope sees only the large tonsils, the tonsils are then removed, and after the operation unpleasant symptoms continue. Why? Simply because he has taken away but one peak

of a chain of mountains and left behind large adenoids or, perhaps, enlarged glands at the base of the tongue. The patient is not relieved in regard to nasal breathing, and his mouth-breathing is made worse. The pharynx becomes more dry and irritated because the tonsils are removed; cough is increased; and the old idea that amputation of the tonsil is a bad operation is due to its being an insufficient one. In a large percentage of his operations he amputates the tonsils and clears out the adenoids, etc.; very seldom does he amputate the tonsil alone any more.

Another point which is of importance and that should be more generally known was that the various enlargements of the glandular tissue of the so-called pharyngeal ring are largely due to various infective processes. The history of these cases usually is that a previously healthy child has had measles, scarlet fever, diphtheria, or some other infectious disease which left a catarrhal condition of the nose or naso-pharynx as a sequel, the secretions from such catarrhal conditions then become infected by the inhaled bacteria or dust, etc. Those who have done practical bacteriological work are familiar with the large number of bacteria found in the chronic discharges from the nose. Generally we have enlargement of the glands from these infective processes. It is very essential, if this be true, for the physician to see that the general catarrhal condition following such diseases be carefully treated in order to prevent these subsequent hypertrophies.

DR. G. G. DAVIS remarked that he could not see why the laryngologists persist in having their tonsillotome made with the opening antero-posteriorly or circular in form instead of at right angles to the shaft. The tonsil is longer up and down than it is antero-posteriorly, therefore, he thinks, the ring of the tonsillotome should be an oval and that the oval should be placed at right angles to the shaft.

The tonsillotome to his mind the most effective is that of Matthieu. It has an oval opening and cuts on the draw; it also has a fork which grasps the tonsil and draws it out. On closing the instrument by approximating the fingers, the fork first pierces the tonsil and draws it out, and not until then is the knife set in motion. He thinks the Mackenzie tonsillotome is particularly objectionable. Those he has seen have comparatively small circular openings and to his mind are unsuitable for nearly all tonsils; if the tonsils are small enough to go into the tonsillotome

the opening is much larger antero-posteriorly than is necessary. Considerable of the difficulty and of the unsatisfactory results in the use of the tonsillotome are due to the bad shape of the instrument, the tonsil not being thoroughly grasped and surrounded by the instrument, a portion above or below projecting beyond the ring of the instrument. He does not think that as good control over the instrument can be obtained by pushing or drawing the fingers together, as in the Matthieu. There is nothing on it to catch the excised piece of tonsil, nor is there anything on it to draw it out. The Matthieu tonsillotome is the safest, from the fact that one can adjust the amount of traction which is exerted on a tonsil by a screw which limits the distance which the jaws draw the tonsil out away from the pharyngeal wall. In other words, if it be desired to draw the tonsil strongly up the screw can be set deeply; if not, the screw can be set low, and that is an advantage which he thinks is not possessed by any of the other instruments.

DR. JOSEPH S. GIBB said that he did not think any one method of operating upon hypertrophied tonsils to be applicable in all cases. The larger number of cases are best treated by the tonsillotome, a certain number by the galvano-cautery snare, and there are some cases in which neither the tonsillotome nor galvano-cautery snare are of any avail. This latter class are the large, flat, hypertrophied tonsil. Dr. Bliss had spoken of these in a paper read before the Otological and Laryngological Section, and advocated the use of scissors, which plan Dr. Gibb thought probably the most efficient.

Dr. Gibb said he believed, with Dr. Makuen and Dr. Bliss, that it is a good thing to remove as much of the tonsils as possible by whatever means we have at our command.

DR. J. CHALMERS DA COSTA, by invitation, reported a case of "Sarcoma of the Tonsil treated by the Toxines of Erysipelas and Prodigiosus," for which see page 107.

DR. W. W. KEEN read a paper upon "The Advantages of the Trendelenburg Posture in Operations about the Throat and Mouth," for which see page 96.

EDITORIAL ARTICLES.

WOLFF ON THE FUNCTIONAL PATHOGENESIS OF DEFORMITIES.¹

UNDER this title Professor Julius Wolff gives a summary of his work on the internal architecture of bones and its relations to their external form, together with the practical conclusions which may be drawn therefrom. In this paper he gives fresh consideration to the "pressure theory" of Volkmann-Hueter, which has hitherto been the basis for all explanations of the origin of the various deformities of bones. He seeks further to bring forth new proofs to strengthen his doctrine of the functional pathogenesis of these deformities, founded as it is on the general theory of the "functional conformation" of the bones. In conclusion, he discusses the objections and confirmations of the theories which have appeared since their publication.

In the first chapter the "pressure theory" is discussed, and under three heads. The first of these is mathematical. In the space allotted to us it will be impossible to go far into details. Since Cullmann's discovery of the analogy between the courses of the trabeculæ in bone spongiosa and those of the pressure and tension trajectories of graphic statics it must be accepted that abnormal increase of pressure, instead of producing atrophy, as the pressure theory would have it, does just the reverse, resulting in the accretion of bony material; the amount of bone thus added is proportional to the increase of the burden at every point in the bone. Therefore, the greater the pressure at any one place, the

¹ Wolff, Jul., "Die Lehre von der functionellen Pathogenese der Deformitäten," Archiv für klinische Chirurgie, Band LIII, Heft 4.

greater is the amount of bone which must be here laid down to resist it.

Conversely, diminished pressure cannot result in the accretion of bony material, but on the contrary, atrophy, for the reason that relief of pressure has made this amount of bone statically superfluous. Furthermore, relief of pressure and tension unrelieved cannot be expected to act in the same way; just as relief of pressure calls for disappearance of bone tissue, so does relief of tension. Increased tension calls for accretion to resist it just as does increase of pressure. It must therefore appear that we cannot expect to find only the one process going on at one side of the deformity and the reverse on the other. The rule is that at all points of pressure or tension resisting material must be laid down while disappearance of the same is found at points where the so-called "shearing strain" comes into play. Wolff here refers to Cullmann's well-known drawing of the crane, similar to the human femur. Mathematically, therefore, processes would be called for just the reverse of those claimed in the "pressure theory."

The results of these mathematical considerations would be comparatively worthless, however, unless corroboration of anatomical nature could be found. In his work on "Transformation of Bone," Wolff has called attention to such corroboration as regards not only the internal architecture of bone, but also its external configuration. By means of many bone specimens of angular deformities, curvatures, and deformities in the narrower sense, he has shown the presence of thickenings of the corticalis and condensation in the spongiosa on the concave side,—*i.e.*, on the side of increased pressure and just the reverse on the side of diminished pressure. He holds that these facts alone show the error of the pressure theory.

This chapter concludes with some clinical considerations, strengthening Wolff's views. In the first place he remarks that the pressure theory accounted not at all for the development of

deformities in adult life, but only during the period of active growth. For the explanation of the deformities in adults an inflammatory osteomalacia was assumed without any sufficient ground. A large part of the congenital deformities and all deformities occurring in bedridden individuals cannot be at all explained by the pressure theory; this is equally true of such deformities as those of the skull in consequence of *caput obstipum*. Finally, no one has yet shown the least evidence that bone may be the seat of interstitial absorption by reason of its compressibility; not even in the case of the Chinese ladies' feet or the Peruvian flat-heads. In these cases we have simply to deal with pressure from the outside which deprives the bone of the space necessary to grow in, causing the trabeculæ to be formed in positions and directions which are abnormal.

The second chapter treats of the functional importance of the form of bones in general. Wolff first calls attention to his having shown that all tissue-changes in bone are determined by function alone; that the normal shape of bone as well as that shape occurring under pathological conditions is always a matter secondary to the function of the bone, which function is the primary and determining agent to be sought for.

It is shown that the external contour of bones and their internal architecture correspond exactly; the external contour represents, mathematically, simply the last curve uniting the ends of the various curves (or trajectories) which make up the internal architecture.

Anatomical evidence of the functional character of bone configuration has been presented in former papers and chiefly in the case of the so-called secondary transformations of the external shape of the bones following primary changes in their form and the alterations in static demands caused by these primary changes; likewise in those transformations of external form following alterations in the static demands without any *primary* changes of form. This was shown, for instance, in cases of frac-

ture united with the fragments in bad position, where secondary changes in form and architecture occurred at places far removed from the original point of fracture. It was also easily demonstrable that the internal architecture of these newly-formed masses of bone always fit in with that of the rest of the bone concerned. From these pathological observations it has become an axiom with the author that the most insignificant pathological deviation from the normal function of a bone causes a change in its form; that this in turn shows the normal shape of the bones to be the only possible shape for normal function and that the normal as well as the deformed shape are both of functional and mathematical import. In other words, the structure of a bone under normal or abnormal conditions might be said to be nothing else than the mathematical figure answering all static demands which can possibly be made upon it, either by the various kinds of muscular action or by its weight-bearing functions.

A third chapter is now concerned with the nature and origin of deformities. The pressure theory is explained as assuming, first, too great pressure on one (the concave) side; second, an abnormal relief from pressure on the opposite (convex) side. The deformity of the bone is caused therefore by the formation of too much bone on the convex side and too little on the concave, and the faulty position of the deformed extremity was considered the natural consequence of the deformity of bone or joint. This hypothesis concerns, however, only those spoken of by Volkmann as "deformities in the narrower sense of the word." He differentiated between deformities in the narrower sense and those in the broad sense.

In the first class (those in the broad sense) belong fractures united with deformity, angular ankyloses, inveterate, unreduced luxations, rachitic bendings, and all those in which the deformity is secondary to some trauma, bone softening, or bone destruction, and where the bone affection is of primary, the deformity itself only of secondary, importance to the surgeon.

The second class (those in the narrow sense) embraces hereditary and paralytic talipes, genu valgum adolescentium, habitual scoliosis, etc., where the deformity occurs without any such trauma or bone-disease as a forerunner, and where the abnormal form of the bones and the faulty configuration of the articular extremities are the original, important, and possibly the only conditions occupying the attention of the surgeon in the treatment.

In showing that improper static demands made upon an extremity resulted in the formation of new masses of bone upon the surface of the bone of this extremity, or that they produced the disappearance (atrophy) of bone masses according to the nature and degree of these disturbances in static requirements, it has at once been shown in what manner deformities have their origin. For these transformations on the surface of bones are nothing other than "deformities" in the wider or narrower sense of the term.

Taking genu valgum or habitual scoliosis as example, the development of a deformity in the narrow sense is thus explained. In the beginning of either of these conditions the shape of the bones is perfectly normal. As the result of excessive fatigue in their too weak muscles the patients are frequently assuming a faulty position of limb or body; they seek to control excessive excursions of their joints by the interference of the articular structures themselves, instead of by muscular activity. The result is a continual alteration in the static requirements made upon the bones and the internal architecture, internal and external configuration of the bones accommodate themselves to the new conditions. Since, according to this reasoning, deformities are nothing else than the result of these transformations which the external form of bones or joints undergoes in accommodating itself to faulty demands made upon them, it must be self-evident that these deformities are to be considered pathological only in the sense that hypertrophy of the cardiac muscle in valvular insufficiency is pathological. That which is really pathological is only

the altered static requirements, the abnormal mechanical function. Far from being pathological the deformity is the only suitable or even possible form by means of which bone or joint can withstand the altered forces bearing upon it; it is nature's way of securing the greatest possible service and strength, under the new conditions, with the use of the least possible amount of material.

The pathogenesis of deformities is therefore functional. *Genu valgum*, for instance, represents only the functional accommodation of femur, tibia, and knee-joint to the improper static demands made by the outward deviation of the leg. Just so are the shapes of the bones in club-foot the expressions of similar functional accommodation to an inward rotation of the foot, or even, sometimes, an inward turning of the whole lower extremity. The faulty position of an extremity under these circumstances is to be regarded rather as a cause of the deformity than as an effect. This faulty position must always occupy a place intermediate, between the remote causes of deformity (hereditary predisposition, habit, muscular weakness, external conditions causing pressure or narrowing space for growth) and the anatomical results which these various remote causes bring about.

When the altered demands upon an extremity do not occur spontaneously, as in the above instances, but, on the other hand, result from a primary disturbance in the shape of the bones, due to trauma or bone-disease with consequent softening or destruction of tissue, there is added to this a secondary change in the external configuration of the bones, and there is thus caused a "deformity in the broad sense of the word." The difference between the two varieties of deformity, therefore, lies only in the addition of a second etiological factor (the trauma, etc.) to the deformity in the broad sense. Both varieties have it in common that the shape of the bones and joints of the deformed part represents nothing else than the expression of a functional accommodation to the faulty static demands made upon it. If Volkmann had been aware of this he would not have been likely to consider these two varieties of deformities as essentially distinct from each other.

The author furnishes special evidence in favor of his theory by presenting illustrations of sections through the upper end of the tibia of an adult individual who had acquired a severe genu valgum about the age of puberty. In this specimen, the following conditions can be demonstrated:

(A) *Transformations of the Internal Architecture.*

(1) Rearrangement of the whole system of trajectories formed by the trabeculæ of the spongiosa in directions which differ everywhere from the normal but which fit exactly to the deformed shape of the bone.

(2) Thickening of the trabeculæ of epiphysis and diaphysis on the concave, lateral aspect (the place of increased pressure) to such extent that it is difficult to say whether we have compact or spongy bone to deal with.

(3) Attenuation and separation from one another of the trabeculæ on the convex, median aspect, the side of relieved pressure. (Porosity of the spongiosa.)

(B) *Transformations of the Internal Configuration.*

(1) Thickening of the wall of the diaphysis on the lateral aspect (the side of increased pressure) to nine millimetres. Attenuation of wall on the median aspect down to three or four millimetres. Normally they are about equally thick.

(2) Eccentric position of the marrow cavity by extension of its upper boundary towards the spongy region above.

(C) *Important Transformations of External Form proving the Functional Origin of the Deformity.*

(1) Alteration of the angles between the lateral walls of the upper end of the tibia and its upper articular surface. Whereas normally the angles, both median and lateral, should be about 60 degrees, the lateral is here about 105 degrees, the median, however, 30 degrees.

(2) Concavity of the bone surface in the region of the boundary between epiphysis and diaphysis on the lateral aspect (normally convex).

(3) Convexity of the corresponding part of the median aspect greatly exaggerated.

(4) Straight direction of the lateral and median walls of the diaphysis near the lower border of the spongiosa in place of the slight concavity normally present.

As a second example by means of which to explain the correctness of the doctrine of functional pathogenesis the author has selected scoliosis. In the first chapter the author showed in detail that the altered conditions in the length and height of the transverse processes of scoliotic vertebræ as well as corresponding conditions in the ribs of the scoliotic thorax are so evident as not possibly to escape notice, and that they can be explained in no other way than as functional accommodation to the circumstances of space, changed and brought about by the continual, faulty, and cramped position of the thorax; this is as true of the convex as of the concave side of the vertebral column, to which the transverse processes and ribs in question belong. It must be manifest that changed relations of one part of the skeleton to any other part of the skeleton (as far as space conditions are concerned) necessarily bring about changes in the mechanical demands made upon this part, and therefore changes in the directions and values of the pressure, tension, and shearing strains of each and every point in this part of the skeleton. The conclusion thus drawn, that accommodation to space means the same as accommodation to function, is of the greatest importance to the *general* doctrine of functional accommodation.

The origin of the wedge-shape of the scoliotic vertebra now comes under discussion. It is assumed by the majority of writers that an abnormal softness of the bones is present in scoliosis, by means of which a faulty position can model the bodies of the vertebræ as it does in the case of rachitic disease of bone, or as it really the case with the intervertebral disks in cases of "habitual scoliosis." While unsupported by any pathologic-anatomical investigations, it is allowed possible, or even probable, that such softness of the bones plays a *rôle* in many cases of scoliosis. It

is certain, however, that this is by no means always the case; as evidenced by the development of scoliosis after empyema in adults, and the great exaggeration in adult life of very slight scolioses originating during youth. It is concluded, on the contrary, that the vertebra may acquire its scoliotic wedge-shape entirely independent of the pressure of the superincumbent weight. Furthermore, in the absence of any abnormal softness of the bones, the body of a vertebra may lose height on the concave side, and gain the same on the convex side through the "tropic stimulus of function" purely; being simply an accommodation to the diminished space on the concave side and increased room at the convexity and the change of mechanical conditions consequent thereupon.

This simple and natural conception of the circumstances concerning the scoliotic wedge must obtain credence, especially since the old view, corresponding to the "pressure theory," has been long ago disproved by Hoffa and Nicoladoni,—namely, that the concave side of the wedge is the seat of atrophy, and that this atrophy accounts for the loss in height of the vertebral body on this side.

After discussing two figures illustrating the above, the author remarks that it is self-evident that the internal architecture of the wedge-shaped vertebra must correspond to the external form of that segment of the spinal column to which it belongs, since there can be no exception to the law of bone transformation. This is spoken of for the reason that Lorenz has disputed this point. Wolff shows Lorenz's error to lie in the fact that he took for his consideration of the lack of harmony between internal structure and external form isolated vertebræ, instead of having considered the architecture of the whole segment of the column to which these vertebræ belonged; this subject is best studied in specimens of ankylosis between several vertebræ, of which Wolff gives an illustration.

It is then shown by the author that the torsion of scoliosis also can be explained by reference to the law of bone transfor-

mation, and that it, again, is nothing but the expression of this same functional pathogenesis. He describes torsion by saying that in the presence of lateral inflexion of the spinal column the middle line of the *bodies* of the vertebræ pushes itself towards the convexity, the *spinous processes* moving towards the concavity of the scoliosis. Von Meyer explained this phenomenon by the difference in compressibility between the line of vertebral bodies and the line of their arches. Wolff, on the contrary, claims that the matter of compressibility need not come into question at all. He shows that this, too, is an accommodation to a matter of altered space conditions.

The objections of five authors to the "functional pathogenesis" are now answered. The first is an objection of Roux, otherwise one of the most enthusiastic and best qualified adherents to the "law of bone transformation." He holds that in considering the origin of the scoliotic wedge we are dealing rather with a "failure to grow" on the side of the concavity than with any actual loss of height in the bony vertebra. Wolff shows that Roux's description of the anatomical conditions present agrees perfectly with his own, but calls attention to the fact that scoliosis is a condition which, in perhaps the majority of cases, develops about puberty, a time when the bony part of the vertebræ has attained very nearly its maximum height. In spite of this fact we see the severest scoliotic deformities developing at this very period of life. Still more inapplicable, therefore, would this explanation seem for scoliosis developing in adults. Roux's other objections are found wanting to an equal degree with this.

It would carry us entirely beyond the proper limits of such an abstract as this to reproduce, even in part, the lengthy discussion of the objections offered by Schede, Korteweg, Lorenz, and Ghillini. The arguments of the first two of these are thoroughly disposed of by Wolff by showing decided contradictions in terms. They assume pressure to result in accretion of bone at one time and atrophy at another, and this Wolff shows

to be untenable. Lorenz concurs with all of Wolff's statements regarding the changes in internal architecture and internal conformation, but finds the pressure theory necessary to explain changes in the external form. Wolff shows his principal error to be the same as Schiede's and Korteweg's. Ghillini, strangely enough, after a number of experiments in animals, finds the "law of transformation" sufficient for the diaphyses of bone, but requires the pressure theory for explanation of the changes in the epiphyses. Ghillini gives no consideration to the possible effects of driving an ivory peg into an epiphysis upon the growth of the latter. In addition, the illustration of genu valgum which he uses in evidence contains, contrary to his statement, all of the corroborative evidence to be found in Wolff's own. Looked at impartially it cannot be said that any of these five objectors has succeeded in attacking the doctrine of functional transformation in any of its vital parts. In addition, the author himself shows the statements of the five objectors to be actually contradictory to one another.

A concluding, fifth, chapter is a short mention of corroborative testimony and opinion on this interesting subject by Lauenstein, Schultz, Ribbert, Hoffa, Graf, and Peters. In addition to these it must be noted that Wolff's anatomical investigations and the facts brought forth are concurred in by the five objectors mentioned; they differ from him chiefly in the matter of interpretation.

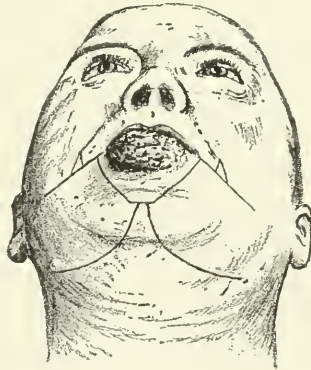
For ourselves, after careful study of this subject since the appearance of Wolff's book, in 1892, we cannot help agreeing with the verdict of König (*Centralblatt für Chirurgie*, No. 10, 1897) that with this paper "the doctrine of the functional pathogenesis of deformities has grown from an hypothesis to a theory well proved and inpregnable."

ALBERT H. FREIBERG.

INDEX TO SURGICAL PROGRESS.

HEAD AND NECK.

I. Restoration of Lower Lip after Excision for Cancer. By CHARLES N. DOWD (New York). The author describes a modification of the method of Malgaigne, by means of which the indications of a more radical removal of glandular infection are likewise met. Objection may be made to the original method of Malgaigne that the incisions do not expose the submaxillary spaces in which diseased lymph-nodes often exist, and that un-



Illustrating Dowd's method of restoration of lower lip after excision for cancer.

necessary deformity results from the prominent position of the scars and the stretching of the narrow flaps. These objections the author obviates by carrying the lower incisions beneath the body of the jaw, extending them from the tip of the chin nearly back to the angle of the jaw, as shown in the accompanying illustration.

Through these incisions the submaxillary spaces can be

thoroughly cleaned out. The salivary glands, if adherent to the cancerous nodes, can also be removed without producing any perceptible interference with the production of saliva. For the removal of the primary growth, the incisions should be made from one-half to three-quarters inch outside its margin, converging below, as shown in the figure. As much tissue as possible should be left in the prominence of the chin. The horizontal incisions from the angles of the mouth should be carried backward two inches, or as far as is necessary to allow approximation of the flaps. These incisions are carried down to the mucous membrane, which is then divided one-third inch higher up to provide a mucous flap to lay over the edge of the new lip. The excess of tissue apparent in the cheeks after the approximation of the flaps is remedied by taking out wedges of skin as required. A lip formed from the cheeks in this way has a good lining and border of mucous membrane from the beginning and does not show a tendency to cicatricial contraction, advantages that do not exist in lips formed by sliding up tissue from the chin. The author urges the importance of clearing out the submaxillary spaces in cases of carcinoma of the lower lip, and reports the details of a case of extensive disease of the lip and submaxillary nodes operated upon by his method, with excellent cosmetic and functional result, and without recurrence one year later.—*Medical Record*, February 20, 1897.

REVIEWS OF BOOKS.

DIE MIKROSKOPISCHE DIAGNOSE DER BÖSARTIGEN GESCHWÜLSTE.
VON DR. DAVID HANSEMANN. Berlin: Verlag von August
Hirschwald, 1897.

The etiology of malignant tumors is still a question surrounded by doubt and uncertainty. The most important object of the study of tumors, the therapeutic end, progresses but slowly. We only know, as we did fifty years ago, that to cure a malignant neoplasm it must be wholly extirpated. The knife still remains the most successful therapeutic agent. We know that the removal of a part of the growth cannot constitute a cure; and until the therapy of this class of diseases becomes materially advanced, the question of diagnosis must still be a matter of the greatest importance. By early and accurate diagnosis we may hope to apply to malignant tumors, at the earliest possible time, the only curative treatment of which we know; and we may also hope to avoid the false encouragement which comes from the application of this treatment to benign growths supposedly malignant.

This work which is now before us is one of extreme value to the diagnostician, and displays the high class of scientific work which has characterized other writings of its accomplished author. The first chapter deals with the general classification of tumors. The following chapter is devoted to the morphology of malignant tumors in comparison with the mother tissues, and takes up in order all of the malignant growths. Chapters are given to the consideration of the karyokinetic processes in malignant tumors, the degenerative processes in the parenchyma of malignant tumors, and the relation of metastases and recurrences

to the primary tumor. The stroma of malignant tumors, the relation of malignant tumors to the organ-parenchyma, the function of the tumor-cells, the histogenesis of malignant tumors, the etiology of malignant tumors, and the diagnosis are all treated of under separate chapters.

All of these chapters are illustrated by pictures which show what the author intended they should show. They are the best examples of microscopic illustration that we have seen, and, naturally enough, none are made from photographs.

In the chapter on the histogenesis of tumors, the author says that there is no tissue in the human body from which malignant tumors cannot develop, with perhaps the exception of the ganglion-cells and the striped muscle. Ganglion-glioma cannot be regarded as malignant. As to striped muscle, no case of rhabdomyoma has been reported which was not really teratoid in character, and malignant tumors which have had a parenchyma of striped-muscle fibres are unknown. Malignant tumors with striped muscle have been described, but these have been teratomata which have undergone sarcomatous degeneration, and in which striped muscle was accidentally contained. The ganglion-cell and the striped-muscle cell are the most highly differentiated of any of the cells in the body; and it is possible that they no longer possess the power of independent heteroplastic development. They are, at the same time, the structures which possess the slightest power of regeneration.

The book is well printed and should be read by every student of the anatomy of malignant tumors.

JAMES P. WARBASSE.

ANOMALIES AND CURIOSITIES OF MEDICINE. By GEORGE M. GOULD, A.M., M.D., and WALTER L. PYLE, A.M., M.D. Philadelphia: W. B. Saunders, 1897.

The anomalous and curious have always been attractive. The dog studies with curious interest the clumsy turtle; the deer,

even when conscious of danger, is not deterred from approaching and examining the stalking flag; the country boys gather about their playmate and examine with eager eyes his sore toe; the rustic travels many miles to behold with open-mouthed wonderment the high buildings of the city; the "Indian-rubber man" is invited to appear before scientific societies; and "a curious case" is reported in the medical journals, and the production of its like challenged. The love for the curious, which is so strong a passion in the human mind, has come to play no inconsiderable rôle in the progress of science. Our medical literature now contains a vast amount of this material,—reports of theretofore unknown conditions, anomalies of structure and function, rare pathological conditions, and things strange and bizarre.

The authors of this work have, after years of research in the literature of all countries, embodied as much of this material as is available and authentic in this volume of a thousand pages. At first one is apt to regard it as a great collection of curiosities, which one might peruse as a matter of diversion or recreation, just as a visit is paid to the museum; but by further study of the book one becomes impressed with the idea of its high scientific value and the real scientific spirit which animated its authors. It is a matter of great scientific and medico-legal value to know how great a destruction of tissue may be sustained without causing death, or how many children have been born at a time, or how early or how late in life an individual may be a parent, or from how great a height a person may have fallen and recovered, or what feats of strength or endurance have been performed, or, indeed, how many heads a man may have upon his shoulders.

A doctor might be placed in an embarrassing position at the bedside of his patient from whom he had already delivered quintuplets, were the laboring woman to exclaim, "This is growing monotonous: is it possible that the end is not yet?" The learned accoucheur who had read this book would be in a position to reply, "Calm yourself, my dear madam, we have in our literature the report of a most estimable lady, one Anna Birch, of Leeds,

who at a single sitting presented her loving husband with ten little babes; and, indeed, according to Le Brun, Gilles de Traze-gines, who accompanied Saint Louis to Palestine, and who was made constable of France, was one of thirteen infants at a simultaneous accouchment." It is interesting for the physician and important for the physiologist to know that a fever reaching 148° F. has been reported by so accurate an observer as Jacoby, of New York; and that a temperature of even 171° F. is recorded.

The work contains a most remarkable collection of the strange things which human beings have done, as well as the strange things which nature has done to human beings. A chapter is devoted to genetic anomalies, in which are described the functional anomalies of the generative organs. Prenatal and obstetric anomalies are described. A chapter each is devoted to prolificity, major terata, minor terata, and anomalies of stature, size, and development. Longevity, physiologic and functional anomalies are fully described. Several chapters are given to surgical anomalies of the head and neck, of the extremities, of the thorax and abdomen, of the genito-urinary system, and to general and miscellaneous surgical anomalies. These chapters treat of the rare conditions of surgical importance and interest, involving all of the pathological classifications, such as injuries, inflammations, tumors, foreign bodies, and deformities. Chapters are devoted to anomalous types and instances of disease, anomalous skin-diseases, nervous and mental diseases; and the whole is closed with a chapter on historic epidemics.

The book contains over 300 illustrations. It is a work of extreme interest, and subserves two distinct purposes: first, it is a valuable book of reference from a purely scientific stand-point; and, second, it is a wonder-book which may be read as a novel, or which may be perused to satisfy the craving for the new and strange and curious, which all men have and which plays so important a rôle in scientific investigation.

JAMES P. WARBASSE.

TENOPLASTIC SURGERY.

BY EDWARD H. BRADFORD, M.D.,

OF BOSTON,

SURGEON TO THE CHILDREN'S AND THE SAMARITAN HOSPITALS.

THE surgery of the tendons could until recently be briefly described as tenotomy and the suture of traumatically divided tendons. But the field has been enlarged since suturing the distal cut end of the tendon of a paralyzed muscle to the proximal end of the tendon from a strong one has been successfully performed.

This procedure is not in as general surgical use as is desirable, largely because sufficient attention has not been called to the subject.

The first to suggest tendon transplantation was Nicoladoni, who in 1881 reported the transplantation of the peroneal tendon to the tendo Achillis in a talipes calcaneus. Hacker has reported a similar case. Phocas and Parrish also report cases. Goldthwait, in 1895, and Milliken, the same year, have reported successful cases, the former having shown by a series of unusual successes the value of the method. Nicoladoni and Willet some years ago have shortened, in cases of calcaneus, the lengthened tendo Achillis, and later, both Goldthwait and Milliken have reported cases where the sartorius muscle is inserted into the tendon of a paralyzed rectus.

This constitutes a short statement of the brief medical literature in a branch of surgery which offers in the success already attained a field of great interest and surgical satisfaction. The technique which is required involves a good knowledge of the anatomy of the parts and of the functions

of the various muscles. It also involves a careful examination of a paralyzed limb in order to determine what muscles need strengthening and what are useful. A certain amount of delicacy of manipulation is needed for success, and also some skill in the insertion and quilting of the transplanted tendons into structures which will in future bear considerable strain. Transplantation of tendons has up to the present time been confined to the lower extremity in cases of paralysis from anterior poliomyelitis.

A detailed description of the well-known condition of the limbs following infantile paralysis is unnecessary. It will suffice to mention that in most instances all of the muscles of the limb are not paralyzed; that certain muscular groups may be spared; but, for want of antagonists, pull the foot or leg into a useless and distorted position. It is necessary not only to correct the deformity, but to restore the balance of the muscles to prevent a recurrence of the deformity. The following may be mentioned: Transplantation of the peroneus longus into the tendo Achillis, into the tibialis posticus and into the anticus; the union of the tibialis anticus with the extensor proprius pollicis; shortening of the extensor tendons of the toes; shortening of the tendo Achillis; lengthening of the tendo Achillis; and insertion of the sartorius muscles into the rectus femoris tendon.

Transplantation of the Peroneus Longus.—Where a tibial group of muscles is weakened and the foot pulled to the outer side, the peroneal tendons being strong, it is desirable to transfer the connection of the tendons in such a way that they will in part take the place of the weakened tibials. The tendon which lends itself to this procedure is the peroneus longus. An incision is made between the outer malleolus and the tendo Achillis, somewhat in the line for the ligature of the peroneal artery, but slightly anterior to it. The sheath is opened slightly above the level of the malleolus, and the tendon gently pulled from the sheath and divided across. The cut end is pulled from the sheath, and enough of the tendon freed to leave a lower tendinous end of at

least two inches in a foot of moderate size. The incised wound is then held apart by means of a retractor, and an opening made between the tendo Achillis and between it and the tibia, the lower tissue in this region being partly incised, and the opening gradually dilated until the tendon can be passed through. An incision is then made on the inner side of the foot in the region of the posterior tibial tendon, the line of incision being slightly in front of that for the ligature of the posterior tibial artery. The paralyzed posterior tibial tendon is then divided across close to its insertion; the cut peroneal tendon is passed through the opening beneath the tendo Achillis, and the cut surfaces of the peroneal and posterior tibial tendons are firmly sewn together. The skin wounds are then sewn.

Where the gastrocnemius is the paralyzed muscle, which needs reinforcement, the cut peroneal tendon is passed through a slit cut in the widest part of the tendo Achillis. The inserted tendon should be stitched by interrupted sutures as it enters the tendo Achillis and as it emerges from the other side; the projecting end can be folded along the edge and stitched to give greater strength. The peroneus brevis also may be transferred across the front of the foot to reinforce the anterior tibial.

The Suture of the Anterior Tibial to the Extensor Proprius.—A straight incision is made in the direction of the extensor proprius pollicis, which can be easily determined by forcibly flexing the great toe. The incision is slightly to the inner side of this tendon; the sheath of the tendon is discovered and opened; the tendon is drawn from its sheath, but not cut across. The tibial tendon will be found lying slightly to the inner side of this; no separate incision is necessary. If the muscle is completely paralyzed, the tendon can be cut across and be sewn into the adjacent tendon of the flexor longus pollicis. If the tendon is not completely paralyzed, but needs reinforcement, the side edges of both the tendons can be refreshed, and the contiguous portions sewn together. It is desirable to avoid opening the annular ligament of the

ankle, and this is not necessary. It is, however, important that a sufficient amount of play should be given to the tendon.

Transplantation of the Posterior Tibial Tendon.—I am not aware that this transplantation has ever been done. It would, however, seem to be a feasible operation, and the steps of the operation would be similar to those already mentioned for the transplantation of the peroneal tendon. The method would recommend itself in cases of paralysis of the peronei, and in paralytic club-foot, where the tibials could be weakened with the hope of strengthening the peronei. A transference of the anterior tibial across the front of the foot to the insertion, to reinforce the peronei, has also, as far as I know, not been done, and seems hardly to recommend itself, as it would be necessary for the tendon to pass under the extensor tendons of the toes, which are not separated from the bone by loose areolar tissue. It may, however, be advisable to unite the peroneus longus, if paralyzed, to the extensor tendon of the fourth or fifth toe, if the latter remains strong.

Goldthwait recommends in certain cases of anterior paralysis, where the tendons are so small that it is difficult to suture them and furnish a firm union, muscle transplantation, uniting the bellies and the intramuscular fascia tibialis of the anterior with that of the common extensor and peroneus tertius muscles, expecting that, after union has taken place, the action of the strong muscle will pull upon the weakened tendon, and later performing a tenotomy upon any tendon, the use of which can be spared. The method has been employed in a few instances by him with success.

Shortening of the Tendons of the Extensor Communis Digitorum.—This operation I have attempted once, in a case where the foot dropped from the entire paralysis of the anterior muscles. The tendons can be divided and shortened above the annular ligament or below it. The former is preferable, as the scar on the dorsum of the foot below the ligament would be inconvenient.

Shortening of the Tendo Achillis.—An incision is made along the tendon, either directly over the tendon or slightly to the side. The latter seems to me to be preferable, as it avoids a scar over the most prominent portion of the tendon. The tendon is laid bare, and the tendon which is relaxed is pulled from its sheath and divided obliquely from above downward; the projecting cut ends are pulled respectively upward and downward, and the tendon sutured by a side-to-side suture, placing such at a lower and higher level than its former position.

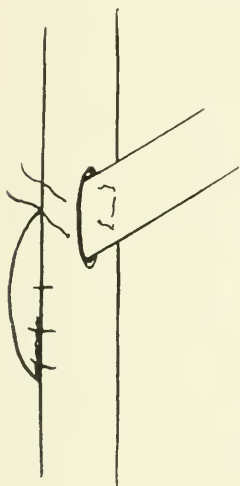


FIG. 1.—Insertion of the cut peroneal tendon into the tendo Achillis.



FIG. 2.—Transplantation of the peroneus longus to the tibialis posticus.

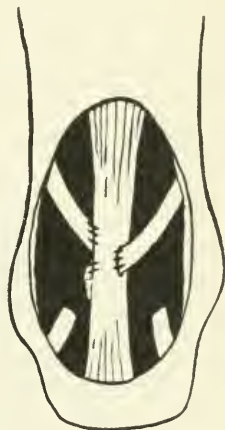


FIG. 3.—Transference of the posterior tibial and peroneus into the tendo Achillis.

Lengthening the Tendo Achillis.—This is ordinarily done by means of subcutaneous tenotomy. In some instances, however, where a foot is especially weak from infantile paralysis and the amount of lengthening to be desired great, the danger of non-union is sufficient to warrant open incision and the lengthening of the tendo Achillis. This can be done by the same incision and a similar method as shortening the tendon, with the exception that the obliquely cut

tendon is pulled apart, and the free ends united at a lower and higher level than before, in a manner reverse to that done for shortening the tendon.

Great care of the sheath is necessary, which should be sutured separately to secure free play of the tendon within it.

The method of suturing the tendon is of importance. Tendinous structures may be supposed not to unite as readily as other tissues, as their vascularity is less, and, furthermore, the strain to which they are subjected is great. It is essential, therefore, not only that no sloughing should take place, but that the sutures should be such as will keep the parts in close contact, and also not to compress unduly. It is of great importance also that the sheaths of the tendon should be but little enlarged, and that the opening through the sheaths of the non-paralyzed muscles should be carefully made, and the tendon handled with care and delicacy. Either catgut, fine silk, or kangaroo tendon can be used for suture.

It is important that the tendons be applied in such a way that the power in contraction is not lost or impaired. It is manifestly useless to expect any power if the tendon is placed nearly at a right angle to its original direction without a firm bone to pass around. The peroneus normally plays around the malleolus, but if it is divided and inserted into the posterior tibial, it cannot be expected that it will exert sufficient power if it passes in loose tissues at a sharp angle with its former direction. Neither can it be expected that the tendon can exercise much power if it is slack in its new position. Although a certain degree of adaptability of the tissues may be expected, there is a limit to this.

Judgment is also required in the length of the tendon to be left after the suture. No precise rules can be laid down in this matter, success depending upon the judgment and operative sense of the surgeon. Where errors of judgment take place, failures or imperfect results will follow. After the operation protection is necessary for a while by a support which prevents strain upon the affected tendon. Where

the muscle is not completely paralyzed but some power remains, a better result can be expected if the muscle is exercised, and in many instances it will be found that a muscle which is apparently unable to exert any great power may develop some strength by use. After-treatment following these operations is, therefore, one which requires considerable care. Supports should, therefore, be used which will constrict as little as possible. The foot or limb should be placed in such a position as to relieve the muscles and tendons operated upon from any strain. Besides the ordinary aseptic dressings, the limb should be covered with sterilized sheet wadding, and the foot and limb held in a plaster-of-Paris bandage, which should remain until union is expected, after which the plaster bandage may be followed by a removable appliance, the patient walking with crutches until the parts are sufficiently strong to stand the amount of weight necessary in locomotion. Later it becomes a question of judgment whether the limb should be supported by means of an apparatus or whether crutches or a cane alone should be used. Where a large tendon is shortened, as in the tendo Achillis, it will be necessary that an apparatus should be worn for several months, according to the age and size of the patient operated upon. The form of apparatus varies with the case, and resembles the appliances which are used for infantile paralysis. It should, however, be borne in mind that no apparatus should be used with straps exercising pressure directly upon the tendons which have been operated upon.

In judging of the ultimate success of this operation, it can be said that the immediate result is always successful as far as recovery from the operation is concerned, this being unattended with danger and always followed by healing. Where ordinary judgment is used, and healthy tendons are sewn to paralyzed ones in a proper manner, there is always a recovery of motion in the paralyzed tendons attached to an active muscle as soon as the wound is healed. This recovery may be regarded as permanent. The actual benefit,

however, to be gained as an ultimate result will depend upon the strength of the muscle utilized as well as the part operated upon. Where the patient is heavy and the tendon subjected to great strain, as a tendo Achillis reinforced by a peroneus muscle, the benefit obtained is not as great if the peroneus is a feeble as if it is a strong muscle.

Transplantation of the Sartorius Muscles.—This is a procedure which has been successfully performed by Goldthwait, and also by Milliken. An incision is made on the inner side of the thigh, from the internal condyle upward in the direction of the insertion of the long adductor tendon. The limb is flexed at the knee and abducted. Some difficulty is frequently encountered in finding the sartorius muscle, which in a paralyzed limb falls more towards the popliteal side than is normally the case. The muscle will be recognized by the nature of its fibres as well as the direction in which they run. The muscle should be followed down well towards its insertion, and cut across at the level of the internal condyle, or slightly below it. The skin incision is then drawn to the outer side, and the conjoined fascia of the rectus and vastus internus is found. The fascia covering this and forming a portion of the tendon is to be dissected up. The divided sartorius muscle is inserted underneath the fascia and sewn to it for the length of half an inch to an inch. Sutures are placed not only on the end but on the side of the cut muscle, the fascia, which is dissected up to cover the muscle, being sewn carefully down on the side to the adjacent portions of the tendinous fascia as well as to the muscle. Beyond the difficulty of finding the sartorius muscle the operation is a simple one, and this difficulty can easily be avoided if it is borne in mind that the position of the sartorius is not that in a normal limb. After the operation the limb is to be fixed in a straight position.

Spastic Paralysis.—Lengthening of the tendons and intramuscular fascia in cases of Little's disease, or infantile spastic hemiplegia, is but little known and of comparatively recent introduction, though the benefit of this operation is

beyond question, and has the sanction of the usage of several years. It was first recommended by Rupprecht, and has since been employed with success by several surgeons. It is of advantage in such cases of this affection of the lower extremity as may be seen in children who are not mentally deficient; slight benefit is obtained in children with marked mental deficiency. This procedure will be found of value in spasm of the gastrocnemius muscle, in the flexor muscles of the legs, and in the adductors. It has also been of use in the spastic condition of muscles of the arm and hand in spastic paralysis. The object of the procedure is to remove the obstacle to the use of the limb, in cases of this sort, which lies in the inability of the opposing muscles to counteract the constant spasm of muscles contracted from an exaggerated reflex sensibility. In some of these muscles a shortening has already taken place which no amount of manipulation, or massage, or mechanical stretching satisfactorily overcomes, but which can be removed by tenotomy. It is, of course, of little use in older cases, where too great structural change has taken place. It will, however, be found of benefit in children.

Subcutaneous tenotomy is the method of tendon lengthening, to be employed in a spastic condition of the gastrocnemius, to be followed by fixation by a plaster bandage in a corrected, but not over-corrected, position. After removal of the bandage, in a fortnight, massage and electricity are to be employed, and the patient permitted to walk as freely as the child desires. This increases as the child's muscular and co-ordinated strength increases.

As Bullard well says, "This operation is to be considered as the first step in the treatment of the severer forms of cerebral spastic paralysis in children, but only as the first step. It needs to be followed by other measures in order that the full benefit should be obtained."—*Boston Children's Hospital Report*, Boston, 1895, p. 339.

Where the hamstring and adductor muscles are contracted, an open incision has seemed to give greater precision

and to permit the more ready division of the intramuscular fascia than tenotomy.

The principles of after-treatment are the same,—viz., fixation of limb in a correct position until healing, followed by gradually increasing exercise and massage.

I have employed the method also in the upper extremity; where the method is followed by massage and muscle-training benefit will follow, though less than in the lower extremity.

Transplantation of the Ligamentum Patellæ in slipping Patella.—It is to Shaffer that the credit belongs of first pointing out a lengthened condition of the ligamentum patellæ in some cases of slipping patella, and suggesting that this be cured by means of surgical intervention. Various procedures have been suggested for this, separation and transplantation of the tubercle of the tibia and the splitting and shortening of the tendon. The latter is much the simpler, and can be readily done. An oblique incision is made dividing the ligamentum patellæ from above downward; the split ligament is pulled forcibly downward, and the lower portion is attached to the periosteum covering the tibia. The upper end of the lower portion of the ligament can be pulled forward and attached firmly to the side of the ligament. The same can be done to the cut surfaces, which can be slid past each other and quilted together; a free end can be attached to the periosteum on the inner side of the tubercle to broaden the attachment. This, accompanied by suturing a fold of the relaxed capsule, is sufficient to cure the distressing and disabling affection of slipping patella. This can be done without opening the joint, as the ligamentum patellæ is entirely separated from the joint capsule. A permanent cure may be expected.

The result in the case of slipping patella operated upon by me was most satisfactory, remaining permanently cured after two years of active use. This is also true of a case reported by Dr. Goldthwait.

Dr. Dawbarn tells me that, in a recent unpublished case, he has successfully transplanted the ligamentum patellæ by

chiselling the bone at the insertion of the ligament free from the rest of the tibia, and attaching the fragment of bone to tibial periosteum, dissected for the purpose, at a lower and inner point on the tibia.

Results.—Tendon transplantation has been performed by my colleagues and myself at the Boston Children's Hospital in twenty-seven cases of infantile paralysis, chiefly those requiring transplantation of the peroneal tendons.

In two of my cases, in children under four years of age, but little benefit followed, the muscles apparently being too weak to justify an expectation of the future development of the muscle.

In the other cases immediate gain of a hitherto unusual motion followed. The ultimate result in cases watched for three years by Dr. Goldthwait was most satisfactory, the gain made after operation being increased under use.

In a case of transplantation of the sartorius, operated upon by Dr. Goldthwait, the restored motion of extension of the leg remained with increased power two years after the operation.

Tenotomy and myototomy with resulting tendon lengthening has been performed in nineteen cases of spastic paraplegia and hemiplegia at the Children's Hospital with satisfactory results, in most instances as recorded by Bullard.—*Children's Hospital Reports*, Boston, 1895, p. 339.

My experience in private practice accords also with hospital experience, and enables me to record permanent improvement from tendon lengthening, in several instances of this affection watched through several years.

In conclusion, it can be safely claimed that tenoplastic surgery affords satisfactory results in affections hitherto untreated by operative surgery.

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COLOPEXY FOR THE RELIEF OF PROLAPSUS OF THE RECTUM.¹

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SURGEON TO BELLEVUE AND TO SAINT VINCENT'S HOSPITALS.

THE operation of elevation and fixation of the lower part of the large intestine to some portion of the wall of the abdominal cavity, for cure of prolapse of the rectum, was devised and performed first by Jaennel on February 5, 1889. He opened the abdomen in the iliac region as for the formation of artificial anus, raised the intestine out of the wound, and drew it upward so as to reduce the prolapse of the rectum. He confined the bowel in place by stitching it to the borders of the wound, and by the support of a steel sound, surrounded by gauze, carried through the mesentery and permitted to lie on the abdomen. An artificial anus was made on the sixth day following the operation; a movement occurred on the eighth, and the sound was removed on the ninth day. The artificial anus was made for the purpose of securing rectal quietude. Electricity was employed to restore tone to the sphincter. Seven months after the operation the following statement was made: "The sphincter has in large part recovered its power, and the mucous membrane does not appear outside." The artificial anus was finally closed on February 26, 1890, by the fourth attempt for this purpose, and the case declared substantially cured, thirteen months from the time of the operation.

The second operation of colopexy was done November 5, 1889, by Verneuil, who was familiar with the preceding

¹ Read before the New York Surgical Society, April 14, 1897.

practice of Jaennel, and pronounced it "an original, ingenious, therapeutic conception."

This, the second, operation—the first of Verneuil—was performed on a woman twenty-six years of age, who had suffered for a long time with a pronounced prolapse of the rectum, which had resisted successfully a cure by the then accredited methods of surgical practice. Through an abdominal incision Verneuil reduced the prolapse and fastened the bowel in place through the agency of the fatty appendices of the sigmoid colon. These appendices were drawn well outward through the wound, and fastened there by sewing. While prompt union rewarded the efforts of the surgeon, the appendices were soon found to be unequal to their task, and a prolapse followed, but of a less degree than that of the original infliction. "Notable amelioration" is the reported outcome in this case.

On January 6, 1890, McLeod, of Calcutta, performed elevation and fixation of the rectum on an Indian boy, nineteen years of age, in the following original manner: He introduced the hand into the rectum and passed it up along with the prolapsed gut to a point about two inches above Poupart's ligament, and fastened the bowel to the abdominal wound at that point by transfixion with two long steel needles, passed from without through the walls of the abdominal and intestinal structures sufficiently far apart to permit the making between them of a short perpendicular incision down to the peritoneum. The anterior wall of the gut and the undivided peritoneum were pressed forward into the abdominal incision, and united with each other by sewing, the finger serving as a guide to the passage of the needle. The wound was closed and the pins allowed to remain in place for twenty-four hours. Good union was secured, and three months after the operation the prolapse had not reappeared. It is hardly needful to recite in detail the further operations, and instead abstracts of them are appended at the close of this paper.

RECORDS OF COLOPEXY.

The case which has been the exciting cause of this paper came under my notice in Bellevue Hospital in 1893. He was then suffering from a prolapse of the rectum four inches in extent, for the cure of which he had submitted to numerous operations by competent surgeons with—as is indicated by the then degree of prolapse—no significant benefit. His sufferings were severe, and in all respects characteristic of the nature of the affection. An artificial anus was made with the view of turning aside the fæcal flow, to secure greater cleanliness and quietude of the rectum subsequent to the radical measures then contemplated for cure of the prolapse. At the end of two weeks the patient was much improved in all respects. At this time I was obliged to leave the city, and before my return the patient himself left the hospital, and I did not see him again for about three months.

He was so much improved at this time that I determined to wait still further the effects on the prolapse of physiological rest of the parts. Without further delay, I will remark that at the end of a year from the time of the establishment of the artificial anus the tone of the sphincter had entirely returned, and the existence of prolapse was not manifest on severe straining of the patient. During this time about a fourth of the fæcal flow had passed through the normal canal, the remainder escaping through the artificial opening.

In presenting this case, with a brief paper, before the surgical section of the Academy of Medicine, I ventured the submission of the following propositions as based on the outcome at that time.

(1) That the performance of the physiological functions of the rectum contributes greatly to the advancement of rectal disease and to the sufferings of the patient.

(2) That the complete vicarious discharge of the fæces through an artificial anus located at the sigmoid flexure reduces the physiological demands on each structure of the rectum to a minimum.

(3) That the lessening of the physiological requirements is commonly in direct proportion to the diminution of the fæcal flow through the rectum.

(4) That the cessation or lessening of the fæcal discharge per anum exercises a palliative and curative influence on diseases of the rectum.

(5) That in certain cases of obstinate rectal prolapse the formation of a vicarious channel for fæcal discharges is justifiable, both as a palliative and curative measure.

(6) That the preliminary establishment of such a channel for the purpose of cleanliness and the prevention of infection is justifiable in grave operations for prolapse of the rectum.

(7) That the dangers attendant on the formation of an inguinal anus are much less than those invited by the contact of fæcal discharges with large fresh cut surfaces of the rectum.

(8) That the case just presented had been, without special risk, greatly benefited, and might be finally cured through the agency of an artificial anus.

(9) That when cure takes place great care must be exercised thereafter, otherwise the prolapse will return.

The last two of these conclusions were not realized to a greater degree than at the time of their presentation, for as the artificial anus gradually diminished in size the rectal prolapse as gradually returned, accompanied with increasing infliction of the kind of the previous experience.

After the lapse of about two years, devoted to physiological therapeutics alone, and with long-before defeated prospects of further improvement, it was determined to resort to colopexy as the next method of treatment. Therefore, on October 31, 1896, the operation was performed, in the presence of the medical class at the Bellevue Hospital amphitheatre. At the time of the operation the prolapse was two and a half inches in length and five inches in circumference (Fig. 1), could be readily reduced by the patient, and remained up except with the act of defecation. The sphinc-



FIG. 1.—Bryant's case of prolapsus of the rectum.

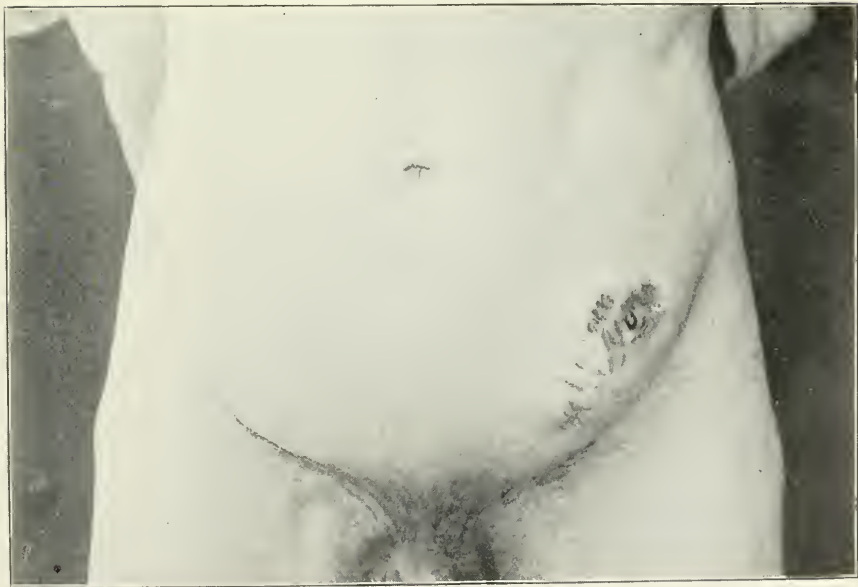


FIG. 3.—Showing condition of abdominal cicatrix after operation.

ter was feeble, indeed, the voluntary action being scarcely apparent.

THE OPERATION.

The opening of the diminutive fæcal fistula—artificial anus—was cleansed, inverted, and closed with sutures to prevent infection. An incision three inches in length, parallel with Poupart's ligament, was made down to and through the peritoneum. The peritoneum was separated from the superimposed tissues at either side for an inch at least, but farther above than below. The gut was pulled upward firmly, causing the prolapse to disappear entirely; and while the gut was being thus held, effort was made by Dr. George D. Stewart to draw down any relaxed tissue of the rectum that might be within reach. The mucous membrane only was relaxed, but not to a sufficient degree to permit its appearance at the anal opening. During firm traction upward on the gut the peritoneal flaps of the wound were joined to it by quilting and continuous sewing with silk, the stitches including the muscular coat of the intestine. (Fig. 2.) Six silk sutures were then carried through the borders of the abdominal wound, and so as to include the muscular coat of the gut, behind the longitudinal band. The longitudinal band was then drawn forward into the wound almost to the external limit, and the sutures were tied firmly, thus causing the border of the wound to grasp firmly the entire band and some portion of the intestinal wall. The wound healed promptly without an untoward manifestation. The patient was kept in bed for three weeks, since which he has been allowed entire freedom of action in all respects. No protrusion has been seen after defecation or with the severest strain since the operation.¹

The patient complains now of occasional diarrhœa and attendant colic.

The Cicatrix.—The cicatrix is the result of prompt and uncomplicated union, and represents, therefore, all that can

¹ At this time, July 6, 1897, no return of the prolapse has occurred.

be expected as the product of such a union at this situation. As can be understood from recent experience in these mat-

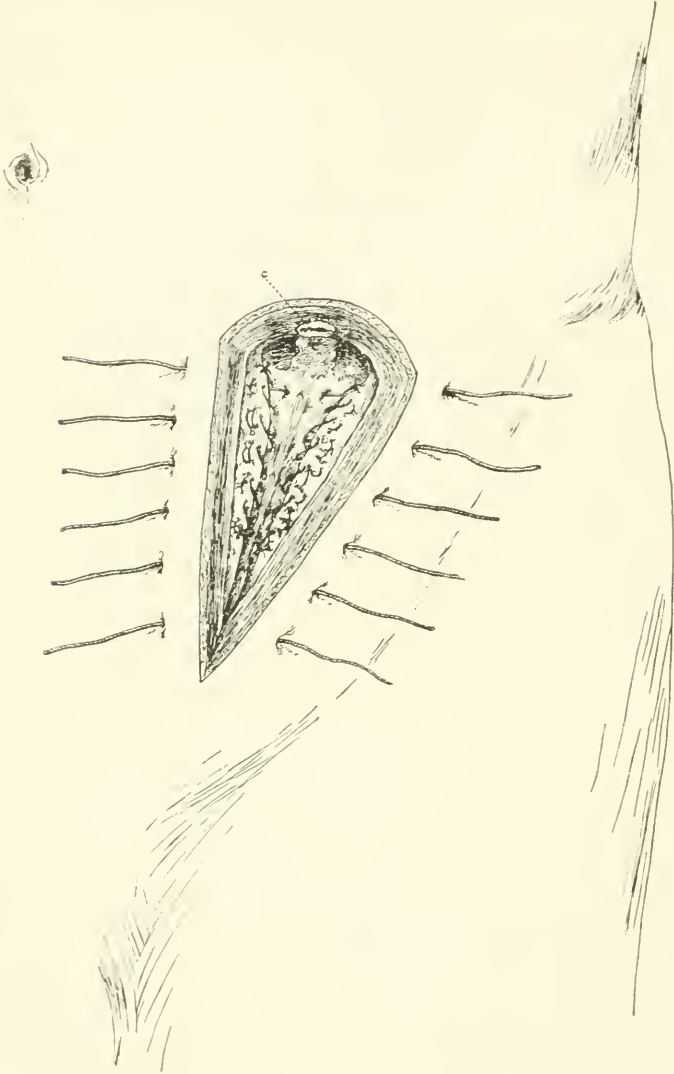


FIG. 2.—The operation of colopexy. A, A, longitudinal band, with sutures passed behind it, including peritoneal and muscular coats of the intestines, drawn forward. B, B, parietal peritoneum quilted to sides of the intestine, showing stitches. C, old fecal fistula.

ters, the width of the cicatrix is increasing proportionately to the increase in dimensions of the protrusion that characterizes its site.

The Fistulous Opening.—The fistulous opening is the relic of the artificial anus established about three years and a half ago, for the purpose of changing the course of the fæcal flow in anticipation of excision of a rectal prolapse, which had thus far resisted other well-applied though less radical measures of relief. The operation of excision was not performed because of the great comfort and physical improvement that followed quite promptly the establishment of the opening, together with the desire to estimate the extent and stability of the curative influence of rest of the rectum in rectal prolapse. No effort was made to cure the fistula at the time of the operation of colopexy, because it was thought its presence might be needed to ameliorate the painful effects of other measures, if colopexy failed of relief. At the present time the fistula is a little less than a quarter of an inch in diameter, and but little fæcal matter escapes from it, and then principally in the presence of diarrhœa. I now intend to close it at once, as it does not appear to meet any present or prospective demands in connection with comfort or cure.

The protrusion is increasing in size, and will, in my opinion, become greater if artificial support be not provided. I am disposed to regard this manifestation of abdominal weakness as a likely sequel whenever the fibrous band of the bowel is introduced into the wound; as then it not only separates the borders of the deep portions of the wound, but acts also as a wedge applied to a line of union necessarily weakened already by its presence there. It is proper to notice, I think, that the protrusion of the bowel exercises a tractile influence on the portion below, but to seek the advantages of a remedy of this kind is not to be considered, as it may become something of an infliction by itself alone. The fixation of the bowel to a portion of the abdominal wall that will be secure in all respects is an important desideratum. At the outset it was my determination to fix the gut to the iliac fascia, but

the greater ease of attainment and fascination of the anterior fixation caused a prompt change of plan after the abdomen had been opened; and it occurred to me that the somewhat vigorous contact of the bowel with the brim of the pelvis, necessarily incident to this plan, might be objectionable, and hence, for these reasons, anterior fixation was practised.

The following brief statement of the general results of the cases here presented enables one to estimate promptly the outcome of these operations. In the twenty-nine cases non-recurrence is noted in twenty-two, partial recurrence in three, and recurrence in four of the cases. Not a single death nor other sequel than that of the case of the writer is reported. No comments bearing on the facts of annoyance or suffering of any kind during convalescence are expressed, nor did any occur referable to the operation in the writer's case. A careful scrutiny of the tabulated statement bearing on the points of "intestinal" and "parietal attachment," while showing the plan adapted in the respective cases, does not establish the utility of an especial method.

Inasmuch as a scrutiny of the results of the appended cases shows so favorable an outcome, without the occurrence of a fatal result, and with a presumptive minimum of pain and annoyance during convalescence, and the absence of the development of significant sequels, I am disposed to offer the following conclusions for consideration:

(1) That the results in the experience of others with colopexy, and the present outcome of this case, bespeak a continued effort in this direction, with a well-founded belief of the attainment of beneficent results in proper cases.

(2) That the brief duration of many of the cases at the time of report and the varying methods of fixation of the bowel to the abdominal wall bespeak further experience in these matters before positive conclusions are expressed.

(3) That fixation of the bowel by sewing it to the deep tissues of the abdominal wall at a point independent of, yet conveniently near to, the incision offers a satisfactory method of anterior fixation.

ANALYSIS OF PUBLISHED CASES OF COLOPEXY.

Cases.	POINTS OF INTESTINAL ATTACHMENT.				POINTS OF PARIETAL ATTACHMENT.						Result.	
	Colon.	Fibrous Bands.	Appendices.	Mesocolon.	Abdominal Wall.	Abdominal Wound.	Skin.	Pertoneum.	Poupart's Ligament.	Lumbar Aponeurosis.		Artificial Anus.
No. 1	By transfixion with sound.	×	+	×	One year after,—cured.
No. 2	+	×	×	Partial recurrence.
No. 3	+	.	.	.	+	.	×	Three months,—no recurrence.
No. 4	×	×	×	×	×	×	.	} Two years,—return in at least one of these three cases. Two years,—no return. Two months,—slight mucous membrane. Two months,—no return. Eighteen months,—no return. Seven months,—return. Fourteen days,—no return. " Excellent result." " Excellent result." " After eighteen, fourteen, and two months respectively,—no return." Six months,—slight return. One month,—no return. Eighteen months,—no return. Twenty-five days,—no return. Twenty days,—no return. Several months,—no return. Eight or ten months,—return. Three months,—return. Two and a half months,—no return. Several months,—no return. Nine months,—no return. Nine months,—no return.
No. 5	×	
No. 6	×	
No. 7	+	.	.	×	
No. 8	×	
No. 9	+	.	.	×	
No. 10	+	.	.	×	
No. 11	+	.	.	×	
No. 12	+	×	
No. 13	×	
No. 14	×	
No. 15	+	.	.	×	
No. 16	×	
No. 17	×	
No. 18	+	.	.	×	
No. 19	+	.	.	×	
No. 20	+	.	×	
No. 21	×	
No. 22	+	.	+	×	
No. 23	×	
No. 24	×	
No. 25	+	.	×	
No. 26	+	.	.	×	
No. 27	+	.	×	
No. 28	×	
No. 29	+	+	.	×	

NOTE.—Corresponding points of attachment are indicated by the same sign. Intestinal attachments indicated by +, mesenteric attachments indicated by X.

ABSTRACT OF PUBLISHED CASES OF COLOPEXY.

(1) Name of operator, Jeannel (of Toulouse): No. of cases, 1: date of operation, February 5, 1889: technique, Littré's incision: intestine held in wound by large urethral sound covered with iodoform gauze passing through mesentery: two appendices epiploïcæ included in stitches narrowing the wound; on sixth day artificial anus produced: result, February 26, 1890, fourth operation for closure of artificial anus,—successful; prolapse cured.

(2) Name of operator, Verneuil (of France): No. of cases, 1: date of operation, November 5, 1889: technique, intestine drawn upward; fixation by including all the appendices epiploïcæ of the sigmoid in a suture, the extremities of which were then passed through the abdominal walls at a centimetre from the edges of the wound: result, partial recurrence (date not given).

(3) Name of operator, McLeod (of Calcutta): No. of cases, 1: date of operation, January 6, 1890: technique, left hand introduced through rectum to just below crural arch; two long steel needles were then thrust a little distance apart parallel to the crural arch, through the abdominal wall and out again, pinning the colon to the parietes; vertical incision between the needles down to peritoneum: colon sutured to peritoneum guided by hand in bowel: result, at end of three months no return of prolapse.

(4, 5, 6) Name of operator, John Berg (of Sweden): No. of cases, 3: date of operation, one case in spring of 1891, two other cases soon afterwards: technique, incision as for iliac colotomy; prolapse reduced by traction; fixation by silk sutures through mesorectum, parietal peritoneum of iliac fossa, and fibres of Poupart's ligament [March 8, 1892, Berg states that he has not had the three cases under observation long enough to judge value of results]: result, October, 1894, return of prolapse in at least one of the three cases (stated by J. Borelius in "Hygeia," 1894).

(7) Name of operator, Jacques Borelius (of Sweden): No. of cases, 1: date of operation, September 17, 1892: technique, incision above left Poupart's ligament: intestine drawn up; suture attached mesentery to abdominal wall, including Poupart's ligament: intestine sutured to parietal peritoneum; wound closed: result, August, 1894, no return of prolapse.

(8) Name of operator, Jeannel (of Toulouse): No. of cases, 2: date of operation, reported prior to October, 1893: technique, I. mesocolon sewed into abdominal wound by four silk sutures: result, two months later slight mucous membrane prolapse.

(9) Technique, II. intestine itself sewed to abdominal wall: result, two months later no recurrence.

(10) Name of operator, Poncet (of Lyons): No. of cases, 1: date of operation, reported prior to October, 1893: technique, iliac incision; prolapsus reduced by traction; fixation by four buried silk sutures through

aponeurosis, muscle, and peritoneum on either side of the wound, and colon beneath: result, eighteen months later no recurrence.

(11) Name of operator, Tuffier (of Paris): No. of cases, 1: date of operation, reported prior to October, 1893: technique, lumbar colopexy; vertical lumbar incision; fixation of colon to lumbar aponeurosis: result, seven months later return of prolapse.

(12) Name of operator, Boiffin (of Nantes): No. of cases, 1: date of operation, October 4, 1893: technique, fixation by three sutures through mesocolon, and muscle fascia and peritoneum of abdominal wall on either side of wound; also two appendices epiploicæ attached to peritoneum at the extremities of the wound: result, fourteen days later no recurrence.

(13, 14) Name of operator, Dr. — (of Melbourne): No. of cases, 2: date of operation, in 1893: technique, sutured mesorectum into abdominal wound: result, "excellent results." (Tuttle, *New York Medical Journal*, January 11, 1896.)

(15, 16) Name of operator, Lennander (of Sweden): No. of cases, 3: date of operation, two operated on in 1893: technique, fixation of sigmoid to anterior abdominal wall: result, after eighteen, fourteen, and two months respectively, no return of prolapses in the three cases.

(17) No. of cases, 1: date of operation, not known: technique, not known: result (stated by Borelius in "Hygeia," 1894).

(18) Name of operator, Jacques Borelius (of Sweden): No. of cases, 1: date of operation, January 22, 1894: technique, incision above left Poupart's ligament; prolapse reduced by traction; fixation of mesorectum to the lower edge of the wound by a deep suture; intestine sutured to parietal peritoneum; wound closed by three layers of sutures: result, July 14, 1894, a slight prolapse occurs at nearly every defecation.

(19) Name of operator, Josef Bogdanik (of Vienna): No. of cases, 1: date of operation, May 10, 1894: technique, sewed colon with continuous catgut suture to peritoneum, first on one side of the wound and then on the other; the serous surfaces to be coapted were first scratched with a needle: result, June 10, 1894, discharged cured.

(20) Name of operator, John F. Erdmann (of New York): No. of cases, 1: date of operation, July 4, 1894: technique, prolapse reduced by traction; mesosigmoid attached to parietal peritoneum by two or three sutures introduced through mesentery parallel to the course of the vessels; intestine itself anchored by sutures through divided peritoneum on either side, and including longitudinal fibres of sigmoid beneath; closure of wound by row of sutures through peritoneum, fascia, and muscles, and one through skin; later established artificial anus through original wound: result, eighteen months later patient died; had had no recurrence of prolapse.

(21) Name of operator, Josef Bogdanik (of Vienna); No. of cases, 1: date of operation, August 18, 1894: technique, same technique as in his previous operation of May 10, 1894 (see *supra*): result, September 12, 1894, discharged cured.

(22) Name of operator, Caddy (of Calcutta): No. of cases, 1: date of

operation, September 16, 1894: technique, incision three inches long, parallel with and two inches internal to Poupart's ligament; prolapse reduced by traction; fixation by two mattress sutures, placed two inches apart, passing through muscles and peritoneum one inch from lower margin of wound, and mesorectum; peritoneum united with fine silk sutures which also included the adjacent appendices epiploicæ; muscles sutured with fine silk and skin with silkworm gut: result, November 6, 1894, cured.

(23) Name of operator, Dr. Berger (of France): No. of cases, 1: date of operation, not known: technique, left inguinal incision; prolapse reduced by traction; loop of sigmoid held outside of wound by glass rod through mesosigmoid; nine days later iliac anus established; several months later iliac anus closed: result, several months after operation no recurrence of prolapse.

(24) Name of operator, John F. Erdmann (of New York): No. of cases, 1: date of operation, February 5, 1895: technique, same technique as in his operation of July 4, 1894, with the exception that no iliac anus was subsequently made; case had subinvolution of uterus associated with prolapse of rectum: result, eight or ten months later prolapse recurred.

(25) Name of operator, George D. Stewart (of New York): No. of cases, 1: date of operation, summer of 1895: technique, incision as for inguinal colotomy; fixation of mesocolon to abdominal wall by two sutures; sewed peritoneal opening with sutures, which included the serous and muscular coats of adjacent colon as elevated, holding it *in situ*; wound closed: result, three months later prolapse recurred.

(26) Name of operator, Sarfert (of Vienna): No. of cases, 1: date of operation, September 5, 1895: technique, colon elevated to reduce prolapse; fixation of mesocolon by five catgut sutures to parietal peritoneum; fixation of intestine itself to parietal peritoneum by three catgut stitches; closure of peritoneal opening with catgut; closure of abdominal wound; total prolapse of uterus retained with a tampon: result, two and a half months after operation no recurrence.

(27) Name of operator, John F. Erdmann (of New York): No. of cases, 1: date of operation, September 12, 1895: technique, same technique as in his second case operated on, February 5, 1895 (see *supra*): result, a number of months later no recurrence.

(28) Name of operator, J. P. Tuttle (of New York): No. of cases, 1: date of operation, January, 1896: technique, two sutures about one and a half inches apart; sutured the colon into the upper and lower angles of the abdominal wound; the intermediate portion of colon was sutured to skin as for inguinal colotomy; healing by granulation: result, nine months later no recurrence.

(29) Name of operator, Joseph D. Bryant (of New York): No. of cases, 1: date of operation, October 31, 1896: technique, lips of old left inguinal fistula (about one-third inch diameter) drawn together with suture; prolapse reduced by traction after making incision around fistula, and downward and inward from fistula for about three inches entering abdominal

cavity; sigmoid attached to parietal peritoneum on both sides of incision by continuous quilt suture, leaving longitudinal fibrous band in bottom of wound; sutures closing the wound included the parietes on either side, and longitudinal fibrous bands of sigmoid in bottom of wound; skin around fistula stitched *in situ*: result, nine months no return.

Classification according to Periods of Time elapsing between the Operation and the Latest Observation of the Case.—Three cases (Nos. 2, 13, and 14), the dates not being given, cannot be included in the classification. These included *one case* in which all the appendices of the sigmoid were attached by one suture to the abdominal wall in which a partial recurrence took place, and *two cases* in which the mesocolon was sewed into the abdominal wound, in which “excellent results” were claimed.

Condition of Cases Reported from Two Weeks to One Month after Operation.—Four cases (Nos. 12, 19, 21, and 22), all showing no return of prolapse.

Condition of Cases Reported from One to Three Months after Operation.—Six cases (Nos. 3, 8, 9, 17, 25, and 26), in which four showed no return, one a slight return, and one a considerable return.

In three of the four cured the points of attachment were as follows: (a) colon attached to abdominal wall by transfixion, and to peritoneum by suture; (b) colon sutured to abdominal wall; (c) colon and mesocolon both attached to peritoneum.

In the fourth the technique is not known. In the case of slight return the mesocolon was attached to the abdominal wound. In the case of return the colon was attached to the peritoneum and the mesocolon to the abdominal wall.

Condition of Cases Reported from Six to Ten Months after Operation.—Seven cases (Nos. 11, 18, 23, 24, 27, 28, and 29), of which four had no recurrence, one a slight recurrence, and two considerable recurrence.

In the four cured the points of attachment were as follows: (a) colon attached to wound and artificial anus formed; (b) fibrous bands and mesocolon both attached to perito-

neum; (c) colon attached to abdominal wound and skin; (d) colon attached to peritoneum and fibrous bands drawn into wound.

In the case of slight recurrence the colon was attached to peritoneum and mesocolon to abdominal wall. Of the two cases of complete return, one had the colon attached to the lumbar aponeurosis, and the other, which was complicated with a subinvoluted uterus, had the fibrous bands and the mesocolon both attached to the peritoneum.

Condition of Cases Reported One Year and over after Operation.—Nine cases (Nos. 1, 4, 5, 6, 7, 10, 15, 16, and 20), of which eight were cured and one had recurrence of prolapse.

Points of attachment in the eight cases cured: (a) colon and two appendices attached to abdominal wound,—iliac anus; (b) two cases in which mesocolon was attached to peritoneum and Poupart's ligament; (c) colon attached to peritoneum and mesocolon to abdominal wall and Poupart's ligament; (d) three cases where colon attached to abdominal wall; (e) fibrous bands and mesocolon both attached to peritoneum,—artificial anus.

In the one case in which there was return, the mesocolon was attached to the peritoneum and Poupart's ligament.

STRANGULATION OF THE INTESTINE BY MECKEL'S DIVERTICULUM.¹

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THE subject of acute intestinal obstruction, of whatever origin, has always been of keen interest to the surgeon. The difficulty and the importance of early diagnosis, upon which prompt surgical interference depends, the certainty of relief to the patient, where surgical aid is not delayed,—all these factors make obstruction by Meckel's diverticulum one of the most interesting varieties of intestinal obstruction, and render it a suitable subject for discussion in this society. These considerations have influenced me in presenting the histories of the following three cases, which have come under my observation during the last few years.

CASE I.—J. B., aged twenty years. The patient was admitted to St. Francis's Hospital towards evening. He had been taken ill the morning of the previous day with severe pains in the right lower half of the abdomen, followed, a few hours later, by vomiting, and a feeling of great exhaustion. His bowels, generally constipated, had been irregular for the previous two weeks. Otherwise his history was entirely negative. The vomiting continued and the pain increased during the night and the next day. When I saw the patient, at about 4 P.M., on the second day, his appearance was as follows: The abdomen was slightly tympanitic, its walls rigid. It was sensitive on pressure all over. In the right iliac region it was distinctly more prominent than on the left side. At this point of greater prominence the percussion sound

¹ Read before the New York Surgical Society, April 28, 1897.

was slightly dull. Although peristaltic movements were absent, the configuration of an underlying loop of intestine against the abdominal wall was quite distinct, and increased resistance was felt at this point on palpation. It was evident from this that a strangulated loop was lying within the abdominal cavity at this point, and the abdomen was, therefore, opened at the outer border of the right rectus muscle by an ample incision. Before cutting the peritoneum a bluish discoloration of the intraperitoneal contents was noticed, and upon incision a perfectly black loop of gut immediately presented itself. The latter was twisted about one full turn, and it took some moments to untwist it and to expose the seat of obstruction, although there were no adhesions. It was now seen that the constriction was caused by a Meckel's diverticulum attached to the convex border of the ileum, about six inches from the ileo-cæcal valve. The end of the diverticulum was apparently adherent at the mesenteric border of the loop from which it arose, after having made not quite one full turn around the bowel involved. The strangulated ileum consisted of that portion of the bowel situated immediately above the origin of the diverticulum, and measured about three feet. It was, as previously stated, uniformly black in color, although it had not entirely lost its gloss. After division of its end the constricting band contracted somewhat, and when entirely removed measured about three inches in length. There was no indication of a mesentery, but it had a lumen about two inches long, which was lined with mucous membrane, the last inch being a solid cord. The base of the diverticulum was rather narrower than its tip, which latter was apparent in the specimen as a lateral bulging. The lumen of the diverticulum just admitted a medium-sized probe. Nowhere was there any indication of peritoneal adhesions, and the end of the cord attached to the mesentery was a solid structure, which seemed to pass into the mesentery itself. Macroscopically I was not able to detect any vessels in the cord at this point, but the specimen was not examined microscopically. At the constriction a deep furrow was visible in the walls of the gut. I pulled out the gangrenous loop well from the abdominal cavity, and made an anastomosis with a Murphy button where the gut appeared healthy. Owing to the critical condition of the patient, and the fact that a general peritonitis was already well established, the gangrenous gut was

wrapped in sterilized gauze, and treated extraperitoneally. The patient rallied somewhat, but succumbed to shock and sepsis eight hours after operation.

CASE II.—T. E., aged forty-four years. Has always been well to within a year ago. Since that time he has suffered from continual diarrhœa, associated with tenesmus and flatulency. For the past month he has complained of considerable pain in the lower abdomen, and this, during the past ten days, has become very severe, and is localized immediately below the umbilicus. He has lost about twenty pounds in weight during the last year. On admission to the hospital a round tumor, about four inches in diameter, was noticed between the umbilicus and symphysis, fluctuating, but not painful during examination. Under ether an incision was made in the median line over and into the tumor, and an abscess cavity opened within the abdominal wall which contained fetid pus, fœcal matter, and a large quantity of gas. In the deepest part of this cavity there was seen a circular opening about an inch wide, which evidently communicated with the colon, judging from the nature of the fœcal matter which escaped from it. This opening, however, was not lined with mucous membrane. For about three weeks after this operation the course of the case was satisfactory, very little fœcal matter appearing at the fistula; the latter contracted, the wound showing a tendency to close. But at this time the patient began to have slight elevations of temperature, and upon firm pressure pus exuded from the fistulous opening. The patient was again anæsthetized, and the opening enlarged. It led into a second cavity about the size of an egg, with indurated walls, in the upper part of which the intestinal opening was finally discovered. From various points of this cavity fistulous tracts could be followed for long distances. They were probably the result of the long-established intraperitoneal suppurative process, as communications with other intestines by them could not be found. The immediate result of this last operation was the discharge of larger quantities of fœcal matter from the wound, resembling normal fœces, and at the same time the disappearance of all symptoms pointing to the retention and decomposition of secretions. Four weeks later another attempt was made to localize and to close the intestinal fistula. An incision was carried along the outer border of the left rectus muscle into the peritoneal

cavity. Everywhere adhesions were found, but, notwithstanding, it was readily seen that the sigmoid flexure was that part of the large intestine which was involved in the formation of the fistula. An attempt was now made to excise the fistula and the indurated parts of the abdominal wall surrounding it. In this attempt the free abdominal cavity was opened, and the primary cause of all the trouble detailed at some length now became apparent. A loop of small intestine, lying immediately behind and in an upward direction from the opening into the sigmoid flexure, was found attached to the umbilicus by a firm, round band, about one and a quarter inches long. The small intestine was evidently much stretched, although, owing to firm adhesions, it did not retract to any extent after section of the band. The latter was continuous with the walls of the small intestine at the convexity of the bowel. It proved, on section, to be without a lumen, about a quarter of an inch in diameter, and tapering somewhat towards its attachment immediately below the umbilicus. It had everywhere a smooth, peritoneal investment. Prolonged attempts to disengage from its adhesions a sufficient portion of the sigmoid flexure for resection and suture had to be abandoned, owing to the density of these adhesions and the friability of the intestinal wall. For the same reasons intestinal anastomosis with the rectum was likewise out of the question, and the only expedient, therefore, left was the establishment of an artificial anus, which was done at two sittings. The entire wound cavity was packed, and, after a somewhat lengthy convalescence, the patient was discharged from the hospital, with a preternatural anus.

CASE III.—C. M., aged eighteen years. Admitted to the hospital June 30. Has always been well. For the last three weeks, after a surf-bath of three hours during menstruation, she was seized with "cramps," which she located in the right iliac region. These have continued off and on ever since. In connection therewith her bowels have been somewhat constipated. On June 30 her bowels were moved by an enema for the last time. From then on to July 3 the patient vomited occasionally. On this day the vomiting became more frequent, and quickly assumed a faecal character, the pains in the abdomen having also become much more severe. When I saw the patient the temperature was 100° F., pulse 120. The abdomen was moderately but symmetrically distended, not tense, but painful on palpation. She

was seized with frequent paroxysms of abdominal pain, and during the same there was very marked peristalsis, the movements of the intestines being very plainly visible through the abdominal walls. The abdomen was everywhere tympanitic, and no area of dulness on percussion could be found. Rectal and vaginal examinations were negative. No gases had escaped from the rectum for the last few days. The diagnosis of intestinal obstruction was easy in this instance, but the localization of the trouble difficult. Accordingly, an incision was carried through the abdominal walls, in the median line, from the umbilicus to the symphysis. The intestines were more inflated than the outward appearance of the abdomen had led me to believe, and were retained within the abdominal cavity with considerable difficulty. They were slightly injected and covered with flakes of lymph here and there. No adhesions were present. After considerable search a loop of small intestine was finally found leading towards the root of the mesentery. Exerting gentle traction on this loop for some moments caused it suddenly to give way, when there appeared a knuckle of gut about one and a half inches long, the two branches of which were adherent to each other, very loosely, however, so that they could be easily separated. There was no line of constriction to be noticed anywhere on their surfaces. A distinct gurgling sound was heard at this time, leading me to believe that the obstruction had been relieved. After following the loop for several inches farther on a renewed resistance was felt, which, on traction, suddenly gave way, and now the gut could be readily pulled outside the abdominal incision. To one point of the small intestine thus delivered a cord was still attached on the convex border, somewhat more than an inch long, of the thickness of a thin lead-pencil, round at its point of attachment to the intestine, but flattened out somewhat in the direction of its torn end. It had no lumen at its torn extremity, and it was therefore not removed. That it was the cause of the strangulation became evident from the fact that immediately, on the side of the intestine next to its attachment, there was seen a well-marked discolored groove, below which the gut was entirely collapsed, rapidly filling, however, before my eyes, with a louder noise than we had heard before. After reposition of the intestines the abdomen was closed, and the patient made an uninterrupted recovery. The

distance of the cord from the cæcum was not ascertained, nor could the point at which the cord had separated be discovered.

The three cases which I have just reported are instances of the most common form of strangulation by Meckel's diverticulum. In all of them the diverticulum was adherent at its end to some point within the abdomen, forming a loop or a tight band which had caused strangulation.

Among the most important contributions to the literature of this subject, containing at the same time the most comprehensive survey of clinical facts up to 1891, I will mention the articles of Neumann in Virchow's "Festschrift," and the dissertation of Boldt. These authors, although not agreeing with one another as regards the relative frequency of the various forms of obstruction by Meckel's diverticulum, agree in this, that strangulation by an attached diverticulum is by far more frequent than strangulation by a diverticulum with a free end. Boldt has collected fifty-seven cases, including all varieties of strangulation; Neumann forty-six, which, however, do not include cases of strangulation by knotting of the free end. The former has found among his cases thirty in which the point of attachment of the end of the diverticulum was distinctly stated. They are the following: twelve attachments to the mesentery; seven attachments at or near the umbilicus; seven attachments to the small intestine; one attachment to the inguinal canal; one attachment to the cæcum; one attachment to the posterior abdominal wall; and one attachment to the vermiform appendix.

Neumann attempts a classification of all his forty-six cases, and finds twenty-four attachments to the mesentery; five attachments to the umbilicus; six attachments to the abdominal walls; ten attachments to other parts of the intestinal tract and abdominal organs; and one with multiple attachments to omentum and intestines.

The difference in these figures is considerable. It is to be explained partly by the fact that in Neumann's statistics an attempt is made to include all his cases, whereas Boldt has

not included sixteen cases which seem to him insufficiently recorded.

Treves, in 1884, mentions twenty-three cases of Cazin, and nineteen additional cases of his own, which, when added together, give the following figures: seventeen attachments to the mesentery; ten attachments at or near the umbilicus; nine attachments to the small gut; three attachments to the cæcum; and three attachments to the colon; inguinal and femoral ring, each one.

It will be seen from this that the combined figures of Treves and Cazin correspond fairly well to those of Boldt.

In looking over the literature since 1890 I have, including my own three cases, found sixteen cases of strangulation by Meckel's diverticulum, in three of which the variety of strangulation is not mentioned. Of the remaining thirteen, ten are recorded as cases in which the tip of the diverticulum was attached as follows: three times to the mesentery; six times to the umbilicus; and once to the free border of the ileum.

By making Neumann's statistics the basis of a combined computation, and adding those of Boldt's cases, which are not included in Neumann's figures, besides my own ten cases, we have a total of thirty-three attachments to the mesentery; thirteen attachments to the umbilicus; eight attachments to the abdominal walls; twelve attachments to the intestinal tract and other abdominal viscera,—sixty-six in all.

The various forms of strangulation by an attached diverticulum are very interesting. The first case reported by myself is of a variety very frequently encountered, and which has only, of late years, been correctly understood. Fitz, in 1884, in an excellent article on the subject, though not the first to advance this theory (Leichtenstern), called special attention to the fact that many so-called inflammatory adhesions of the end of a diverticulum, or of the cord forming this end, did not at all present the characteristics of inflammatory peritoneal adhesion. Neumann, in his later publication, insisted more strongly on this point, and both

observers have been able, by careful dissection, to discover that the bands or cords connecting the diverticulum with the mesentery were nothing more or less than the frequently obliterated omphalo-mesenteric vessels. These have, in many instances, been followed to their point of union with some mesenteric vessel. In my first case I have no doubt that this condition really existed. There was no indication of any previous inflammatory process in the exposed part of the abdominal cavity, and the terminal cord, an inch long, extending from a point immediately at the side of the apex of the diverticulum to the mesentery, where it disappeared within the folds of the latter, was entirely uniform in contour, and on section at its mesenteric attachment had the appearance of a fibrous cord. There can be no question in my mind that the case is one of strangulation within a loop formed by a diverticulum and the remnants of the omphalo-mesenteric vessels. In some of the cases reported there still existed a rudimentary mesentery, sometimes stretched out between the diverticulum and the vessels, more especially when the cord, after meeting the diverticulum, is further continued, either as a free band of varying length, or with an insertion at the umbilicus, or some other point of the abdominal cavity.

Of the last case I reported I cannot speak as definitely as of the others. But that the case was only one of strangulation by Meckel's diverticulum cannot, I think, be questioned. The round, smooth surface of the cord, springing from the convex border of the ileum, its very probable other attachment to the mesentery, the negative previous history in the case, these facts make the assumption of an inflammatory origin of the cord also improbable in this case. It is true its torn end did not, on macroscopical examination, reveal a diverticular lumen, or the presence of vessels, and I did not deem it opportune, with a view to determining the presence of an open diverticulum, to run the risk of opening the intestinal canal by cutting off the projection at its point of union with the intestines. Assuming the nature of the

constricting band to have been established, there remains the interesting question of the nature of the strangulation. The knuckle of intestine which first came into view, while its ends were adherent to one another, showed no mark of strangulation at its base. On the contrary, it was only after developing several inches more of the same coil that a distinct, discolored furrow was seen on the wall of the loop from which the diverticulum was given off. The knuckle of adherent intestine could not, therefore, have been the strangulated portion. Most probably a small coil, one end of which must have been located at the base of the diverticulum, slipped under the latter in such a way that the constricting band pressed only on this end, as no second furrow was seen at any other part of the intestinal tract. The strangulated loop evidently lay on the posterior wall of the pelvis. I imagine that the end which was not marked by a furrow was pressed against the mesentery, and farther on against the pelvic wall, causing a strangulation of, fortunately, not a very severe type.

I have not been able to find a case similar to the second one which I have reported, where strangulation of the highest point of the sigmoid flexure occurred, giving rise to the formation of an intraperitoneal abscess, although I have made a careful survey of the literature of the subject. In my second case the cord passed from the intestine to the umbilicus, and was very short. Whether or not this cord represented the remnant of the omphalo-mesenteric duct or of the omphalo-mesenteric vessels, which accompany the duct, I cannot state, but I am rather inclined to assume the former. It had no lumen when cut about midway between the intestine and the umbilicus, and no vessels appeared on the cross-section. But its base was situated exactly on the convex border of the small intestine, and careful examination did not disclose anything in the nature of a cord running over the intestine towards the mesentery, as we would expect it, if the cord had been due to the persistence of the vessels. The duct, we know, occasionally remains open at the umbilicus,

discharging fæces from this opening, or it may close immediately after birth, with the separation of the umbilical cord, in which instance, however, we will have a diverticulum with a lumen extending to the umbilicus, and adherent there. Neumann says he has not been able to find one well-authenticated case of Meckel's diverticulum attached to the umbilicus, in which the terminal portion—a solid cord—was due to the obliteration of the duct itself. It seems that these solid cords are all the remains of the omphalo-mesenteric vessels, which may be accompanied for a certain distance by a diverticulum firmly united to them, giving the external appearance of one solid cord. Many cases recorded in literature as an obliteration and fibrous continuation of the diverticulum proper to the umbilicus simply admit of this explanation. In other instances the omphalo-mesenteric vessels run as a separate cord from the intestine to the umbilicus, a free diverticulum, unconnected with them coexisting, or the cord may be simply composed of vessels, the omphalo-mesenteric duct having entirely disappeared.

When the cord which is attached to the umbilicus is long and not tightly drawn, several varieties of strangulation may occur. The offending band may form a loop into which a coil of intestine has been pushed, or the cord may be twisted in a figure-of-8 loop, and strangulate different portions of the small intestine. Again, a coil of intestine may find its way over or under the loose cord, and, returning from the opposite side towards its base, may then by twisting form a loop of the cord. This may even be repeated so as to form two full turns of the constricting band. When the cord is tense and long it is difficult to understand how strangulation can take place, and I have not been able to find any satisfactory explanation of the mechanism of such strangulation. In one case (Elliot) the diverticulum with its end fixed at the umbilicus "was twisted and strangulated at its base by the turning over of a coil of ileum." In this case the diverticulum itself became gangrenous. In another, the ileum was twisted on itself at the point of origin of the diverticu-

lum, forming a volvulus, and causing complete obstruction (Copeland); and in another (Allen) "a band was found extending from the region of the cæcum to a point one and a half inches to the right and below the umbilicus. A coil of small intestine was twisted about this band and constricted."

The above quotations are taken from the thirteen cases which I have found published since 1891, and among them, only the last refers to a strangulation of the intestine by the cord itself. The statistics of Neumann and Boldt throw no light on this form of strangulation. Neumann seems to doubt that it can occur. When, however, under similar conditions, the cord is very short, as in my case, I think an explanation is easier. There, as the free abdominal cavity was opened, the direction of the cord was found to be forward and towards the right, the small intestine from which it originated lying within the left half of the pelvis. The cord and part of the small intestine passed immediately beneath the opening in the sigmoid flexure, the exact nature of which I was not able to ascertain. It is evident that the apex of the sigmoid flexure must have been caught between the tightly drawn cord and the anterior abdominal wall and strangulated. Very likely some attachment of the ileum connected with the diverticulum on the left side was present. A condition would thus be created somewhat similar to the most frequent variety of strangulation by inflammatory bands,—*i.e.*, a tightly stretched band along a firm surface,—in this case, the anterior abdominal wall.

I shall briefly refer to some other forms of strangulation by Meckel's diverticulum. The most important one is strangulation by knotting. In Boldt's statistics it is mentioned as occurring ten times in fifty-seven cases. The mechanism of this form of obstruction has been well understood since it was described by Parise. The diverticulum must be of some length, say ten centimetres at least, and its free end must be dilatible, like a small pouch, so that, when closed in the shape of a ring and held in place by a coil of intestine, which has entered this ring, the knot may not be untied by the increasing tension caused by strangulation.

Another interesting form of obstruction, rarely caused by a diverticulum, is intussusception. One case is reported by Golding-Bird, in which intussusception occurred through a diverticulum which was attached to the umbilicus, and open at that point. In another instance an ileo-colic intussusception was caused by a Meckel diverticulum, situated eight inches from the valve, and itself three inches long (Adams).

I have already mentioned cases of obstruction where the diverticulum, while being the cause of the trouble, did not actually produce strangulation,—one in which it was itself the seat of gangrene (Elliot), and another in which it caused a volvulus of the ileum exactly at its point of attachment. Good has described an interesting case in which there existed a moderate stenosis of the ileum, beyond which the bowel was much contracted. Immediately beyond the stenosis a Meckel diverticulum was attached to the ileum with a blind end, and a lumen as large as that of the intestine leading up to the stenosis. Both the diverticulum and the ileum before the stenosis were filled and distended with intestinal contents. By the weight of the diverticulum, suspended in the pelvis, traction was exerted upon the ileum, which, in turn, favored a rotation of the distended intestine towards its own mesentery; as a result of this, an acute obstruction occurred exactly at the stenosis.

In attempting a diagnosis of strangulation by Meckel's diverticulum we will meet with all the difficulties attending the diagnosis of acute intestinal obstruction in general. It will rarely be possible to determine a certain variety of strangulation, and it certainly is of little practical value to accomplish this diagnostic feat when once the case is recognized as one of acute intestinal obstruction. An important question, however, arises at this moment. Where, at what point of the intestinal tract, does the obstruction exist? A correct answer to this question may considerably influence our operative measures. If any form of acute obstruction calls for immediate surgical relief, the one of strangulation by Meckel's diverticulum is that variety. The onset of symp-

toms seems to be especially acute in these instances. Severe pain in the abdomen, followed very shortly by nausea and then by vomiting,—the latter somewhat delayed,—increasing tympanites, and an absolute cessation of the passage of gases and faecal matter,—all these symptoms, accompanying a more or less sudden attack, indicate acute obstruction, probably in the lower ileum. It is well to recall, in this connection, that the lowest part of the ileum, lying between the diverticulum and the caecum, is generally the strangulated portion.

Two further symptoms—increased peristalsis and localized meteorism—are of great diagnostic value in cases of doubtful intestinal occlusion, and attention has frequently been called to them in recent years. The former, it is true, becomes most pronounced in chronic obstruction, especially when an attack of acute faecal retention supervenes. In such cases, tetanic contraction of the distended and hypertrophic intestines, alternating with violent peristalsis above the seat of obstruction, so graphically described by Nothnagel, leave little doubt as to the diagnosis. Such contractions are not seen in cases of acute obstruction of a previously—to all clinical appearances—normal gut. It seems, nevertheless, to be the consensus of medical opinion that moderate, visible peristalsis (*Schlange* and *Obalinski*) is a valuable symptom in the early stages of acute obstruction. In the very acute cases, on the other hand, with rapidly increasing tympanites and rapidly developing intestinal paresis, we may look in vain for this symptom. In the third case which I have reported it was very marked, and there the strangulation did not appear to be of the very acute kind. Localized meteorism (*von Wahl*, *Kader*, *Nothnagel*) will only be found when a loop of intestine is strangulated and closed at both ends. It does not exist in simple obstruction, the result of pressure at one point of the intestinal tract (bands running across the gut, tumors, gall-stones, and so forth). It is the result of circulatory disturbances in a loop of varying length, and is mainly due to the constriction of the mesentery of the stran-

gulated loop. In a few hours, under such conditions, transudation into the walls of the strangulated portion of the intestine, into the peritoneal cavity, and especially into the lumen of the gut, takes place. Very soon, also, the formation of gases, due again to venous stasis and compression of the mesenteric vessels, adds to the distention of the loop. In from four to eight hours this distention may acquire a very marked degree, at a time when the general distention of the intestine above the strangulation is still very moderate, and it is at this moment that localized meteorism is so valuable as a diagnostic sign. In my first patient the seat of the trouble was ascertainable by simple inspection. The well-marked prominence on the right side of the abdomen, and even the figure of the enormously distended loop outlined against the abdominal wall, was readily detected by the eye alone. Increased resistance on palpation was very evident, the percussion-note was slightly dull, compared with the tympanitic sound over the rest of the abdomen. It is in regard to this point that I have found conflicting statements. Some authors say the percussion-note is dull, whereas, the majority seem to agree that it is tympanitic over the strangulated loop. My own impression is that it will vary with the contents of the latter, whether they be fluid or gaseous. In two cases I have myself found the percussion-note distinctly dull, in comparison to that of the surrounding parts of the abdomen. If such localized meteorism be present, and if other symptoms suggest internal strangulation, the diagnosis is assured, and should the strangulating band prove to be a Meckel diverticulum, then operative interference cannot be resorted to too soon. When, somewhat later, general distention increases, obscuring the symptoms of localized meteorism, when—and this may occur within twenty-four hours of an acute onset—intestinal paresis begins to develop, and intestinal peristalsis is at a low ebb, then, indeed, the diagnosis between beginning peritonitis and intestinal obstruction may be impossible.

The value of localizing the seat of obstruction was

brought home to me some years ago in a forcible manner, in the case of a young girl of eighteen. I saw her on the fourth day of her illness. At that time all the symptoms of acute obstruction were present. The abdomen was much distended and uniform in appearance, but upon the left side, in the iliac region, I thought I felt a somewhat greater resistance than elsewhere, and the attending physician told me that he had been able previously to map out an area of dullness on percussion at this point, which had now, however, disappeared. I suspected the seat of trouble in the left iliac fossa, but I did not feel sufficiently certain in my diagnosis to warrant a lateral incision. I, therefore, incised the abdomen in the median line. On opening it, a slight fæcal odor was noticed by all present, and the enormously distended intestines immediately appeared in the wound. There were no adhesions. Pushing aside the gut, I very carefully introduced my hand in the direction of the iliac fossa, among the distended coils, which could not be distinguished from one another. Suddenly, without any warning and without any undue exertion on my part, an intestinal loop gave way, and the entire abdominal cavity was flooded with thin fæcal matter. On closer examination a large coil of small intestine, very dark in color, was found constricted at its base by a band, the nature of which was not determined. After it was separated and the intestine pulled forth, there were seen several gangrenous patches on the wall of the latter, one of which had given way, and was permitting the escape of fæcal matter. After the operation was concluded the patient rallied somewhat, but died eight hours later. Without wishing to state that the patient might have fared any better with a lateral incision, the same would have exposed the seat of trouble, and might have prevented the untimely evacuation of intestinal contents.

In conclusion, I would say that it is the duty of every surgeon to consider most carefully the symptoms of a given case in which we have reason to suspect intestinal obstruction. If this is done early in the case, and the examination

frequently repeated, we may be able to appreciate the correct state of affairs before conditions develop within the abdomen that make a general diagnosis of obstruction impossible, and we may even, if we are fortunate, be able to localize the trouble to the great advantage of our patient. That we should be able to distinguish, as the cause of constriction, a Meckel diverticulum, is a hope cherished by some, which has, however, been seldom realized. It must be granted, certain signs do point to diverticular obstruction, as, for instance, other congenital malformations (club-foot, supernumerary digits, congenital defects of bones, hare-lip), suddenness of the attack, with a negative previous history, the great preponderance of the male sex, the age of the patient, between twenty and thirty. But what I mean is, that valuable time should not be lost in a display of unnecessary diagnostic skill. "Unnecessary," because of no influence in determining the time or quality of surgical intervention. The latter ought to take place, especially in the cases under consideration, at an early moment, when the contractile power of the intestinal wall is not too seriously impaired, and we are not confronted, owing to the serious condition of the patient, with the necessity of simply restricting our surgical aid to the establishing of an outlet for the accumulated fæcal matter. Then we may hope to improve somewhat the results of operative interference for strangulation by Meckel's diverticulum, for which Boldt has found less than 25 per cent. recovery.

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SUCCESSFUL TREATMENT OF SARCOMA BY
ELECTROLYSIS AND CATAPHORESIS, COM-
BINED WITH THE INTERNAL USE OF
DONOVAN'S SOLUTION.¹

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THE distinguishing features of benign and malignant tumors are supposed to depend upon the difference in origin, and while other abnormal growths result from the development of micro-organisms they have no part in these neoplasms.

The various benign tumors are produced from tissues corresponding to those of their seat, and are styled homologous, while the malignant tumors have different elements from the surrounding structures, being designated as heterologous formations.

It is held by some pathologists that the source of malignant growth is found in the foetus, and that the pre-existing state leads ultimately to the modification of structure presented in postnatal conditions. Yet this does not seem compatible with the usual late appearance of malignant neoplasms.

Professor Senn thinks that the definition of a tumor should explain its origin, its histological characteristics, and its behavior towards its immediate environment. He refers to the different attempts to define tumors, and gives his own definition as follows: "A tumor is a localized increase of tissue,

¹ Read before the American Surgical Association, May 6, 1897.

the product of tissue-proliferation of embryonic cells of congenital or postnatal origin, produced independently of microbic causes."

This may convey a definite idea to those who are satisfied with Cohnheim's theory, but I must confess that it does not give me a clear conception of the essential pathological features of tumors, and I am disposed to hold on to the old, simple definition, which I have given for many years in opening my lectures upon tumors,—viz., "A tumor is an abnormal development of tissue, independent of the ordinary results of inflammation." This is free from ambiguity and contains no contested points, which cannot be said of the above definition.

The treatment of uterine fibroids by the Apostoli methods of applying electricity has been attended with fairly good results, and the cauterizing effects of the electro-cautery has been generally satisfactory in the lesser cutaneous growths, but, so far as known to me, the field of malignant tumors has only recently been explored by electricity, so as to yield practical results.

Dr. G. Betton Massey directed attention to a new treatment of sarcoma, at the meeting of the Medical Society of Pennsylvania, May 21, 1896.¹ This is based upon the curative action of electricity, which "requires a soluble zinc electrode as positive pole, freshly coated with mercury at each application, and properly insulated. This electrode, of a size and shape adapted to each case, is inserted into the tumor after a small opening is made by negative electropuncture, under the chloride-of-ethyl spray, and with a properly adjusted large negative pole, as indifferent pole, a current of from 100 to 200 milliamperes may be gradually turned on," and repeated daily, until a cure is effected.

"Under this method the tumor is gradually disintegrated, and much of it discharged through the opening; the area of induration about it shrinks progressively until finally the malignant growth is replaced by a healthy wound, which is ultimately allowed to heal, but not until the whole of the

morbid tissue is destroyed or transformed into granulation tissue."

It is notable that the process adopted by Dr. Massey contemplates a comparatively rapid breaking down of the morbid structure and a disintegration with discharge of the *débris*, whereas the course pursued in a different class of cases by Dr. Robert Newman is only "to use weak currents of from three to four milliampères, *séances* lasting not more than from five to ten minutes, with intervals of about one week or longer." He says that "electrolysis acts as a chemical decomposition by absorption, which never burns or destroys tissues. It is not followed by hæmorrhage or other unpleasant consequences."

The internal use of the preparations of arsenic, urged especially by Lawson, and the employment hypodermically of the antitoxine by Coley, have been attended with benefit in some cases and failure in others.

The feasibility of curing a malignant growth without surgical interference by the knife or cauterization has been thought questionable; and yet there are some instances of the disappearance of tumors which were recognized as malignant neoplasms under the influence of constitutional and local measures which are worthy of consideration.

In view of facts indicating the practicability of treating malignant inoperable tumors by electrolysis and cataphoresis, I undertook the management of a case in which the diagnosis of sarcoma was previously made by two colleagues based upon macroscopic and microscopic tests.

A white boy of twelve years of age suffered for some months from a growth in the hypogastric region, and was placed under the care of Dr. J. B. S. Holmes, of this city. An exploratory incision was made by him diagonally across the right flank above the internal abdominal ring, and into the indurated mass of the tumor. It was found that it presented the characteristics of sarcoma, with such adhesions to the surrounding structures as to preclude any attempt to remove it by the knife. The incision was accordingly closed, and an unfavorable prognosis of the case

was given to the parents of the boy. Dr. William Perrin Nicolson also examined him and fully concurred in the views of Dr. Holmes. It was afterwards determined to take the patient to Richmond, Va., where Dr. Hunter McGuire examined the case, and reopened the incision, so as to procure a specimen of the tumor for microscopic investigation. He was impressed with the serious nature of the case, and declined to undertake any radical operation. The result of a careful examination of the specimen with the microscope by Dr. M. D. Hoge, Jr., of Richmond, indicated that the tumor was a small, round-celled sarcoma, and thus confirmed the previous diagnosis in the case.

This patient was turned over to me for examination on the 16th of November, 1895, and I found an abdominal tumor, extending from near the anterior inferior spinous process of the ilium and the adjacent portion of the pubic bone across to nearly the corresponding line on the opposite side, and reaching from near the symphysis pubis to the umbilicus, with marked induration of the mass. There was no mobility in the tumor, and adhesions seemed to exist between its anterior surface and the abdominal wall. An exact measurement of the outlines of the tumor gave in the transverse diameter six inches; in the longitudinal diameter, seven inches; in circumference, twenty-one inches.

The anterior surface was smooth and somewhat prominent, but without any salient projection. Moderate pressure by palpation was borne without flinching, and there was no complaint of sharp pain or discomfort in that region. The general condition of the boy was that of cachexia with pallor and weakness, but without any marked emaciation of body or limbs. With these facts before me, the history of the family, given by the father of the boy, threw no light upon the case, and I felt constrained to accept the view of the case taken by my colleagues, as reported to me.

It was evidently impracticable to do any radical surgical operation, and although I was not aware that Dr. Massey had then reported his cases,² nor had I received any report of success in the use of electricity for sarcoma, I came to the conclusion that it offered some prospect of relief in this case. Upon stating my conviction to the father, who is a very intelligent man, he manifested a favorable disposition towards accepting my propo-

sition as a *dernier ressort*. My suggestion was adopted also in regard to combining an alternative course of internal treatment, with the resort to electrolysis locally, and the following prescription, which I have found to exert great resolvent influence in other cases, was ordered for the patient:

R Syrup trifolium compound, fluidounces, $3\frac{1}{2}$;
Donovan's solution (liq. ars. et hyd. iod.). fluidounce, $\frac{1}{2}$.

SIG.—Mix, and take a small teaspoonful with water three times a day.

It may be stated that each fluidounce of the trifolium syrup contains the following: Red clover-blossoms, 32 grains; stil-lingia, 16 grains; lappa, 16 grains; phytolacca root, 16 grains; berberis aquifolium, 16 grains; casca amarga, 16 grains; xanthoxylum, 4 grains; iodide of potassium, 8 grains.

This was employed simply as a menstruum for the more active preparation of the double iodide of mercury and arsenic, known as liquor arsenici et hydrargyri iodidi in the United States Pharmacopœia. The patient got about one grain of iodide of potassium with eight drops of Donovan's solution in a teaspoonful of the mixture three times a day, and took it, without any disturbance of his stomach or bowels, continuously while electrolysis was applied to the tumor.

I am giving a somewhat minute account of the medical treatment in this case so as to enable others to judge of the influence of medication upon the result when considered in connection with the application of electricity locally. On the 17th of November, 1895, I commenced the use of electricity with a twelve-cell battery, manufactured by Waite & Bartlett, having the cups of glass, in which the zinc and carbon plates are immersed in a solution of bichromate of potassium, which was kindly furnished by Dr. J. A. Childs, of this city.

The needle representing the positive pole was introduced into the substance of the right side of the tumor, and the sponge electrode representing the negative pole, about two inches in diameter, was placed on the left margin of the tumor, having the connection of six cells, and keeping up the current for five minutes daily. *Séance* was gradually increased during the first week, and afterwards, until the time was extended to ten minutes; the punctures were made about half an inch apart, going around the outer border of the tumor; and after the 25th of November

the applications were only made on every alternate day, until the 20th of April, 1896, when they were made every third day. In the mean time the needle was changed to the negative pole, and on December 29, 1895, Donovan's solution was commenced upon the positive pole, by saturating a small piece of cotton with it, and laying it upon the central portion of the moistened sponge electrode. This process is known as cataphoresis, by which medicinal substances are introduced into the body with the galvanic current. Knowing that Dr. Hunter McGuire had obtained satisfactory results in the treatment of goitre by this means, I wrote to him for information as to the method of procedure, and he kindly furnished me with an account of the process adopted in his cases, which has served as a guide in my application of the medicated electricity in this case.

Having no means of estimating the voltage or ampère, with the resistance by ohms, I depended upon the manifestations of local effects, and graduated the number of cells accordingly. When the fluid has become weaker by repetition of the current the number of cells has been increased, and after renewal of the fluid fewer cells have again been employed in making the applications. Without regard, therefore, to an accurate scientific record the clinical result has been closely watched, and in the course of the treatment a larger battery has been used, so as to get the effect of a weaker current diffused over more space by having a larger number of cells included in the connection of the poles. This was resorted to when the force of the galvanic current was materially lessened by repeated application of the battery with the same fluid. And as many as thirty cells have thus been brought into the circuit without any marked inconvenience to the patient. The effect was marked by minute vesication alternated with small pits over the part to which the Donovan solution was applied, while the usual liberation of gas and some exudation of fluid occurred around the needle of the negative pole. After encircling the entire tumor with the punctures the needle was dispensed with, and another sponge electrode substituted for it; when no sign of any irritation was apparent at the negative pole, but the vesication continued to appear at the seat of the positive electrode, when it was applied for as much as ten minutes, with the pledget of cotton, soaked in Donovan's solution, placed on the moist sponge.

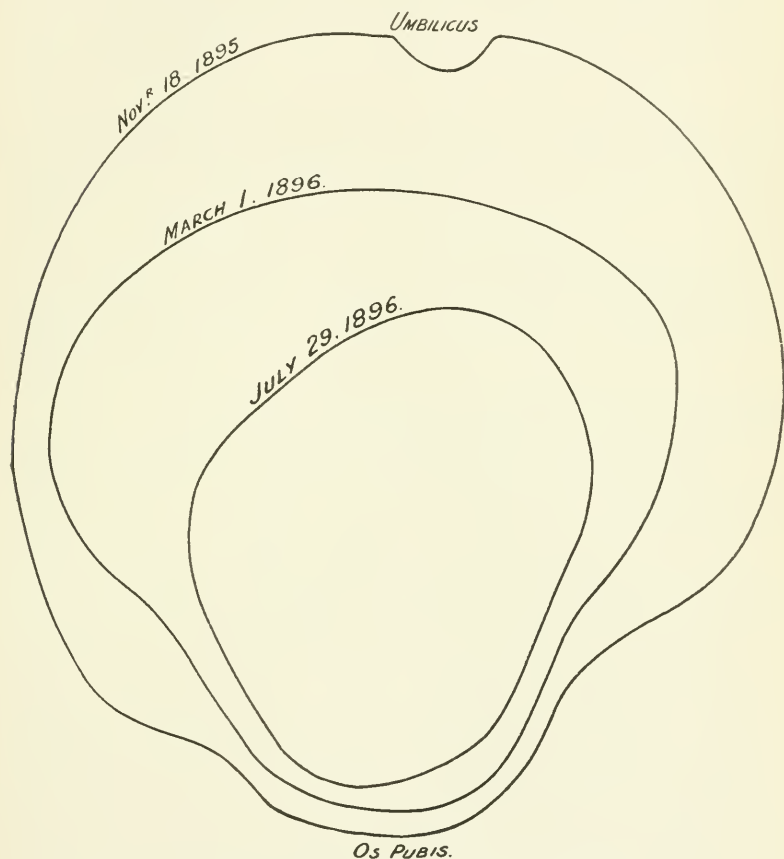
During the application of the galvanic current with the needle, whether on the side of the positive or negative pole, there was pain to a marked degree, and this was indicated by yells and screams on the part of the boy from the beginning to the end of the *séance* so as to attract the attention of all the neighbors. There was less suffering with the use of the positive and negative sponge electrodes, and eventually the twelve-cell battery was changed for my own of thirty cells, with a gradual increase to fifteen, twenty, and thirty cells in the circuit, applied every five days. The internal administration of the syrup of trifolium compound and Donovan's solution was in the month of February, 1896, changed for a combination of the same quantity of Donovan's solution with five and a half ounces of succus alterans, which consists of the following in each pint: Sixteen troy ounces of *stillingia sylvatica*, *smilax sarsaparilla*, *phytolacca decandra*, *lappa minor*, and *xanthoxylum Carolinianum*. (Eli Lilly.) A teaspoonful of this mixture was taken three times a day. It will be observed that the chief difference of this from the other compound is that the iodide of potassium is omitted. I observed, in studying authorities upon this matter, that Dalton included among the incompatibles with Donovan's solution the salts of the alkalies, and hence I used as a menstruum the succus alterans.

In the mean time notable changes were observed in the size and density of the tumor, and in the general condition of the patient. The border-line had receded decidedly from its original limits, excepting at its encroachments upon the horizontal ramus of the right pubic bone, where it remained in such close proximity as to give the impression to the touch that the tumor was attached to the bone.

The measurements, on March 1, 1896, of the tumor, made by my son, Dr. J. McF. Gaston, Jr., gave for the longitudinal diameter five inches; for the transverse diameter, four and a half inches; for circumference, fifteen and a half inches; showing the great reduction in the respective dimensions of two inches, one and a half inches, and five and a half inches from those of November 18, 1895, being three and a half months.

Another measurement, made the 29th of July, 1896, by my son, was as follows: Longitudinal, median line, three and a half inches; transverse line, at broadest line, three inches; circumfer-

ence, ten and a half inches; making a reduction, in four months, in the respective dimensions, of one and one-half inches, one and one-half inches, and five inches in the previous measurement. The mobility of the small mass remaining was now very notable, when the tumor was caught up between the thumb and fingers; but there was still an attachment between the tumor and the



Showing measurements of tumor at different dates.

parietal wall, and some slight oozing of a serous nature from the outer end of the incision. This appeared to discharge from the substance of the tumor, and indicates persistent degeneration in it.

The general health of the patient has very materially im-

proved, and having undergone examination at different periods since being under my care by Drs. Hunter McGuire, J. B. S. Holmes, Arch and J. C. Avery, they all coincided in the favorable progress of the case.

Upon furnishing the details of my treatment in this case to Dr. G. Betton Massey he expressed his gratification at my success, and regards it as a confirmation of the claims made in his paper, to which I have referred, and also in a previous one read before the Philadelphia County Medical Society, January 9, 1895. He infers correctly that I had not seen the earlier paper, thus affording another instance of the independent conception of another novelty in surgery. This point has been illustrated by my previous experience on several occasions, but my view is none the less original from being anticipated by another, with also priority of publication. Dr. Massey presented a paper at the meeting of the American Medical Association, May, 1897, in further demonstration of the result of his mode of treatment.

My case illustrates another phase of electrolysis and cataphoresis. There was a marked diminution in the induration of the tissue and in the general prominence of the mass, with less discharge from the incision which had been made by my colleague before the case was placed under my care, and had only partially closed by granulation.

It should be noted that the only restriction made in the diet of the patient from the outset of the treatment was to exclude all greasy food and highly seasoned dishes, and the digestion was good during the use of the medicine and cataphoresis for more than a year without interruption. He has only taken a tablespoonful of the succus alterans and Donovan's solution once a day for the past three months, and has used the medicated electricity by cataphoresis once a week, for fifteen minutes at each *séance*. During the month of March he was laid up with an attack of mumps (parotitis) for more than a week, and suspended the regular treatment for the appropriate remedies to combat this acute condition, but the use of this special course has since been resumed, and he

has returned to his duties at school, presenting no traces of disease of a local or constitutional nature at the present time, May 1, 1897.

We are prepared by the foregoing considerations to make the following inferences:

(1) That the diagnosis of sarcoma being made by clinical observation and confirmed by the microscope, there ought not to exist any question as to the nature of the disease.

(2) The evident adhesion of the tumor to the abdominal viscera, and especially to the front wall of the abdomen, precluded surgical interference with the knife, and thus placed the case under the class of inoperable tumors.

(3) Having a reasonable ground to expect some benefits in malignant growths from medicinal treatment, the combination of mineral and vegetable alteratives affords the best prospect of relief in this condition.

(4) The history of the treatment of benign tumors with the continuous galvanic current gives encouragement for its application in cases of a malignant type, and especially in that variety of neoplasm known as sarcoma, in which its efficacy has been recently tested.

(5) It is not requisite to employ a destructive or disintegrating effect of the continuous electric current to secure the favorable action upon tumors, and the process of electrolysis may be initiated with a few cells and gradually increased, without disintegration at either electrode.

(6) This treatment may be commenced with the needle at the positive pole and the sponge electrode at the negative pole of the Waite & Bartlett battery, and so placed as to pass the current through the substance of the tumor. After the daily application thus for a week or ten days, the needle may be used with the negative pole and the sponge with the positive pole, making the applications on alternate days.

(7) The employment of cataphoresis, in which medication is applied upon the positive sponge electrode, while either the needle or sponge electrode is connected with the

negative pole, induces some irritation of the skin when the medicine is applied and conveys its properties into the substance of the tumor.

(8) While the exact estimate of the force of the electric current would promote scientific results, the clinical observation of the effects upon the tissues subserves all practical purposes in the treatment of tumors by electrolysis and cataphoresis; and it is not requisite to be provided with the appliances for measuring the voltage and ampèrage or ohms of resistance in the use of the battery. The time occupied in accomplishing a cure by the moderate current of electricity is greater than that which would be taken in a more violent application, yet the freedom from any destructive process renders the former more satisfactory to the patient.

(9) My case, added to those already reported in which medicated electricity has been efficient in the removal of malignant tumors, should warrant the profession in resorting to this mode of treatment; I can further vouch for the efficacy of internal medication with electrolysis and cataphoresis in the treatment of sarcoma.

(10) Theoretic views in regard to the origin of malignant tumors should not prove a barrier to the adoption of general and local measures of treatment, which have been employed with satisfactory results in a case clearly diagnosed to be sarcoma. Clinical observations in the progressive development of the neoplasm, with macroscopic and microscopic tests, clearly indicate its malignant character.

(11) The process of atrophic decomposition and reabsorption of the sarcomatous structures under the operation of the medicated electric current favor the expectation that tumors of a carcinomatous nature may undergo like changes with similar treatment. We are, therefore, warranted in resorting to cataphoresis as a tentative measure of treatment, for all kinds of malignant neoplasms.

REFERENCES.

¹ American Medico-Surgical Bulletin, June 27, 1896.

² Medical News, March 9, 1895; Journal of the American Medical Association, August 24, 1895; Philadelphia Polyclinic, October 19, 1895.

REMARKS ON LAMINECTOMY, WITH REPORT
OF A CASE DONE SIXTEEN MONTHS AFTER
FRACTURE.¹

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VISITING SURGEON TO KING'S DAUGHTERS' HOME FOR INCURABLES; ADJUNCT
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FRACTURE of the spine or, more properly speaking, of one or more vertebræ is in itself a complex mechanical problem regarding the bone, and on the resulting condition of the delicate nerve-structure contained within—the cord—depends the welfare of the patient. What shall the surgeon do when confronted by such a case? To be conservative, and to await developments, is an acknowledgment of being helplessly discouraged, especially when marked displacement or crepitus of fragments is evident.

We are indebted for much of our present knowledge in this class of injuries to physiologic researches on animals, locating centres of reflexes and functions of tracts; to deductions from necropsies of patients, who have died from spinal lesions, compared with their symptoms during life; but the knowledge thus acquired does not begin to compare with the carefully compiled statistics, recording the experiences in operated cases, by many surgeons in different countries. The clinical experiences contained in these statistics, and our observation of them, teach us not to remain idly by, but that much may be gained by an operation, not only early but *immediately*; that we might see for ourselves to what extent the

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cord has been injured by either displaced fragments, blood-clots, or other *débris* compressing or only partially crushing it.

Even in old cases, where we suspect pressure on the cord by displaced fragments, we are justified in operative interference, since nothing is to be lost, and all to be gained, depending upon the advance of secondary degeneration. Should we discover secondary degeneration of the cord, we will at least, even then, have accomplished some good, if we have only relieved the pathological conditions caused by direct pressure upon the cord.

The following case, operated upon sixteen months after injury, immediately producing complete paralysis of both lower extremities, of bladder and rectum, may be considered positive proof of the above statement.

E. W., aged thirty-seven years; native of Switzerland; single; by occupation clerk; temporary store-keeper in wine-cellar of Pacific Union Club; family history negative; health always good. Shortly after noon, on April 23, 1894, he was engaged in bringing the freight elevator to the level of the sidewalk, the doors being closed. Five feet from the sidewalk the elevator refused to work, and several attempts to stop the elevator were futile. When patient saw his perilous condition he attempted to slide off, but was caught about the waist-line, and crushed between the platform of elevator and ceiling of basement. He remembers hearing some bones snap, and then became unconscious. As he afterwards learned, he must have been imprisoned in this position for about ten minutes before he was discovered. The elevator was lowered, and willing hands held on to his lower extremities, which were on the platform. As soon as the elevator descended the men lost their hold, and, to their horror, the body fell to pavement of the basement, a distance of about twelve feet. He was taken, bleeding from nose and ears, to the City Receiving Hospital, where he regained consciousness late the same afternoon. His eyes were bloodshot, and remained so for over three months. He could distinctly recall how the accident had happened, complained of some pain in the back, and sharp pain over left lower ribs when taking deep breath, and some pain when

moving his left arm. He could not move his legs, and had no feeling in them. He had to be catheterized; his bowels remained constipated. After three days he was removed to a hospital, where he was placed in a plaster-of-Paris jacket, extending from the armpits to his toes, in which he remained seven weeks. On the fourth day after the accident a permanent catheter was put *in situ* for incontinence of urine, and the bladder irrigated on alternate days. The same day, after a dose of compound licorice powder, his bowels moved for the first time, but he was unconscious of the passage. He remained in this condition until June 10, 1894, when the plaster jacket was removed. During this time, the only complaint by patient was pain in his bladder, especially when irrigation was applied. He often had fever, climbing at times as high as 104° F. His bowels would move unnoticed, for which provision was made. At this time permanent drainage of the bladder was discontinued, the urinal taking its place; irrigation of bladder was continued at irregular intervals, often not for two weeks at a time. When plaster casing was removed, decubiti were present symmetrically over scapulæ, over both sacro-iliac synchondroses, over sacrum, over both heads of fibulæ, and both heels. Poultices were applied to bed-sores for two weeks, and then changed to application of salves. He was on a full diet with two ounces of brandy daily. Four and one-half months passed without change in his condition, except that his bladder became more painful, and decubiti enlarged.

On October 26, 1894, he was removed to the King's Daughter's Home for Incurables. For three months he received baths, massage, with cod-liver oil, his bed-sores were attended to with antiseptic dressings, and when I was called to see him for the first time, on February 4, 1895, the following status was taken: Head and arms show nothing abnormal. The cutaneous and muscular reflexes normal; hands, slight tremor; left clavicle presents a badly-united, typical inner third fracture, the internal overriding the external fragment. Thorax bulging on left side, corresponding to a fracture of seventh, eighth, and ninth ribs. Spine painful over spinous processes of first and second lumbar vertebræ, and these distinctly displaced towards the right of spinal axis. Decubiti in the above-mentioned regions. Incontinence of urine and fæces; strong ammoniacal odor pervading the room. Urine alkaline, contains albumen, and rich in phos-

phates. Pus and epithelial cells full of micro-organisms. Paralysis of the lower extremities; these extremely atrophied, especially the legs. Only a slight movement of the hip-joint possible. Both knee- and ankle-joints, as well as those of the toes, ankylotic. On percussion of quadriceps tendon the muscles of the thigh show clonic contraction, throwing the whole leg in vibration. A minute description of sensory disturbances is not at my disposal, but a superficial examination by myself revealed subæsthesia (hypæsthesia) and subalgæsia (hypalgæsia) with disturbances of temperature sensations. Vasomotor disturbances show themselves by livid, blue discoloration of legs; cutaneous temperature of limbs decreased; the patient then had temperature continually ranging from 100.4° and 102.5° F., no doubt due to purulent cystitis. It was thought advisable to postpone laminectomy until patient's bladder was in a better condition. In the mean time the ankylosis of these joints was attended to. Consecutive consultations were held with Drs. Barbat and Carpenter, to determine the justifiability of an operation at so late a date. I wish to thank these gentlemen, at this time, for their kind assistance rendered during treatment, and at the time of operation.

On February 19, 1895, patient was deeply chloroformed, and movements in hip-joint found decidedly restricted, especially outward rotations; both knee-joints ankylosed, also ankle- and toe-joints. Careful force was applied, and distinct snaps and crepitus could be felt, but only to a small degree could the right leg be bent, possibly ten degrees, despite the exertions of both Dr. Barbat, myself, and a nurse. The left knee-joint was manipulated in the same manner, where ankylosis was still more pronounced, when suddenly a sharp snap was heard, found to have been caused by a *vertical fracture* of the patella. The manipulations were discontinued, a pillow brought under the right knee, and an ice-bag continually applied to the left one for three weeks. During this interval massage was given daily. At the end of that time he was again chloroformed, and the same manipulations gone through with, with a little more success, but our expectations were far from gratified, on account of muscular contractions. Hoppe's patent extension splints were applied, to be used as a means to prevent readherence of adhesions, as well as to use force on passive flexion. They were badly borne on ac-

count of pain, but made it possible to prevent the loss of any advances made, while the patient's limbs were manipulated under chloroform. These manipulations under chloroform were repeated twice more in an interval of seven weeks, during which time baths and massage, bladder douches, and careful cleanliness were observed. At the end of May he could, with the assistance of the furniture, move a few steps around the room, but could not sit on a chair, as the ankylosis of the knee-joint would not permit movement of his legs to that extent. He could throw himself into an arm-chair, from which he could only rise with difficulty.

The cystitis was much improved, incontinentia urinæ and fæces still persisting. At the end of June he could so use his thighs that he could throw his legs forward, and was able to insecurely stand, and walk a few steps with the assistance of crutches. His legs at that time could be passively bent to quite a degree, but not actively.

Operation.—At this stage, discouraged by a lack of improvement commensurate with his expectations, after much persuasion, the patient consented to an operation. He was transferred to the New French Hospital, where I made a laminectomy on him, assisted by Drs. Barbat, Carpenter, and Villain, on September 6, 1895. An incision was made, extending from over the spinous process of the twelfth dorsal vertebra down to the spinous process of the fifth lumbar vertebra. The muscles, fasciæ, and ligaments were detached as close as possible to the bone on either side of the spinous processes with the periosteotome. The hæmorrhage, though very profuse, was almost completely arrested with hot, sterilized, 7 per cent. salt solution, only requiring one catgut ligature. We found the spinous processes of the first and second lumbar vertebræ individually and separately movable to a slight extent, when manipulated with force, and did not stand "in line." The spinous processes of the first, second, and third lumbar vertebræ were snipped off close to their base. The laminæ were then exposed to full view by further work with the periosteotome. The hæmorrhage was stopped as before, with hot solution alone, and the edges of wound retracted. The laminæ of the first and second lumbar vertebræ showed a decided recedence from their preceding respectively following laminæ. With rongeur forceps these two laminæ were removed. The dura was found adherent to the cord, could not be lifted, so

it was not opened. Careful examination up and down the canal thus exposed gave no evidence of any further encroachment upon its lumen. Careful hæmostasis with hot salt solution and compression. Closing of wound with deeply-placed silkworm-gut sutures. Inserted in the centre of wound a rubber drainage-tube, and for the space left open an untied suture was placed *in situ*. Patient comes out of narcosis without shock, complains of very little pain over site of wound, rests comfortably on an air-mattress. Temperature remains between 100° and 100.8° F. (cystitis). Third day, changed dressings, which were slightly saturated with highly tinged serum, removed drainage-tube, and closure of wound. No improvement of general symptoms followed for the next fifteen days, when patient for the first time asked for the vessel, his bowels responding to a voluntary effort. Incontinence of urine continued. Bladder irrigation was continued twice daily, with 4 per cent. boric acid solution. September 20, wound healed by first intention; sutures removed; gauze dressing.

October 8, patient leaves bed, somewhat weaker in legs, but has slightly more control of movements; massage and electricity renewed. October 21, patient leaves hospital with portable urinal; can use crutches fairly well. Patient seen at office November 27. Walks with the aid of one stick. Legs thrown as in an ataxic gait. Says he can hold urine for about one hour, and can voluntarily void it. In the next few months improvement continues, until he can retain urine for three and four hours, can walk several miles, and can even walk up and down stairs without support, or even the guidance of the rail. He is now ready to take employment, and expects to be reinstated in his position at the Pacific Union Club. Quite a depression exists where the spinous processes and laminæ were removed, but firm fibrous bands hold, and have to some extent filled in the space where the arches were removed.

I am much indebted to Dr. E. O. Jellineck, who, at my request, made an examination of patient, and furnished the following report:

"Eye movement normal; reaction of pupils normal; ophthalmic examination negative; no nystagmus.

"Nervus facialis, trigeminus, hypoglossus, glosso-pharyngeus normal; examination negative.

“Upper extremity in every regard normal; lower extremity, skin of normal color and temperature. Legs show slight œdematous condition, which is increased evenings. Pes varo equinus to a slight degree on left side. Slight muscular atrophy of both legs.

“Motory action of both thighs decreased, the left a little more than the right; the legs present still less.

“Movements of both hip- and knee-joints normal.

“Movements of ankle- and toe-joints lessened to a marked degree, more so on the left side.

“Passive movement in the right ankle-joint, lessened still more in the left.

“The toes present the same condition.

“Patellar reflex and ankle clonus absent on both sides. Plantar reflex exaggerated on both sides.

“Left cremaster reflex slightly decreased. Right cremaster reflex changed as follows: Immediately after stroking the inside of the right thigh there is no response; four to five seconds later a very slow peristaltic contraction is to be noticed.

“Sensory reaction: In the region supplied by nervous cutaneous femoralis posterior (plexus sacral, one-half sacral nerves) subæsthesia and subalgæsia. Pin-pricking cannot be differentiated from touching with finger-nail. Most pronounced is this disturbance in the inner aspect of the thigh from symphysis down to about the middle of thigh, where the cutaneous regions of the nervus obturatorius begin. The same sensory disturbances are noted on the left thigh, but not so pronounced. The gluteal regions on both sides to the height of the cœccyx is affected in the same manner. Subæsthesia and subalgæsia of the skin of penis and scrotum (nervus pudendalis communis) and the triangle supplied by the nervus ilio-inguinalis.

“In all the cutaneous regions mentioned, warmth cannot be differentiated from cold; all other regions show nothing abnormal.

“Patient’s gait slightly ataxic. The thighs are slightly over elevated; patient brings foot down with toes first (paresis of nervus peroneus,—(marches de steppeur.)

“No static ataxia. No disturbance of co-ordination. The muscles of both legs and feet show, by electrical stimulation, a pronounced quantitative decrease, as well as a qualitative change, called reaction of degeneration.

“(1) The still-existing disturbances are caused by destruction of posterior roots of the second, third, and fourth lumbar segment (absence of patellar reflex disturbances of sensibility).

“(2) By destruction of the motor ganglia in the anterior horn of the fourth and fifth lumbar segment, and first and second, probably also third, sacral segment (degenerative atrophy of muscles of both legs and feet).

“(3) Disturbances of the sensory regions in the third, fourth, and fifth sacral segment (sensory disturbances of skin, of perineum, scrotum, and penis).

“(4) Disturbances in sensibility for temperature, above mentioned, may be caused by hæmorrhage into the central canal of the sacral segment of the cord (hæmatomyelitis).

“These symptoms, just enumerated, are caused by organic destruction of nerve tissue, for which no hope of future regeneration can be entertained. The symptoms enumerated before the operation, which since have disappeared,—*i.e.*, spastic paraplegia, incontinence of urine and fæces,—can only have been caused by pressure of the dislocated fragments of the first and second lumbar vertebræ, without effecting organic destruction of the centres that supply these functions.”

The current literature on spinal surgery, in comparison with other important branches of surgery, is at best but meagre. While the first authentic report of operative interference to afford relief from compression of the cord, caused by fracture, comes from Cline¹ in 1814; suggestions had already been made to the same end by Heister,² Sir Astley Cooper, and others. Up to 1881 upward of twenty-five cases had been reported with such discouraging results that Herbert Paget³ wrote, “The operation of trepanation of the spine has made no progress, and probably will never make any. The operation does not belong to practical surgery.” Since then more attempts have been made to change this hopeless condition by surgical procedure. Abbe⁴ and Morris⁵ attempted to reunite the inferior nerve-roots, after resecting the severed cord proper, but failed.

Comparing the mortality of these cases, we find a distinct change during the antiseptic era. Gurlt,⁶ of 270 re-

corded cases, reports 217 deaths, or over 80 per cent.; Burrell.⁷ of eighty-two cases, at the Boston City Hospital, sixty-four deaths, or 79 per cent. In cases recorded by Chipault⁸ the prognosis is decidedly better. In his admirable work, which is the most complete treatise to date, he gives a careful review of all that has been done in spinal surgery, including, besides fractures, tubercular, traumatic, and osteomyelitic diseases, the whole category of tumors which are found in this region, arising from bone, meninges, or cord itself, and a careful comparison of injuries at different height of cord. Every one who desires to study the subject exhaustively must regret the absence of an English translation of so excellent a work, on so important a subject. Chipault, including his own cases, tabulated 164 cases of fractures operated upon, with the following results: In twelve cases, cures; in twenty-six cases, improvements; in eighty cases, death; in forty-six cases, no noticeable improvement. Non-success in operative interference he attributes to the following causes: (1) Severity of cord lesions; (a) height of fractured vertebræ; (b) that centres important to life have been interfered with (respiration, heart, etc.). (2) Wound infection. (3) Infection through pneumonia, cystitis, decubitus.

The operative technique is exhaustively discussed, discarding the trephine entirely, leaving choice only between chisel and hammer, and Mathieu's rongeur forceps for removing the laminæ. The former method is much more liable to do damage, aside from causing shock, since spiculæ or whole fragments may be driven into the cord. The spinous processes may be retained by being detached at their base, leaving them attached to the muscles of one side, and retracted with these. For support this is not necessary, as the gap fills up sufficiently with fibrous tissue or even bone to give strength.

The fractures that cause compression of the cord, by being wedged between the displaced fragment of the fractured body of one vertebra against the laminæ of the one immediately above, should be considered as cause when no

lesions are found in the arches. Mills showed that the cord manipulated properly allows of considerable displacements without injury to itself or nerve-roots. The cord should be retracted to allow whatever encroachments may be upon the lumen of the medullary canal to be removed by chisel or gouge.

Starr⁹ has collected valuable information gained from observation on a number of cases of spinal lesions, regarding cutaneous sensory disturbances. These, with deductions from tendon reflexes and electric reactions of muscles, help to complete the diagnosis regarding the seat of injury.

Lloyd,¹⁰ comparing the results of the preantiseptic era with the present, gives results eclipsing the most sanguine expectations. The mortality given is only 25 per cent., where other factors leading to death are excluded, while the preantiseptic era, deducting all causes of death other than the operation, still furnishes 45 per cent. In selecting the time for operation many changes have been wrought during this decade. Lauenstein¹¹ advised operative interference after a lapse of six to ten weeks, if incontinence of urine and *faeces* persisted, as little was to be hoped from the unaided efforts of nature. This has been discarded by himself as well as others, by reason of the beautiful results obtained by Schede,¹² Péan,¹³ and others who operated immediately, and have shown that even lesions situated high up the cord are followed by complete recovery if the compressing *débris* is removed, thus minimizing direct secondary degenerations or those following myelitis due to compression. Interesting and of great surgical value are the experiments made by Enderlen¹⁴ on rabbits, to establish the rapidity with which injuries are followed by secondary degenerations, and the extent of such degenerations. Aseptic needle-punctures showed degenerations wherever made, and were surrounded by a zone of secondary degeneration. This zone of secondary degeneration was increased in direct ratio to the primary destruction caused by the force of the trauma. Thorburn,¹⁵ for convenience of reference, divides these injuries into

classes. (1) Unilateral dislocations; (2) bilateral dislocations with persistent displacement; (3) bilateral dislocations with recoil; (4) fracture of the bodies with persistent displacements; (5) fracture of the bodies with recoil; (6) fractures of the laminae with spinous processes, etc.; (7) compound fractures; (8) secondary lesions, as hæmorrhages, meningitis, myelitis, etc.

Thorburn, of late years, has grown to favor operations less, and differences of opinion appeared among the other surgeons who took part in a discussion of this subject in the Sixty-second Annual Meeting of the British Medical Society in 1894. It did but little towards settling the problem of the necessity of operative interference. Barling classifies these injuries into two groups,—those caused by direct and those by indirect violence, the former indicating operation far more than the latter. He would select for operation cases where the deep reflexes were not abolished, and anæsthesia was not complete. Burrell now advises operative procedure, whereas in 1887 he advocated forced reduction, with application of plaster jackets. After „seven years’ trial he gave it up for operative procedure, that he might ascertain to what extent the cord had been injured.

J. William White¹⁶ in 1891 summed up the danger as follows:

(1) Disturbance of the cord is more or less involved in almost every form of operative procedure, and its exact importance is as yet unknown.

(2) The hæmorrhage from the external and internal spinal plexus of veins.

(3) Laceration of the membranes, the risk of which accident would, of course, be increased if they were adherent to the long walls of the vertebral canal.

(4) The danger from etherization of the patient, which is much increased by the prone position, and by the paralysis of the abdominal walls.

Clark¹⁷ considers spinal meningitis and pyæmia the principal dangers from operation. Victor Horsley considers

sepsis the only real danger, owing to the complex structure of the vertebral canal, and the depths of the wound.

Hutchinson¹⁸ condemns the operation, as he can see no good resulting from the removal of the laminæ, as these never cause compressions. He claims that in the twenty cases that he had a chance to examine post mortem, the causes of compression were due to bends, while those cases where displacement was greatest were not always the most serious.

This is in opposition to the observations of more modern investigators, especially as the condition noted post mortem is not conclusive of the primary lesion existing. As we have already stated, secondary degeneration extends proportionately to the primary injury inflicted.

In conclusion, I would say that, upon the evidence of the statistics collected within recent years, an operative proceeding is justified, no matter how hopeless the case may appear.

The operation *per se* is neither more difficult nor more severe than many others made possible and sanctioned by the advances of modern surgery.

Though the operation is essentially experimental, and its results problematical, still the few striking cures accomplished within recent years must spur us on to a procedure which holds out to patient and surgeon only a promise of resulting good.

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A CASE OF PERFORATING TYPHOID ULCER, WITH
RECOVERY, AFTER OPERATION.

BY A. C. PANTON, M.D.,

OF PORTLAND, OREGON,

J. F. M., German; pastry cook; aged forty-five years; temperate beer-drinker; never ill before; rather spare; father alive, aged ninety-two years; mother living, aged eighty-seven years, when last heard from,—three years ago; three brothers older and three younger than himself,—all living.

March 17, 1897, at McMinnville, Oregon, became ill with what a doctor diagnosed as typhoid fever. Was confined to bed for three weeks; then got up, April 8, and improved in general health till April 25, when he resumed work at his trade. That night he had chills and fever, with general illness, which continued; and he came to Portland and entered my service at Good Samaritan Hospital, April 29. On admission his axillary temperature was 100.2° F.; pulse, 100; respirations, 30; general examination, negative. Was given bath in tub, and put to bed on milk diet; no medicine. Next morning rather better; but pulse and respiration still too high. Given mercurial purge, and quinine ten grains at night and five grains morning and noon.

May 1, 2, and 3, temperature and respiration normal; pulse slightly accelerated. Diet increased to the hospital "medium." Given acidum hydrochloricum dilutum, ten minims; pepsin, three grains, three times a day; and allowed to get up.

May 4, felt uncommonly well, and at 11.40 A.M. was sitting outside on balcony, enjoying the sunshine, when he was seized with a sudden and very severe pain in lower part of right side of abdomen, "as though a knife were being thrust through him." The suffering soon became so unendurable that he returned to the ward with some difficulty and took off his clothes, but had to be helped into bed. At noon the nurse could not feel his pulse; pain had spread all over abdomen; respiration costal and labored;

general evidences of shock. Owing to bad telephone service I was not notified until my regular visit next morning.

One of the house surgeons gave patient a hypodermic of one-fourth grain of morphine sulphate at 1.50 P.M. Reaction set in; at 4 P.M. temperature 104° F.; pulse, 110; respiration, 20. By sponging temperature was reduced to 102° . Hypodermic of morphine sulphate one-fourth grain, at 5.50 P.M. At midnight, ice-bag applied to right iliac region; and whiskey given every three hours. Morphine repeated for pain at 3 A.M. (May 5.) Very little sleep. I saw patient at 9 A.M., six weeks and six days from beginning of illness, and found his abdomen excessively tympanitic and tender. Pulse, 120, wiry; axillary temperature, 98° ; respirations, 20, costal; facies haggard; free perspiration.

I believed it was probably a case of perforating typhoid ulcer,—possibly perforating appendicitis.

The condition being critical, I asked Dr. George F. Wilson, also of hospital visiting staff, to see patient with me; and he concurred in believing that it was a case of general peritonitis from intestinal perforation; and that operation was advisable. I am much indebted to Dr. Wilson for counsel and assistance.

At 1 P.M.—the usual antiseptic preparations having been made—patient was etherized by Dr. Rudy, one of the house surgeons.

I was assisted by Dr. George F. Wilson; Dr. J. J. Panton, Dr. John Brooke, Dr. Snape, and Dr. Rosenberg being also present. Incision about three and one-half inches in length as for appendicectomy, afterwards enlarged to four and one-half inches along outer margin of right rectus. Abdominal wall hyperæmic. As peritoneum was opened there was a gush of gas and thin yellow fæcal matter, which was abundant everywhere, free in abdomen, bathing the viscera. There was intense general peritonitis, especially in ileo-cæcal region, where there was some lymph exudation.

Much delay and difficulty were experienced on account of greatly distended bowels crowding out of abdominal wound. Appendix presented no abnormality, other than general peritoneal inflammation. About twelve to eighteen inches from ileo-cæcal valve a round perforation of an ulcer of the ileum was found, about five millimetres in diameter, imperfectly closed by a weak barrier of lymph. From this opening gas and fæcal matter, similar to that loose in abdomen, were escaping.

The perforated loop of intestine was pulled out and held on both sides; then emptied by squeezing its contents through the perforation. At this point the intestinal walls were much thickened, friable, and covered with lymph. Unhealthy ulcer-edges trimmed with scissors, and opening closed with about fifteen interrupted *Lenibert* sutures of fine silk, reinforced by a continuous mattress suture of the same material.

Great delicacy was necessary in introducing and tying the sutures, several of which cut out, owing to the friable condition of the gut, and had to be reintroduced. I could not invert the edges of the ulcer by traction on sutures in tying them, as they would tear away. The turning-in had to be done by lateral pressure from the fingers of an assistant, while the edges of the perforation were depressed by means of a probe as the sutures were tightened. The newly-healed scar of another ulcer which had eaten to the peritoneal coat was seen; but no further search was made, owing to patient's bad condition. The abdomen was then flushed with copious quantities of hot normal saline solution, about thirty-six gallons in all, through a large hose, with glass nozzle, about fifteen millimetres in diameter, which sent a torrent of the solution through the abdomen, till all seemed clean. Diverging strips of iodoform gauze were introduced, across to opposite side of abdomen, upward, downward, and backward; and the sutured coil of intestine was left close to the abdominal incision, with a strip of iodoform gauze in contact with the line of suture. The parietal incision was partially closed by two silkworm-gut crossed sutures at its upper angle. Sterilized gauze and cotton dressings applied.

Time of operation about an hour. Patient seemed moribund at close. Was given one-twentieth grain of strychnine sulphate hypodermically, and an ounce of whiskey in a pint normal salt solution as enema; afterwards strychnine sulphate, one-fortieth grain, every three hours. Whiskey and saline enema were given at 8 P.M., and again at one o'clock next morning. Occasional sips of hot water by mouth. Gradually rallied. Some nausea and vomiting. Slept well after midnight. The outer dressings were changed three times in the twenty-four hours following operation, on account of copious oozing from wound.

May 6.—Temperature did not reach 100° F.; pulse, 114 to 120; respiration, 26 to 30. Given a little milk and lime-water.

May 7, 6 A.M.—Temperature, 98.4°; pulse, 110; respiration,

28. Nausea and vomiting early last night; but slept well after 2 A.M. Looks brighter. Passed flatus twice early this morning.

At 9 A.M., gauze drains removed; saline solution irrigation; everything looks clean; no pus. Line of union of wounded bowel in sight,—lymph covering it. Intestines is evidently full of faecal matter at this point. Intestines are inclined to protrude from wound; packed back with iodoform gauze.

To have half an ounce saturated solution of magnesia sulphate to begin; and two drachms every two hours thereafter till bowels move. Severe abdominal pain set in after dressing. Temperature at noon, 100.8°; pulse, 126; respiration, 42. General condition unpromising; vomited.

At 6 P.M. bowels moved fairly well; freely at 10 P.M.

May 8.—General great improvement. From this time on recovery was rapid. Some diarrhoea had to be checked.

The line of union of sutured bowel was plainly visible May 9, well healed.

May 11.—Intestines have been bulging in wound.

After breaking up the new adhesions of guts to parietes, I tried to make secondary suture of incised abdominal wall; but could not approximate the retracted muscles.

There was slight infection of one of the stitches put into upper angle of wound at time of operation. A few drops of pus found here; but no other pus was apparent at any time.

Failing to close the incision, I packed the bulging bowels back into abdomen with sterilized gauze, and kept them there.

May 25, wound is reduced to a narrow granulating line, almost closed; and patient is convalescent. It is a matter for regret that no cultures were made of the abdominal fluids at time of operation.

May we not attribute recovery in some measure to the great vitality this man inherited from his parents, and which tided him over the time of greatest danger, when an individual of less hardy stock must have succumbed?

June 12, a plastic operation was done to strengthen the abdominal wall at site of wound.

June 22, sutures removed; restoration perfect. Patient has gained greatly in weight, and is in excellent general health. Excluding doubtful cases, this is the twelfth case on record of recovery from operation for perforating typhoid ulcer, giving 26.3 per cent. of recoveries out of a total of forty-six recorded operations.

THE LATE RESULTS OF A CASE OF IMPLANTATION OF BONE-CHIPS IN A CYST OF THE HEAD OF THE TIBIA.

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THE circumstances attending the after-history of the operation here described are, the writer believes, unique. No similar observations of so late development of trouble after implantation of bone-chips have been found described in the literature.

M. A., male, eighteen years old, was admitted to St. Luke's Hospital October, 1891. A cyst of the head of the tibia was opened with the chisel and the cavity packed with sterile gauze. Two weeks later the hole was filled with bone-chips, prepared according to Senn's method, and closed above by suturing together the soft parts. There was undisturbed healing, with the exception of a very minute opening, which for some little time discharged clear serous fluid. Patient seen several times in the next years, and at each inspection the parts were found in a satisfactory condition, with perfect function of the limb.

He entered the writer's service in May, 1896, with the wound in a rather acutely inflamed condition. Some weeks previously a sinus had formed and "particles" had come away. The wound was reopened and a considerable quantity (about half of the original amount) of bone-chips were removed; they were found to present absolutely the same appearance as on their implantation; at no place was there evidence of any absorption. They were buried in a mass of loose, gritty granulation tissue and detritus. Cavity freely curetted and packed. Some weeks' observation having shown that there was no tendency on the part of the

bone to throw out granulations, a second operation was undertaken. The walls were so densely eburnated that a considerable thickness of bone had to be chiselled away, especially on the posterior aspect, before a satisfactory refreshing could be obtained. The cavity was finally closed by resorting to Neuber's operation, —beveling the lateral walls and free dissection of cutaneous flaps which were slid forward and nailed to the floor of the defect. The tension on the flaps prevented their edges from being brought into perfect apposition. The progress of the case, though tedious, was quite satisfactory. One nail was removed on the fifth day to relieve too dangerous tension, and the remainder in ten days, when the flaps were found to be in firm contact with the bone. The small area of the floor left uncovered finally healed by granulation, and there is now simply a depression in the bone covered entirely by skin or cicatricial tissue. The depth of this depression will gradually decrease as bony proliferation tends to raise up the skin.

The general experience with bone-chips has, the writer believes, been rather unsatisfactory. Most of the unsuccessful results have been due to failure to obtain aseptic wound-healing, with a resultant discharge of the bone-chips a few weeks after implantation. The case here recorded is interesting as showing at what a late period an apparently aseptic foreign body can set up disturbances. It would tend to contradict the usual impression of the behavior of foreign substances intended to promote the generation of bone, as they are supposed not to become ossified, but to be absorbed by the growth of new bone which it is their rôle to stimulate. As there was practically no bone produced in this instance, it is possible that the unossifying granulation tissue lacked the chemical constituents necessary for their solution.

A fuller history of the original operation was published by Dr. B. F. Curtis in an article in the *American Journal of the Medical Sciences* for 1893, Vol. CVI.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 24, 1897.

The President, FRANK HARTLEY, M.D., in the Chair.

MODIFIED INCISION FOR QUIESCENT APPEN- DICITIS.

DR. FRED. KAMMERER showed two patients on whom he had operated for appendicitis by a modification of the incision at the outer border of the rectus. The modification consisted in the following: An incision is carried through the skin, subcutaneous tissues, and outer layer of the sheath of the rectus. The outer border of the muscle itself is exposed, and the latter is drawn towards the median line by one or two sharp retractors. Then its posterior surface can be very quickly and neatly separated from the subjacent posterior layer of the sheath. In four of the five cases operated on in this way he had divided the epigastric vessels because they were in the way, to which procedure he attached no importance. He had also divided the branch of the ileo-hypogastric nerve which enters the sheath at this point. It would be better to avoid this, as in both the cases shown there is present an atrophy of that part of the rectus which is supplied by the nerve in question. With the muscle drawn out of the way an incision is now made an inch from the semilunar line, through the posterior layer of the sheath, the fascia transversalis, and the peritoneum. This incision runs in the same direction as the primary incision. He had found no difficulty in reaching the appendix in any of the five cases after separating the edges of the wound. After its removal the incision through the posterior layer of the rectus sheath, the transversalis fascia, and the peritoneum is closed by a running catgut suture. The rectus muscle is now

released from the retractors and allowed to fall back into its normal position, and the incision in the anterior layer of the sheath is closed by individual catgut sutures, some of which are passed through the substance of the muscle itself. The skin is finally sutured with catgut. The method is only adapted to cases of appendicitis in the quiescent state.

DR. R. F. WEIR said Dr. Kammerer's operation for appendicitis commended itself to him from several points of view. When the appendix was attacked in the quiescent state, free from adhesions, the McBurney operation impressed him as ideal. But the quiescent stage and freedom from adhesions did not always exist when we expected to find it. He had recently found in one case extensive adhesions, and in two instances fifteen or twenty drops of pus were present. Under such circumstances the intermuscular opening was not large enough, and he had been compelled to enlarge the wound upward, and, as a result, got jagged edges with a weakened abdominal wall, and hence lost the advantages claimed for the procedure. For this reason he was willing to try some other procedure, such as that proposed by Dr. Kammerer, although he was not sure that this would give ready access to the outer side of the cæcum. It should be remembered that the question of damage to the nerve-supply of the rectus by a longitudinal abdominal incision was raised by Kocher, who therefore recommended the oblique incision in operations upon the gall-bladder. In two cases Dr. Weir, in performing cholecystotomy by the oblique incision, cut open the anterior sheath of the rectus, drew the muscle strongly to the left, then incised its posterior sheath, and so saved dividing this muscle. At the completion of the operation he sewed up the posterior fascia, let the muscle fall into place, and finally completed the suturing of the anterior portion of the sheath. This apparently gave a stronger cicatrix than usual.

DR. COLEY thought any improvement in the technique of closure of the abdominal wound following the operation for appendicitis would be welcome. Probably few appreciated the number of cases of hernia following this operation. Since April, 1895, there had been observed at the Hospital for the Ruptured and Crippled fifty-five cases. That was evidence that in many instances the wound was improperly closed. He would add, however, that perhaps in a large majority of the cases there had

evidently been suppuration during the healing of the wound. The McBurney method would answer all purposes in most cases, although the one suggested by Dr. Kammerer impressed him as an ingenious one.

DR. WEIR thought the last speaker's statement should be challenged unless it was stated definitely in what class of wounds the hernia had recurred. Had the operation been done when there was little damage to the abdominal wall, was it done during the quiescent stage, what sort of operation was performed?

DR. COLEY replied that he had simply called attention to the fact that hernia followed operation for appendicitis more frequently than was generally supposed. He had stated that in many of the cases he had observed the wounds had evidently healed by granulation.

DR. ABBE, while believing Dr. Kammerer's operation would give real support to the abdominal wall, was inclined to think that the risk of dividing the lateral nerve-supply and the inconvenience of dividing the artery would counteract the advantages. He agreed with Dr. Stimson in some remarks which he had recently made with regard to the McBurney operation; that it was applicable to suppurative cases, although that had not been claimed for it by Dr. McBurney. Dr. Abbe had employed it during the past year in all suppurative as well as non-suppurative cases. Without cutting muscular structures it is possible to separate the internal oblique and transversalis muscle fibres in an outward direction, so as to make a large enough opening to approach any abscess cavity in the iliac fossa and perform necessary manipulation in suppurative cases, including ligation or treating the appendix as desired. In leaving an opening in the intermuscular space to allow drainage there was no trouble in subsequent healing of the wound. The natural tendency of the muscular fibres to draw together in the direction of their length approximated those which had been drawn out of their course, and allowed them to resume their function. As a rule, after granulation the wound unites in a fine linear scar, without stitching.

DR. MEYER had performed Dr. McBurney's operation in seventeen cases, and had found it easy and rapid to perform and to give proper access to the appendix. He agreed with Dr. Abbe, if he understood him correctly, that if any difficulty were experi-

enced in breaking up adhesions, one could add a longitudinal incision through fascia and peritoneum running along-side the rectus muscle. Thus a fascio-peritoneal flap could be formed underneath the bluntly divided muscles and the field of the operation be made accessible. He thought that Dr. Kammerer's operation, otherwise a good one, might at times place the incision too far inward. We all frequently found the appendix behind and to the outer side of the cæcum, and to reach it through this incision might then be very difficult.

He had never applied McBurney's operation in suppurative cases, but Dr. Abbe's experience in this direction spoke strongly in its favor. It was certainly an ideal operation in the cases in which he had used it.

DR. KAMMERER thought that an incision at the outer border of the rectus muscle during the quiescent stage of appendicitis, which was about what his operation amounted to, would enable one to get at almost any appendix. He had had no difficulty in four cases in reaching the same. He would hesitate to employ the McBurney incision in all suppurative cases, for he felt sure that he had saved some patients with more or less extended but still localized peritonitis following appendicitis by free drainage, and had the opening been somewhat smaller than the one made he believed the patients would have been lost. Possibly, in suppurative cases, with only a small abscess about the appendix, drainage through the McBurney incision would be sufficient, but in severe cases a large incision with abundant drainage constituted the proper method. In such cases he did not quite agree with Dr. Abbe that sufficient drainage could be obtained when the muscles of the abdominal walls were not cut.

CASE OF EXTIRPATION OF MOTOR CENTRE OF ARM FOR JACKSONIAN EPILEPSY.

DR. WILLY MEYER again presented a man who had been operated upon several times for Jacksonian epilepsy which had followed trauma of the anterior part of the left parietal bone in 1888. It would be remembered that he was trephined in the South, then remained well six years; suddenly developed epilepsy with maniacal tendency, came to New York in August, 1894. Dr. Meyer opened the skull, removed a hernia of the brain at the seat of the first trephining, also removed a piece of bone larger

than a silver dollar, covered the opening with celluloid. The patient was well for five months, then mild epileptiform attacks developed. When he reached New York he had nearly 100 attacks in the twenty-four hours. The opening in the skull was reopened; the bone had largely reformed under the thin celluloid plate. The new bone was removed in larger extent than before, and the slightly protruding brain aspirated. No fluid was found. A plate of celluloid, about one-sixteenth of an inch thick, was used to fill the gap. The patient left the hospital within two weeks, and remained well fully eleven months. A second time he returned from his work in the South on account of recurrence of the epileptiform attacks, and underwent a fourth operation. The plate was removed and the portion of brain underneath, which had always slightly protruded, was excised. This time the celluloid plate was not replaced.

After this operation, which was done in February, 1896, the man went to work in Hoboken. Three months later he began again to have mild attacks, two or three times a week, and Dr. Meyer stated, when afterwards he presented the patient to the society, that he intended to excise the motor area of the right arm, for the attacks always began in the right arm. Consequently, October 19, 1896, he turned a large flap back, including the former field of operation, which covered that portion of the brain; the motor area of the right arm was located, as was customary by the electric current, and the centre was cut out. Paralysis of the right arm followed immediately. During the operation the veins of the pia mater were tied in two places and divided between, but in one instance the ligature cut through and there was much hæmorrhage. For this reason a gauze drain was introduced and left in forty-eight hours. It was decided not to put in a plate at once, but to wait four or five days until all wound-secretion should have subsided and granulation begun. On the fifth day after the operation he put in the plate, and succeeded, after some difficulty, in moulding it to fit the very large opening. He was much disconcerted to find that, owing to scar tissue from the former operations, which crossed near the border of the flap, some necrosis had taken place in the flap. These two or three small necrosed points spoiled the asepsis. Eight days later it became necessary to remove the plate. When the patient was brought to the operating-table, on the fifth day after

the excision of the centre for the purpose named, the paralysis of the arm had almost disappeared. But the paralysis recurred about the twelfth day, showing that there must be pressure from lymph, etc., under the plate. It therefore had to be removed. There was then also slight facial paralysis. The wound had to be allowed to heal by granulation. The paralysis slowly disappeared in six or eight weeks and the patient gained full control of the right arm and hand. But he had not been entirely cured of his epilepsy, which, of course, could not be expected after adhesions had reformed between the dura and periosteum. But he now had premonition of his attacks and could sit down and wait for them to pass away.

The case would seem to prove that there were within the brain what might be spoken of as preformed substitutes for the motor area to take the place of the excised one, for this patient was able on the fifth day after the operation to again move his arm and wrist, which could hardly be accounted for except on the supposition that substitute centres had existed previously, and soon came into activity.

SUBMUSCULAR LIPOMA OF THIGH SIMULATING PERIOSTEAL SARCOMA.

DR. MEYER presented a second patient, the interest of whose case centred chiefly in the clinical diagnosis between submuscular lipoma and periosteal sarcoma of the thigh. He was a tall, heavy man, who, when seen by Dr. Meyer last September, gave a history of having always been healthy, but for three months had observed an increase in the size of the lower third of the left thigh. He always gave the same answer to questions, that he had observed the growth only within the previous three months, and that its increase had been rapid. The knee seemed not to be involved, but the tumor gave every semblance of a growth from the periosteum of the lower end of the femur which had perforated into the overlying tissues. The patient was told that if, on cutting down upon the tumor, it were found to be sarcoma, he (Dr. Meyer) would proceed to amputate at the hip-joint, otherwise he would try to save the limb. October 9 he made incisions, one along the inner and another along the outer side of the thigh, found a very large lipoma attached along the periosteum and to the synovial sac of the joint, which he removed by joining the

two longitudinal incisions at their upper ends by a cross incision and turning down the flap. The joint was opened at one point, and was at once sutured with catgut. The patient made a good recovery and had regained full power in the leg, and had also recovered from a temporary neuritis in the opposite (right) thigh, whose relation to the operation was through the cord. In thinking of the origin of the tumor, so rare in this locality, Dr. Meyer was of opinion that it must have sprung from the subserous fat around the knee-joint, and, being firmly attached to the synovial membrane, the joint had to be opened during its removal.

DR. WEIR said he would add to the interest of Dr. Meyer's case by showing another of these rare forms of lipoma. Such growths occurring singly in the lower extremity—that is, independently of lipomata elsewhere in the body—were among the rarest of all tumors. Having had occasion some years ago to remove a pedunculated fatty growth from the knee-joint, his attention was directed to the points from which such growths might originate. A common place was under the ligamentum patellæ, and they might arise from the alar ligaments of the knee-joint itself, but also from the anterior surface of the femur, just behind the capsule of the joint, and the latter place was probably the origin of the tumor just shown by Dr. Meyer.

The specimen presented by Dr. Weir had been removed from a man sixty years of age, who had first noticed it on the leg about six years ago. About two years ago he had sought surgical relief at a hospital where, anæsthesia being established, an incision was made into the tumor on the outer aspect of the leg. When the patient recovered from the ether he found the tumor still present, and was told that the operator had found it was something more serious than what he had supposed,—instead of being a cyst, it was a sarcoma. The tumor continued to grow until, when Dr. Weir saw the patient, about the 1st of December, 1896, it had attained the size of two fists, and projected about the height of one fist beyond the level of the leg. He was in doubt as to its nature, and, thinking it might be a cystic sarcoma, he introduced the aspirator needle. No fluid was obtained. The slowness of the growth was in favor of its being benign, and an exploratory incision was planned with the understanding that if, after incision, it were found to be sarcoma, amputation would be resorted to. Microscopic examination of a section showed

only fatty tissue, and when the incision was prolonged from the ankle to the head of the fibula, this diagnosis of its nature was confirmed. Some difficulty was experienced in separating it from its attachments and getting it out. It involved and was largely contained in the extensor digitorum muscle, though numerous outgrowths were found in the intermuscular septa. The tumor weighed nearly two pounds. The patient made a prompt recovery. There had been some interference with the function of the muscle from the presence of the tumor and from the dissection, but this was steadily disappearing.

SPINDLE-CELLED SARCOMA OF THE ABDOMINAL
WALL SUCCESSFULLY TREATED BY THE
MIXED TOXINES OF ERYSIPELAS AND
BACILLUS PRODIGIOSUS.

DR. WILLIAM B. COLEY presented a young woman, aged eighteen years, who was admitted to the New York Cancer Hospital January 1, 1897, on the service of Dr. Joseph Brettauer, for operation for a tumor of the abdomen of two or three months' duration. Before operation it was uncertain whether the tumor was situated in the abdominal wall or involved the uterus. It could be distinctly felt by vaginal examination. An exploratory laparotomy was made by Dr. Brettauer, assisted by Dr. George W. Jarman, January 2, 1897, and the large mass was found to be both intra- and extraperitoneal. Dr. Brettauer regarded it as impossible to remove by operation, and closed the incision, having first excised a portion of the tumor for examination. The wound healed partly by primary union and partly by granulation. The case was then transferred to Dr. Coley's service with a view of having the toxines tried, and the wound having healed, the injections were begun January 19, 1897.

Physical examination made at this time showed the following condition: "Just above the symphysis pubis and extending upward nearly to umbilicus, to the right of the median line two inches, and to the left one inch, is a tumor, apparently located in the abdominal wall. The tumor is smooth in outline, firm in consistence, and apparently does not involve the intraperitoneal structures." (Copy of history from hospital records.)

The first injection consisted of three minims of mixed filtered toxines, prepared by Dr. B. H. Buxton, at the Loomis

Laboratory, from cultures of the streptococcus of erysipelas and bacillus prodigiosus. The erysipelas cultures had been passed through fifty-six rabbits, and had attained an extraordinary degree of virulence. There was no chill following the first injection; temperature rose to 99.8° F.; pulse, 104.

January 20, four minims, same preparation; temperature, 99.8°; pulse, 104.

January 21, five minims, same preparation; temperature, 99.8°; pulse, 114.

January 22, six minims, same preparation; temperature, 98.2°; pulse, 116.

January 23, seven minims, same preparation; temperature, 99.6°; pulse, 120.

January 24, eight minims, same preparation; temperature, 98.4°; pulse, 116.

January 25, nine minims, same preparation; temperature, 99.4°; pulse, 108.

January 26, unfiltered toxines were begun, dose one and a half minims; temperature, 99.4°; pulse, 100.

January 27, unfiltered, two minims; temperature, 99.8°; pulse, 88.

January 28, unfiltered, three minims; temperature, 99°; pulse, 104.

January 29, unfiltered, four minims; temperature, 99.2°; pulse, 112.

January 30, unfiltered, five minims; temperature, 99.2°; pulse, 112.

February 1, unfiltered, six minims; temperature, 98.4°; pulse, 90.

February 2, unfiltered, six minims into tumor; chill, thirty-five minutes; temperature, 100.6°; pulse, 126.

February 5, six minims; chill severe; temperature, 103.8°; pulse, 142.

February 7, two minims; chill; temperature, 101.6°; pulse, 114.

The injections were continued every two days in small doses (two to three minims) until March 3, and then the patient was allowed a week's rest. The last injection was made March 16, 1897.

The entire course of treatment lasted from January 19 to

March 16, or two months, during which time thirty injections were given, producing six chills. The improvement was apparent very soon, and the tumor steadily decreased in size, with no softening or breaking down. At the end of six weeks it had entirely disappeared, and at present the abdominal wall is quite soft and normal.

The microscopical examination was made by Dr. E. K. Dunham and Dr. B. H. Buxton, the pathologists of the New York Cancer Hospital, who pronounced the growth "spindle-celled sarcoma." (The injections were continued in moderate doses and with occasional intervals of rest until the end of June in order to lessen the chances of recurrence. The patient was discharged from the Cancer Hospital July 1, 1897, in perfect health, having gained five pounds in weight. No trace of the tumor or even induration could be detected.)

REMOVAL OF MOTOR AREA OF CEREBRUM FOR TRAUMATIC EPILEPSY.

DR. W. W. VAN ARSDALE presented a boy, nearly five years of age, upon whom he had operated, by invitation, for Dr. Gerster at Mt. Sinai Hospital for epilepsy. The patient's family history was good. Fifteen months prior to admission, November 30, 1896, the child had fallen down a cellar fifteen feet, striking the top of the head on the asphalt floor. Not unconscious, no vomiting, no paralysis, no fever. Headache next day. Two weeks later he fell from a wagon, causing a scalp wound of left side of the head. It healed after much suppuration, necessitating an incision. There were no untoward symptoms at the time. Headache four weeks later. Then, October 8, 1895, first convulsion, with unconsciousness, spasms of both upper and lower extremities, twitching of mouth, both eyes turned upward. Five months later three convulsions in one week. Two months later increasing frequency of attacks, until two or three occurred every day.

Character of convulsions at first: Loss of speech, often for twenty-four to thirty-six hours after attack. Unconscious urination frequently during attacks. The boy could often foretell the attacks and cry for assistance.

Operation by Dr. Van Arsdale, under chloroform. A large flap of bone with skin attached was turned down after trephining

near the top of the head, Dr. Van Arsdale's saw and trephine being used. Hæmorrhage was controlled by an elastic band about the head. Many adhesions were encountered between the dura and the skull. Dr. Sachs, who had seen the case with Dr. Gerster, was present and located the arm- and leg-centres both before and after the skull was opened. The brain was punctured with aspirating needle for exploration, with negative results. The dura was then incised and turned back, the arm-centre of the cortex removed for about one-half inch square, one-quarter inch thick, hæmostatic sutures having first been applied all around. The dura was then sutured, bone flap and button replaced, iodoform gauze drain, nosophen dressing. There was very slight loss of blood during the operation. The child recovered well from the anæsthesia. No paralysis. No post-operative temperature. For the first few days there were no convulsions. After that they returned, but not so frequently as before. Since the operation there had been two attacks of erysipelas of the head, and at present the boy had acute bronchitis, which had caused the epileptic attacks to become somewhat more frequent again,—three or more a day.

Dr. Van Arsdale said he had not presented the case either in favor of or against this operation for epilepsy, for it was not one of pure Jacksonian type. He had rather presented it because it was the first instance in which he had had opportunity to use his new saw, and it illustrated how well and quickly this worked. Certain improvements had been made in it since his first presentation of it.

THE TREATMENT OF GENERAL SEPTIC PERITONITIS.

DR. A. J. McCOSH read a paper on this subject, for which see page 687, Vol. XXV, June, 1897.

DR. R. F. WEIR said that he had had over twenty cases of general suppurative peritonitis, and had not yet been rewarded by success in a single instance. Perhaps one reason why his figures were smaller than those of Dr. McCosh was that he made a distinction between cases of general suppurative peritonitis following appendicitis and of peritonitis where an abscess formation was more or less perfectly present, and where in it there were a goodly amount of adhesions. Cases with a fair abundance of

lymph effusion in the peritoneal cavity gave one a little more encouragement than those in which there was no lymph at all or but very little. In one of his cases there was slowly progressive appendicitis in a hearty young man, then sudden intensification of the symptoms, four or five hours later the abdomen was opened, and thin pus was found smeared over the whole intestine. No adhesions were present anywhere, and the appendix and caput coli rolled into view on slight traction without a sign of false membrane, and the former was found to contain a small perforation. The wound was enlarged to six or eight inches in length and up to the liver, the intestines were drawn out and washed off by repeated douchings of hot saline water. The emptied peritoneal cavity was also flooded a number of times. Iodoform drainage in numerous directions carried out. The patient stood all these manœuvres well, and it was felt that an unusually thorough effort had been made in this case. Moreover, in view of his fatal results in similar cases, Dr. Weir concluded to try the latest additional treatment in sepsis, and injected the patient with antistreptococcus serum, first that made at the Pasteur Institute of Paris and afterwards that of Park, Davis & Co., using larger doses than he had ever employed before under other circumstances.

During the first twenty-four hours 100 cubic centimetres of the serum were injected; there was not much change. The pulse was 112, the temperature nearly 102° F. At the end of the second twenty-four hours he crowded the serum, injecting 120 cubic centimetres; but it brought about an irregular action of the heart without influencing the temperature, vomiting, or other untoward symptoms, and had to be given up. The patient gradually sank and died at the end of five or six days.

He had tried injection into the intestine of sulphate of magnesia in two cases, but this was in times past, when we were not as thorough in our methods of cleansing the abdomen as at present. Both patients died. He had also tried hypodermic injection of sulphate of magnesia, four or five grains. It was liable to poison the patient. Three or four days ago a patient not in his service at the New York Hospital received an injection of sulphate of magnesia into the intestine, but it did not save life.

DR. ABBE mentioned the fact that in discussing a paper of Dr. McBurney's, nearly two years ago, he stated that out of a

considerable experience he was able to recall six or seven cases of recovery after laparotomy for unconfined septic peritonitis. The methods which he had employed had been the various ones described by Dr. McCosh. The application of ice over the abdomen after the operation was, he thought, an advantage, as it seemed to retard bacterial growth, diminish inflammatory action, and give the system a chance to repel the invader. He thought it also stimulated intestinal peristalsis. It was known that ice upon the abdomen in the healthy state provoked peristalsis, and clinically the happy results of its action were seen in inflammatory states.

The use of intractintestinal injection of sulphate of magnesia bade fair to be a very important step. He had used it only twice, but in neither case did he succeed in saving the patient. But that was three years ago, and he hoped to use it to better advantage in the future. With regard to cleansing the abdominal cavity, he thought there was a good deal of shock from elaborate washing of the intestines,—a great deal more shock than most patients could stand in this condition of unconfined septic peritonitis. If, however, the patient was in condition to stand the additional shock, he thought it was a beneficial procedure. His custom was to use the water as hot as the hand in the abdomen could stand it.

With regard to removal of lymph, Dr. Abbe's experience was against it. Nature, it seemed, threw out the lymph to protect the parts, and to remove it left a raw surface, which was more favorable for infection. Where patients recovered the lymph was readily disposed of, so that after six months or a year the intestines would be found entirely free, as if no peritonitis had existed. He had used antistreptococcus serum in only two cases of grave septic peritonitis. It did not save the patients. The experience of others, however, would seem to show that it might prove to be a remedy of great value.

DR. KAMMERER said he had been able lately, by washing out the peritoneal cavity with normal salt solution, to save one patient with general septic peritonitis. In all of his previous cases, about twenty, the washing, although done in the manner described by Dr. McCosh, followed by extensive drainage, had been without avail. Occasionally he had removed the intestines from the abdominal cavity to cleanse them, but he was

rather of the opinion of Dr. Abbe, that the shock of this procedure was too severe for these patients. Some of them seemed to collapse very rapidly, partly, no doubt, because of the difficulty of replacing the distended intestine, and the necessary manipulation to accomplish this end.

DR. W. W. VAN ARSDALE thought that all who had followed Dr. McCosh's paper would agree that he had fortunately combined several recognized ways of treating this class of patients, and he had succeeded remarkably well. The speaker had operated upon fifteen cases at Mt. Sinai Hospital the past two years, in two of which the notes were so incomplete that he could make use of only thirteen of the number. All were cases of generalized septic peritonitis, with either very thin or thick pus, or with sero-fibrinous foci combined therewith. Only three of the thirteen were treated with irrigation, the other ten without irrigation. Nine recovered, four died, two of the latter having been treated with irrigation. Most of the cases were due to perforating appendicitis, with more or less gangrene. One was caused by a gangrenous cholecystitis, recovery without irrigation. In one case there was obstruction (intestinal?), and it was probably to that that death was due. The treatment was by large drainage-tubes inserted on both sides. The diagnosis of acute general peritonitis was not made except where an incision was made on both sides of the abdomen, and the peritonitis was found to exist everywhere. Localized conditions, then, could be ruled out. Except in the cases in which irrigation was practised with salt solution, the only surgical treatment consisted in introducing large rubber drainage-tubes in different directions through the openings, and in packing with iodoform gauze. Of the two fibrinous cases both died, while most of the sero-purulent cases lived. In two of the successful cases streptococcus antitoxine was used, but not in as large doses as Dr. Weir had mentioned.

DR. MCCOSH said, with regard to shock attending evisceration of the intestines, that formerly he had been inclined to adopt the opinion which had been expressed by Drs. Abbe and Kammerer, but later he had not observed that the shock of the operation was much increased by the temporary removal of the intestines from the cavity, provided they were at once covered by towels as hot as could be borne by the hands and the irrigating water had a temperature of 110° to 114° F. In his practice the

fluid had a temperature of 120° in the jar, and probably 112° to 114° when it reached the intestines.

He was glad to hear Dr. Abbe's opinion with regard to removal of lymph. He had himself been in doubt as to the propriety of removing it. In only one of his eight successful cases was there enough lymph to stick the intestines together. He had been much surprised to hear that in Dr. Van Arsdale's statistics both patients in whom the inflammation was of fibrinous character died. It had been his impression that where there was a large amount of fibrine the prognosis was more favorable, while it was generally regarded that the least favorable cases were those where no adhesions were present.

NEPHROTOMY ON TUBERCULAR KIDNEY, THE OTHER KIDNEY HAVING PREVIOUSLY BEEN REMOVED FOR TUBERCULOSIS.

DR. KAMMERER presented a large tubercular kidney, the pockets having been full of pus and but little kidney tissue remaining. The patient was a girl of eighteen years, who had been operated upon a few years ago by Dr. Willy Meyer by nephrectomy for tuberculosis of one kidney. A few weeks ago she had returned to the hospital with complete anuria for five days. A large tumor was present on the side of the remaining kidney, extending to the median line. Dr. Kammerer made a lateral incision down upon the kidney and established drainage. The patient lived two weeks, and abundant secretion of urine had followed from the incision in the loin. The pelvis and upper ureter were completely filled with cheesy masses.

STRICTURES OF THE APPENDIX VERMIFORMIS.

DR. ABBE presented six specimens of appendix, removed during the past four weeks, in illustration of a method of demonstrating stricture or strictures where to external appearances or on opening the appendix in the fresh state none were seen. In many cases at operations in the interval between attacks the appendix showed so little evidence of disease or stricture that physicians present expressed astonishment that the surgeon should go on to remove it. Yet nine times out of ten one or more constrictions would show up very plainly if the specimen were properly prepared. Before cutting it off a ligature should be

tied near its attachment so as to confine its contents. It should then be placed in water and put aside until a convenient moment. Within an hour or two, the ligature being removed, its contents are removed, and a small conical end syringe used to inject at first water for cleansing and then 95 per cent. alcohol to distend it, a fresh thread being thrown round its cut end to confine the alcohol, as the syringe is withdrawn. This distended appendix is then immersed in alcohol, and allowed to harden for a day or more. Now, on being divided from end to end, a most beautiful picture is presented of the lining and coats, variously affected by previous inflammation, usually there will be revealed from one to several strictures precisely analogous to those seen in the urethra. These are frequently of pin-hole aperture and confine intervening cavities. The hypertrophy of the muscular coat is sometimes very great, and is in exact ratio to the tightness of the strictures, thus giving a graphic illustration of the torment which this unhappy organ had been for months suffering in its efforts to rid itself of unwelcome contents, and of the consequent appendical colic or indigestion disturbances from which the patient had been suffering.

Stated Meeting, April 14, 1897.

FRANCIS W. MURRAY, M.D., President, *pro tem.* in the Chair.

TRAUMATIC ABSCESS OF FRONTAL LOBE; OPERATION; RECOVERY.

DR. B. F. CURTIS presented a boy, five years old, of Russian parentage, who was admitted to the Babies' Wards of the Post-Graduate Hospital, February 7, 1897. In September, 1896, he fell through a height of five stories, and sustained a compound fracture of the frontal bone, with an extensive wound reaching entirely across the forehead just above the eyebrows. He recovered with considerable loss of bone, leaving an opening about the size of the tip of the index-finger over the right supraorbital ridge. He remained well until about three weeks before admission, when he complained of pain in the scar at this point, and seemed dull and vaguely ill. The brain bulged and pulsated

strongly in the opening. Gradually these symptoms increased, the protruding scar was very tender to pressure and red in color. The mental dulness increased and the child slept a large part of the time. Dr. Curtis saw him at intervals of four or five days, and finally concluded that the symptoms justified a diagnosis of cerebral abscess, and had the eyes examined by the kindness of Dr. A. E. Davis, who reported the left eye normal, but extensive choked disk symptoms in the right eye, with no ocular paralysis, and fair vision. The temperature was 101° F. on admission, and 99° A.M. the day of operation (rectal). There was no motor or sensory paralysis or staggering in the gait. February 6, operation by Dr. Curtis. A flap was raised of the thin skin and cicatricial tissue and the brain exposed. The brain pulsated freely under the scar. The meningeal cavity was opened in the upper part of the wound, but was shut off by packing with a small strip of gauze. A director was thrust into the brain, and pus was reached at a depth of one-eighth of an inch, which was under such strong pressure that it spurting in a fine stream for a distance of three feet. The opening was enlarged, a drainage-tube inserted, and a dressing applied without irrigation. About three ounces of pus escaped, and the cavity measured fully two inches in diameter. The following day the boy evidently felt much brighter, but a temperature of about 101° F. was observed. This fell to normal in two or three days. The discharge gradually ceased and the wound slowly healed over without further disturbance. The boy is now perfectly well and has a smooth, white scar at the point of the opening in the bone, in which pulsation is scarcely to be noticed.

NOMA (?) WITH LOSS OF ENTIRE RIGHT SUPERIOR
MAXILLA; PLASTIC OPERATION TO CLOSE
OPENING IN CHEEK, AND ESMARCH'S OPERA-
TION ON LOWER JAW FOR ANKYLOSIS.

DR. CURTIS presented a second patient, a girl, four years of age, who was admitted to the Babies' Wards of the Post-Graduate Hospital in March, 1896, with great swelling and redness of the right cheek, with a circular slough appearing in its centre, and a very fetid discharge from the mouth and nostrils. There was but slight fever, and the child retained its food well, and the pulse was not rapid. The child had just recovered from an attack of

measles. In a few days the slough separated, leaving a circular opening in the cheek about an inch and a half in diameter, with all the characteristics of noma. It was also evident by that time that the superior maxilla was dead and exposed for a large part of its surface. A few days later the right upper jaw was removed entire through the mouth (specimen shown). The child's general condition forbade any attempt at plastic operation for some weeks. May 1, Dr. Curtis cut a flap from the neck just under the chin, with its base at the angle of the jaw, and made an opening into the mouth by cutting through the deeper tissues at the upper border of the flap, along the inferior margin of the lower jaw. Through this opening the flap was turned into the mouth, with its epithelial side turned inward, and the raw surface applied to the edges of the opening in the cheek and showing through the same. The following day the child had a sudden rise of temperature, which proved to be the beginning of an attack of scarlet fever, the source of which could not be found. Her convalescence was protracted by nephritis and the flap sloughed almost entirely. Her nephritis and great anæmia compelled a delay until the following September, then the remains of the flap, where it passed through the tissues of the cheek, at the border of the jaw, were cut loose and turned into the opening, with the cutaneous surface directed towards the mouth, in order to diminish the contraction. By this time such extensive contraction had taken place that the angle of the mouth was drawn up to the malar bone, and the teeth were held firmly together by the scar in the right cheek. There was still an opening in the cheek which would admit the index-finger. This operation resulted in closing the opening and nearly restored the lips to their proper position. In October, 1896, Dr. Curtis performed Es-march's operation by removing a portion of the bone at the right angle of the lower jaw, sufficient to make a gap between the two ends at the point where the bone was divided, into which the finger could be laid with ease, the periosteum being removed to the same extent. The wound was packed, and the child at once regained the power of mastication, the incisor teeth separating sufficiently to admit the index-finger. The wound healed by granulation to a narrow sinus, and no bone necrosis followed. The jaws were exercised for some time by forcible dilatation, and it will be seen that now the teeth can be separated freely to a dis-

tance of over half an inch. This is the patient referred to some time ago in connection with Dr. Willy Meyer's case of exfoliation of the entire lower jaw. The result is satisfactory both as to looks and as to functions of the jaw.

CASE OF GASTROSTOMY BY SENN'S METHOD.

DR. ROBERT ABBE presented a man, over fifty years of age, whom he had seen with Dr. Merrill, of Paterson, N. J., in December, 1896. The man had lost sixty pounds weight in ten months, was troubled to swallow, and vomited his food. At last he had become unable to swallow anything except milk and water. No tumor could be felt. Dr. Abbe had been waiting for a case on which to perform gastrostomy according to Senn's method (*Journal of American Medical Association*, November 28, 1896), and made use of the present one with very satisfactory result. The patient sat up on the fourth day after the operation, and walked about on the tenth day. The wound did not leak in the least. The lesion found was one of carcinoma of the lower end of the œsophagus and upper part of the stomach, forming a tumor of funnel shape. Of course, it could not be removed, and nothing further was done than to make the stomach opening through which to feed the patient. He had gained twelve pounds in weight since the operation.

The operation consisted in making a median incision, attaching the front of the stomach, by a circle of an inch and a half, to the parietal peritoneum, making an omental graft on the stomach passing a double purse-string suture around a circle, about an inch in diameter, in the centre of the attached portion of the stomach, drawing the sutures tight simultaneously, so as to pucker it up, and then making an opening in the centre of the circle enclosed by the purse-string suture, and passing into it a catheter. Two extra stitches held the catheter in place and inverted the stomach wall. In other words, he said, a valve-like opening was made, with a double purse-string suture, and a graft of omentum to form a collar or deeper neck for the valve. The wound was then closed rather closely against the catheter and healed quickly by granulation, leaving the small valve-like opening. Dr. Abbe thought the principle was correct, and in the present case it proved very successful in practice. He believed the omental graft was unnecessary, and in two similar cases

during the past three years he had omitted this step, and regarded the operation as the best one which he had ever seen performed. The first of the two cases was one of absolute obstruction of the œsophagus. In that instance he attached the stomach to the parietal peritoneum an inch and a half in diameter, made an incision through which he explored the interior of the stomach with the finger, closed the incision to the extent of leaving room only for the introduction of a catheter, then took another purse-string suture so as to secure the stomach wall tightly around the catheter. The patient had an absolutely dry wound during the four months that he lived, and went about his business in Wall Street. He then died suddenly of rupture of an aortic aneurism into the œsophagus while at breakfast, the aneurismal tumor having been the cause of the obstruction. The other case was one of cancer of the stomach, the wound was quite dry during the ten days that the patient lived. Death occurred from pneumonia. These two cases illustrated the same principle of an inverted valve, and constituted the simplest, the easiest, and the most efficient method of operating. As already stated, he thought the omental collar was unnecessary.

DR. WILLY MEYER agreed fully with Dr. Abbe that the omental flap was superfluous in Senn's operation. Yet Senn's case and the one shown were excellent in their final result. The method was a very ingenious one, but on analyzing it we ought to distinguish between the necessary and the unnecessary parts.

On glancing over his twenty-seven cases of gastrostomy he had come to the conclusion that the method proposed by Kader, inverting the stomach by a double fold around the tube, was the best one yet devised. He thought it was easier than Senn's. It was so safe that the patient could get up the next day, which was an important point, for after gastrostomy the patient should get up as soon as possible. One could operate under cocaine, and ought to do so, especially in cases of bronchitis. The only time when pain was felt under local cocaine anæsthesia was, perhaps, during the cutting of the parietal peritoneum. He could not imagine an easier method than this one of putting in four stitches in double row. Von Hacker's operation should be reserved for very low patients. If properly performed, it was in its final functional result also an excellent operation.

DR. LILIENTHAL, referring to the death from septic pneu-

monia ten days after operation of gastrostomy, said he had lost two patients from the same cause, one on the fourth the other on the sixth day after the operation. He thought it probable that the cause of the septic pneumonia was the fact that the patient could not, as he could under anæsthesia ordinarily, swallow the bronchial secretions, but had to aspirate them back again. Nor was it unlikely that the secretions of the œsophagus, which were increased by the action of the anæsthetic, were aspirated into the lungs and gave rise to a slow form of pneumonia. The next time he should have occasion to do gastrostomy he intended to perform preliminary tracheotomy, tampon back in the throat, and give the anæsthetic by the tracheotomy wound. The latter could be closed as soon as the patient regained consciousness after the operation. The suggestion might have been made before, but it seemed to him a reasonable one, for the danger of septic pneumonia was serious in these cases.

DR. ABBE thought the suggestion, to do preliminary tracheotomy, was an excellent one in cases of œsophageal stricture. In cases of cancer of the stomach there was not so great danger from aspiration pneumonia since the secretions could be swallowed. Yet he thought the operation under cocaine was perfectly feasible, for he had performed many laparotomies under cocaine in which there was more handling of the viscera.

LATE RESULT OF HUMPHREY'S OPERATION FOR ANKYLOSIS OF LOWER JAW.

DR. ABBE presented a young man, of twenty-four years, on whom he had performed Humphrey's operation for ankylosis of the lower jaw seventeen years ago, when he was seven years old. The jaw at that time was completely ankylosed, so that not even a piece of paper could be introduced between the teeth. This had resulted from middle-ear disease with suppuration involving the maxillary articulation. The lad desired that something should be done because his school-fellows were in the habit of poking fun at him. The case was published at the time, with photographs. (*New York Medical Journal*, April, 1880, p. 362.) There had been no tendency of the ankylosis to return: the boy had perfect use of the jaw. The greater atrophy of one side, which existed at the time of the operation, was yet manifest. Dr. Abbe added that during the operation the fibres of the facial nerve came

plainly into view, were pulled to one side, none were cut: the opening was large enough to permit of easy access to the parts.

DOUBLE FEMORAL HERNIA IN A MALE CHILD, AGED TWO YEARS.

DR. W. B. COLEY presented the youngest child (two years) which he had ever seen with femoral hernia. The hernia on the right side was cæcal, about the size of an English walnut; that on the left was about the size of an olive. He had operated on the right side a week ago, finding the cæcum, which he pushed back, removed the redundant portion of the sac, and closed the canal with a purse-string suture of kangaroo tendon. The posterior part of the cæcum was not invested with peritoneum. Dr. Coley said that femoral hernia under the tenth year was very rare. He had operated upon seven cases, but had found the cæcum only in the present instance. The operation consisted in high ligation of the sac and closure of the femoral opening by purse-string suture, using kangaroo tendon. He had employed this method in eighteen cases on patients of various ages, and had had no relapses, although in some instances the operation was done five years ago. So far as he knew, the patient presented was the youngest one ever treated by operation.

DR. MEYER asked whether Dr. Coley had found the simple purse-string suture efficient in cases of femoral hernia with an opening larger than was sufficient simply to admit the tip of the finger. That seemed not to be the view of other authors, and he had himself a few days ago read a paper describing Fabricius's operation. This operation was more difficult to perform than Bassini's for femoral hernia, the latter being the one which Dr. Coley had resorted to, and if the result had been permanent cure he thought we ought to employ it in these cases just as we employed his inguinal operation for inguinal hernia.

DR. COLEY said he had employed Bassini's method for femoral hernia in ten cases, and the purse-string method in eighteen cases, with no relapses after either method, in some instances the operation having been done five years ago, and all but four cases had been traced. In all cases the purse-string suture had been sufficient, not excepting cases in which the opening was large enough to admit the thumb. The rarity of femoral hernia in infants and children was shown by the fact that three

years ago Dr. De Garmo said that in all of his experience he had seen but one case in a patient under eight years of age.

COLOPEXY.

DR. JOSEPH D. BRYANT read a paper on the above subject, for which see page 165.

DR. ROBERT ABBE thought that the presentation of colopexy made by Dr. Bryant did not offer the operation as a routine one for relieving extreme chronic prolapse of the rectum. Personally Dr. Abbe had had no experience with the operation, nor with any extreme operative measures for the relief of rectal prolapse, yet from the ease and safety of removal of cancer of the rectum it seemed to him that resection of the lower portion in extreme prolapse would prove more satisfactory than colopexy with its attendant danger of hernia. The quick repair of the lower rectum was a matter of daily experience in pelvic surgery.

DR. KAMMERER said he had had no experience with colopexy, and agreed with Dr. Abbe that it was rather an extreme measure, in view of the fact that there were other means at hand to accomplish the object. The author had stated that a number of cases had been cured by establishing a preternatural anus, but he had not quite understood whether that preternatural anus had afterwards closed, or whether it had remained permanently open. Certainly, in the latter case, he should think some other method preferable. On the other hand, an artificial anus established in such a way as to determine the escape of all of the fæces through the opening was very difficult to close, and involving a lengthy and delicate operation.

Dr. Kammerer had treated some severe cases of rectal prolapse with very satisfactory results by Dieffenbach's method as modified by Roberts, of Philadelphia. In three or four cases examined after some years there had not been the slightest recurrence. The operation consisted in the excision of a V-shaped piece of the rectal wall, the ends of the V being at the sphincter, then suturing the edges, taking special pains to suture the sphincter muscle accurately. One of his cases was associated with total prolapse of the uterus, which he treated subsequent to the operation on the rectum by anterior abdominal fixation. The patient was a laboring woman, and was completely cured of the rectal prolapse of three or four inches and of the uterine prolapse.

As before stated, no recurrence after three or four years. He had never seen fæcal fistula follow the operation, but he thought it was important to introduce a small tampon into the upper angle of the wound, just below the point of the coccyx, as this part of the wound cavity could not well be closed by suturing in tiers with buried catgut, which was otherwise the best manner of closing it.

DR. MEYER had during the past year done Roberts's operation on a woman, forty years of age, who had had marked rectal prolapse for fifteen years. The operation itself was not difficult, but there was a large sac of intestine between the sacrum and rectum which caused him annoyance on passing sutures, etc. Nevertheless, primary union took place, and during the seven months since the operation there had been good functional result; no relapse. A little redundance of mucous membrane could be seen within the anus, but he thought that could have been avoided.

Dr. Meyer thought ventral hernia was the chief objection to colopexy, and he suggested, as a means of avoiding this, blunt separation of the abdominal muscles on the left side, as in McBurney's operation for appendicitis. Then he would stitch the gut to the fascia transversalis and peritoneum, which would be sufficient to give permanent fixation. He should try colopexy in this manner, for patients had to stay abed a number of weeks, eight to fourteen, after Roberts's operation.

DR. BRYANT said that the literature bearing on the subject had been brought together through the assiduity of Dr. Lusk, by whom the twenty-nine cases had been gathered. Among these it appears, in the first place, that there was no death. In the next place, twenty-two cases were reported as recovered. Still, it is fair to say that sufficient time has not elapsed to warrant the assumption that the cases have recovered in the sense that we should wish it understood as belonging to a recovery. It will be noted, too, that in some of the cases the mesocolon has been sewed to the abdominal wall, some three of which have been reported as recovered. However, there are associated with the mesocolon in the fixation other attachments, which fact renders the importance of either less certain; and there were but two or three instances in which but one attachment alone was employed. That fact led him to express the belief that the operation is ex-

tremely simple; that the patient is exposed to no special danger. Further, twenty-two of the twenty-nine cases were regarded as cured at the time of report, which would show a good outcome with very little apparent danger to the patient. It seems to him that the point to be determined is, whether it is wise or not to attach the colon to the incision made in the abdominal wall. He was convinced that he himself had drawn it too far forward. He was satisfied that the protrusion was the result of attaching too much of the intestinal tissues to the lips of the abdominal wound. Therefore, it seemed to him that if one could make the attachment, perhaps, in the manner suggested by Dr. Meyer, outside of the abdominal incision, one will have placed the operation in as favorable a position as possible. His own case is the only one in which protrusion has been reported.

EDITORIAL ARTICLES.

CLARK ON DRAINAGE OF THE PERITONEAL CAVITY.¹

DR. J. G. CLARK, resident gynaecologist in the Johns Hopkins Hospital, Baltimore, Md., presents an interesting paper to prove, from a review of 1700 abdominal section cases, performed from the opening of the gynaecological department of the Johns Hopkins Hospital, in 1889, up to October 1, 1896, that not only is drainage valueless in the great majority of cases in which it has hitherto been used, and is still used by some surgeons and gynaecologists, but that it is frequently productive of harm.

By clinical observation the conditions supposed to demand drainage have gradually reduced from a formidable number to a comparatively small one, and he is certain that this number is still too large, for in many cases a more minute attention to the smaller details of surgical operation, with a greater reliance upon the ability of the peritoneum and general system to eliminate infectious matter, will overcome many difficulties which are now incorrectly supposed to be obviated by drainage.

The quantitative absorption of fluids by the peritoneum was first worked out in an extremely interesting series of experiments on dogs by G. Wegner, the results of whose investigations the author sums up in the following conclusions:

(1) The surface of the peritoneum is equivalent to that of the skin (17,182 square centimetres peritoneum, 17,502 square centimetres of skin surface).

¹ J. G. CLARK, M.D., Baltimore. A critical review of seventeen hundred cases of abdominal section from the stand-point of intraperitoneal drainage, *American Journal of Obstetrics and Diseases of Women and Children*, April and May, 1897.

(2) It has an enormous absorbing function, taking up in an hour 3 to 8 per cent. of the entire body weight.

(3) Under the influence of very toxic or irritant substances an equal transudation into the peritoneal cavity may take place.

As the final results of a series of experiments Muscatello concludes that the diaphragmatic part of the peritoneum is the only place where the lymph from the peritoneal cavity is absorbed, and that the lymph-glands of the mediastinum are the collecting organs for this area.

Recklinghausen investigated the mechanism of the absorption of fluids in the peritoneal cavity of rabbits, and affirms that the fluid is taken up through the stomata between the endothelium of the diaphragmatic peritoneum.

To summarize, the points in the anatomy and function of the peritoneum which bear upon the subject of intraperitoneal drainage and the etiology of peritonitis are as follows:

(1) Fluids and solids may pass through the endothelial layer of the peritoneum, the fluids in many places, the solid particles only through the spaces in the diaphragm.

(2) Minute solid particles are carried from the peritoneal cavity through the diaphragm into the mediastinal lymph-vessels and glands, and thence into the blood circulation, by which they are distributed to the abdominal organs, to appear later in the collecting lymph-glands of these organs.

(3) Large quantities of fluids may be absorbed by the peritoneum in an astonishingly short time.

(4) The leucocytes are largely the bearers of foreign bodies from the peritoneal cavity into the mediastinal lymph-glands.

(5) There is normally a force in the peritoneal cavity which carries fluids and foreign particles towards the diaphragm, regardless of the posture of the animal, although gravity can greatly favor or retard the current.

Grawitz took up the experimental study of infection of the peritoneum, pursuing his work under improved bacteriological

technique. The results of his investigations, which appear to have been very thorough, were as follows:

(1) The introduction of non-pyogenic organisms into the abdominal cavity, either in small or large quantity, or mixed with formed particles, produces no harm.

(2) Great quantities of organisms, which ordinarily produce no disturbance, may give rise to a general sepsis if the absorptive ability of the peritoneum is impaired.

(3) The injection into the peritoneal cavity of pyogenic organisms may be quite as harmless as the non-pathogenic varieties. In these experiments he employed a flocculent emulsion of staphylococcus albus, staphylococcus aureus, and streptococcus pyogenes in ten cubic centimetres of water, without any visible reaction.

(4) The introduction of pus-producing cocci into the normal peritoneal cavity produces a purulent peritonitis, (a) if the culture fluid is difficult of absorption; (b) if irritating material is present which destroys the tissues of the peritoneum, and thus prepares a place for the lodgement of the organisms; (c) a purulent peritonitis will certainly be produced if a wound of the abdominal wall is present which forms a nidus for the infectious process.

The experiments of Cobbett and Melsome make more prominent the fact, brought out by previous observers, that even after the injection of virulent streptococci little or no peritonitis may be produced if the peritoneum is normal.

From the collective literature the following conclusions may be drawn:

(1) Under normal conditions the peritoneum can dispose of pyogenic organisms in varying quantities, depending upon the virulence of the organism, without producing peritonitis.

(2) The less the absorption from the peritoneal cavity the greater the danger of infection.

(3) Solid sterile particles are partly absorbed, and the remainder is encapsulated without the production of peritonitis.

(4) Death may be produced by general septicæmia, and not peritonitis, where large quantities of organisms are taken up by the lymph streams.

(5) Peritonitis may be produced if the culture fluid is difficult of absorption.

(6) Irritant material which destroys the tissues of the peritoneum prepares a place for the lodgement of organisms and the starting place for peritonitis.

(7) An infected stitch-hole tract or a localized phlegmon communicating with the peritoneum forms an excellent starting place for general peritonitis.

(8) Stagnation of degenerated fluid in dead spaces favors the growth of organisms.

(9) The presence of infected blood clots is especially liable to cause a virulent peritonitis.

(10) Injury to the abdominal viscera, such as strangulation of an intestine, constriction and ligation of large areas of tissue in the presence of pyogenic organisms, will almost certainly be followed by peritonitis.

ETIOLOGY OF PERITONITIS.

A review of the autopsy records of all cases of peritonitis dying in the gynæcological wards of the Johns Hopkins Hospital shows that they conform largely to the types described by Pawlowsky in his experiments upon dogs. His classification is as follows:

(1) An extremely toxic variety, in which the virulence of the infecting organism is so great that the patient is at once overwhelmed and dies within forty-eight hours with all the signs of shock. In these cases the peritoneum is covered with a slimy fluid containing a few blood-corpuscles, fibrin flakes, and many bacteria.

(2) Hæmorrhagic peritonitis, in which the virulence of the infection is also very great. Varying grades of hæmorrhagic

extravasations, with a greater or lesser mixture of pus and masses of bacteria, are found.

(3) Fibrino-purulent peritonitis, due to a less intense or slower infection, characterized by masses of fibrino-purulent matter, consisting principally of pus-corpuscles and bacteria contained in the fibrin masses.

(4) Purulent peritonitis consisting of much pus and fluid matter.

These classifications merely indicate the severity of the infection, all being forms of mycotic or infectious peritonitis.

In the purulent form of peritonitis the peritoneal cavity contains a large quantity of pus; organisms may be abundant, but often they are not found when the patient is operated upon or goes to autopsy, because they have died out by that time. In the diaphragmatic openings large masses of bacteria, free and enclosed in leucocytes, are found, which prevent the absorption of the peritoneal exudate by occluding the openings and setting up inflammation in the adjacent tissues.

Traumatic and Chemical Irritation produced by the Drainage Material.—The effect of long-continued contact of a foreign body with the peritoneum is to cause a destruction and exfoliation of the endothelium, followed by the escape of serum and leucocytes which quickly surrounded it with a fibrinous envelope. Dr. Flexner ascribed the inflammatory reaction adjacent to an iodoformized drain, in a fatal case of general post-operative peritonitis, to the chemical irritation of the iodoform.

Any material which is impregnated with chemicals sufficient to be of the least value as a germicide, if left in contact with the peritoneum, will produce greater irritation than a simple sterile body. For this reason Clark does not think that the bichloride, iodoformized, carbolized, and permanganate gauzes should be used. The inefficiency of iodoform as a germicide has been demonstrated time and again in many practical and experimental studies, and the cultures which we have made from the iodo-

formed gauze drains have invariably grown luxuriantly, even from the very centre of a gauze roll. While the objection to iodoform as a chemical irritant is unquestionably slight, yet the weight of a straw in some cases may be sufficient to determine the fate of a patient. A mechanical or chemical irritation of the peritoneum sufficient to induce a reactionary inflammation certainly reduces the resistant force of the peritoneum against infection in proportion to the extent of local injury.

Retardation of Healing.—One glance at the drainage chart constructed by Clark from the 1700 abdominal cases is sufficient to prove that local healing is retarded. Looking at the mere question of its effects upon the abdominal wound, we find that the percentage line of local suppuration conforms in the most remarkable way to the rise and fall of the drainage line. This retardation of the healing may be explained, to a certain extent, by the mere mechanical injury to the tissues from the presence of a foreign body like the gauze or tube; but the fact that in the discharge from the drainage tract and adjacent to it organisms are most often found which normally have their habitat in the skin, goes far towards proving that they are introduced with the drain or gain entrance after its insertion.

Following the removal of a drain, healing in its tract can only take place by granulation process, which is necessarily slow, especially in those cases where deep cavities must be closed. For this reason alone the average number of days in the hospital of drained cases will invariably be greater than that of undrained ones. If the healing progresses satisfactorily, the drainage tract may be closed entirely within ten days; if, on the other hand, slight infection takes place, suppuration may result, and not only the tract itself but also the adjacent tissues may break down and thus prolong the patient's stay in bed many days.

Drainage not Effective in removing Fluids and Infectious Matter.—Autopsy after autopsy has shown that all forms of drainage are frequently valueless in removing fluids from the abdominal or pelvic cavity. The artificial efforts to remove ac-

accumulating fluid in the peritoneal cavity with a drainage-tube syringe, by mopping it out with pledgets of cotton, or by depending upon the capillary absorption of a gauze drain, are largely ineffective.

By the introduction of the drainage material the peritoneum is handicapped in three ways: (1) the normal peritoneal currents are disturbed, consequently the circulation of fluids and foreign matter towards the diaphragm is retarded; (2) a reactive inflammation is set up about the drain, limiting and impeding the action of the peritoneum; and (3) within a few hours the general peritoneum is cut off from all participation in the work of absorption by the wall of adhesions around the drain.

In place of the natural agencies the work is thrown upon an agent which at best can only remove the fluid from a small pocket. The old illustration cited in favor of drainage, of the gauze wick emptying a bowl of water by capillary attraction, is delusive. The syrup-like serous or bloody fluid, which quickly coagulates and fills up the meshes of the gauze, almost entirely checks the capillary action. A limited quantity of fluid will be removed during the first two hours, but after that the drain acts like a plug by preventing the outflow of fluid, which then accumulates in the dependent pockets. In many instances we have found these encapsulated collections of infected matter within a half centimetre of a drained track.

The rate of absorption is so great in the active peritoneum that a large quantity of fluid and infectious matter, which may be present or introduced at the time of operation, may be eliminated through its normal channels before the drained cavity is shut off by adhesions. In two autopsies on drainage cases dying of peritonitis the drained field showed myriads of organisms, while that portion of the general peritoneal cavity walled off by adhesions in the immediate vicinity of the drainage cavity showed no trace of them. The advocates of drainage would cite these cases as demonstrating the efficacy of the drain in limiting the infection to the drained field.

In the light of experimental work such a conclusion is erroneous; it is impossible for a sharp dividing wall to be established between an infected and a non-infected area before the lymph-currents have distributed the foreign matter more or less generally in the peritoneal cavity. It would seem that the better explanation for this phenomenon is that the healthy peritoneum has successfully met the invasion of the infectious matter and has overcome it, while the drain has failed in its task of removing the micro-organisms from the encapsulated pocket.

The experiments of all investigators have established the fact that there is a limit beyond which the peritoneum is unable to resist infection. Experience has taught that abdominal operations performed during the active stage of infection, especially of the puerperal types, in which infectious matter is left behind, often terminate fatally within a few hours from the most virulent forms of peritonitis, whether they are drained or undrained.

Two cases of streptococcus infection representing identical conditions were operated upon in this series, and both died within three days after the operation; in one a large drain was employed, and in the usual surgical sense was "very effective," yet the fatal progress was apparently in no way hindered.

Operations during the acute stage of a pelvic inflammatory process are especially dangerous, because even with the greatest care infectious matter will be liberated or left behind, and thus gain a ready entrance into the general system, which is already greatly taxed, and may quickly cause a fatal termination. In organs like the vermiform appendix, where an early rupture into the peritoneal cavity may occur, operation may be indicated in the acute stage of the infection; but here the chances for a clean operation are better than in the pelvis, where adhesions and infection of the adjacent structures are much more frequent accompaniments of inflammatory processes. Even in these cases it is better to delay operation if the acute symptoms are subsiding when the case is first seen. Out of the 4500 gynæcological cases

admitted to the Johns Hopkins Hospital, only one patient died from peritonitis following rupture of a pyosalpinx, showing that the dangers of this accident are very slight and that it should not influence us in operating precipitately.

There is still another important reason for delaying operation until the acute attack is over. From Cobbett and Melsome's experiments on animals we may draw the conclusion that acute pelvic infections render the patient more or less immune to a similar infection, and if we wait until the acute process is over an operation is much safer, because even if the latent germs are liberated they may then have little or no injurious effect. To obtain the greatest benefit from this immunity the operation should, however, be performed as soon as possible after the acute symptoms have subsided, because it is of short duration, lasting in animals, according to Cobbett and Melsome, only a few days or weeks.

Infection frequently occurs through the Drainage-Tract.—The bacteriological investigation of Robb and Ghriskey, relative to infection through the drainage-tube, in which they found a large proportion (44 per cent.) of the tubes contaminated with some form of organism, emphasized the objection which other writers before them had insisted upon: that a more or less virulent infection might take place through this channel. The results of these investigations, and the proved inefficiency of the tube in removing the fluids, caused Dr. Kelly to abandon it in favor of gauze. While the gauze serves a better purpose in checking oozing, and in some other respects is superior to the glass tube, it is no less likely to be the means of transportation of bacteria from without. The bacteriological examination of sixteen abdominal gauze drains by Drs. Miller and Clark has shown that in not a single instance was the entire piece of gauze free from organisms. While infections of the drain are usually mild and produce little or no harm, the 1700 cases reviewed show a small number where a fatal termination was caused in this way, and a

large number in which more or less extensive local suppuration occurred. For the last three years a simple reduplicated gauze drain, filling the cavity to be drained from the bottom to the top, has been used. In order to ascertain the point of infection in these drains, cultures were taken from the upper, middle, and lower third of the drains.

The method of making the cultures was as follows: The projecting end of gauze, which lies loosely nested in the abdomen, was unfolded with sterile forceps, and from that portion next to the abdomen a culture was taken. The gauze was then half-way withdrawn, the folds unrolled, and a culture taken from the centre, after which the gauze was completely removed and the third culture taken from the end in contact with the bottom of the drained cavity. The first cultures were made upon agar, from which they were transplanted to the various differentiating media until a diagnosis was reached. They began the bacteriological study of these cases with the expectation of finding comparatively few contaminated drains, but, to their surprise, in every instance organisms were obtained from some portion of the drain.

In these cases the most scrupulous care was exercised in the dressings subsequent to the operations, and in some cases the dressings were not changed from the time the gauze was introduced until the cultures were taken. Notwithstanding these precautions, the drains, without exception, showed a growth in some of the tubes. In every instance control cultures were made, at the time of operation, from the pus in the inflammatory cases, and from the peritoneal secretions in the non-inflammatory cases, and were negative. In two cases organisms were seen on cover glasses, but failed to grow in culture.

From these positive results it would appear that a gauze drain will almost invariably become contaminated, the variety and virulence of the organism depending upon the cleanliness of the surrounding skin and to some extent upon the purity of the

air. Infection from germs floating in the air is probably not a common occurrence, and most of the blame, therefore, must be attached to the immediate environs of the wound.

DRAINAGE IN CASES NOT PRIMARILY INFECTED.

In order to arrive at a clearer determination of the source of infection in the drained cases Clark has divided them into two groups, the first containing those in which infection previous to operation is rarely present, such as abdominal tumors, cysts, and extrauterine pregnancy; the second including the inflammatory cases, such as pelvic abscess, pyosalpinx, acute and chronic salpingitis, and perioöphoritis. In the first class drainage was usually employed to control oozing from adherent surfaces and to remove collecting fluids.

Blood within the peritoneal cavity may be disposed of in various ways: it may be absorbed before it coagulates; it may coagulate and then be removed gradually by the disintegrating action of the leucocytes; it may become encapsulated, after which it is partially or wholly removed or becomes organized; or it may become infected and suppurate. Absorption takes place much more readily when the peritoneum is normal or only slightly injured, but even when an extensive local injury has occurred free blood may be taken up. This fact has been demonstrated by autopsies in cases dying a few hours or days after operations accompanied with free oozing.

If there has been excessive traumatism, especially in cases where the function of the peritoneum has already been impaired by disease, blood and serum may accumulate in dependent pockets and become encapsulated. Its subsequent disposal then depends upon whether it is infected or not. In addition to the antagonism manifested by the peritoneum to infection, the fact must not be lost sight of that freshly effused blood surrounded by living tissue does not lose its vital properties immediately, but is actively germicidal for some time, and it may be assumed that a large number of organisms are thus destroyed.

Of 100 undrained cases where there were more or less extensive adhesions, only one case was complicated by the formation of a pelvic abscess after the operation; in 100 similar cases which were drained eight such sequelæ have occurred. This fact goes far towards proving that these coagula seldom suppurate if left to the care of even a disabled peritoneum.

The introduction of a gauze drain into a raw and bleeding cavity, while it may check the oozing, will invariably induce a free serous secretion, which is quite as dangerous, when it degenerates and becomes infected, as infected blood.

Among the many experimental studies on infection of the peritoneum there has been a general agreement of results on the following point,—viz., when an infected material which is very difficult or impossible of absorption is introduced into the peritoneal cavity, peritonitis invariably occurs. If there is associated with this an injured peritoneum, the toxic effects of the infection are more virulent and more rapid. From a practical application of this experimental fact to cases drained for oozing, one infers that the introduction of a foreign body, such as a piece of gauze or glass tube, into a peritoneal pocket containing a suitable culture medium, establishes a dangerous communication with the skin of the abdominal wall, populated by its myriads of bacteria, some of which, as Dr. Welch has shown, cannot be removed by any of our present methods of skin disinfection. What better culture-tube can be found than a pocket of this kind communicating, through a drainage-track, with the exterior?

After the infection has taken place the fate of the patient depends upon the species and virulence of the organism, the quantity and quality of the medium, the density and resistance of the local barriers, and the vital resistance of the patient. That the latter force is a predominating one is proved by the many infected cases which not only recover but show comparatively little systemic reaction. On the other hand, even the most benign pyogenic organisms may, under proper conditions, produce serious results.

The danger of infection through a drainage-track is undoubtedly greater after the first removal of the drain than immediately after the operation. In many cases no symptoms of systemic disturbance have been observed until two or three days after this time. Within a few hours after the introduction of a drain a tenacious, plastic, cement-like, fibrinous envelope is formed about it, binding the adjacent peritoneum and gauze together in the closest apposition. Any attempt to remove the drain at this time not only causes great pain to the patient, but serious accidents may follow the disruption of the adhesions. In eight of the drainage cases of our series loops of intestines and parts of the omentum have been dragged out upon the abdomen, and in one instance fatal hæmorrhage followed the dislodgement of ligatures in a very adherent inflammatory case where numerous vessels had been tied. As the fibrinous envelope begins to organize, the new vessels enter it a short distance, the layer of fibrin in contact with the gauze degenerates, and the close band of union between the gauze and peritoneum is dissolved. Practical experience has taught us that this stage in the organization of the fibrin is reached about the fifth day. Even then the gauze may adhere so closely to the floor of the pelvis as to be dislodged with great difficulty. Under the most favorable circumstances the enveloping wall of adhesions may be broken up, giving an easy entrance to the peritoneal cavity of infectious matter from the exterior, through the drainage material.

These are the lesser evils following the removal of the drain. As demonstrated twice in this series of cases, a fatal termination may follow from the rupture of the pent-up fluid into the peritoneal cavity. This accident occurred in a case of ectopic pregnancy and in a pelvic inflammatory case. The case of ectopic pregnancy also demonstrated the danger of introducing a drain into coagulated blood. It is always dangerous to fill a freshly oozing area with a gauze drain. It is much safer to allow small

encapsulated collections of blood, like those found after the rupture of an early ectopic pregnancy, to be disposed of by the means at Nature's command, than to open the abdominal cavity and drain.

DRAINAGE IN CASES WHERE INFECTIOUS MATTER IS SUPPOSED TO BE PRESENT AT THE TIME OF THE OPERATION.

From Dr. Miller's bacteriological examination of the ovaries, tubes, and uteri removed for inflammatory conditions, we have learned that the accumulation of pus in the pelvis rarely contains active organisms at the time of operation. In forty-four specimens of ovaries and tubes, organisms resembling gonococci were found in six cover-glass preparations, but did not grow in cultures. The staphylococcus albus and aureus and streptococcus were found once in culture. With these exceptions the forty-four cases were negative. Fifty-six uteri were examined, in none of which were organisms found in culture. The gonococcus was observed once in cover-glass preparations.

POST-OPERATIVE OBSTRUCTION OF THE BOWEL FROM THE USE OF DRAINAGE.

Doubtless the obstinate constipation, tympanites, and nausea and vomiting after operations in which drains are employed are due to a constrained position of the intestine around the drain, because these complications are much more frequent in the drained than in the undrained cases. The ability of the intestine to maintain its function under adverse circumstances is remarkable, but in no case is it more frequently demonstrated than in drained cases.

Autopsies on cases in which no symptoms of obstruction have been present have frequently shown the intestines matted together around a drainage-track like a tangled skein of yarn.

FÆCAL FISTULA FOLLOWING DRAINAGE.

This complication occurred once in the series of 1700 cases,

and in another case which had been operated upon elsewhere. In both instances the fistula had resulted from pressure necrosis produced by the glass tube on the bowel.

VESICAL COMPLICATIONS PRODUCED BY DRAINAGE.

The cavity to be drained is usually situated in the cul-de-sac or on the floor of the pelvis, and to place the gauze properly it must be brought out by the side or over the fundus of the bladder into the lower angle of the wound. The inflammatory reaction around the drain may cause vesical irritation, cystitis, and persistent dysuria. A perivesical inflammation may be established by continuity, the adhesions may prevent the normal distention of the bladder or hinder its contraction, or, more rarely, a suppurating cavity may rupture into the bladder. In the largest number of cases these minor complications have disappeared in a short time, but occasionally have persisted as chronic disabilities.

POST-OPERATIVE HERNIA DUE TO DRAINAGE.

At least 8 per cent. of cases in which an extensive drain has been used have been followed by hernia. For two years past buried silver-wire sutures have been used to close the abdominal wound, and this method has greatly decreased the number of herniæ following operation.

PREVENTION AND REMOVAL OF INFECTION WITHOUT THE EMPLOYMENT OF DRAINAGE.

In order to avoid the supposed necessity for drainage, certain details of an abdominal operation should be observed with the most scrupulous and painstaking care.

(1) *Thorough Disinfection of the Hands.*—No preliminary preparation for operation requires more care than the cleansing of the hands, as they, above all other agencies, are most likely to carry infected matter into a wound.

Zweifel lays down the rule that at least three days should supervene after contact with infectious matter before abdominal operations can with safety be undertaken. The transmission of infection from one case to another has been demonstrated by him in an outbreak of puerperal infection, where one patient infected herself from a discharging abscess in the eyelid, and from this case the infection was carried to other patients by the ward midwife, notwithstanding the very thorough disinfection of her hands.

A very clear example of this accident also occurred in the Johns Hopkins Hospital. An operation for the relief of an ovarian abscess infected with virulent streptococci was followed by a rapidly fatal termination from general infection. Four patients operated upon during three subsequent operating days became infected with the same organism. Fortunately none of the cases secondarily infected died, but in all extensive suppuration of the abdominal wounds occurred, necessitating the removal of the patient to the isolation ward. In these cases the operator and assistants had followed the usual methods of disinfection, but, notwithstanding this precaution, the organisms were evidently transmitted from one case to another by the hands.

It is certainly safer to suspend all operations, after contact with an infectious case, for at least three days, as suggested by Zweifel.

(2) *Control Hæmorrhage.*—Hæmorrhage should be stopped by ligating the larger vessels and twisting or clamping the ends of the smaller vessels. Ligation or clamping of large areas of tissue is bad surgery. When oozing occurs every means should be employed to check it; if it persists it is safer to leave the peritoneum to take care of it than to drain. In none of our cases has the bleeding from ordinary oozing surfaces proved dangerous *per se*, but serious harm has resulted from an infection of these areas through a drain.

(3) *Avoid bruising or otherwise injuring tissues.*

(4) *Isolate the General Peritoneal Cavity during Operation.*—This precaution should be observed as far as possible during the course of the operation by walling off the general peritoneal cavity with gauze pads and non-absorbent cotton bolsters enveloped in gauze. While it is perfectly safe to assume that the peritoneum is capable of destroying a considerable amount of infectious matter, unnecessary work should not be thrown upon it by allowing fluids and *débris* to escape into the general peritoneal cavity during operation.

(5) *Preserve the Peritoneum.*—Sacrifice as little of the peritoneum as possible, and when this is unavoidable try to bring an adjacent peritoneal surface in contact with the denuded area.

(6) *Conserve the Body Heat.*—Avoid exposing the intestines, and never allow them to become chilled. Wegner has shown that the resistance to infection is greatly decreased by lowering the temperature of the intestines. Peristalsis is more or less inhibited; the transudation of serum is increased without compensatory absorption, on account of the local shock produced by the cold.

(7) *Avoid Rupture of Intraperitoneal Abscesses.*—Avoid rupturing abscesses in the peritoneal cavity. If this accident occurs lose no time in removing the pus and irrigating the pelvic or peritoneal cavity, if the pus has been generally distributed.

(8) *Irrigate the Peritoneal Cavity.*—After every operation where *débris* or normal fluids escape into the peritoneal cavity, irrigate the abdomen thoroughly with normal salt solution (0.6 per cent.), with a view of removing all extraneous matter that is possible

(9) *Promote Absorption by Saline Infusions into the Peritoneal Cavity, followed by Postural Drainage.*—Introduce 500 to 1000 cubic centimetres of salt solution into the peritoneal cavity when the operation has been prolonged or the presence of septic matter is suspected, and, when the patient is returned to her room, elevate the foot of the bed eighteen inches for the first twenty-four hours after the operation.

(10) *Submammary Saline Infusions*.—If symptoms of infection arise after operation, inject salt-solution infusions into the cellular tissue beneath the breasts.

The necessity for the first seven of these procedures is generally accepted, but the last three are open to discussion. Some surgeons insist upon a dry technique throughout an abdominal operation, and are much opposed to the dispersion of blood or infectious matter in the general peritoneal cavity by irrigation. For the last three years it has been the custom not only to irrigate the abdominal cavity thoroughly after all operations where pus or other fluids have escaped, but frequently also to leave as much as one litre of salt solution in the peritoneal cavity before closing the abdominal wound.

It is a well-known principle in physics that a substance will undergo combustion or solution much more rapidly in a finely divided state than when it is massed together. The same principle may be applied to the disposal of foreign matter in the peritoneal cavity. In Muscatello's experiments the leucocytes could easily surround the smaller foreign bodies and carry them into the general circulation through the spaces in the diaphragm; but where they were larger many leucocytes were required for this task, and the removal of still larger particles could only be accomplished after their encapsulation and subsequent slow disintegration by the leucocytes. His experiments also demonstrated that there existed an intraperitoneal current capable of transporting the carmine bodies, even against the force of gravity, from the pelvis to the diaphragm. When to these conditions we add the proved fact that the normal peritoneum can take care of a large amount of infectious matter without danger to the animal, it appears to me that there can be no question but that it is better to disintegrate and distribute infectious matter rather than allow it to remain in a localized area.

POSTURAL METHOD OF DRAINING THE ABDOMINAL CAVITY.

The many bacteriological studies in cases of experimental and post-operative peritonitis and in experimental infections of the peritoneum show conclusively that the infecting organisms are quickly distributed more or less generally in the peritoneal cavity, from whence they are carried into the system at large. Where there is no persistent source of infection, virulent species of bacteria may be destroyed effectually in this way: but when a nidus of infection exists in which the micro-organisms are propagated, the patient is either carried off by a rapidly fatal septicæmia or peritonitis, or the peritoneal exudate forms a barrier to the further distribution of the infectious matter, which then follows the clinical course of any localized collection of pus.

To avoid this danger the most scrupulous care should be observed in every abdominal operation not to leave behind any condition which may furnish a starting point for an infectious process. Oozing should be controlled as far as possible, injury and exposure of the peritoneum should be guarded against, raw areas should be covered with adjacent healthy peritoneum when practicable, and all *débris* and fluids should be removed as far as possible before the abdomen is closed.

Notwithstanding every precaution, dead spaces will be left after many operations, which may become collecting places for degenerating fluids. In addition to these artificial spaces, oozing serum and blood may collect in Douglas's cul-de-sac or in the anteuterine space and become the focus of a general peritonitis or a localized pelvic abscess. To offset these dangers all dependent spaces should be drained as rapidly as possible, thus preventing the collection and stagnation of vital fluids, which are active germicides when first secreted, but become excellent culture media when degenerated.

By elevating the pelvis after operation the normal intraperitoneal current may be assisted greatly in at once draining dead spaces, and thus give the general peritoneal cavity and system

at large the best opportunity to meet the invading organisms before they have had time to increase in numbers. To remind one of the incredible rate of multiplication of micro-organisms it is only necessary to quote Cohn's classical statement that "one germ under proper conditions may give rise to more than a half-million of similar organisms within twenty-four hours." Stagnating fluids in the dependent parts of the abdominal cavity or in dead spaces may furnish such a favorable culture-bed that a few organisms may quickly generate myriads of others and overcome the most resistant germicidal forces; if, on the other hand, these spaces can be prevented from filling with fluids, the organisms may easily be overcome.

In addition to the mere transportation of the organisms from an area of decreased resistance to one of normal resistance, the irritant chemical toxins elaborated by the bacteria are diluted and the infectious matter is divided into a fine, granular state, thus giving the leucocytes the best opportunity to encompass the organisms.

Although fatal septicæmia may be produced in animals by the absorption of large quantities of organisms from the peritoneal cavity, it appears correct to assume that after a well-conducted abdominal operation no such quantities of organisms will be left behind as are necessary to produce septicæmia in the animal experimentally. If such a condition should exist the patient would certainly die from the rapid multiplication of the organisms in dependent cavities. Hence Clark concludes that the better chance for the patient's recovery lies in the direction indicated. His arguments, therefore, in support of this postural method of drainage are, first, stagnating fluids are prevented from collecting in dead spaces in the pelvis; second, infectious organisms are quickly carried into normal areas of the body, where they are destroyed before they can increase in numbers; and, third, toxic substances elaborated by the organisms are diluted and prevented from expending their irritant effects on a wounded area.

The method which he commends is briefly as follows: At the conclusion of an operation all fluids and *débris* should be removed as far as possible by sponges, after which the abdominal cavity should be irrigated thoroughly with normal salt solution until the fluid comes away clear. When the irrigation fluid is all sponged out, 500 to 1000 cubic centimetres of salt solution should be poured into the peritoneal cavity, so that when the patient is elevated after she is returned to the ward the artificial current may be started at once towards the diaphragm, thus supplementing the normal current. After the introduction of the salt solution the omentum and intestines should be replaced in an orderly way and the abdomen closed. As soon as the patient is returned to her room the foot of the bed should be elevated about twenty degrees, which gives sufficient inclination of the posterior pelvic wall to assist the flow towards the general peritoneal cavity. This posture should be maintained for twenty-four to thirty-six hours, after which the bed may be lowered. Leaving the salt solution in the abdominal cavity is not a novel procedure, as it has been done in a large number of cases during the last two years in the gynæcological department, and other abdominal surgeons have used it with good effect.

This postural method of drainage is offered as a prophylactic measure against post-operative peritonitis, but *not as a curative measure after the peritonitis is established*. It should therefore not be employed when an operation is performed for the relief of purulent peritonitis or for inflammatory conditions associated with general peritonitis, as for instance some cases of appendicitis.

From the experiments of Waterhouse in which he proved the danger of infection in cats suffering with ascites on account of the defective absorptive mechanism, it would also appear unsafe to adopt the postural method in cases when this complication is coincident with the surgical affection. Pawlowsky has shown, in his excellent experimental investigations, that the

lymph-channels leading from the peritoneal cavity are choked with the infectious bacteria and inflammatory products in purulent peritonitis, and therefore advises free drainage through an abdominal incision.

In these cases it is evident that the multiplication and virulence of the organism have been too great for the phagocytes to overcome successfully, and that the only method of treating this condition is to remove as much pus as possible by irrigation with salt solution or by mopping the peritoneal surfaces with sponges wet with salt solution, as suggested by Finney, and then to insert a very free drain.

Only one of the cases reported in this paper showed organisms on culture. The presence of pyogenic organisms is not a contraindication to the employment of the postural method, because all investigations have proved conclusively that the peritoneum can overcome the invasion of large numbers of the most virulent organisms. Cases of pelvic inflammatory diseases, however, rarely come to operation while the organisms are yet active, as shown by Miller of the Johns Hopkins Hospital, Schauta, Menge, and others.

SUBMAMMARY SALINE INFUSIONS AS A THERAPEUTIC AGENT IN SEPTICÆMIA.

Recent investigations by Bosc and Claisse show that saline infusions are of marked benefit in septic cases. Observations, although somewhat meagre, point decidedly to the value of this method of treatment. A patient treated in the gynæcological wards in December, 1895, was apparently carried over the worst stage of a very severe puerperal infection by this means. Following the injection of a litre of saline solution under the breasts, the symptoms of profound sepsis subsided, and the patient recovered from an almost moribund state.

CASES IN WHICH DRAINAGE MAY BE INDICATED.

From a critical review of all classes of drained cases Clark

reduces the conditions in which drainage may be indicated to the following:

(1) *In appendicitis* when the peritoneum and tissues adjacent to the appendix are infiltrated with inflammatory products, preventing a secure closure of the stump after amputation of the appendix, and when the appendix has ruptured and either caused a localized abscess or a general peritonitis. If the operation can be performed early, when the inflammatory process is confined to the dependent portion of the appendix, *never drain*. The objections to drainage in these cases are probably not as great as when the gauze is introduced deeply into the pelvis, because the site of the operation is more superficial and therefore the possibility of effecting true drainage is better; but if a clean operation has been performed the drain is superfluous. A distinct objection to drainage in the appendical area is the liability of post-operative hernia occurring in its track.

(2) *Localized Collections of Pus in the Pelvis*.—In these cases either the abscess sac should be cleanly enucleated and the abdomen closed without drainage, or it should not be opened through the abdomen if it is too adherent to be enucleated safely. These cases are, *par excellence*, the ones for incision and drainage through the vagina, as shown by sixty-five cases thus treated in the Johns Hopkins Hospital with only two deaths.

Before this method of treatment was adopted by Dr. Kelly the mortality following the enucleation of these structures was very much greater. When these abscesses are evacuated from below the operation is wholly extraperitoneal, and the peritoneum is therefore not involved.

It is a very hazardous procedure to open these cavities intraperitoneally and drain from above, both because of the dangers of a fatal peritonitis and, if this is escaped, the certainty of prolonged suppuration and slow granulation of the sac. In some cases these abscesses never heal when treated in this way. A large ectopic pregnancy sac, which is securely walled off from

the general peritoneal cavity, may also be treated by vaginal drainage with the best results.

(3) *Suture of Intestine*.—A drain should only be employed when there is doubt as to the integrity of the suturing.

(4) *Excision of Fistulous Tracts leading from the Intestines to the Abdominal Wall*.—In these cases it is safer to pack a gauze drain down to the sutured areas in the intestine, for they are especially prone to break down and re-establish the track. In case this accident occurs the gauze forms a safe avenue for the escape of fluids and gas, and the subsequent contraction of the drainage track may close the intestinal fistula, as demonstrated in two cases which have been treated in this way in the Johns Hopkins Hospital.

(5) *Purulent Peritonitis*.—Pawlowsky has shown that the usual avenues for the absorption of fluids from the abdominal cavity are closed in purulent peritonitis, consequently we can only endeavor to supplement them by thorough irrigation of the abdominal cavity and free drainage. In order that the drain shall serve the best purpose it should be a large one, and, if necessary, in addition to a central opening in the abdomen, lateral openings in the flanks, as advocated by Dr. Kelly, may be made. The prognosis in these cases is always grave, but this method of treatment gives the patient the best chance of recovery.

Finney, of the Johns Hopkins Hospital, has lately reported five cases of purulent peritonitis treated successfully by thoroughly mopping the peritoneal coat of the intestine, one loop after another, until cleansed of pus and fibrinous exudate.

From these results it now appears possible that even purulent peritonitis may be eliminated from the list of conditions in which drainage is indicated.

Although it is desirable to close our abdominal wounds without drainage whenever possible, still may not Dr. Clark have over-estimated the dangers arising from the use of drainage? The chief of these dangers, we are told, is the infection of the drain and

the drained cavity. We are, moreover, told that after a few hours the drain becomes ineffective because the peritoneal cavity becomes shut off from the drain-cavity, so that drainage from within outward is no longer possible. These have become well accepted facts; and it is also accepted that this barrier of adhesions prevents infection from without inward as well, and that the danger of such infection is very slight indeed. It is during just these first few hours that the abdominal drainage is needed. That is the time when irritated areas are becoming walled off by their own natural efforts, and when it is most important that the products of these areas be conducted away.

The drain having served its purpose, its further usefulness consists in draining the cavity which it has made for itself; and in the treatment of this cavity, guided by the general principles of surgery, the surgeon need anticipate no difficulty.

JAMES P. WARBASSE.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. **Bacterium Therapy of Malignant Tumors.** BY DR. WALTHER PETERSEN (Heidelberg). The author reports thirty-eight cases of malignant tumor treated by toxins, antitoxines, or serums. In no case was a carcinomatous tumor improved. With sarcomata, on the other hand, the progress of the disease seemed to be slower when treated with one of the various agents, and in two cases there was a decided decrease in size of the tumor. The final result was the same in every case.

The author believes that the toxine of the streptococcus exerts no specific action upon malignant growths. There are several toxic agents which profoundly influence the general system, any one of which may exert a beneficial action on sarcomatous tumors.

Coley's serum, which consists of the toxins from a mixed culture of the streptococcus and bacillus prodigiosus, depends for its action almost entirely upon the toxine of the prodigiosus, the streptococcus produces very little toxine in a mixed culture.

The results of the toxine treatment of cancer have been to prove that further experimentation should be limited to inoperable cases and to the prevention of recurrence after operation.—*Beiträge zur klinische Chirurgie*, 1896, Band XVII, Heft 2, p. 341.

GEORGE R. WHITE (New York).

HEAD AND NECK.

II. **The Present Status of Partial and Total Extirpation of the Larynx for Malignant Tumors.** BY DR. K. CZWIKLITZER (Breslau). Thirteen cases of laryngectomy are reported from the

clinic of Professor Mikulicz, including nine cases of partial resection, two cases of resection of half of the larynx, and two cases of total extirpation. Including a case done six weeks before the report was made five of the thirteen cases have lived. These five are all cases of partial resection and have lived six weeks, one and a half years, two and a half years, five years, and eight and a half years respectively.

As compared with the earlier statistics there is some improvement in recent years, due to two causes,—namely, better selection of cases, and improvement in operative technique.

There is now a larger proportion of partial resections showing that the operation is done earlier than formerly, and a falling off in the number of cases of total extirpation owing to the almost constant fatal result following that operation.

The chief improvement in the technique consists in closing off the buccal cavity in cases of total extirpation by suturing the anterior wall of the œsophagus to the base of the epiglottis, thus avoiding sepsis from the secretions of the mouth.

Preliminary tracheotomy several days or weeks before the operation, to get the patient accustomed to the tube, is now given up as the cicatrix about the tube is detrimental in several ways, and is liable to become invaded by the malignant growth. Tracheotomy is done at the time of the operation, using Trendelenburg's or Hahn's tube. The former, however, is liable to be punctured during the operation with serious results.

Rose's position, with the head dependent, has not given satisfactory results either during or after the operation.

The functional result depends largely upon the amount of tissue removed. In cases with two-thirds or more of the larynx remaining, a fairly normal function may be expected if the tracheotomy-tube is removed early and care taken to prevent cicatricial stenosis. Five of Mikulicz's thirteen cases were able to speak audibly, but with a harsh, rough voice.

The artificial larynx seems to be falling into disuse, neither

Mikulicz nor Billroth has used it. For cases of partial resection it is best to have the patients learn to speak without the use of apparatus, and for cases of total extirpation the mouth and trachea may be connected by a so-called chimney-tube,—a plain glass tube, convex anteriorly, with a fenestrum in front. Reference is made to a case of Solis-Cohen, who learned to speak audibly, although there was no connection between the mouth and trachea. In conclusion, he makes a strong plea for early diagnosis and operation.—*Beiträge zur klinische Chirurgie*, 1896, Band XVIII, Heft 2, p. 447.

GEORGE R. WHITE (New York).

CHEST AND ABDOMEN.

I. In what Directions may Cancer of the Mamma Spread? By DR. G. GEROTA (Berlin). (1) Mammary cancer early infects the lymphatics and glands in the axilla.

(2) At the same time, or a little later, it is by no means uncommon to find one or two cancerous nodules immediately below and external to the mamma. This is due to the fact that some very small lymphatics, originating in the breast, pass into the small lymph-glands in this location. These vessels and glands are so small that in the normal subject they are found with difficulty, even when a satisfactory injection has been made.

(3) The subclavian and cervical lymphatics, being closely connected to the axillary, are very prone to become cancerous.

(4) Mammary cancer involves the skin in about 65 to 70 per cent. of the cases. This skin involvement is by no means always confined to that side of the thorax on which the primary lesion originated; it frequently crosses the middle line of the body towards the other breast. It is a mistake to assume that the lymphatics are divided into two distinct systems at the middle line of the body. Gerota has been able to inject completely the lymphatics of both right and left breasts in a seven-months' foetus, from a single point in the right breast, and was unable to

note the slightest difference in the calibre, distribution, or numbers of the capillaries, whether they were situated in the middle line or laterally.

(5) When cancer has progressed to a certain point the mamma is no longer movable on the pectoralis major muscle. This means that the disease has spread to the muscle. The perforating branches of the internal mammary artery are accompanied by lymphatics which can be injected, but apparently there are many other lymph capillaries, not demonstrable by injection, which arise from the deep surface of the mamma and perforate the pectoralis major, thus explaining the recurrence of cancer after operations in which that muscle has not been removed. Involvement of the retrosternal glands is by the same route.

(6) Extension of the disease may take place downward through lymphatic channels. This was well shown in the cadaver of a woman received in the Berlin Anatomical Institute. There was a large scar resulting from the extirpation of the right breast. In this scar there was a recurrent cancer which involved all the tissues down to the ribs. The left breast and axilla were also diseased. Lastly, the right inguinal glands were larger than the left. On injection of the lymphatics there was found a single lymph-vessel arising from beside the right mamma, and running downward and inward to a point between the sternal and costal heads of the rectus abdominalis muscle. From this point, in its downward course, it accompanied the superior and then the deep epigastric arteries, until it entered a lymph-gland situated immediately below the semilunar fold of Douglas. This gland was cancerous on the left side, while no lymphatic could be found taking a course similar to the above, yet three small glands were discovered not far from the inferior epigastric artery at the level of Douglas's line. The right inguinal glands were found to be cancerous.

Gerota suggests the following explanation for the peculiar lymph circulation present on the right side of this case. As a re-

sult of the operation the normal circulation of the blood and lymph on the right thorax was modified; all the perforating branches of the internal mammary artery, as well as the arteries of the thorax, had been divided or tied. As a result of this both blood and lymph had to seek new channels. The new lymph channels were,—

(1) To the left side through the lymphatics mentioned previously.

(2) Downward in a vessel accompanying the deep epigastric artery.

(3) It is possible that lymph from the breast may find its way through cutaneous vessels to the subcutaneous lymphatics at the umbilical region and hence downward towards the inguinal region.—*Archiv für klinische Chirurgie*, Band LIV, S. 280.

II. Resection of the Liver. By DR. M. AUVRAY (Paris). Auvray recommends applying to the liver around the portion to be removed a series of interlocked ligatures of thick silk. To apply the ligatures he makes use of a blunt pedicle needle with a long curve to it. Each individual ligature, after being crossed with its fellow to the right and left, is slowly and steadily tied with such firmness that the liver parenchyma is cut, but the vessels are retained undivided in the loop. When the whole series of ligatures are tied then the vessels are to be severed by the knife or scissors. It is of importance while transfixing the liver to use little force, and when any slight obstacle to the passage of the instrument is encountered, to manipulate the needle from side to side, and so gently guide it past the obstruction. Such obstructions are usually large vessels and any force used might cause them to be perforated. The points of transfixion ought to be about one centimetre apart. In his experiments Auvray has never met with any difficulty, and has never found that the wound in the liver bled in the slightest degree, either primarily or secondarily.

Auvray's experiments were made on living dogs and on re-

cent human cadavers. Seven dogs were operated upon. Of these two died from chloroform as the operation was being finished. The rest recovered rapidly and were killed for examination at periods of from two to thirty-one days after the operation. In all the cases which survived the anæsthetization adhesions were found between the wound in the liver and neighboring organs. These adhesions were formed rapidly, since in a dog sacrificed forty-eight hours after the operation they existed between the omentum and the anterior surface of the stomach. The wounds in the liver healed rapidly. In an animal which was sacrificed after thirty-one days the portion of liver removed had been regenerated, thus confirming anew the observation of Ponfick and others.

Experiments made on recent human cadavers were equally satisfactory. After the ligatures were applied and the portion of liver supposed to be the seat of tumor was removed, injection of the liver with colored fluid did not show any leak in the wound. To test the firmness and safety of the ligatures traction was made upon them with the result that the vessels were partially pulled out from the parenchyma behind the ligatures, but that these latter did not slip.

Auvray suggests that it might be well in excising portions of the liver to make the wound wedge-shaped so that, hæmostasis having been obtained by ligatures, the wound might be made less extensive by means of sutures passed from side to side.—*Revue de Chirurgie*, April, 1897.

J. F. BINNIE (Kansas City, Mo.).

FEMALE GENITO-URINARY ORGANS.

I. The Principles of Vaginal Hysterectomy for Carcinoma. By DR. R. OLSHAUSEN (Berlin). The operation is so absolutely new that its history only dates back to the beginning of the century. The first authentic report of such an operation for an undoubted carcinoma emanates from Sauter, in 1822, the pa-

tient surviving four months. Somewhat later Recamier performed the operation with previous ligature of the uterine arteries by transfixion.

In 1878, A. W. Freund brought out his abdominal operation, evolved by careful study and repetition on the cadaver. It received instant acknowledgment and was resorted to extensively, but in the next two years its dangerous mortality and almost constant recurrences became evident.

In the same year, 1878, Czerny resuscitated the Sauter-Recamier operation. In his first case, a cancer of the cervix, he turned out the uterus through an incision in the anterior vaginal wall. The patient recovered with a vesico-vaginal fistula, succumbing four months later with a peritoneal abscess. This procedure was followed by Schede and Billroth, in 1879, and soon after by numerous others.

The principles of the operation are, selection of the cases and the methods of examination, preparation of the patient for operation, the technique of the operation proper, and finally the after-treatment.

The selection of cases is of the greatest importance. We should abide by the rule, to abstain from operation whenever the carcinoma has invaded the broad ligaments or the glands. For the limits of the operation are generally carried too far, and operations are performed when the chances of a radical cure are practically *nil*. Although one may intend to abide by the formula not to operate where the growth has gone beyond the limits of the uterus and the vagina, the presence of these conditions being occasionally recognized, such cases undergo operations with a frequency varying according to the individual operator.

A rightly conducted examination is absolutely essential in making a diagnosis of the extent of the disease. The earlier rule that it must be possible to pull the cervix down to the vulva must be given up, the operation is perfectly feasible oftentimes when such mobility is absent. Rectal palpation allows of recognition

of the posterior aspect of the broad ligaments and, what is of the greatest importance, of the condition of the gland situated at the bifurcation of the common iliac, as these are usually involved at an early period of the disease.

The practice nowadays adopted is to prepare the patient for operation immediately prior to it and not some days previously, as in former times. After disinfection of the vagina, all the soft part of the cancer is removed with the curette and the Paquelin cautery applied to the entire ulcerating surface. The vagina is again disinfected and all instruments previously employed are discarded. The result of such curetting often exposes conditions which determine the inoperable nature of a case; under such conditions it is better to cut the operation short.

Briefly described, the steps of the operation are, circular incision of the cervix through the entire thickness of the vaginal wall, and blunt dissection from the bladder beginning laterally and proceeding towards the middle line. Complete separation of the bladder pushing it up to the peritoneal reduplication is the essential and only safeguard against wounding of the ureters. Douglas's cul-de-sac is now opened and the lowest ligature applied on either side. If the hæmostasis is not absolute, then the uterine artery has not been secured, and a second ligature is placed beyond the first before proceeding further on that side. All the ligatures are placed with the curved Deschamp's needle from Douglas's space towards the front. The placing of the ligatures is completed first on the side which offers the least suspicion of disease, thus favoring placing ligature farther outward, if necessary, on the other side. This last procedure is one of the advantages possessed by the ligatures over clamps. Six to eight ligatures are placed on each side. After division of the ligaments the cut surfaces are carefully examined and the operation completed by sewing the peritoneum and the vaginal vault by one continuous catgut suture. The same suture serves to anchor the stumps of the broad ligament previously well drawn down into the

vagina, the tubes and ligaments having been divided fairly close to the uterus, unless dealing with cancer of the body of the uterus. In the latter case the ligaments are secured as far out as possible and the ovaries are also removed.

There is only one principle of after-treatment,—refraining from any interference. The tampon is removed on the second day, and nothing more is done till the end of the third week, when examination with the speculum is made.

Other methods are not considered; the clamp method is rejected as it does not allow of closure of the peritoneum, which is held necessary to guard against secondary infection from the vagina. The sacral and parasacral methods are not employed as the vaginal route affords ample space for all justifiable operative cases.

The primary results of vaginal hysterectomy compare favorably with any others. One hundred and thirty-nine cases since April, 1894, with three deaths. The last 100 cases have not contained a single fatal result.

Further time will have to elapse before any deductions can be drawn as to the results of the operations of the last few years. If personal impressions are not misleading recurrences occur much more rarely than formerly, and the opinion is justified that cancer of no other organ offers such a bright prospect of cure by operation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

C. L. GIBSON (New York).

CORRESPONDENCE.

A CASE OF OBSTRUCTION OF CYSTIC DUCT ACCOMPANIED BY ICTERUS.

IN a very exhaustive and instructive article on the surgical treatment of stones in the common bile-duct (*American Journal of the Medical Sciences*, February and March, 1896), Dr. Christian Fenger endeavors to establish the differential diagnosis between obstruction of the cystic duct and obstruction of the common duct. In the course of his remarks on that point he says, "Is icterus present in cholelithiasis outside the common and hepatic ducts? In stones of the gall-bladder, with or without inflammation, it is not present. If the stone enter the dilated cystic duct, it may, by its size or possibly by pericystic inflammation, cause compression of the hepatic duct and icterus. This would explain those cases of stone in the gall-bladder in which icterus is present, and removal of the stones by cholecystotomy effects a cure. In some cases the cystic duct might be large enough to permit the stones to float down into the common duct and back into the gall-bladder. Remittent icterus would, of course, be expected in such cases."

Now as choledochotomy is becoming an established operation, it is of vital importance to differentiate between obstruction of the common and cystic ducts; therefore any case that adds to our knowledge of the symptomatology of cholelithiasis should be reported.

The following case of obstruction of the cystic duct is unique in two particulars: (1) A distinct icterus which could not be explained by any hypothesis advanced by Dr. Fenger; (2) all the

gall-stones found in the gall-bladder and those obstructing the cystic duct were of small size. This is at variance with nearly all authorities on the subject.

The case in question, briefly stated, is as follows: Woman, forty years old, with an unimportant family and personal history. Her first attack of gall-stone colic occurred at Thanksgiving time, 1895. It was unaccompanied by icterus or putty-colored stools. She was in bed a week and required opiates to relieve the pain. She had but indifferent health from that time until Christmas week, when she was seized with a second attack of colic, requiring morphine hypodermically for relief.

I saw her, in consultation with her physician, on January 3, 1896. From the history, character, and location of the pain, and the tenderness in the region of the gall-bladder we reached a diagnosis of cholelithiasis. The absence of icterus and the presence of bile in the stools pointed to the trouble being in the cystic duct, but as no tumor was present it was supposed that the cystic duct was not completely obstructed. The possibility of an operation was explained to the husband, but medicines were to be tried first,—glycerin, chloroform, and sweet oil.

She did not do well, at first, under this treatment, but at the end of two weeks it was supposed that she was better. During the last week of January she grew rapidly worse, with symptoms that indicated a gradual obstruction of the bowels. I saw her again on February 1. There was now marked emaciation, an anxious expression to countenance, muddy skin, *a marked yellow tinge to sclerotics*, a feeble pulse of 120, and a temperature of 100° F. Examination of abdomen showed a fulness on right side, but the walls were so tense that palpation could not outline any tumor, though there was some dulness on percussion, continuous with liver dulness to the crest of the ilium and extending beyond the median line.

It was decided to open the abdomen by a median incision, as it was not clear what was causing the symptoms of obstruction.

Accordingly the patient was prepared for an abdominal section. When the patient was well under the anæsthetic, it was readily seen that we had a tumor on the right side; still it was held advisable to make the median incision to facilitate the search for an obstructing gall-stone in the bowels, if the tumor in itself would not account for the obstruction.

With the assistance of my colleague, Dr. Wilson, and the patient's physician, Dr. Aird, the abdomen was opened by a three-inch median incision, the centre of the incision corresponding to the navel. The tumor presented in the incision. A hypodermic needle showed its contents to be healthy bile. The patient was turned upon the side and the sac freely incised. An enormous amount of bile was discharged, and as the bottom of the sac was reached ropy mucus and small gall-stones of uniform size,—being about as large as a buck-shot. The sac was stitched to the upper angle of the wound, which had been extended upward one inch, and thoroughly washed out with sterilized water. An effort was now made to clear the cystic duct, but was abandoned on account of the friable condition of the walls of the sac; so we contented ourselves with simply carrying a very large drainage-tube down to the cystic duct, packing some gauze about it, and closing the abdominal wound, leaving for a subsequent operation the freeing of the cystic duct. The size of the gall-bladder was a satisfactory explanation to the symptoms of obstruction of the bowels.

During the following three days a little bile was continuously discharged through the drainage-tube and occasionally a small gall-stone. On the fourth day, while Dr. Aird was dressing the case, two more gall-stones were discharged, followed immediately by a copious flow of bile, showing the cystic duct freely open.

There was no further trouble with the case. The tube was removed at the end of two weeks, but the patient was not allowed upon her feet until the fourth week, by which time the sinus had permanently closed.

The patient has had excellent health since the operation.

The point of interest in the case, and the one that has any special clinical interest, was the existence of a well-marked jaundiced condition without obstruction of either the hepatic or common ducts. If the common duct had been obstructed the icterus would have been more intense and of an intermittent type, and the stools, at times at least, would have been clay-colored. It is possible that a pericyclic inflammation might have involved a branch of the hepatic duct, and thus have accounted for the icterus and a small amount of bile pigment found in the urine, but it would not account for the bile of normal appearance filling this enormously distended gall-bladder. An easier and, it seemed to me, a more rational explanation would be that one of the small calculi was acting as a ball-valve at the entrance of the cystic duct into the gall-bladder,—that is, this calculus would allow some bile to pass down the cystic duct into the gall-bladder, but little or none to return; hence the icterus and the bile of normal appearance in the gall-bladder.

Fenger proved by actual experiment upon the cadaver that a choledochus stone produced its symptoms of obstruction, not by totally occluding the common duct, but by acting as a ball-valve at the point of entrance of the common duct into the duodenum; and, further, he demonstrated that with equal facility a floating choledochus stone could prevent the entrance of bile into the gall-bladder by acting as a ball-valve at the proximal end of the cystic duct. This being proven, why is it not possible for a calculus at the distal extremity of the cystic duct to act in the same way in regard to the bile already in the gall-bladder? I will admit that I was at a loss to explain all the symptoms of the case, and to account for conditions found at the operation until I read Dr. Fenger's paper, when the above explanation readily suggested itself.

The case may be very exceptional on this one point, as I do not recall any case reported in recent years where the contents of

a gall-bladder of this size consisted of bile; but if mention was made of its contents, it has always been mucus or pus resulting from inflammation in the lining membrane of the gall-bladder or infection from the bowel.

However, the anatomical conditions existing at the proximal end of the cystic duct are not so dissimilar to those at the distal end as to preclude the application of the theory to one end as well as to the other.

I have nothing to offer in explanation of the fact that all the gall-stones were of small size. It would be natural to suppose that calculi of the size we found at the operation would be able to pass through the cystic duct, and from thence to the duodenum, with but little trouble, but they did not do so; so here we have to deal, not with a theory but a condition demonstrated to exist, in this one case at least.

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A PLEA FOR A REVISED NOMENCLATURE OF
OPERATIONS UPON THE ALIMEN-
TARY CANAL.

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IN no branch of surgery more than in that which concerns itself with the alimentary canal has there arisen such an exceptional combination of circumstances that was bound sooner or later to lead to confusion and misunderstanding in the terms made use of. The circumstances which have led to these difficulties are easy to explain. We have, in the first place, certain sections, as the œsophagus, stomach, intestines, and rectum, which have at all times received more or less separate attention by surgeons, who, with somewhat exclusive considerations, have employed certain terms which appear appropriate for the end in view, but used without due regard to the possibility of similar terms being in vogue for other sections of the canal, with, however, differences of significance. Another reason, and a very natural one, arises from the extraordinary development, which has taken place within the last fifteen years, of the surgery of this region. It was thus bound to happen that a term would be applied to a particular operation apparently quite suitable at the time, but proving inadequate and inappropriate when operation became more numerous, and differences often slight, but still important, distinguished the old from the new. Still another reason for this confusion, which it is impossible to ignore, and that is the almost classical associations which have grown up around a particular operation and the name originally applied

to it. A difficulty of no small moment is further added in this respect that most of the older terms were in use or came to be used in the earlier years of many of our now most experienced and most distinguished surgeons. A natural conservatism would, therefore, exist in the mind of these surgeons against changing a now almost classical term for a more suitable one, however much the newer operation might indicate the advisability of doing so. Time-honored reasons are cogent ones against making changes, and merit alike respect and all due consideration. In equal estimation and regard should be held the reluctance of those with whom custom has bred familiarity. But what, it may be justly asked, of the future generations of rising surgeons upon whom custom has but little hold, especially when viewed in relation to the innumerable and steadily increasing difficulties with which they see themselves confronted? What also of the poor, hard-worked student of the day, whose mind is already taxed to the utmost, and who finds when he enters upon the domain of the surgery of the alimentary canal a series of terms as bewildering in number as they are confusing in meaning? Fresh from his school or college, he looks at the etymology of the long words he meets with, hoping that thereby he may get some clue as to their true significance. His good hopes, however, are soon dispersed, for he finds terms etymologically alike yet signifying different operations; and operations quite similar, but designated by different names.

At the commencement of the chapter upon the operations of the intestine, in my work upon the "Surgery of the Alimentary Canal" (Chapter LXIV, p. 518), I have striven to point out how great is the need for some reform in the nomenclature of these operations; and I have further ventured to suggest certain alterations and limitations in the usage of terms which, if promulgated by writers and teachers, would very materially simplify the present cumbersomeness of modern terminology.

Without a complete revision—which would for practical purposes be needlessly too radical—it is not possible to devise

a set of terms that would be etymologically correct. The object I have aimed at is to be sure that a certain operation performed upon the œsophagus under a particular name, that name should, with merely the regional distinction, convey to the student a clear conception of a like operation performed either on the stomach, bowel, or rectum.

To make clearer what I have above stated I will illustrate by reference to certain operations, both the confusion associated with the present system of nomenclature and the advantages attached to some alteration in it.

Take first the term œsophagotomy. Etymologically the word signifies a cut into the œsophagus. The student in this instance easily grasps the general nature of the operation. He learns, therefore, that the operation consists in opening the canal for the removal of foreign bodies, for the passage of bougies, exploratory purposes, etc., and its closure at the same operation. He has at the same time acquired an approximate knowledge of the operations of gastrotomy and duodenotomy. As, however, the canal is descended, he meets with the terms, enterotomy, jejunotomy, and ileotomy, when confusion commences, and, by the time he arrives at colotomy he becomes worse than confounded, for he encounters a term which has several synonymes, none of which help, but all tend to further confuse. Leaving, for the present, out of consideration the ambiguity connected with the “-otomies” of the small intestine, the student is now told that the term colotomy signifies an opening in the large intestine, made with the object of giving free escape to the contents of an obstructed bowel; that it is sometimes spoken of as an artificial anus, a fœcal fistula, or a colostomy.

In order to fully appreciate the position I am striving to take up, I must beg again of the reader to bear in mind that I am assuming the position of a student, and that to rightly understand the situation he must do the same, freeing himself, for the time being, of that knowledge which places his own conception of things in a clearer light than it is possible for the uninitiated to have.

If, now, the student has been correctly taught what he is to understand by an artificial anus, a fæcal fistula, and a colostomy, he will probably give the following definitions. He will say that an artificial anus is an opening made into the bowel with the object of diverting *all* the contents of the same through the newly made orifice; while a fæcal fistula, when produced by operation, is the diversion of only a *portion* of the bowel contents through the opening. A colostomy he will state is the name of an operation performed for relieving an obstructed intestine, and may fulfil the functions of an artificial anus or a fæcal fistula, according to the completeness of the obstruction below the seat of the artificial opening. The term colostomy may puzzle in its etymological significance when compared with the correct application of the affix in the operation of œsophagostomy, gastrostomy, or duodenostomy. The affix “-stomy,” literally translated, is a mouth (*στομα*), and naturally suggests the function connected with that aperture. Its usage, therefore, for an opening to admit of the exit and not the entrance of material is somewhat a misnomer. So far, however, as the nature of the operation is concerned, its more recent applications have still maintained a similitude to the original, so that whatever section of the canal is associated with the affix, whether it be the œsophagus, the stomach, the duodenum, the intestines (enterostomy), comprising the jejunum (jejunostomy) and the ileum (ileostomy), the colon, or the sigmoid flexure (sigmoidostomy), it is sufficiently well understood what is the nature of the operation performed.

Let us now take another word. The term enterorrhaphy etymologically signifies suture of the intestine (*ῥαφή*, “suture”), but in usage it has been specialized to mean suture of the *cut edges* of the bowel. The unfortunate student now comes across the more recently introduced term of gastrorrhaphy, and is quite wrong if he assigns to it a meaning similar to that he has learned in connection with the intestine, for here the term has assumed its correct meaning, and signifies an operation where the suturing together of a fold in a

dilated stomach is the essential feature. With the knowledge of these two different operations he now comes across the operation of proctorrhaphy, and is fairly puzzled to know whether it is an operation which resembles enterorrhaphy or one like gastrorrhaphy. The term is used in the same sense as for the intestine, for the union of the *cut edges* of the rectum; but Lang has performed an operation for prolapse of the rectum, narrowing the dilated canal of the gut by inserting two rows of buried sutures, which have the effect of doubling in a longitudinal fold. Thus this operation is precisely analogous to gastrorrhaphy, and should be designated by the same affix. Since, at the present time, the cut edges of the bowel are united in so many different ways, and by such various methods, how much simpler to speak of "union by suture," "union by button," "union by plates," etc., than to confuse by employing a word which could be well appropriated for a specific operation.

I might multiply instances of the confusion, through carelessness often, which exists in the employment of other terms; but I feel I have said enough to show that there is some reason for striving to lessen the ever-increasing technical vocabulary of the already overburdened student; and for endeavoring to place on a sounder and more rational basis the nomenclature of operations upon a region which has come to play such an all-important part in the field of surgery.

It is probably very often not alone the student who is puzzled to know what was the precise nature of an operation performed when designated by a certain name, but the experienced surgeon. I have frequently had difficulty in ascertaining, when an operator has stated that he has performed such and such an operation, what it was he actually did perform, because of the terms used admitting of more than one interpretation.

I shall endeavor to frame a scheme which, I think, will help to systematize these various operations, but which I quite feel cannot overcome all the difficulties of the case. If, however, it only forms a basis for further improvement, my object will not have been attempted in vain.

It can be easily understood that the determining feature of a name lies in the affix, and that if a true similarity is to exist between the potentiality of one name and that of another, the meaning of the affix must be constantly adhered to in all its applications. Further, it may be stated, that there is no limit to the terms which might be coined when a particular region is meant to be associated with the operation, for all that it is necessary to do is to prefix the name of the region to the required affix, and at once the correct name is obtained; thus, supposing there existed such a condition as an abnormally dilated duodenum which needed reducing in calibre by suture, then the correct term for the operation would be duodenorrhaphy.

Commencing with the better-known and more commonly met with affix “-tomy” we shall have the following series of terms all signifying the same operation, differentiated only by the region—borne by the prefix—upon which the operation is performed. For these operations and those which are to follow, distinguished by other affixes, the scheme may now be consulted.

PROPOSED REVISED NOMENCLATURE FOR OPERATIONS UPON THE
ŒSOPHAGUS, STOMACH, SMALL AND LARGE INTESTINE,
AND RECTUM.

I. The affix tomy (τέμνω, “to cut”).

Operations which consist in opening some part of the alimentary tract for exploratory and other purposes, and its *closure at the same operation*.

OPERATIONS:

Œsophagotomy.	Cæcotomy.
Gastrotomy.	Colotomy.
Duodenotomy.	Sigmoidotomy.
Enterotomy. { Jejunotomy.	Proctotomy.
{ Ileotomy.	

II. The affix stomy (στόμα, “mouth”).

A. Operations which consist in stitching some portion of the alimentary tract to the parietes and establishing a temporary or permanent opening.

OPERATIONS:

Œsophagostomy.	Colostomy.
Gastrostomy.	Sigmoidostomy.
Duodenostomy.	
Enterostomy. { Jejunostomy.	
{ Ileostomy.	

B. Operations which consist in establishing permanent openings between one segment of the canal and another. (In these compound words the proximal segment where two different regions are united should be named first.)

OPERATIONS :

Gastro-enterostomy.	{	Gastro-duodenostomy.
		Gastro-jejunostomy.
		Gastro-ileostomy.
		Gastro-colostomy.

Entero-enterostomy (entero-anastomosis).	{	Jejuno-jejunostomy.
		Jejuno-ileostomy.
		Ileo-ileostomy.

Ileo- (or colo-) proctostomy.

III. The affix ectomy (*εξ τέρμινω* "to cut out").

Operations which consist in the removal of some part of the canal.

OPERATIONS :

Œsophagectomy.	Cæcectomy.
Gastrectomy.	Colectomy.
Pylorectomy.	Sigmoidectomy.
Duodenectomy.	Proctectomy.
Enterectomy.	{ Jejunectomy.
	{ Ileocectomy.

IV. After excision of any part of the canal its continuity may be established by—
End-to-end junction.

Lateral approximation. (The ends are closed and openings are made in the sides of the apposing coils.)

Lateral implantation. (One end is closed while the other is fixed into a lateral opening of the occluded portion.)

V. The methods by which the parts are secured together after incision or excision of any part of the tract are known mostly by the name of the materials used, or the authors devising them.

Union by (Czerny-Lembert, Halsted, Abbe, Maunsell, etc.) suture; union by Murphy's button; union by Senn's decalcified bone plates; union by Robson bone bobbins. etc.

VI. The affix rhaphy (*ράφή* "suture").

Operations which consist in lessening abnormally enlarged or dilated sections of the tract by suturing together folds of the visceral parietes.

OPERATIONS :

Gastrorrhaphy.	Colorrhaphy.	Proctorrhaphy.
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VII. The affix plasty (*πλάσσω* "to form").

Operations performed for stricture of some part of the canal, the stricture being divided in the long axis, while the parietal edges are united in the transverse axis, thus forming a wider channel.

OPERATIONS :

Pyloroplasty.	Enteroplasty.
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VIII. The affix pexy ($\pi\acute{\iota}\gamma\upsilon\nu\acute{\iota}\mu\iota$, $\pi\acute{\iota}\xi\omega$, "to fix").

Operations which consist in fixing by suture to the parietes some abnormally dilated or movable segment of the canal.

OPERATIONS :

Gastropexy.

Colopexy.

Proctopexy.

IX. Artificial anus.

Operations for diverting the whole contents of the intestine through an artificial opening; performed by bringing a loop of bowel outside the parietes or breaking the continuity of the canal by section, and fixing the proximal extremity to the parietal incision.

OPERATIONS :

Enteric anus.	Ascending colonic or	{ Right inguinal anus. Right lumbar anus.
Sigmoid anus.	Descending colonic or	
Sacral anus.	Transverse colonic anus.	{ Left inguinal anus. Left lumbar anus.

A PRELIMINARY COMPARISON OF METHODS
AND RESULTS IN OPERATIVE SURGERY AT
THE SEA-LEVEL (NEW YORK) AND
IN PLACES OF HIGH ALTI-
TUDE (DENVER).¹

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IN July, 1894, it was my fortune to go from the city of New York to Denver, Colorado, there to engage in the practice of surgery. It was found that the climatic conditions of the latter city differed materially from those obtaining in the East. Denver is one mile above sea-level. The mean barometric pressure is only 24.52 inches, so that the air pressure upon the body surface is reduced from fifteen pounds per square inch to twelve pounds. The climate is distinctly a cool one, and bracing. The air is not only thin but very dry, the mean relative humidity being but 50 per cent., and the absolute moisture 1.8 grains to the cubic foot. The sky is for the most part cloudless, there being but sixty days in the year when the sun does not shine. As a result the days have a brilliance which greatly increases the apparent warmth. The sunshine is very hot, even on days when the air itself is below freezing. This dry, clear air, with its increased diathermance, renders the winters mild and pleasant, and the great contrast between sun and shade gives relief and comfort in the summer. Radiation is rapid, and the nights are always cool.

¹ Read at the American Surgical Association, May, 1897.

The effect upon the new-comer, especially if he be an invalid, as so many of the residents are, is immediate and marked. The appetite is improved, the nutritive processes and tissue-metabolism are increased and accelerated. Respiration is deepened and for a time somewhat quickened. The nervous system especially feels the intoxication of the bright, dry, sunny air. The sense of energy and well-being is an immediate and continued pleasure.

The dry air rapidly absorbs the insensible perspiration, so that the skin is always dry and cool. This greater rapidity of evaporation and radiation is very marked, and as the climatic conditions differ so materially from those at the sea-coast, it may be surmised that these differences have something of an effect on the field of operative surgery. I have therefore endeavored to make a careful estimate of the value of these factors, but this estimate is only a preliminary one, for my observation has not as yet been sufficiently extensive. While a basis for comparison rests upon eleven years of daily surgical work in the hospitals and dispensaries of New York City, experience in the new region has been limited to 248 operative cases. These were cutting operations done under general anæsthesia, and do not include such procedures as the reduction of dislocations, the putting up of simple or compound fractures under ether or chloroform, the breaking up of joint adhesions and the like, or the minor operations done under local anæsthesia. Two hundred and eleven out of the 248 cases occurred in private consultation practice. The subjoined list¹ indicates the character of the operations.

The cases have the following regional distribution: Head and neck, 54; chest and trunk, 33; abdomen, 36; genito-urinary, 34; rectum and anus, 19; extremities, 72.

There have been eleven deaths; one after exploration of the brain (error in diagnosis, pre-existing suppurative meningitis), one after excision of the upper jaw for cancer (shock and exhaustion), one after excision of the tongue for carcinoma (acute bronchitis), one after operation in two stages for enormous hæmorrhagic cyst of spleen (septicæmia, death on

twentieth day), one after nephrectomy for suppurative kidney (exhaustion), two after operation for general suppurative peritonitis due to appendicitis, two of exhaustion after cystotomy (one perineal, one suprapubic) for cancer of bladder, one from exhaustion after gastrostomy, one from shock and exhaustion after choledolithotomy, and one after operation for general suppurative peritonitis due to abscess of mesentery. In all instances the history has been carefully kept and closely studied. It is felt, therefore, that while the future with its wider observation may lead to a modification of present views, these 248 cases permit of a preliminary comparison.

This comparison is by no means easy to formulate. It must be in large part a personal estimate. Many factors enter into such a broad problem, but the greatest difficulty arises, perhaps, in weighing the general condition of the patient before the operation and at the time of its performance. This estimate can only be made in a general way, and one must rely chiefly on the impressions left upon him as he works from day to day; this to be supplemented by perusal of the histories of the cases.

It would seem that the selection of cases in Denver requires some modification of the laws which one is accustomed to follow in the East. So, in general, it seems proper to refrain from operating on people who have recently come up from tide-water, unless the operation be one of emergency or of very brief duration. The rarefied atmosphere makes necessary increased action of the heart and lungs, and I have on several occasions seen marked embarrassment of the circulation in patients undergoing short operative procedure, they having presented no cardiac evidences before operation, and being people in whom no untoward symptoms would ordinarily be expected. Especially is operation to be avoided in new-comers who show evidence of cardiac weakness. As an illustration may be cited the case of a young gentleman of seventeen years, who, while on a hunting trip in the Rockies, sustained a severe laceration of the face, with compound fracture of the superior maxilla. Wound infection quickly

set in, and was fully developed when the patient arrived within reach of surgical aid. The action of the heart was somewhat irregular and intermittent, and this irregularity was markedly increased when slight anæsthetization was made for purpose of incision and wound cleansing. As half of the upper lip and the entire cheek were torn up a fairly extensive plastic operation was necessary, and for this it seemed best that the patient should return to his home in New York. There a two and one-half hours' operation was safely carried out.

Other cases have served as well to impress on me the provisional thought that patients with marked cardiac weakness had, in the absence of contraindication, best go to the sea-level for surgical operation. But while, as said, the newcomer may well postpone his operation for a few weeks, or return to the sea-level for it, I am inclined to believe that the converse holds good, and that those thoroughly acclimated bear surgical procedure better at the high altitude than at a lower. This is especially true of the pulmonary invalid, for those whose lungs are in any way impaired feel very markedly a depression and an embarrassment of respiration when they encounter increased humidity of the atmosphere, and I can but feel that this embarrassment must be much augmented by the administration of an anæsthetic. Paul Bert, Eggers, and others (Solly), have shown that the number of red blood-cells is materially increased in climates exemplified by Colorado, and I am inclined to think that pulmonary and certain other invalids in whom operation is to be done, but in whom delay is permissible, may perhaps be placed in better condition by a sojourn in a high, dry climate.

The preparation for operation and the organization itself should be the same wherever we are; it should be the very best possible, and no detail is to be overlooked which inures to accuracy in technique or to the rapidity with which a given procedure may be brought to a close. I am much in sympathy with the views set forth by Dr. Dudley P. Allen in the admirable paper read before this association, one year ago, on the relative temperature and moisture of the atmosphere

of the operating room, and had myself formulated the conclusions at which he arrives. I feel that the best atmosphere for the operating room is that in which the patient is wont to live,² and that hot, moist air is even more depressing to him than to the operator and by-standers. Especially is this important to those who live in a dry climate, where radiation and evaporation take place so rapidly. Care must be taken to keep the patient well wrapped in woollen garments, to preserve the body heat, and to augment it by appropriate measures in suitable instances. These rules apply with increased force to those who have pulmonary tuberculosis.

In the choice of the anæsthetic a study of my cases would seem to show that ether is, in general, more irritating to the mucous membrane of the respiratory tract than is the case in a moist climate. I have been particularly struck by the frequency of profuse bronchorrhœa during etherization, and find that in thirty-six cases it has been found necessary to change to chloroform during anæsthetization because of this. A rational cause for this would seem, perhaps, to lie in the fact that, as the lungs are normally accustomed to the inhalation of a comparatively dry gas, the moisture of the vapor of ether is particularly irritating. However this may be, I find that I am getting to place more and more reliance on chloroform, and while the rule to employ ether unless there be present some distinct indication for chloroform has not as yet been reversed, the field for the employment of chloroform has certainly been very much broadened in my practice. Of the 248 operations ether was employed in 159 and chloroform in 89. I attribute one of the deaths to the administration of ether. The case was that of a man of sixty-nine years, who was to undergo excision of the tongue. The heart being very weak, ether was thought the safer anæsthetic, but profuse bronchorrhœa necessitated a speedy change to chloroform. A rapidly developing bronchitis proved fatal on the fourth day. This bronchitis was not due to the entrance of blood to the trachea.

The relative amount of surgical shock shown in opera-

tive work at high altitudes is something regarding which difference of opinion obtains among the Denver surgeons. On first taking up work in this city I found a general impression to the effect that shock was more severe than at the sea-level, and that especially active means had to be employed to combat this. My observations do not tend to bear this out. Indeed, a careful scrutiny of my cases thus far has tended to show that under the same conditions, with assistance equally valuable and organization equally complete, patients who possess equal health and strength bear surgical operation rather better in Colorado than in New York. To put this in another and perhaps a plainer way: if two individuals, one of whom had lived for some years in Colorado while the other had lived in New York, and who were found to be in the same general condition, should be subjected to the same severe operative procedure under precisely similar conditions, I am inclined to think that the Colorado patient (operated in Colorado) would bear the operation rather the better.³ Resistance seems to be greater and reaction more rapid, and this again is especially true of the pulmonary invalid.

Hæmorrhage in general seems to be rather less profuse in the places of high altitude, particularly the oozing from the smallest vessels, and we may well surmise that atmospheric dryness would conduce to capillary hæmostasis. In areas which have for some time been the seat of chronic inflammation, however, the bleeding seems to be somewhat more troublesome than in the same class of people at the sea-level. I refer in this to those who have been residents of the high region for some years; but why this should be so I am unable to say, and it may be that I have encountered a series of exceptional cases, and that further experience may lead to a modification of this thought. I am inclined to think that bleeding is a little better borne by our high altitude people; it seems to me that saline infusion and similar measures are rather less frequently demanded. A reason for this may, perhaps, be found in the increased number of red blood-globules

and the markedly increased chest expansion which more than compensates for the thinness of our atmosphere.

So far as wound-healing is concerned, operations on aseptic fields doubtless yield the same results as do those done under similar precautions at the sea-level. I find that of my 248 operations, 101 were "clean" procedures, and of these ninety-seven, or 96 per cent., healed without suppuration, while in the remaining four cases the infection was but slight (in some part of the suture line), and did not retard convalescence. Cases in which infection has occurred are, I am inclined to think, rather more easy to manage than in moist climates, and, indeed, we may reasonably argue that the drier the atmosphere the less favorable must be the conditions for germ growth.⁴

There is one class of surgical cases which does better in such a climate as that of Colorado than in a lower, moist country, and that class embraces the tuberculous.

Not only am I inclined to the belief that these cases heal more rapidly and that the healing is more permanent, but I am impressed by the small proportion of pulmonary invalids who develop surgical tuberculosis. The percentage is, I feel certain, smaller than obtains under less favorable climatic conditions. Cases of genito-urinary tuberculosis, tuberculosis of the bladder, of the prostate, or of the testes make decidedly better progress than was made by similar cases which were seen in the East. Again, in cases of chest drainage for empyema the greater lung expansion must tend directly towards a more rapid obliteration of the cavity.

It must not be assumed that the differences that have been indicated between operative surgery at the sea-coast and in mountainous regions are marked, for they are not. The majority of cases pursue their course on similar lines, and differences, when present, are as a rule only slight. I have endeavored to indicate in a brief way some of the peculiarities attending surgical work in high altitudes, feeling, as I have said, that my experience is as yet insufficient to permit of more than provisional statements, and in conclusion beg to sum up as follows:

(1) Operative surgery in dry climates, having an altitude of one mile or thereabout, is to be pursued on the same general lines which govern it at the sea-level. However,

(2) Care must be exercised in subjecting those recently from a lower altitude to severe or prolonged surgical procedure, especially if the patient be a pulmonary invalid or if he exhibit cardiac weakness; and

(3) It would seem that those who are thoroughly acclimated bear operation rather better when at home than when they go to tide-water, and this again is particularly true of patients afflicted with pulmonary tuberculosis.

(4) Ether must be employed with greater caution, and is more of an irritant to the respiratory mucous membrane. Chloroform may find wider employment than at the sea-level.

(5) The loss of blood seems to be rather less in the high, dry climate, possibly excepting cases in which the operative field is the seat of chronic inflammation.

(6) Shock, also, seems to be less pronounced, patients rally rather more quickly after operation. In the tuberculous this feature seems to be marked.

(7) Aseptic wound management must be the same in all regions. Infection, when it occurs, doubtless makes less progress in a dry atmosphere than in one containing a greater degree of moisture.

(8) It is believed that accumulated statistics will show that operations for surgical tuberculosis are attended by a greater permanency of healing in the high altitudes, and that patients presenting such lesions, but whose lungs are yet free, do all possible to ward off pulmonary invasion by taking up their abode in such a climate as that of Colorado.

REFERENCES.

¹ *Head and Neck*.—For dermoid cyst of neck, 1; for tubercular glands of neck, 5; for necrosis of skull, syphilitic, 1; excision of upper jaw for carcinoma (death from exhaustion), 1; staphylorrhaphy, 1; staphylorrhaphy and uranoplasty, 1; for deep abscess of neck, 3; blepharoplasty, 1; for acute suppurative glossitis, 1; excision of tongue for carcinoma (death from bronchitis), 1; for epithelioma of lip, 5; for carcinoma of upper jaw, 1; for sarcoma of neck, 1; for calculus in submaxillary gland,

1; for septic wound of face, incision and drainage, 2; for epithelioma of nose, 1; for dermoid cyst of orbit, 1; for necrosis of lower jaw, 3; for dermoid cyst of tongue, 1; for nævus of face, 1; for tuberculosis of tongue, 1; for harelip, 2; for cystic tumor of neck, 1; for tumor of parotid, 1; extirpation of parotid for carcinoma, 1; for osteoma of lower jaw, 1; external cesophagotomy for impacted foreign body, 2; for compound depressed fracture of skull, 3; for supposed abscess of brain, which proved to be suppurative meningitis (died), 1; for old bullet wound of skull, trephining with removal of depressed bone, 1; for gunshot wound of neck, 1; for branchial cyst of neck, 1; plastic on ear, 1; plastic on face, 4.

Chest and Trunk.—Abscess of chest wall, 1; for melanosarcoma of back, 1; for keloid of chest, 1; for cystic tumor of back, 1; for sarcoma of axilla, 1; for sarcoma of anterior chest wall, 1; for empyema, 3; for bullet in chest wall, 1; for carcinoma of breast ("complete" operation), 14; for abscess of breast, 3; for adenoma of breast, 1; for recurrent carcinoma of breast, 1; for fibroma of breast, 1; for tuberculosis of breast, 1; for cyst of breast, 2.

Abdomen.—For acute appendicitis, 14; for appendicitis and general suppurative peritonitis (died), 2; for relapsing appendicitis, 2; for gallstones in cystic duct (died of shock and exhaustion), 1; for abscess of mesentery and general peritonitis (died), 1; for abscess of liver, operation in two stages, 1; exploratory laparotomy, 3; gastrostomy (died in twenty-four hours from exhaustion), 1; for ovarian cyst, 3; for strangulated inguinal hernia, 2; radical cure of inguinal hernia (Bassini), 5; for cyst of spleen, operation in two stages (died of septicæmia and exhaustion on twentieth day), 1.

Rectum and Anus.—For polypoid growth, 1; for adenoma, 1; for hæmorrhoids, 8; for tubercular ulcers, 1; for prolapsus, 1; for fistula in ano, 7.

Genito-Urinary.—Circumcision, 6; external and internal urethrotomy, 6; for carcinoma of bladder, suprapubic cystotomy (died), 1; for varicocele (Bennet's operation), 6; internal urethrotomy, 2; suprapubic cystotomy for foreign body, 1; suprapubic cystotomy for stone, 1; nephrotomy, 2; nephrectomy (died of exhaustion), 1; orchectomy for tuberculosis, 1; orchectomy for sarcoma, 1; for hydrocele (Volkman's operation), 2; suprapubic cystotomy for tuberculosis, 1; for rupture of urethra and extravasation of urine, 1; plastic on male perineum, 1; perineal cystotomy for carcinoma (died of exhaustion), 1.

Extremities.—For foreign body in knee, 1; Thiersch's skin grafting, 7; for necrosis of tibia, 5; for abscess of thigh, 4; for lacerated wound at wrist, tenorrhaphy and neurorrhaphy, 1; for suppurative arthritis of elbow, drainage, 1; for cystic tumor of thigh, 1; for tuberculosis of tarsus, 4; for malunion of femur, 1; for suppurative arthritis of knee, drainage, 1; for ganglion at wrist, excision, 1; for deep cellulitis of leg, incision and drainage, 4; for necrosis of ulna, 1; for necrosis of femur, 1; for old sinuses of thigh, 1; for bullet in foot, 2; for tubercular osteitis of ulna, 1; for deep abscesses of thigh and leg, 1; for osteomyelitis of tibia, 4; for caries of carpus, 1; excision of elbow for

tuberculosis, 1; for fatty tumor of shoulder, 1; for malunion of bones of forearm, 2; tenorrhaphy and skin grafting, 1; incision for suppurative phlebitis, 1; for gonorrhoeal arthritis of elbow, drainage, 1; for hammer-toe, 1; for hallux valgus, 2; for ununited fracture of humerus, 1; amputation of fingers, 4; amputation through forearm, 1; amputation at elbow, 1; amputation through upper third of arm, 1; amputation at shoulder, 2; amputation of toes, 5; amputation at knee, 1; amputation through middle of thigh, 1; amputation of leg, 2.

² I have not as yet found abdominal operations to require a special atmosphere.

³ This is simply a personal opinion. I have carefully studied the interesting paper by Dr. H. G. Wetherill, published in the *ANNALS OF SURGERY*, April, 1897. The arguments set forth therein are very ingenious, but I find myself unable to agree with either the premises or the conclusions in so far as the latter assert that surgical shock is greater in the higher altitudes.

⁴ Dr. E. H. Norton, formerly house surgeon to the New York Hospital and surgeon to the Fitch Accident Hospital at Buffalo, who is in charge of large coal-mines at Rock Springs, Wyo. (altitude 6000 feet), writes me that the severe accidents incident to mine surgery show far less infection than would be probable in a moist climate.

THE TECHNIQUE OF INTRACRANIAL SURGERY.¹

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IN this short paper the subject—a more or less extensive one—has been divided into heads, which I speak of seriatim:

(1) *The Difference between Operations for Traumatic and Pathologic Causes.*—The two should be considered quite separately; indeed, comparison between them is almost impossible. In traumatic cases operation is undertaken as a matter of necessity, suddenly, perhaps with instruments not quite suitable, but certainly without delay, the condition of the patient not permitting it. There has been no previous preparation of the patient. His general condition is unknown,—by this I mean the condition of his internal organs. No preparatory treatment is possible. The elements of sepsis are often present, not only upon the surface, but perhaps thrust into the tissues by the traumatism for which the operation is undertaken, and infection may have already occurred within the head. The condition of the kidneys may be mentioned, as a matter of which the operator must be in ignorance; for, even though the urine be examined immediately after the injury and before the operation is undertaken,—and this should always be done,—yet, if the patient has been transported a certain distance in cold weather, or the skin surface has been largely uncovered, as is not unusual after an injury, albumen will generally be present, and, possibly also, casts may exist; and so an accurate knowledge of the condition of

¹ Read before the American Surgical Association, May, 1897.

the kidneys is wanting. The details in operative work, also, are often obscure, landmarks obliterated, both within and without the skull. Finally, the head is opened, in traumatic work, as circumstances permit or seem to indicate. The head may have been already opened before the case is seen by the surgeon who is forced to do patchwork.

In operations for pathologic conditions, on the other hand, the reverse of what has been said exists. The proper time is chosen; all things are prepared; the proper light obtained; asepsis is secured; there is a due regard for both local and general cleanliness; not only has the condition of the internal organs been investigated, but they have been made to work, and work smoothly; a well and carefully considered operative procedure is carried through after due study and consideration, and all things necessary are at hand. The operation then is undertaken in the best way for the patient's welfare. It is proper, therefore, to draw a hard-and-fast line between the results of operations undertaken for traumatic and pathologic conditions, not that excellent work is impossible in traumatic cases, but the very fact of the patient's having been subject to injury may take out of the surgeon's power the ability to obtain certain conditions which are essential to success, and should exist, but may not,—cleanliness, for instance.

Preparation of the Patient.—It is not easy to clean a head, and it is still more difficult to prepare a portion of a head and operate so that cleanliness shall obtain. It is best, therefore, that the whole head should be prepared and cleaned. This applies to all cases, unless of a very minor character.

In traumatic cases the head is to be shaved and the skin cleaned with green soap, hot water, nail-brush, and carefully scrubbed. The ears should be cleaned out and filled with sterile cotton. The eyes should be closed with pads of sterile cotton. The scrubbing should be done not only upon the surface, but, if a wound exist, it should be scrubbed likewise, and an effort made to get out any dirt which has been forced beneath the skin; punctured wounds should be laid open;

tracks beneath the skin should be opened and scrubbed, the edges of irregularly bruised tissue may be trimmed away and a clean surface obtained. Where coal-dust or grease has been forced beneath the surface, scrubbing with a nail-brush and soap and washing with ether and alcohol will often be sufficient to obtain a clean surface. Dirt ground into the surface or edges of broken bone can be scraped away, or nibbled away with forceps, so as to be gotten rid of. After cleansing the head for traumatic operations, a towel wrung out in corrosive sublimate solution, or sterile water, perhaps, can be used as a cover for the prepared territory until instruments and other things are ready. In preparing a patient for an operation undertaken for some pathologic condition (not traumatic, of course), I have always prepared my patient a day before the operation, and then again just prior to operating, and I see no reason to depart from this habit. An alkaline solution, bicarbonate of soda, I have found useful to remove dandruff from the scalp, but I generally use green soap. Shaving and scrubbing with green soap, or a poultice of green soap applied over the surface after shaving and left on for a couple of hours and then scrubbing afterwards, is efficacious. I remove the green soap with alcohol, and then ether, and then have the clean scalp tied up in a corrosive sublimate solution until the following day; a repetition of the cleansing as already described gives me a clean surface upon which to operate.

(2) *The Best Way of gaining Access to the Brain.*—As the brain is to be covered in after the operation, a large osteo-cutaneous flap, the base turned towards the blood-vessels, is probably the most effective way of uncovering the brain. It should be cut in one piece and then broken at the base so as to permit of turning down. This breaking at the base is much assisted by cutting across the bone with sharp forceps, or otherwise, and it should be so cared for during operation that the skin and bone are not torn asunder; it may be necessary to envelop it in a cloth wrung out in hot sterile salt solution. The cutting of the bone is to be done by the instrument with which the surgeon is most familiar,—the trephine,

rapidly revolving saw, chisel and mallet, all have their advocates. Jarring the head is probably the objection most frequently raised against the last-mentioned tools,—the chisel and mallet. They are, however, the tools with which I am most familiar and which I prefer. Should the opening not be large enough in the skull, there should be no hesitation about cutting away the borders of the opening until sufficiently large. For this purpose rongeur forceps seem to leave little to be desired.

There is a difference between the sides of the skull and the top, for bone need not be put back in the temporal fossa, since, thanks to the dense temporal fascia, there is not much sinking in; it is otherwise at the top and front of the skull, as bone there wanting results in a deep depression. The time which is consumed in exposing the brain is largely the result of the bone-cutting. Twice it has been my fortune to operate upon heads where, at previous operations, bone has not been replaced. It was very easy to open these heads, and the operation was done with great rapidity. It is therefore a matter to be thought over and carefully considered, whether, when it becomes necessary to operate within the head, it may not be expedient to raise a large flap, remove the necessary bone, replace the flap, and allow it to heal. A month or two afterwards the surgeon will operate to remove the pathologic condition present, and can do so rapidly, bone not obstructing. The removal of a piece of cranium and replacement of the skin-flap is accompanied by so little danger that this plan offers advantages, especially so when the prolonged bone-cutting, which is necessitated by an intact cranium, is to be followed by a long piece of intracranial surgery.

It is worth while remembering that opening the skull, even in incurable cases, may diminish pain and optic neuritis. The dura is to be divided and turned aside as a flap, the line of division being about one-third of an inch internal to the bone section, so as to permit of suturing and replacement. Generally speaking, the dura is to be respected and treated as are other serous membranes,—the peritoneum, for instance,—and with no more consideration.

(3) *Arrest of Hæmorrhage.*—From the skin, hæmostatic forceps have sufficed in my hands to arrest hæmorrhage. I can imagine that with a transverse bar at the top, T-shaped blade, a large area of skin would be pressed upon and so bleeding better arrested; perhaps the T-shaped blade could be covered by rubber with advantage. By encircling the cranium with a rubber band I have not had satisfactory results. Hæmorrhage from the bone during the cutting may be arrested by Horsley's putty, or pressure with dry gauze. By crushing in the edges of the bone with heavy forceps bleeding from the diploe has always been arrested. From the dura, a curved needle, carrying a fine thread, passed around the artery and tied, has sufficed to stop bleeding. From veins the same may be said. Where hæmorrhage comes from a sinus, I have arrested bleeding in several ways,—by suturing the wound in the vessel with a curved needle; passing the thread around it and tying it; by gauze pressure; these methods have been sufficient in my hands. After turning the dura back and exposing the surface of the brain vessels are to be sought for and tied very carefully, without dragging, by two threads and divided between. Forceps will generally tear off, and should not be employed, save very temporarily. It might be that serrefines would be of use.

It is worth while to call attention to the fact that tumors within the brain will push up sulci from below so that vessels can be tied more easily than in the normal brain. A growth should be encircled by ligatures under these circumstances. The material used in ligating will be at the surgeon's pleasure. I use very fine sterile silk. Finally, there is that form of hæmorrhage which may come from the exposed surface after removal of a growth, and is usually denominated parenchymatous. I have found nothing so effectual in arresting this as pressure with gauze. It may be that the gauze can be taken away at the end of the operation; usually, however, it is to be left protruding and removed in two or three days. In a recent case under my care the gush of blood, after the removal of the tumor, was enormous, yet ceased promptly on packing.

In regard to the anæsthetic: special indications for one or the other anæsthetic lacking, I have used chloroform, intracranial congestion being probably lessened thereby. It is a well-known fact that under ether the face becomes congested; it is reasonable to presume that a similar condition may obtain within the skull. In a recent case I commenced anæsthesia with ether, the face became much swollen, especially at the angle of the eye, so I changed to chloroform during the course of the operation, and the venous turgescence entirely disappeared. This change of anæsthetic I have resorted to several times while actually operating.

(4) *The Recognition of the Brain Area presenting.*—This has to do with cerebral topography, and it is scarcely necessary here to speak more fully on this subject. I have not hesitated in intracranial work to have at hand a cast of the brain, in order that I might compare it with the exposed area, and I see no reason to doubt that it is a good plan. Electrical stimulation of the exposed area by the methods at present in vogue gives most efficient aid to the operator.

When operating for a tumor of the brain, which is covered by the cortex, the color and consistency of the exposed area may give information, but an incision will probably be of advantage. Certain growths have the same consistency as the brain, and have been traversed by needles without recognition, hence color and consistency failing to be recognized, probably an incision into the brain is best; touch followed by incision, if the tumor does not present, is a far better way than touch followed by puncture, unless a cyst is recognized as present.

(5) *Removal of Intracranial Structures.*—Of the tumor it is scarcely necessary to speak, but the removal of the cortex is a matter about which much can be said. Undoubtedly, in many cases of tumor, the cortex is greatly displaced, but it is also probable that, where the cortex is removed, restoration of function, to a certain extent at all events, will follow. Circumscribed growths may be taken away by spoon, finger, knife, etc., but infiltrated growths, while they may be taken

away, so far as can be recognized by the operator, give most unsatisfactory ultimate results, recurrence being the rule. The dura, being removed, should be, in my opinion, replaced by gold foil, to prevent adhesions between brain and scalp, and in my hands this plan has been efficient.

(6) *Closure of the Wound and Dressings.*—Intracranial sutures of silk I have used with advantage. To obtain a bone flap where it is thought necessary, when the natural bone is wanting, different expedients have been made use of; thus the periosteum from the tibia has been transferred to the head; the outer table of the skull, while connected with the skin, has been fashioned as a flap to turn and cover the defect; the removed bone, perforated with holes so as to permit of drainage, has been used, etc. For the skin I use always subcutaneous suture of silkworm gut, and I see no reason to be dissatisfied with it. A voluminous dressing of sterile absorbent gauze has done all that is necessary. I have not closed completely a head opened for an extensive operation, save in one or two instances, and here I have had occasion to regret my method. I drain by means of a piece of silver wire hooked in the lower angle of the wound, and believe that my patient's condition will be improved thereby. The time when dressings are to be changed will vary with the condition of affairs present; and it is scarcely necessary to call attention to the fact that such redressing is to be carried out with the precautions for cleanliness which characterized the first dressing.

A CONTRIBUTION TO THE EXPERIMENTAL SURGERY OF THE URETER.

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IT is our purpose in this short paper to deal only with such injuries of the ureter as require restoration after its complete lateral division. At present opinion is divided as to the relative merits of uniting the two ends of the cut ureter and implanting the kidney portion into the bladder. Both operations have been done successfully, though bladder implantation far exceeds in the number of cases operated on. To the writer there appears a fairly clear field for each operation, yet some of the best men of the country believe one may be substituted for the other or that only the one should ever be done. Nearly all are agreed that either is preferable to nephrectomy, believing conservation of kidney function is far better than its destruction on one side. We are aware that some German operators say the kidney must be removed when the ureter is disabled by such an accident as complete division.

We had the misfortune, about one year ago, to sever a ureter in removing a tubo-ovarian abscess, but saved the life of the patient and restored the duct by obliquely splicing the cut ends. The case was published in the *ANNALS OF SURGERY*, January, 1897. This was the only time this precise manner of repair had ever been employed either in man or the lower animals.

It had been stated by some experimenters in this line of

work that, even if union did occur after such anastomoses, constriction was sure to follow. Though the few published cases did not lend support to such statements, we decided to make a few experiments on dogs to corroborate or refute them. The test was not a fair one, as the size of the ureter in the dog does not compare at all favorably with that duct in man. It is much smaller, and therefore more difficulty is experienced in operations on it in dogs. Again, these animals are more difficult to prepare for such surgery and to control after operation. Sepsis is very liable to complicate abdominal surgery in dogs.

Our experiments on splicing the ureter, as recited below, were not altogether satisfactory on account of sepsis and shock. The animals we were able to obtain for the work were too small, both for ease in work and in durability against anæsthesia and the operation. The third, however, was fairly successful as to subsequent constriction, and all were satisfactory as to union of the severed duct.

To demonstrate the possibility of union in dogs of the oblique splice of the ureter, the following two experiments were made:

First Experiment.—On February 12, 1897, chloroformed a young, male, setter dog, weighing about forty pounds, and, after shaving the hair from a portion of the abdomen and cleansing the skin, an incision four inches in length was made through the abdominal wall parallel to, and two inches to the left of, the median line. The left kidney was searched for and found, and its ureter traced to the bladder; the peritoneum covering it was grasped just above the iliac crest with forceps, raised, and divided a distance of about one inch along the duct. The ureter was then lifted and with sharp scissors completely cut in two, very obliquely. A filiform bougie was then passed up through it to the kidney and downward to the bladder, thus proving it to be a ureter. The ends at the point of section were then carefully dilated with forceps, into both extremities was introduced a piece of a small elastic bougie, two inches in length, that had tied about its middle a piece of silk suture-material; the ends of the ureter were brought near each other, and six interrupted sutures of

NO. 1 silk inserted through the muscular and fibrous coats of both; three were tied carefully to prevent puckering; the piece of bougie was now gently withdrawn by means of the ligature about it, and the remaining three sutures tied. The cut in the peritoneum was closed with fine silk and the abdomen closed without drainage. Death occurred on the fifth day. The autopsy a few hours later revealed a considerable amount of dark-brown fluid in the peritoneal cavity; intestinal loops adhered to each other, and peritonitis was intense; the peritoneum at place of sutures over the ureter was found to be united firmly, and no pus noticed about it. There was no dilatation of the ureter above the severed and sutured point; removed five inches of the ureter including the seat of operation. One end of it was drawn over the tip end of a syringe that had previously been filled with water, and by slowly forcing down the piston the water flowed freely from the other end. This end was now ligated with a silk thread, and more water gently forced into the tube; no leakage about the point of section occurred; the water was now very forcibly injected, and none escaped. Death was evidently due to infection of the peritoneum at the time of operation.

Second Experiment.—February 17, 1897, a small, long-haired, male dog, weighing about twenty pounds, was operated on as in the first experiment. Owing to the extreme smallness of the ureter in this animal considerable time was required in finding the left one and in its dilatation and suturing. The dog nearly succumbed to the chloroform during the operation, and artificial respiration had to be employed for some considerable time before the animal breathed well. Death occurred on the third day from shock.

Autopsy.—No peritonitis; ureteral injury found healed and in the same condition as in first experiment, except that it yielded slightly to pressure, and the water trickled through a minute opening and ran along the outside of the ureter. No cause for the result, other than shock, was determined.

These two experiments demonstrated the possibility of securing union after oblique section of the ureter, even in a duct about one-fifth the size of that of the human adult, as was the second.

But subsequent constriction, one of the strongest objec-

tions offered to this method of conservation of injured ureters, was not disproved on account of the early death of the dogs. To this extent the experiments were failures. Even had these animals lived sufficiently long for such constriction to occur, and it had occurred, we could find in it no decisive proof that such is the result in man.

Moreover, the experiments made by Poggi, of Italy, in 1887, by invaginating the upper end into the lower one were very successful. He killed one of the dogs three and a half months after the operation, and found not the slightest constriction at the point of anastomosis. It may be well to state that this objection has not been urged against the lateral implantation method of Van Hook, and no constriction has been known to follow this method, either in the lower animals or in the three women on which the operation was done by Kelly, Emmet, and Doherty.

A sufficient number of cases of the restoration of the continuity of this duct by the end-to-end and the end-in-end splices have now been reported to prove the fallacy of this objection. Nine cases done by these methods have been recorded, three of which died, but none from urinary complications. Omitting the case of Schopf, that is purely negative, dying of tuberculosis on the forty-second day after the operation; Hochenegg's, which died from secondary hæmorrhage twenty days after a Kraske hysterectomy for cancer; and that of Pawlik, which died from shock fourteen hours after operation, we have six cases to consider. These were done by Tauffer, Robson, Fritsch, Cushing, and the writer. Tauffer being the only surgeon to operate on two cases, it is easily understood that experience lent no particular advantage to the five operators. So far as the writer is aware, the six cases were successful in every way. Cushing wrote recently that his, done five years since, is apparently perfect in result, notwithstanding it is the only one reported in which leakage of urine occurred after the operation. The writer's case, operated eleven months ago, is free from any trouble. If the results of these six cases be considered together, with the three

done by the Van Hook method, it will be noticed that no failure occurred, nor is there anything about them that tends to retract from the high standing that should be accorded this surgical procedure.

In discussing a paper at the last meeting of the Southern Surgical and Gynæcological Society, Dr. Noble, of Philadelphia, mentioned a case in which he unintentionally removed a large portion of a ureter with a badly adhered abdominal tumor, leaving but a few inches of it in the pelvis and a short portion attached to the kidney. He later removed the kidney successfully. The relation of this case led the writer to devise a method for yet saving the urinary function thus suspended. Knowing the kidney to be very movable, we endeavored to take advantage of this abnormal mobility of that organ to meet the conditions in precisely such cases as narrated by Noble. It was also necessary to have a remedy applicable to the ordinarily well fastened kidney. We had already shown that oblique end-to-end anastomosis was applicable when three inches or less of the ureter were removed, provided the lowest two inches of the duct was unharmed. If the kidney is movable, then it may be depressed to allow anastomosis of the ends of the ureter when a greater extent of the duct is removed. To meet the requirements above mentioned, we decided to attempt to loosen the kidney from its moorings, depress it sufficiently, and then to anchor it in its new position. Accordingly the following two experiments were done:

Third Experiment.—February 23, 1897, a large male dog, weighing about forty pounds, was chloroformed, and a right lumbar incision to the peritoneum made; this was extended down to the anterior border of the iliac crest. The kidney was now found and separated from the surrounding tissues to a considerable extent; the ureter was dissected from the peritoneum in its upper three inches; the kidney was now brought down to the level of the iliac crest and the slack portion of the ureter removed. Oblique end-to-end anastomosis of the remaining portions of the ureter was done, and the kidney was stitched by buried sutures to the wound in the abdominal wall. March 13,

dog killed. Autopsy: kidney firmly fastened, ureter firmly united, pervious and of good calibre throughout.

Fourth Experiment.—February 24, 1897; small female dog; chloroformed and same operation done. The dog recovered well, but escaped the thirteenth day after operation and could not be traced.

While these two experiments do not demonstrate beyond doubt the feasibility of downward displacement of the kidney to allow approximation of distant points of the ureter in man, they furnish us with prospects for a conservative operation and for the removal of one of the indications for nephrectomy. If, too, it is found feasible, the force of the arguments in favor of implantation of the ureter into the various portions of the intestinal canal and on to the surface of the body will be very much weakened. If it will prove to be a practical operation, and we believe it will, then its employment will be indicated in cases in which the loss of extent of the ureter is too great to be spliced by any of the four methods heretofore employed. If the portion of the duct disabled be the extreme lowest, then the depression of the kidney will be to permit the operation of uretero-cystotomy, as suturing the ureter deep in the pelvis is very difficult, though the ureteral catheter and the position of Trendelenburg render it much easier of execution. This new operation is not designed for competition with uretero-cystotomy, uretero-ureteral anastomosis instead, being the successful competitor of that operation in most cases. On the contrary, it may be employed as a preliminary operation to bladder implantation of the ureter. That the kidney in the dog is more movable than that organ in man is of no importance, for we well know that separating that organ in man from its attachments, other than about the renal vessels, is not difficult. And we will find the elasticity of these vessels together with their attachments to surrounding tissues near their junction with the kidney will be the controlling element in the mobility of this organ downward. By careful dissection this limitation can be very materially modified to meet the demands of nearly any requirement.

INCISION OF THE KIDNEY IN CASES OF UNCOMPLICATED NEPHROLITHIASIS.

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THE symptoms of nephrolithiasis, when there is no dilatation of the urinary gland or suppurative process going on within the organ, are *pain and hæmaturia*. Renal pain is usually intermittent, and is rather more a sensation of lameness or a tearing feeling, usually extending to the lumbar and inguinal regions. In every type of renal calculus the pain is increased by walking or riding, and can in most cases be calmed by quiet, especially in the recumbent position. But it would appear from reported cases, and from several that have come under the writer's observation, that small calculi, consequently those that are movable, cause more acute pain than larger ones, and which is more frequently the result of very slight movement or exercise. The pain may even become continuous, and some patients will suffer constantly for years.

Palpation and pressure over the lumbar region will in most cases give rise to pain. Percussion of the lumbar region can also provoke an attack or increase it if pain be already present. Jordan Lloyd says that a quick, sharp blow will always give rise to pain when the kidney contains a calculus, but the writer cannot agree on this point, at least in every case.

Hæmaturia is a symptom which is nearly always present in nephrolithiasis, and although not profuse, it often coincides with the pain, and when the patient has taken an unusual amount of exercise, hæmaturia may occur either during or

between paroxysms of renal colic; it appears early or late in the course of the affection, but is rarely, if ever, completely absent, especially in cases of small stones, and it thus may be considered as a characteristic symptom of the latter when it frequently occurs, is considerable in amount, and accompanied by nearly constant pain.

It may also be a very important symptom for the diagnosis of the presence of a stone in the kidney, in those cases where there is a little obscurity as to the nature of the affection present, as well as determining which of the two glands is the seat of the trouble, when reflex pain occurs in the normal kidney. For the diagnosis of the latter a cystoscopic examination should be made after the patient has taken a long walk, when we will be able to detect small jets of blood or blood-stained urine escaping from the ureteral orifice on the affected side. In the female, the passage of the ureteral catheter and comparative analysis of the urine from the right and left kidney will be found of great help in cases of nephrolithiasis, or when the stone is in the pelvis of the kidney or lodged in the ureter.

When the calculus enters the ureter it produces nephritic colic, which, with all its symptoms, is of much value to the surgeon, because it is a sure indication of nephrolithiasis. The same may be said of intermittent hydronephrosis, which indicates that the stone has become lodged in either the pelvis of the kidney or in the ureter, producing a momentary obstruction to the passage of the urine. Small calculi particularly often become engaged in the pelvis of the kidney on account of their mobility, and set up a pseudo-nephritic colic which is caused by a distention of the urinary gland.

Renal colic is sometimes the first symptom of nephrolithiasis, while at others it only occurs some time after the localized paroxysms of pain.

Each one of the symptoms of nephrolithiasis—viz., lumbar pain, nephritic colic, and hæmaturia—has an intrinsic value, but is not in itself sufficient cause to justify the advisability of surgical treatment. But in a case which has passed

through several paroxysms of nephritic colic, and in which the usual pain, with or without hæmaturia, has baffled judicious medical treatment, the propriety of surgical treatment should be considered, because not only will an operation do away with the unbearable suffering of the patient, but it will be the means of removing all the complications which will most likely occur sooner or later.

Statistics show that operations performed when the patient presented anuria from an obstructing calculus, that the mortality is about 33 per cent., while if suppuration is present in the kidney it may be placed at about 50 per cent. In those cases forming the subject of this paper—that is to say, small stones in a healthy kidney—the physical signs are almost absent. The kidney being normal in size cannot be made out by bimanual palpation, unless the organ be movable or slightly below its normal situation.

Pain on palpation of the region of the kidney is present in the majority of cases, but it may be absent, as has been pointed out by Tuffier, who removed a calculus three centimetres in length, and which was movable in the pelvis of the kidney, and in which no pain could be elicited by palpation. We consequently must base our diagnosis on the rational signs combined, and not considered singly.

The urine may also be of help to us in making a diagnosis, for occasionally we may find a deposit of fine crystals of uric acid, forming a yellowish or a brick-red layer at the bottom of the test-tube. The reaction will be found acid, and indicates an excess of uric acid and occasionally oxalate of lime.

It is difficult to decide the point beyond which medical treatment may be considered as of no avail, but by studying the cases reported it may be said that nephrolithotomy has been performed when medical treatment has proved itself useless. When a patient has suffered from severe paroxysms of pain, and these occur at shorter intervals and with increasing severity; when hæmaturia frequently occurs, which, as has already been pointed out, is especially characteristic of small

stones, and medical treatment cannot control this condition, we think that the time has come to resort to nephrolithotomy, because the lesions, which oftentimes may develop in the urinary gland, are quite enough to demonstrate the justness of surgical aid before septic accidents have made their appearance.

Operative measures being decided on, the patient is placed, as in any operation on the kidney, in the lateral decubitus position, on the side of the healthy kidney. The loins, being next the operating-table, should be well raised up by a large and firm cushion, in order to put on the stretch the parts to be operated on. The thigh on the side of operation should be slightly flexed.

The operator stands facing the patient's back and an assistant on the other side of the table opposite him. The twelfth rib, the crest of the ilium, and the external border of the sacro-lumbar muscular mass are located by palpation. The proper incision to select in order to reach the kidney with ease has been a matter of much debate among surgeons. All the various cutaneous incisions have been pretty thoroughly tried; the vertical incision of Simon, with a prolongation over the ribs and buttock; Czerny's incision extending outward from the last rib; Guyon's oblique incision, Morris's very oblique incision, and that of Le Dentu, which is parallel to the twelfth rib. Tuffier's incision begins at the eleventh rib, about eight centimetres from the spinous apophysis, and is carried down to the iliac crest. If the kidney is in its normal position, this incision should be parallel, or nearly so, to the twelfth rib, but if the organ is found, by palpation, to be lower down than normal, the incision should be made slightly oblique downward and outward.

If Tuffier's incision be chosen,—and it appears to the writer the best of those already proposed,—the skin being incised, we fall upon the subcutaneous cellular tissue, which in stout subjects is quite thick. This is in turn incised, and the lower fibres of the great dorsal muscle will be seen in the upper part of the incision. The great dorsal muscle is incised

and then the great oblique; then underneath these we come to the small oblique and the white, glistening aponeurosis, which is the point of insertion of the transverse muscle. A few small vessels coming from the posterior lumbar vessels will be cut during the incision, but the bleeding is easily controlled by artery-clips.

The wound is next wiped out with gauze tampons, and then the upper part of the border of the quadratus lumborum may be seen. It is not necessary to incise this muscle. Then below a large nerve-trunk, which is the first lumbar pair, will be seen following nearly the same oblique direction as the incision. Only one more layer of tissue now remains to be incised; it is an offshoot, so to speak, of the aponeurosis of the transverse muscle, and passes in front of the quadratus lumborum. This aponeurosis is very thin, so much so that in most subjects the subperitoneal and perineal fat may be seen by transparency.

The nerves cut in this operation are of no account, as only a few fibres of the perforating lateral branch of the twelfth intercostal nerve are in the way.

There is, however, one accident that must be avoided in incising the lumbar walls, and that is, opening the pleural cavity, which at the costo-lumbar hiatus of the diaphragm is only separated from the renal fat by a very thin fibrous layer, coming down from the concave aspect of the diaphragm to the quadratus lumborum. For prudence' sake, it may be advisable to open the aponeurosis of the transverse from *below upward*, then introducing the finger into the incision in the aponeurosis, the fat and pleural cul-de-sac are pushed upward on the end of the digit.

Next to be accomplished is to get through the perirenal fat, and this should be begun at the *anterior* aspect of the kidney, as it will be done more quickly by so doing. When the organ has been laid bare it is brought up into the incision, but this must be done slowly so as not to exercise too sudden a traction on the pedicle. If there is any difficulty in bringing the kidney up into the incision, an assistant places his closed

fists under the ribs and pushes the organ up into the wound. This is known as Guyon's method.¹

When the kidney is brought up under the twelfth rib both its sides and ends must be carefully explored, as well as the pelvis of the organ, in order to detect the presence of a calculus. If digital exploration is without result, which is in most instances the case even when large calculi are present, acupuncture should be resorted to. This is done by means of a long, fine needle introduced methodically into the parenchyma of the kidney, centimetre by centimetre, along the convex border of the organ; then in the sides and at the hilum after the exact position of the renal vessels has been located. If the needle strikes a stone, it will transmit a special sensation to the surgeon's fingers.

If neither palpation nor acupuncture reveal the presence of a calculus, the only alternative that remains is to incise the kidney, and this should be done without the slightest hesitation. Incision of the kidney is perfectly safe, but should be made in such a manner as to involve the least vascularized part of the gland. We may thus attain the calyces and the pelvis of the organ, and the incision is afterwards closed by sutures without the least harm being done to the vitality of the organ. The pelvis of the kidney should never be incised, even if the calculus is felt within it, because the incision is likely to heal imperfectly, resulting in a urinary fistula.

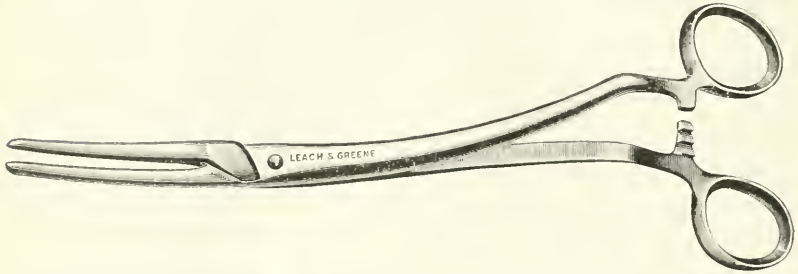
Before incising the kidney, which should be done on its convex border, preventive hæmostasis should be secured by compression of the pedicle, either between the fingers of an assistant, if the patient is thin and the opening sufficiently large, or between the operator's fingers of the left hand. Forcippresure can also be used by covering the blades of a clamp with rubber tubing.

Believing, however, that the majority of surgeons would prefer applying a clamp to the pedicle, as in the writer's experiments on the cadaver, it was found that digital com-

¹ C. G. Cumston, "Lumbar Nephrectomy in Anuria due to Uterine Cancer," Boston Medical and Surgical Journal, March 19, 1896.

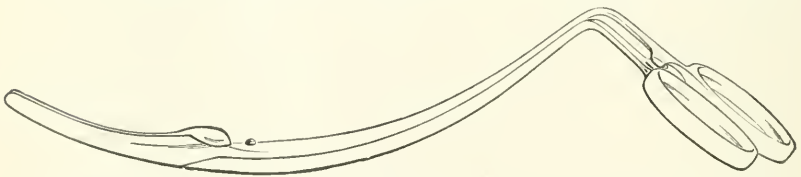
pression was very tiresome and not secure, he has devised a clamp for this purpose, the cut of which is here represented, and offers it, not as "a long-felt want," but as an instrument that he has found serviceable and to answer the purpose very well.

Preventive hæmostasis is absolutely necessary, as no hæmorrhage can occur, and the field of operation is unobstructed by blood. Compression of the pedicle with clamps



does no harm, and may be kept up without danger for half an hour, as is claimed by Tuffier, without any bad result. Cases reported by Desnos, Mayo Robson, and others are striking examples of those uncontrollable hæmorrhages occurring during exploration of the kidney by incision, and which have necessitated immediate nephrectomy.

In order to reach the pedicle and properly apply the



clamp the fingers should be passed down by the easiest opening,—that is to say, underneath the lower end of the kidney. By following the concave aspect of the organ, the fingers will feel the pulsations of the artery. If a clamp is used, it is simply introduced along the fingers, using them as a director.

The kidney being held in the incision, it is incised on its convex aspect for from four to ten centimetres, and the incision should be carried down deeply in the parenchyma, so as

to open into the pelvis of the organ. The slight oozing that takes place is rapidly mastered by packing the incision with gauze for a few moments. The finger is then passed into the kidney, and the presence of a calculus lodged in the parenchyma, calyces, or pelvis is sought for. If nothing can be felt, a very fine ureteral bougie should be passed down along the ureter to make sure that the calculus has not become lodged therein.

When the calculus or calculi have been found, they must be removed. If the stone is small and movable, the finger alone can generally remove it from the kidney. If, on the contrary, it is lodged in the parenchyma, a small forceps or better a curette must be employed, as recommended by Le Dentu, Keith, and others. If the calculus, as sometimes happens, sends off prolongations into the calyces, a careful dissection must be made with the knife, as has been done by Tuffier, and the resulting wound closed with fine catgut sutures.

Tuffier was the first to demonstrate experimentally that immediate suture of the renal parenchyma could be done while compression of the pedicle was still applied, with the result that all hæmorrhage was prevented after the compression was removed, and that an exact union by first intention took place, and which did not allow the urine to escape from cutaneous fistula in the lumbar incision. Applied to man, this method has given remarkable results.

All that is necessary is a good, curved needle, and stout catgut of large size. The borders of the renal incision are brought together and held in apposition by an assistant while the sutures are being passed deeply through the parenchyma. Each suture is tied as soon as inserted, from four to eight being sufficient, according to the length of the incision, and should be only *moderately tight*, because it must be remembered that there still being a compression of the pedicle, the kidney is empty of all blood, and consequently it is easy to approximate the borders of the incision. But when the clamp is removed, the organ greatly increases in size by the return

of the circulation, and the sutures will compress the parenchyma so that the organ becomes lobulated, and if the catgut has been tied too tightly it will cut through the tissues, an event that is to be avoided

The pedicle clamp should only be removed when the catgut sutures have been tied, and what is most astonishing, not a single drop of blood will be seen to ooze from the renal incision, if the sutures have been properly applied.

After having made sure that hæmostasis is complete, the kidney is dropped back into its place, and the perirenal fat is closed over it by a running suture of fine catgut. The external incision is in turn closed, according to the method employed by the operator, and as each surgeon differs and has his own technique we will not insist on that point.

REPORT UPON THE USE OF A MIXTURE OF
CASTOR OIL AND BALSAM OF PERU
AS A SURGICAL DRESSING.

By A. ERNEST GALLANT, M.D.,

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IN a paper read before the Section on Surgery of the New York Academy of Medicine, June 12, 1893, by Professor William Waldo Van Arsdale, on the "Treatment of Granulating Wounds,"¹ attention was directed to a careful study of various solutions in water and mixtures in water and oils, to discover a dressing which would overcome the objections to those in general use. This was accomplished by using a mixture of the best qualities of—

R Balsam of Peru ℥xxx;
Oleum ricini ℥i.

The mixture is viscid enough to remain for any length of time in direct contact with a wound, not spreading beyond those portions of the dressing on which it is originally poured. The castor oil remains sweet when mixed with balsam of Peru, and the mixture will keep any length of time.

Any powder can be dusted on the ulcer or granulating surface in special cases; the oil will not interfere with its remedial action, but will prevent drying and scabbing. The disagreeable odor of iodoform is very much modified when used with this dressing. Balsam of Peru is too irritating to the skin when applied in a mixture of more than 10 per cent. As to the castor oil: this can be heated to any degree deemed necessary; but this must be done previously to the

¹ New York Medical Journal, 1893, Vol. LVIII, p. 115.

admixture of the balsam. Since this oil comes to us direct from the manufacturers, Van Arsdale had not considered it necessary to subject it to further procedures for sterilizing it. It appears probable, however, that this balsam mixture is mildly antiseptic.

The following advantages are claimed to attend the use of this balsam oil:

As long as there is any secretion the oil in this mixture prevents surface union, or closure of the gap, when an incision has been made, thus preventing any accumulation of blood or serum in the depths of the wound. Dry gauze, like a dry sponge, will not take up fluids as readily as when previously moistened. As the dressing remains moist and does not dry, there can be no scabbing. The sponge-like action is *continuous* and no reaccumulation of discharge can take place. "The oily mixture *saturates the fibres* of the gauze and the secretions are drawn into the interstices" until the whole dressing is completely saturated. It is therefore important to apply, directly over the opening, a relatively large quantity of gauze. The immediate removal of secretion from the depths of the abscess facilitates rapid contraction of its cavity and aids *healing from the bottom*.

For the application of the dressing a bunch of plain or sterilized absorbent gauze is spread with the balsam oil over an area somewhat larger than the wound to be dressed, the amount varying according to the size of the dressing and the period during which the dressing is to remain in place. The mixture should permeate the first four to six layers of gauze. The gauze is then laid over the opening so that the oil comes in direct contact with the skin, and is then covered by a protective layer of gutta-percha tissue, oil-silk, oil-muslin, or paraffin paper, large enough to cover in all the gauze, and is then secured in place by a bandage; this constitutes the "balsam-oil dressing." Neither the castor oil, balsam of Peru, nor the gauze need be sterilized. Starched gauze or crinoline may be used to prevent removal and retain the dressing undisturbed.

Packing abscess cavities is not to be resorted to, as it interferes with rapid contraction, keeps the interior moist, and by its irritation as a foreign body mechanically increases the amount of secretion.

Powdered bismuth subiodide (red) was extensively used by Dr. Van Arsdale as a mild astringent, and silver-nitrate stick as a caustic when cases presented with weak or excessive granulations.

Under the direction of Dr. Van Arsdale this balsam-oil dressing has been used during the past nine years, 1887 to 1896, in the treatment of over 29,000 cases at the Eastern and the Good Samaritan Dispensaries in New York City, among 69,364 new patients who were treated by him in those institutions during that time. During five years of this time the treatment of the patients at the Good Samaritan Dispensary, and the results obtained have been in part under my own observation.

In carrying out the object of this paper—viz., of noting the application of balsam oil and the auxiliary measures made use of in the numerous conditions met with—it will be convenient to group these cases as follows:

Burns and scalds, 2482; *abrasions of skin*, 236; *chemical burns*, 4. Blebs were opened, and in neglected cases, where suppuration already had taken place, the elevated skin was entirely cut away, and the raw surface dusted with powdered bismuth subiodide. Within a short time after the balsam-oil dressing was applied pain subsided. Suppuration and absorption fever were notably absent, or if present, when first seen, disappeared in a few hours after the first dressing. Suppuration has never been met with when this was the primary dressing. Replacement of epithelium was remarkably rapid, and the cicatrix soft and pliable.

Wounds (6428).—Under this heading were included stab (1), poisoned (41), punctured (81), contused (175), incised (503), septic (671), and granulating (4867) wounds, in which the powdered bismuth and the balsam-oil dressing alone were used. Nineteen bullet-wounds, with or without extraction

of the bullet or wad, closed promptly; ten divided tendons were sutured and dressed as above. Animal bites, by cat (5), horse (7), rat (7), human (8), dog (130), were never cauterized, but only drained in the same way. In insect bites (3) the irritation readily subsided on applying the dressing over the seat of puncture.

Abscesses (9925); on the hands or fingers (4634).—In this total were included felons, which were incised to the bone. In paronychia or an inflammation at the base of the nail, a drop or two of tincture of iodine, from a camel's-hair brush, was allowed to run around the base of the nail, the latter never being removed, in order to avoid subsequent deformity of the new nail. Palmar abscesses: Incision and a drainage-tube carried well under the palmar fascia, with immobilization of the hand and wrist, if much swelling or infiltration were present, and the hand carried well up onto the opposite shoulder, by means of a sling. After the abscess had closed, passive and active motion, with massage, was necessary to restore the function of the hand and fingers. It was in these cases, usually so difficult and tedious, that the brilliant effects of drainage by this dressing were most beautifully illustrated, and rapid healing secured. Subcutaneous abscesses in other locations than the hand and fingers (2495): ischio-rectal (55), periurethral (6), suppurating bursitis (236) were all incised, drained, and the balsam oil used as a dressing.

Lymphatic gland abscesses (1352), principally located in the necks of children, including retropharyngeal abscesses, many being of the size of an orange, all were treated as follows: Under nitrous oxide anæsthesia a small incision was made at the point of most marked thinning, a pair of modified Lister's forceps introduced, the blades separated so as to stretch the opening enough to admit a fenestrated rubber drainage-tube. This was bevelled at the end to facilitate introduction with the forceps and carried to the bottom of the abscess cavity. It was then cut off on a level with the skin. No irrigation or scraping of the cavity was practised, nor was any preliminary disinfection of the skin necessary.

A large quantity of gauze, or oakum enclosed in gauze, to one side of which the balsam oil had been applied, was placed directly over the opening, and the whole covered with rubber tissue and secured by a muslin bandage, over which a few turns of a starch bandage were taken to prevent the child from removing the dressing. On the third day, when the dressing was first removed, the following conditions were noted: First, the dressing was moist throughout, more or less soaked with the discharge; second, the abscess cavity had contracted down to the natural level, the tube being partially extruded, and its calibre not plugged, as is usual with other dressings; third, the short tract of the drainage-tube and the small opening made by the knife were all that remained of the large abscess. Two or three more dressings sufficed to complete the cure, and a scar not more than one-fourth inch remained.

Packing cavities was never practised as it retards contraction, the dressing is simply laid over the opening.

Mastoid Abscesses (20).—In young children the soft bone could be readily cut through and the abscess drained by tube and balsam oil.

Mediastinal Abscess (1).—This case illustrated very forcibly the absorptive power of this dressing. The opening was above the sternum, and a rubber tube, about eight inches long, was inserted behind the sternum, and efficiently drained the cavity.

Suppurating Bubo (159).—Nitrous oxide gas or ether was administered, a free incision made, the cavity wiped out, and to the interior caustic potassa stick was thoroughly applied, converting the multiple foci into one general cavity, and balsam-oil dressing put on for drainage.

Mammary Abscesses (967).—When a single point of fluctuation was made out, it was opened and drained; but in many cases multiple foci had to be incised, the septa broken down so as to make a single cavity, and one or more fenestrated drainage-tubes placed in each opening.

The next group of 3229 cases represents a series of infec-

tious diseases which Dr. Van Arsdale has classified after the following manner:

Phlegmon (877) in its early stage, when it represented merely a diffuse purulent infiltration of the skin and underlying tissues, was treated by rest and cold and, if possible, elevation. A splint was applied, and the old-fashioned lead and opium lotion given to the patient with directions to apply it cold, and at frequent intervals upon compresses. As soon as fluctuation appeared or the pain became localized, at one point free incision was made and the balsam-oil dressing used.

In *furuncles* (2092), on the other hand, commencing as a circumscribed inflammation of the hair-follicles or sweat-glands, and limited to skin itself, better results were achieved by an early application of a salve consisting of 10-per-cent. balsam of Peru and vaseline, applied twice daily. This usually made further proceeding unnecessary, and was of specially good service in the severer cases of furuncles on the face and lips. If, however, the "boils" went on to suppuration, so that an abscess was formed, free incision was practised, and the balsam-oil dressing applied. No drainage-tubes were used.

Carbuncles (71) of the neck and back, representing a group of furuncles, were treated exactly after the same manner, and suppuration here was rare; the slough coming away through the multiple openings under the applied balsam salve, without any incision.

Multiple Abscesses (187), frequently found on the heads of children, were treated by free incision, and the application of a large dressing of balsam oil; while general *furunculosis* of the body was referred to the medical department for appropriate internal treatment.

Malignant pustule proper (1) or *anthrax* was also treated purely expectantly. All incisions or anything which might cause bleeding were abstained from. If the epithelium in the centre of the pustule was loose and wrinkled, it was gently lifted off with forceps to give exit to the few drops of serum underneath; care being taken to cause no bleeding. The balsam-oil dressing was applied and rest enforced. Where possible a splint was used.

Actinomycosis (1).—In this case, with incision and drainage and the balsam-oil dressing, supplemented by the internal administration of potassi iodidi, the foci healed and the patient gained in strength and weight. (See ANNALS OF SURGERY, 1895, Vol. XXII, page 387.)

Ulcers (2772).—*Varicose ulcers* of the legs (1610) are usually characterized by an œdematous condition of the tissues surrounding the ulcer, eczematous exfoliation of skin, which necessitated a special method of dressing. Two or three yards of gauze were folded to about twelve inches square, and very thinly spread with Hebra's ointment, consisting of equal parts diachylon and lard (or vaseline). At the point where this plaster would cover the ulcer an opening or "window," the size of the latter, was cut out of the plaster, and the balsam-oil mixture spread in the opening and covered with an extra gauze pad. This afforded free drainage of all secretions from the ulcer, prevented irritation of the edges, and the ointment brought about a healthy condition of the adjacent skin, so that epithelial growth was not interfered with.

Chancroids (430) when dusted with the bismuth subiodide and dressed with balsam oil buboes were not met with, and if the inguinal glands were enlarged, but not suppurating, they quickly subsided to the normal. *Chancres* (89) also healed quickly. Circumferential dressings were never applied to the penis, lest they should cause constriction and sloughing. A pad of gauze smeared with the balsam oil was placed upon the ulcer, and secured in place by a strip of rubber tissue, fastened by moistening the end with a little chloroform. This will stretch if erection takes place.

Syphilitic ulcers on the leg (94), tertiary, were dressed with a thin layer of a one-in-eight iodoform in vaseline ointment, and the ingestion of potassium iodide.

Vaccination ulcers (394), the result of mixed infection, with scabbing and retention; simple *traumatic ulcers* (213), all recovered with the application of the bismuth powder and balsam-oil dressing.

Tubercular ulcers (136) respond best to a dressing of

gauze partially soaked with a mixture of iodoform, 10 per cent., in a 1 in 2000 solution of bichloride in water, to render the iodoform sterile.

Gangrene (14) of one or more toes and *sloughing ulcers* were dusted with powdered charcoal, or dressed with pyoktanin gauze, moistened with the balsam oil to destroy the offensive odor. In some cases the 10-per-cent. iodoform ointment was more successful.

Tabetic Ulcers—Malperforant (5).—When the excavation was filled with dry boracic acid powder and covered with dry cotton, the most rapid building up of lost tissue resulted.

Miscellaneous Conditions (3944).—*Empyema* (27).—After resection of one or more ribs to evacuate pus from the pleural cavity, in order to prevent profuse granulations, avoid irritation of the skin around the opening, and afford constant absorption of the pus, the following dressing was devised. Upon several thicknesses of gauze a thin layer of diachylon ointment was spread, a hole just large enough for the drainage-tube cut through, and the diachylon plaster placed in direct contact with the skin. Over this was placed a perforated layer of rubber tissue. Next a generous dressing of gauze enclosing a bunch of oakum, smeared with the balsam oil, so placed as to enclose the protruding end of the drainage-tube, and the whole covered with rubber tissue.

Ingrowing Toe-Nail (637).—A drop or two of tincture of iodine was placed at the unguinal junction; next the proliferating granulations were depressed outward, and a few drops of flexible collodion allowed to run under the edge of the irritating nail. When the collodion had hardened, the balsam-oil dressing was fixed in place with a gauze bandage, and secured by a few turns of a starch bandage. This procedure was repeated every third day, and gave good results. Many of the above number submitted to operation, that known as Hamilton's, giving the best permanent result.

Umbilical Fungus (79).—The projecting fungus was ligated with fine catgut and a dressing of balsam oil fastened in place with a strip of rubber plaster. In many cases the red-iodide powder was also used as an astringent.

Adherent Prepuce.—In the large majority of these sufferers circumcision was not deemed necessary. The foreskin was dilated, adhesions separated, and the prepuce retracted behind the glans penis, which was smeared with vaseline or balsam oil and the foreskin replaced. The patient was directed to repeat the retraction and application of vaseline daily, for a week, giving permanent relief. When the foreskin was very long and strongly adherent circumcision was performed and balsam oil used as a dressing.

Lymphadenitis (2795) distributed in various parts of the body, an ointment of 10 per cent. potassii iodidi in vaseline was rubbed over the glands once daily. When due to pediculosis capitis, upon the application to the head of "Kaposi's mixture" the enlarged glands soon returned to their normal size. When suppurating, free incision and balsam-oil dressing.

Lymphangitis (120).—A wet dressing of lead and opium was used, a liberal quantity of gauze bound on, and the patient directed to keep it moist with the lotion, the point of infection being dressed with balsam oil.

Acute Suppurative Arthritis (139), described by Drs. Koplik and Van Arsdale as "streptococcus osteomyelitis in children" (*Transactions of the New York Academy of Medicine*, 1892, Vol. VIII, pp. 323 and 354), frequently referred to as "Volkman's catarrhal arthritis," following acute infectious diseases; after incision and the insertion of a drainage-tube, the drainage has been more perfect when balsam oil has been used than under the creoline dressing recommended in the above-named paper.

Suppurative Periostitis (116), *Subperiosteal Abscesses, without Necrosis.*—These comprised cases operated upon at the dispensary or in hospitals, and sooner or later referred to the dispensary. Balsam oil proved an excellent dressing.

Sinuses (15) and *Fistulæ* (16).—In the treatment of post-operative sinuses, bone sinuses, and fistulæ in various parts, the balsam-oil dressing was especially valuable. Owing to the fact that the castor oil kept the opening patent, pre-

venting accumulation of secretion in the tract, and facilitating healing from the bottom. In abdominal sinuses the writer has had good results from the injection, twice a week, of from thirty to sixty minims of pure ichthyol into the bottom of the sinus. A long bulb-pointed urethral syringe was used for introducing the ichthyol.

Aseptic Surgical Wounds.—Under this heading eighty-nine cases were operated upon, under cocaine anæsthesia, some sutured, others not, and dressed with the unsterilized balsam oil, yet despite the imperfect asepsis primary union was secured in every case.

In his hospital work Dr. Van Arsdale has used the *sterilized* castor oil, without balsam of Peru. Under this dressing Thiersch grafts and large skin-flaps, without pedicles, have adhered primarily, and have given more satisfactory results than under saline dressings.

The *advantages* of the balsam-oil dressing may be summarized as follows:

(1) *Continuous Drainage.*—It affords a continuous sponge-like absorption of the discharge, to the point of saturation, so that the ulcer or abscess is kept clean and dry. Under these conditions—

(2) *Retention* cannot take place, there can be no scabbing, no pain, no redness, no swelling; and if these are present all subside in a short time after the first dressing is applied.

(3) *Bacterial growth* is reduced to a minimum, the production of ptomaines practically ceases, and, as they are not under pressure but at once soaked up into the dressing, no lymphangitis or systemic absorption can take place, and no fever be present.

(4) *Epithelial growth* goes on more rapidly than under any other dressing.

(5) *No eczema* occurs around the margins of ulcers, owing to its clean and dry condition, and there is an entire absence of the irritation met with when antiseptic dressings are used.

(6) *Removal is painless* and bleeding does not occur, as the dressing does not adhere to the granulations. This bleeding is a too often overlooked source of reinfection.

(7) *Granulations* are never profuse, and quickly shrink after the dressing is properly applied.

(8) *Infrequent Dressings*.—It need not be changed, on an average, oftener than twice a week.

(9) *Irrigation, disinfection*, or scraping of abscess cavities may be avoided.

“The dressing does not actively prevent suppuration, it simply drains the wounds and keeps them in a clean condition.”

The occasional growth of the bacillus pyocyaneus in the dressing is not prevented by the mixture. This bacillus is certainly harmless to wounds, and does not delay healing.

Of more importance are the varieties of the bacillus foetidus. This could be overcome by the use of say 1 to 500 dry bichloride gauze, used with the oil, without local detriment. The green and violet pyoktanin gauze with the balsam oil did not always prove satisfactory.

A REPORT OF TWO CASES OF ANTE-OPERATIVE
ASPHYXIA, FOLLOWING ACUTE IN-
TESTINAL OBSTRUCTION.¹

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THE interim between the occurrence of the following two cases was of such a short duration, and the fact that they should have happened respectively in the practice of two surgeons, who are doing a large amount of intestinal work, and yet neither of them had ever experienced such a complication, which was not only identical in both cases, but also necessitated the immediate abandonment of all surgical interference, on account of the sudden death of the patients, make the cause of death, which I witnessed, of some import.

CASE I.—A patient of Dr. Snider's, New Oxford, Pa., aged seventy-five years, white, small, well-nourished woman. She had had a ventral hernia, post-operative, for several years; and though subject to repeated attacks, of severe abdominal pains, acute indigestion, and persistent constipation, which for the time would incapacitate her for her duties, she nevertheless led an active, energetic life. On Tuesday, February 9, the patient was seen, in consultation, by Dr. Kelly. She had then been having an attack for four days, which in every way resembled the previous ones. It commenced, while she was at the breakfast-table, as an acute pain in abdomen, just below the umbilicus. The pain during the day was paroxysmal in character and exceedingly severe at times. On the following morning the patient began to complain of nausea, which was soon followed by vomiting. The

¹ Read before the Medical and Chirurgical Faculty of the State of Maryland, at its Annual Meeting in Baltimore, April 27, 1897.

patient's general condition at this time, though not alarming, was only fair. There was a slight elevation of temperature, and her pulse was somewhat quickened. This condition remained about the same during this and the following day. By the next morning, however, there was a decided change for the worse. The vomitus consisted, for the first time, of a yellow fluid with an unmistakable fæcal odor. The patient strained and retched with each effort. All attempts up to this time to move the bowels had been totally ineffectual. The next morning the patient was seen by Dr. Kelly. She then had an anxious expression, the face and nails of a bluish color, pulse 120, temperature slightly above normal. All decided attempts at vomiting had subsided. Now and then, however, the patient would empty her mouth of an ounce or so of a thin, light, yellowish fluid, exceedingly offensive, and having a sweetish, fæcal odor. This fluid seemed to gush up into the mouth. There was apparently little if any muscular exertion on the part of the patient, nor did it seem to annoy or distress her. Though the patient's general condition was not good, she was not in a condition of collapse; nor did she appear to be beyond surgical aid. On inspection, the abdomen was irregularly enlarged, two masses could be seen protruding outward and downward, one on either side of the "old scar." The mass, on the left side, was fourteen by fourteen centimetres, prominent, tense, rather hard, and painful on manipulation. Even under anæsthesia it was not possible to reduce this mass at all. The utmost which could be effected was to cause some of the contents of the tumor to regurgitate back into the abdomen, to return again as soon as the pressure was withdrawn. The tumor was everywhere tympanitic, and was diagnosed as a strangulated gut. The harder and slightly lobulated areas around the base of the tumor were thought to be portions of an incarcerated omentum. The mass on the right side—eight by ten centimetres in diameter—was firm and regular in outline.

After failing to reduce the hernia by gentle manipulation, under slight chloroform narcosis the patient was more deeply anæsthetized with ether. Then she was cautiously lifted from the bed and carried into a room near by, and placed upon a table. There had not been any special difficulty in administering the ether, nor had it produced any untoward effect upon the patient; in fact, her pulse seemed to improve under the anæsthetic. At

no time was the patient profoundly anæsthetized. Even after she had been placed upon the table she offered some resistance. The usual cleansing of the abdomen had just been commenced, when, without the slightest premonitory sign, the thin yellowish fluid, most offensive, began to pour out of the patient's nose and mouth. The head instantly was turned on its side, the patient turned well on her side, and the tongue pulled forward. There were one or two convulsive respiratory efforts. The patient became profoundly cyanosed, her pupils widely dilated, there was cessation of heart-beats, death, notwithstanding that active stimulation and artificial respiration were employed for a long time.

By permission of the family a post-mortem examination was immediately made. An elliptical incision into the sack, made to either side of primary incision, through thin abdominal walls, made up of skin and small amount of adipose tissue. The flap was then dissected up, exposing a firm, fibrous band, which formed the neck of the "hernia ring,"—twenty-five by eighteen centimetres in diameter. This ring was composed of the rectifascia, on the upper surface, and the adherent peritoneum on under surface. The parietal peritoneum was smooth and glistening. The intestines were thus exposed, and found greatly distended, both above and below the point of constriction, and filled entirely the abdominal cavity, being of a dark-reddened hue.

On left side, a coil of intestine, twenty centimetres in length, the ileum, was found protruding over left margin of the "ring," and extending down, immediately beneath the skin, into the left lumbar region. Then doubling on itself, it passed back over the lower limb of the loop, again through the ring into the general cavity. The point of constriction was just where the lower limb of the loop protruded down over the edge of the ring. The upper limb was not constricted. On making traction upon it there was no difficulty in freeing and drawing the entire coil of intestine out of the ring, though the constriction of the lower limb during life had been so great as not only to completely occlude the lumen but almost to sever the gut. On the right side, the bulging mass which had been felt externally proved to be a tremendously redundant omentum, the lower end of which had entered the sack, and lay between the abdominal wall and the ring; but nowhere was it incarcerated.

CASE II.—A patient of Dr. H. M. Wilson, of this city, aged

sixty-five years, white, single, large, well-built man, and of a highly nervous temperament. He had been a "hard drinker," at irregular intervals, for many years, with occasional attacks of what he called "whiskey gout;" but for the past two years he had been correct in habits. During the night of February 18 he was seized with severe abdominal pains, which he attributed to imprudence in his diet. On the following morning the patient was seen by Dr. Wilson. Then there was some slight tenderness over the abdomen, but no nausea nor any rise of temperature. The following morning he was greatly improved. His bowels had been slightly moved and the pain much less in severity. But during that night he was again seized with an acute pain, which was referred to the hepatic region. This pain was relieved by an ordinary dose of opium. The next day a slightly jaundiced appearance of the face and eyes was noted. The patient complained of slight pain over his liver. The abdomen was somewhat tympanitic and tender on pressure. Occasionally the patient would expectorate a mouthful of a thin fluid, slightly discolored, but without any appreciable odor. The next morning—the fourth day of illness—the patient was much distressed, not only by the pain along the lower edge of the liver, which had greatly increased in severity, but also from an increase in the frequency of the regurgitation of the fluid, and constant thirst. At frequent intervals, during this day, the patient had severe and violent vomiting attacks. The vomitus was, though not distinctly fecal in odor, decidedly offensive.

The diagnosis of intestinal obstruction was then made; and late that afternoon Dr. Finney saw the patient in consultation with Dr. Wilson. He found the abdomen distended, hard, tympanitic, and painful on gentle pressure. The patient's pulse was weak and rapid. The temperature 102° F., and all efforts towards moving the bowels had proved ineffectual. All attempts to vomit had ceased by this time. The fluid, apparently, just welled up into the mouth, and the patient would expectorate two or three ounces of it, now and then. Dr. Finney advised an immediate operation, and in about two hours later the administration of the ether was commenced. The patient was in the horizontal position, on the bed. The anæsthetic was given slowly and most cautiously by an experienced anæsthetizer, and no especial difficulty was encountered save the frequent interruption to allow the patient to expectorate. The character of this expectoration

was the same as it had been during the earlier part of the day. Finally—though not profoundly anæsthetized—the patient was carefully lifted from the bed, carried a short distance, and placed upon the table. The expectoration by this time had entirely ceased. After the abdomen had been cleansed in the usual manner, and the dressings applied, the patient was placed in the moderate Trendelenburg position. Almost immediately the patient became profoundly cyanosed, and the fluid—just as in the first case—began to well up, pouring out of the patient's nose and mouth, with considerable force. All respiratory effort ceased. The head of the patient was immediately turned far over on the side and drawn over on the edge of the table, and the tongue pulled forward. Though attempted, it was utterly impossible to clear the trachea by swabbing. Then the patient, head downward, was held over the backs of two assistants, and artificial respiration employed; but at no time did the patient make the slightest respiratory effort, while at the same time the fluid, without any cessation, kept on pouring out of the nose and mouth. Though artificial respiration and other means towards resuscitation were employed for a long time, they proved inefficient.

By permission a post-mortem exploratory incision in the median line was made. The peritoneum, though smooth, had lost its normal lustre. There was not any fibrinous exudate present, nor any other signs of active peritoneal inflammation. The intestine was greatly distended throughout its entire length. The cæcum was densely adherent to the parietal peritoneum, and laid in the right iliac fossa. No kink nor band of constriction could be found. The appendix was intimately adherent to the under margin of the cæcum. It was about four centimetres in length, and of the usual calibre. Its lumen was patulous and the mucous membrane normal in appearance. Extending from the lower border of the liver to the pelvic brim, and walled off from the general cavity by the cæcum, were, to all appearances, evidences of a former abscess sac or cavity. It was at the time of the post-mortem examination practically obliterated; the only remains being here and there pieces of a membrane, which was pyogenic in character; but no purulent contents nor serous fluid were present. No occlusion of the lumen of the intestines could be found nor could any cause for the apparently complete paresis of the intestine be demonstrated. All the other abdominal viscera were normal in appearance, as were also the heart and lungs.

The most salient point suggested by these two cases is that such a complication as arose in them, and which is surely a possibility in every case of intestinal obstruction, should be prevented rather than to rely on a possibility of overcoming it, after it has once taken place. For to those who witnessed the sudden, profound asphyxia of either of the patients, who saw them drowned in their own intestinal fluid, it was apparent, from the instant of the onset, that any probability of overcoming the complication was hardly to be expected. The persistent oozing up of the intestinal fluid, following the cessation of the more expulsive efforts, as vomiting, was of great significance. For it indicated not only that there was a large amount of the fluid being rapidly secreted by the intestinal mucous membrane, but also of the very high pressure it was under, and the great probability of regurgitation following anæsthesia.

Again, both patients were in the horizontal position while they were being anæsthetized, which allowed the stomach to act as a reservoir for the intestinal fluid. So that, as soon as the anæsthesia produced an incomplete relaxation, the large amount of fluid already collected not only poured out in a large stream; but with great force. Though the position of the patients, the moment the fluid commenced to ooze up, was changed, it proved totally ineffectual. In the first case the patient was drawn over the end of the table, and turned well over on her side. In the second case the patient was literally hung up by his feet. In both cases artificial respiration was kept up for thirty minutes or so; and during this entire time the fluid poured from the mouth and nose in such a torrent that it was impossible to keep it from running back into the trachea.

In 1885, Dr. L. McLane Tiffany noted two cases of strangulated herniæ, in which there was regurgitation of intestinal contents during the handling and reduction of the gut. In both of his cases the patient was turned face downward, over the edge of the table, and in this way the asphyxia was supposed to have been averted. Finally, in all cases of suspected intestinal obstruction, having such an ante-opera-

tive symptom, as the regurgitation of the intestinal contents following the total cessation of all efforts to vomit, it would at least be of some advantage to lavage the stomach just before the anæsthesia is commenced. In fact, Kussmaul claims to have cured a case of an "ileus" by this method. (*Berliner klinische Wochenschrift*, Vol. XXI, 1884.)

Doubtless, in some cases, it would be almost an endless task to empty the stomach of all its intestinal contents; but in every case at least a large amount of the contents could be siphoned off, and in this way not only reducing the amount of fluid above the seat of obstruction, but also to very greatly lessen the pressure which it is under. The patient should be well propped up and kept in this position, not only during the administration of the anæsthetic and the opening of the abdomen, but especially until the distention of the intestines is reduced, either by the removal of the obstruction or by the aspiration of the gut.

The use of the Trendelenburg position, or allowing the patient to remain even in the horizontal position, during the administration of the anæsthetic cannot be too strongly discountenanced, after the stomach has been relieved of at least some of the intestinal fluid. For the cessation of vomiting followed by the regurgitation of the intestinal contents does not necessarily mean a condition of collapse of the patient, nor that the patient is beyond surgical aid. Doubtless such condition may rapidly take place in the patient after the gut has become paralyzed. At first, however, the cessation of vomiting is probably due to the complete paresis of the stomach, so that the intestinal fluid, under high pressure, is forced through the pyloric orifice into the stomach, which has become by this time non-sensitive and unable to make any effort to empty itself. The fluid will therefore collect in the stomach, only to pour out the cardiac orifice the moment the stomach becomes over-distended; or the patient is put in such a position as to invite the fluid, possibly under high pressure, to gravitate out with such a stream as to make it utterly impossible to keep the trachea free.

SOME REMARKS ON HOSPITAL BEDS, WITH
DESCRIPTION OF A NEW MODEL.

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To all those to whose lot it has fallen to treat chronic invalidism, and such injuries as fracture of the spine, and of the hip in aged persons, the desirability of improvement in hospital beds has certainly suggested itself. The old-fashioned hospital bed, with which so many of our institutions are unhappily still provided, is too low by a number of inches for the comfort of both nurse and dresser. As far as the comfort of the patient is concerned, it makes no difference whether the bed be sixteen inches from the floor or thirty-two inches. But to the attendant, who has dressings to change or the multiplicity of small things to attend to, which care of the invalid entails, the height of the bed means the difference between comparative comfort and the greatest weariness. For no attitude is more wearying than that of standing over a sick-bed in a half-doubled-up attitude.

The height of the bed is to be considered in another regard,—viz., the height of the operating table. Patients are ordinarily transferred from the bed to the wheeled table, and from this, in turn, to the operating table. After completion of the operation the patient is returned to bed by the reversed procedure. The wheeled table is ordinarily about the same height as the operating table, and the transfers from one to the other are usually easily made. But it is a difficult matter, sometimes, to get heavy patients from low beds onto the

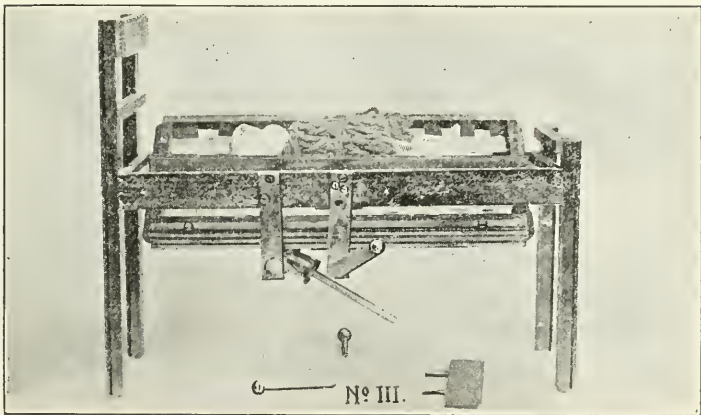
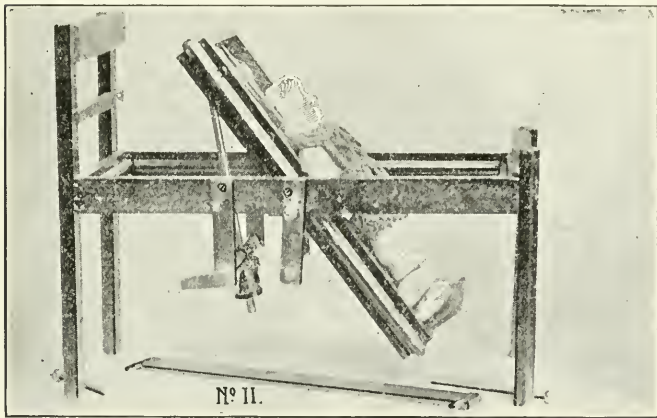
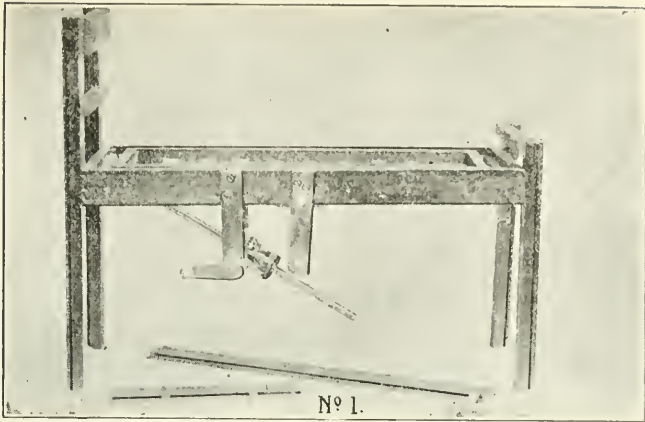
wheeled table, and from the wheeled table back to bed again. Not only is it difficult but sometimes dangerous, as, after operations, where clamps have been left in place to control hæmorrhage, as in vaginal hysterectomy, for instance. The best and safest way to make such a transfer is to lift the table-top bearing the patient off of the wheeled frame, place its edge on the bed about a foot from the bed's edge, then, by gradually raising the free outer edge of the table-top, and with an assistant on the other side of the bed to steady and pull the patient's body, the latter can be slid off into the bed with comparative ease and safety.

Without entering further into the details of construction of ordinary hospital beds, details assuring convenience as well as cleanliness, I desire to emphasize only this one essential point, the desirability of having them sufficiently high.

Recognizing the difficulties of meeting satisfactorily and safely by means of the ordinary bed several surgical demands, as especially fracture of the spine and fracture of the hip and thigh in old persons, it occurred to me some time ago that if a bed could be so constructed as to permit of changing the bed-plane longitudinally and laterally, throwing the head up or down, and the two sides up or down as desired, a decided help would be given to the treatment of the class of cases referred to. As a solution of the mechanical difficulties involved, I offer the following model:

No. 1 presents the bed in position for use as an ordinary hospital bed. The inner frame is held rigidly in place by four pins, one in the middle of each side and each end, as can be better seen in Nos. 2 and 3. It being desired to elevate or depress the head of the bed, as in No. 2, the end pins are withdrawn, the inner bed-frame being pivoted then on the two side pins. Now by application of the crank to the front screw-gear the head of the bed can be raised or lowered as desired, as shown in No. 2.

By removing the side pins the bed-frame is pivoted on the two end pins, and by applying the crank to the rear worm-gear (an Archimedes screw) the bed-plane can be changed



laterally, as shown in No. 3. The gears are so constructed that the bed remains securely in any position, either longitudinal or lateral elevation, which may be given it.

In treating fractures of the hip in old persons the perfect immobility of the parts has frequently to be sacrificed to the necessity of early placing the patient in the upright position, as hypostatic congestion is properly regarded as one of the most serious probabilities. By fixing in position the foot-piece and blocking hard pillows between this and the sound limb, and also by throwing straps across the body and beneath the arms, if this were deemed necessary, the patient could be held securely in place and given any inclination desired. Slightly beyond an obliquity of 45 degrees would probably be as far as it would be found necessary to elevate the head. The patient could be left in this position as many minutes or as many hours as thought advisable, and the procedure could be repeated as often as desired, as it would require only a few minutes to effect the change, and a single attendant could easily manipulate the apparatus.

In prolonged invalidism, where patients are bedridden for a long time, it becomes necessary to shift the body frequently, both for comfort and for the purpose of avoiding the effects of decubitus. This is sometimes very difficult and painful. Even the experienced nurse is sometimes balked, and the cotton ring and the air-cushion must be employed as the only protection against bed-sores. By fixing in place the side bar, packing in hard pillows between the bar and the patient's body, and then changing the whole bed-plane laterally, the weight can be shifted from the back to either side, or the reverse, without the patient having moved an inch, or having exerted even so much strength as would be required to lift the little finger. After some surgical operations, where it is necessary that no muscular exertion be made and perfect quiet maintained, the enforced position frequently becomes almost unbearable. In such cases great comfort could be afforded by shifting the weight in this way, and at least some of the post-operative suffering mitigated.

With the bed-plane turned laterally 45 degrees, the body weight would be borne equally by the back and side; 60 degrees would probably be as far as it would ever be found necessary to tilt the frame.

It has been suggested that it would be very desirable to arrange for defecation by making a trap-door in the mattress. Such arrangements have not been found very useful and practicable. In this case they would complicate the mechanism and weaken the floor of the bed. Many patients readily come to the comfortable use of the bedpan. By elevating the head of the bed it is quite possible the use of the bedpan would be much facilitated. In some cases, as fracture of the spine, for instance, the best plan would be to place a rubber sheet under the patient and a pad of oakum beneath the buttocks; the head of the bed would then be somewhat elevated and the evacuation received into the oakum. The inclination would be sufficient to prevent the flow of liquid fæces up under the patient's body.

In the case of very heavy patients the nurse has greater or less difficulty in changing the bed-linen. I believe the lateral inclinations of this bed would much facilitate such changing.

With the bed-plane inclined laterally 60 degrees, it would be quite easy to get behind the back and insinuate the bed-clothing. Then by turning the bed-plane to 60 degrees on the other side, the change could be completed without great difficulty.

In cases of severe hæmorrhage, as postpartum or after surgical operations, where the foot of the bed is ordinarily elevated, the same thing is accomplished by lowering the head of this bed.

It is not necessary to attempt enumeration of all the uses to which such a bed could be put. To all who have felt the necessity for such a device in the hard school of practice I am sure these varied uses will suggest themselves. I will only hint at its use, however, in physical examination of very sick patients.

So far as I know, a bed of this kind, involving the principle of change in inclination of the whole bed-plane longitudinally and laterally, has not before been described. The Crosby bed is ingenious and useful in some cases, but is not adapted for the uses which have been briefly pointed out in this paper.

A CASE OF DIAPHRAGMATIC HERNIA.

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MR.—, aged forty years, a laborer; a well built, healthy man. For years he has had an old, reducible, incomplete, inguinal (right) hernia. This man, after rolling coal in a wheelbarrow all day, was taken with a severe pain in the central abdomen. This pain was continuous, yet paroxysms of increased intensity characterized the attack. He began vomiting, the retching and vomiting being of frequent occurrence. The vomited matter had become fecal in character. No bowel movement. He continued in this condition up to the time when I first saw him. I found him on the floor, writhing with pain. His cries could be heard a block away. Temperature 98.5° F., pulse 54, hiccoughing and vomiting repeatedly. I could not keep him still long enough to examine him thoroughly. The abdomen was not distended. He had never had any attack of colic, or pain of any kind in the abdomen, before.

Recognizing the necessity for an operation to relieve the obstruction or constriction that plainly seemed to exist somewhere in the alimentary canal, an operation was performed with that idea in view. On opening the abdomen at the median line, at the umbilicus, the bowel presented an empty appearance. A coil was picked up, and followed in a direction that proved to be towards the cæcum. The appendix was healthy, and no obstruction was found in this portion of the bowel. The first loop picked up having been marked by a small piece of an aseptic sponge (gauze) clamped gently on it was again picked up, and the bowel explored upward to the duodenum. No obstruction was found. The transverse colon was then examined as far as the fingers could reach, and was found empty and not distended with gas. As much as a gallon of water had been injected per rectum, so it was reasonable to suppose that no obstruction ex-

isted lower down. The splenic flexure, being farthest away from the incision, was last explored, yet needed exploration most. The sigmoid was examined. I was nonplussed, and reluctantly closed the abdomen without having found the source of his symptoms. The gall-bladder and ureter were palpated intraperitoneally.

The hernial openings were explored, and during the operation I felt over the diaphragm for a possible hernia.

After the operation I examined the gums for a blue line, thinking it possible he had a severe lead colic, yet the faecal vomiting and other symptoms did not point that way in the least.

His symptoms remained about the same for five days longer, or up to his death. No bowel movement.

A post mortem, made ten hours after death, revealed no peritonitis from the operation, the operative wound was healing nicely; no distention of the bowel. On the left side of the diaphragm there existed an opening at least three inches in diameter, the edges of which in some places presented a callous or hard border, evidently of old standing, yet at other points there existed an ecchymotic or freshly torn surface, a small amount of blood being extravasated in the cellular tissues in the immediate vicinity of the edges of the opening. Through this opening disappeared the splenic flexure of the colon, the entire stomach, and with it most of the omentum. At the time of operation an absence of the omentum was noticed, but as the stomach was not looked for its absence from its natural position was not noticed. Not wanting to disturb the misplaced viscera the diaphragm was excised and removed, after noting the position of the natural and foreign viscera in the pleural cavity. The stomach was entirely in the pleural cavity. The pyloric end had been pulled up through the tear by the distention of the stomach. The omentum (free border) was up against the upper ribs. The colon (splenic flexure) was not distended very greatly, yet it was constricted, more or less, at its two bearings at its passage through the diaphragm. The spleen was also pulled up into the pleural cavity. The lung was compressed backward, and the heart was well to the right of the sternum. The stomach was greatly distended, and its walls were very dark (congested), showing the effect of the partial constriction. It was filled with gas and a

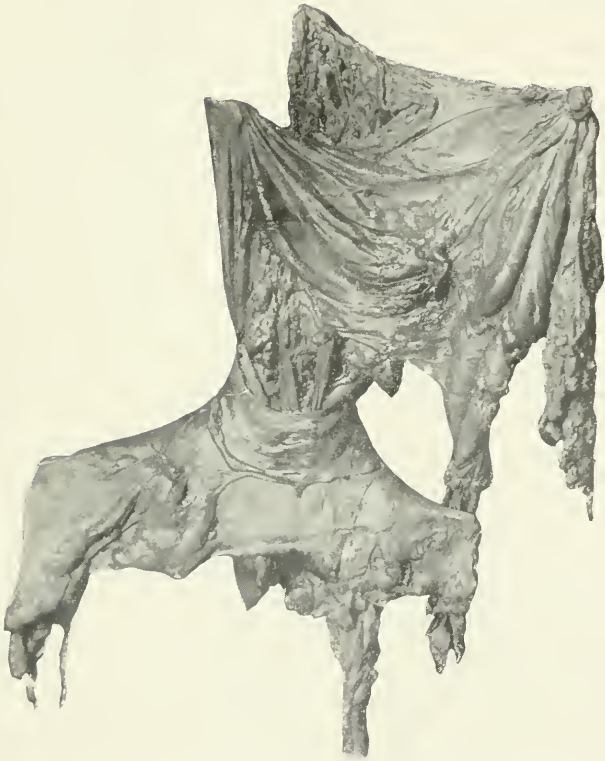


FIG. 1.—Diaphragmatic hernia, showing upper side of diaphragm with protruding contents of abdomen in pleural cavity.



FIG. 2.—The same showing opening in diaphragm after reduction of hernial mass.

large quantity of a dark, offensive liquid, evidently fæcal, and hæmorrhagic in character. The whole mass was removed with the diaphragm, and photographs were made while the specimen was fresh, showing the relation of the structures constricted above the diaphragm, also showing the size of the opening in the diaphragm after the viscera were reduced.

There are many features in this remarkable and rare case worthy of extended comment.

The absence of direct traumatism, as a crush or kick, preceding the development of the hernia would rather lead one to believe that the rupture was an old one with an acute strangulation, yet the absence of any former history of symptoms would in part negative that view, added to which the fact revealed at the post mortem that neither the diaphragmatic peritoneum nor pleura were sacculated into the thorax in the least, and, further, that they had been freshly torn across, all form a chain of conditions establishing the acute character of the attack or development of the hernia. The absence of respiratory or circulatory disturbance was remarkable, when we recall the presence of all the structures in this abnormal situation.

How liquids from the lower small bowel (ileum) could find a passage and traverse the whole length of the small bowel, up through the pylorus, into the stomach, above the constriction, back down again through the cardiac orifice, below the diaphragm, up again through the œsophageal opening, and finally be vomited, is, indeed, a remarkable example of a reversed peristalsis, and that, too, in the face of the fact that the colon was at no time completely constricted by the borders of the opening, as was evidenced by the large enemata repeatedly used. Why the bowel does not in part empty itself of the little gas per rectum is a mystery yet unsolved in cases of bowel obstruction.

A positive diagnosis might have been made in the case by a painstaking examination, and I censure myself in part for not examining the case thoroughly, as I am in the habit of doing in all cases before operating, but I may in part be excused

for this seeming neglect on remembering his extreme restlessness and intense pain upon my arrival. Besides, his symptoms seemed so plain that a mistake looked to be almost impossible. The insufflation of the rectum with gas might lead to a correct diagnosis, provided the obstruction of the colon was not complete at the diaphragmatic opening. The gas passing into the thorax would be manifested by gurgling and increased intrathoracic pressure and absence of abdominal distention.

The failure to examine for the stomach was an oversight not likely ever to occur again in any of my cases of operation for alimentary-canal-obstruction symptoms, especially should I fail to find the source of the ileus in its normal place. The discovery of the hernia and its withdrawal might have saved the patient, and should a similar case ever present itself, I would, after reducing the hernia, and failing to close the opening, anchor the omentum and stomach about the edge of the opening in the diaphragm securely, and trust nature and the stitches to retain the abdominal organs in the peritoneal cavity.

Of 250 cases reported by Leichtenstern, only five were diagnosed before death. The excessive thirst mentioned by some authors was not a marked feature of this case.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, April 28, 1897.

CHARLES K. BRIDDON, M.D., President *pro tem.*, in the Chair.

CORRECTION OF DEFORMITY FOLLOWING OLD EXCISION OF KNEE.

DR. VIRGIL P. GIBNEY presented a girl, about twelve years old, illustrating the result of operations for the correction of deformity of the left leg. The patient had been presented to the society about three months ago, when it was stated that about five years previously a surgeon at Bellevue Hospital had performed excision of the knee, but the patient left the hospital so soon thereafter that the good position secured by the operation was lost. One of the suggestions made at the meeting about three months ago was that cuneiform osteotomy should now be done in the line of the old excision; another was osteotomy above the condyles. Shortly after the meeting Dr. Gibney performed osteotomy above the condyles, with the result of correcting the deformity except for a certain amount of outward bowing of the leg. A brace on the inner side of the limb, with straps passed around the bow in the leg, failed to correct the bowing. Rather than send the patient out even with this slight amount of deformity he corrected it by a further osteotomy below the head of the tibia. Following each operation the limb was put up in plaster splint. The original excision of the knee had resulted in shortening of the limb, so that it was necessary to apply a high shoe. Photographs were presented, showing the former flexion at the knee and bowing of the leg. The limb was now quite straight.

OPERATION ON BLADDER FOR CARCINOMA.

DR. FRED. KAMMERER presented a patient on whom he had operated for cancer of the bladder in August, 1896. The man

gave the following history: He had been suffering for the last thirteen months, at first only from pain in the bladder and a frequent desire to pass water; during the last six months from hæmaturia, increasing in severity. He was run down and had a cachectic appearance. A very severe cystitis was present. On examination with the irrigation-cystoscope a tumor could be made out, occupying the greater part of the right wall of the viscus. It presented itself as an ulcerating surface with elevated edges. At the operation, which consisted in a transverse incision over the pubes and a vertical incision into the bladder, the diagnosis made with the cystoscope was verified. The extirpation of the tumor was begun at the vertical incision, the same reaching almost to that point, and being about the size of a silver dollar. Extirpation with scissors necessitated the removal of almost the entire right side of the bladder, it being difficult to avoid the cutting of the right ureter. The peritoneal investment of the bladder had been stripped back with considerable ease, so that the peritoneal cavity was not opened. After resection of the tumor, during which there was free, but not alarming, hæmorrhage, the left half of the bladder was drawn to the right side and united by catgut sutures to what was left of the right half of the viscus low in the pelvis. A suprapubic drainage was established at one point and the large wound cavity was tamponed. The appearance of the bladder after suture was that of a sausage with its long diameter in an antero-posterior direction. The capacity of the sutured viscus seemed very small. Although much suppuration and sloughing of tissues was set up by the contamination of the wound-surfaces with ammoniacal urine, and although the healing process was very much retarded thereby, complete closure of a long-persisting suprapubic sinus occurred in January, and now, after eight months, the patient has gained ten pounds in weight, evacuates normal urine three or four times a day, has no pain nor hæmaturia, and the capacity of his bladder, measured by injection, is 200 cubic centimetres before a desire to micturate is experienced. A recent cystoscopic examination of the patient reveals no sign of a recurrence as yet. The result is certainly a very gratifying one in a case of infiltrating cancer, and a most interesting point is the perfect manner in which the capacity of the bladder has, to all appearances, been regained.

DR. WILLY MEYER expressed the opinion that surgeons

would meet with more cases of operable cancer of the bladder if the cystoscope were always used at the first indication. It was because of neglect to use the cystoscope *early* that we were obliged to rest content with partial removal of the tumor or with shelling it out of its bed and cauterization of its base instead of making radical resection of the bladder. The physicians still hesitated, but every surgeon ought always to determine at once, in cases of hæmaturia, just where the blood came from,—whether from the kidneys, which kidney; from the bladder, what portion of the bladder; whether due to tumor, to calculus, etc. For this purpose he should emphasize an early resort to cystoscopy. Even in persons with very much enlarged prostate a cystoscopic diagnosis could be made, but, of course, it could be made more easily at an earlier date. Dr. Meyer's first case bearing on this subject was seen in 1890, in a patient fifty-four years of age, with a very large prostate, who had had continuous hæmaturia for two months. There was pain at the end of the penis, very frequent micturition, voiding of a smoky, constantly deep brown-colored urine. The whole history pointed to trouble in the bladder. This was confirmed by use of the long cystoscope, No. 1 Nitze. He soon discovered, about an inch and a half above the left ureteral fold, a sessile growth of the size and shape of a strawberry, and bleeding. The examination was very difficult on account of the hæmaturia, yet by bringing the cystoscope close to the left side he could distinctly see and analyze the tumor, which was sessile and had a large base. According to the cystoscopic picture it was a cancer. The patient was a very fat man. A suprapubic transverse incision was recommended, with such further steps as might be indicated on entering the bladder. The patient gave his consent, the incision was made, and the tumor found as diagnosed with the cystoscope. The fundus of the bladder was then grasped with forceps and drawn forward, and the growth removed by an elliptic incision, passing through healthy tissue about half an inch on all sides of it, but not quite through. Then the base was cauterized with the Paquelin cautery. The operation was performed in March, 1890. There had been no recurrence up to date. The man was now sixty-two years of age, was as fat as formerly, had never again had hæmaturia. Microscopic examination showed the tumor to be distinctly carcinoma.

All other cancerous tumors of the bladder which had come

under Dr. Meyer's observation since that date were of a nature making radical removal by resection impossible. Last summer a patient from the northern part of the State had come under his care, and, after opening the bladder, it was found that the tumor was so large as to render resection impossible. It would have been necessary to resect at least two-thirds of the viscus. With the curved Paquelin cautery he carefully cut the growth out of the vesical wall, leaving a wound area almost twice the size of a silver dollar. Recovery was uninterrupted. He had seen the patient again only a few weeks ago. There had thus far been no recurrence, nearly a year after the operation.

The latter part of last December a man came under his care who had had hæmaturia over a year and a half and had lost a great deal in weight. Cystoscopic examination showed distinctly a sessile tumor on the left side of the bladder with a very large base. He could make out that it would have been impossible to properly avoid the tumor by longitudinal incision in the median line. He performed suprapubic cystotomy, and made transverse incision also through the bladder. On entering the bladder a cancer was found involving the whole left side. The viscus was large, and the question arose whether to make resection. This was done without special difficulty. He was surprised to find how easily the peritoneum could be stripped off. The entire left half of the bladder, including the left ureter, was resected to within half an inch of the internal urethral orifice. There was little hæmorrhage. On closing the resected viscus only a very small cavity was left, which was drained, as well as a cavity which led posteriorly down to the rectum. During the operation an assistant had kept his finger in the rectum as a guide to prevent injury of that structure. The patient made a good recovery, going the first two or three weeks without rise of temperature. The left ureter, which had been cut and so shortened during the operation that it could not be stitched into the bladder, was sewed into the wound to prevent its retraction, and a catheter was introduced into it for drainage. The temperature rising at the beginning of the fourth week, Dr. Meyer supposed it to be due to suppurative pyelitis, on the left side, such as usually developed when the ureter was divided and could not be reunited with the bladder. Therefore in February he removed the left kidney. But the temperature did not fall, and it was then found to be due to periostitis of the pubic bone. This had continued and had ex-

tended to the iliac bone. No doubt all present had frequently performed suprapubic cystotomy without having met with periostitis. This was the speaker's first experience with that complication, and he could not account for it except by the fact that it had been necessary to strip the bladder entirely away from the symphysis on the inner side; it had no chance to drop again towards the symphysis, the urine had continuously flowed over and lodged in this pouch. He hoped the patient might yet recover, although the chances were not altogether favorable. It was likely he would always require suprapubic drainage. The case was another one illustrating the necessity for an earlier diagnosis and the use of the cystoscope at once after the occurrence of hæmaturia.

DR. BRIDDON said he had once had suppuration of the intra-articular cartilage of the symphysis after suprapubic cystotomy by transverse incision, but the bone itself did not become involved in the necrosis. The patient eventually made a perfect recovery.

DR. KAMMERER said that in his case the ease with which the peritoneum could be stripped up from the bladder was rather astonishing; it was fully as easy over the infiltrated portion as over the healthy area. With regard to necrosis, in this case, he could feel the raw surface of the symphysis for a few months, but healing finally took place without necrosis of the bone itself.

STRANGULATION OF INTESTINE BY MECKEL'S DIVERTICULUM.

DR. KAMMERER read the paper on this subject, for which see page 179.

Stated Meeting, May 12, 1897.

The President, FRANK HARTLEY, M.D., in the Chair.

TOTAL EXTIRPATION OF URETER SUBSEQUENT TO NEPHRECTOMY.

DR. ARPAD G. GERSTER presented a patient with the following history: A young man, twenty-six years old, in the summer of 1893 came under treatment at Buffalo, where Dr. Park found

pyonephrosis, and started to do nephrotomy, but finding the kidney totally disorganized, removed it. A fistula remained, which closed from time to time, and whenever it closed fever set in, with local pain. Finally perforation would take place and a large quantity of pus would escape. This had happened several times, and finally, in July, 1896, the patient was admitted to Mt. Sinai Hospital, New York. There very pronounced pyuria was found and an abscess of the prostate. The latter was incised by Dr. Lilienthal. There was a tight stricture of the urethra at the junction of the prostatic and membranous portions, which made cystoscopic examination impossible. In the loin was the fistula, surrounded by massive cicatricial tissue. No tumor could be felt in the hypochondrium. Profuse suppuration continued from the fistula, and Dr. Gerster suspected that the pedicle of the kidney, which possibly had been tied with silk, had retained the silk ligature, and that this was the cause of the continued suppuration. Hence he laid the region of the fistula freely open and went down to the peritoneum, but failed to find the ligature. During the healing of the wound the following condition was observed: Whenever the fistula in the loin closed the quantity of pus contained in his urine increased very considerably. At the same time the irritability of his bladder increased. Whenever the fistula opened, so that there was free discharge of pus from the loin, the quantity of pus in the urine diminished very much, so that there was a certain vicariousness in the two conditions. From this it was concluded that the cause of the prolonged suppuration must be an empyema of the ureter.

The healing of the prostatic fistula took place very slowly, but, finally, at the end of October or the beginning of November, 1896, the wound had closed, and on November 13 Dr. Gerster proceeded to extirpate the ureter. The difficult portion of the operation consisted in finding the renal end of the ureter, which was embedded in a large and dense mass of cicatrix. He did not work at random, but followed a well-laid plan. He prolonged the oblique incision at the site of the first incision made by Dr. Park, well forward and downward into the abdominal walls to the place where the abdominal walls had not been incised and to where the peritoneum was presumably normal. He stripped up the peritoneum to near the colon, then proceeded towards the spinal column until he reached the margin of the cicatricial tissue, with

the peritoneum as a guide, searching for the ureter. Getting deeper, he became cramped by the narrowness of the wound and rigidity of the tissues, and therefore added a vertical incision to the oblique one, which enabled him to expose the renal end of the ureter, which he was able to recognize by its everted, hyperæmic, and bleeding mucous membrane. From this point on the operation became easy. The ureter was dissected out of the cicatrix, the peritoneum was freed sufficiently to enable him to lift it up and to strip it from the posterior abdominal wall. He then saw the observation of Cabot, of Boston, beautifully verified, that when one stripped up the peritoneum the ureter followed. It was closely attached to the peritoneum. The external incision was now continued down to Poupart's ligament, the parts were well opened up; he continued to strip up the peritoneum and finally came down to the bladder. The whole dissection was very easy, the hæmorrhage scanty. Near the bladder the ureter was found much distended, its walls much thickened. The ureter here would admit comfortably the end of two fingers. A little less than an inch from the bladder there was a stricture of the ureter which could be passed after some manipulation by the head of an ordinary silver probe, which then entered the bladder. Nevertheless no urine escaped into the ureter. Apparently pus could escape from the ureter into the bladder when it stood under some pressure, but the closure was valvular, and the urine could not enter the ureter from the bladder in a retrograde manner. The dissection of this portion of the ureter was difficult. Indeed, it tore off and dissection became impossible. Therefore he severed it close to the bladder and plugged up the bottom of the wound with iodoform gauze. During these last steps of the operation considerable pus escaped from the distended ureter and flooded the field of operation, on account of which thorough irrigation of the entire wound was practised. Most of the abdominal incision was then closed. Sufficient muscular tissue had been left attached to the crest of the ilium in the line of the incision to leave room for putting in abdominal sutures. The upper and lower angles of the wound were left open and packed with gauze.

The operation lasted nearly two hours, the patient was well exhausted, and energetic stimulating measures had to be resorted to. For forty-eight hours his condition remained critical, with continuous vomiting, subnormal temperature, very profuse

sweats, and a general condition of collapse. He then began to improve, and went on to recovery uninterruptedly. Most of the abdominal sutures healed by first intention; first the upper angle of the wound closed, then the lower one, which had, for a week or ten days after the operation, discharged considerable pus. Towards the end of the after-treatment they began to attend to his deep-seated urethral stricture, dilating it so that a cystoscope could be used. The mouth of the right ureter presented a normal aspect. The left one was very much congested, so that the aperture of the ureter could not be distinctly seen. The intense cystitis, being treated by irrigations of the bladder, gradually improved, the patient was discharged cured January 27, 1897, in an excellent general condition.

Cases of total extirpation of the ureter were few. He believed this was the seventh.

DR. McCOSH said that he did not think the rule always held that in raising the peritoneum the ureter went with it. About eighteen months ago a case of tubercular kidney with large perinephritic abscess was sent him by Dr. F. Tilden Brown. The patient was in desperate condition and the diagnosis was not perfectly clear. Dr. McCosh made an incision extending from the anterior superior spine upward and backward, opened a retro-peritoneal abscess, came down upon the ureter, which at first looked like a small intestine. It was as large as the small intestine, and was puckered more markedly than would be the large intestine. It was full of pus. An obstruction existed in the ureter about half an inch from the bladder. He began the operation proper by dividing the ureter at its entrance into the bladder and following it up, excising the entire ureter and the entire kidney. But in that case the ureter had been dissected off from the peritoneum, presumably by suppuration. At any rate, it was not at all adherent to the peritoneum at any point. It was adherent slightly to the lumbar fascia, at the side of the pelvis. The patient recovered and was now, he understood, in excellent condition.

About two years ago he had excised a tubercular ureter; some eighteen months after a nephrectomy had been done for a tubercular kidney, and in that instance he met with the same difficulty, mentioned by Dr. Gerster, in finding the nephritic end of the ureter. It was so difficult to find in the cicatricial tissue that he gave up the search, and proceeded very much as Dr. Gerster

had done, making a fresh incision along Poupart's ligament, finding the ureter down by the bladder, and following it up towards the cicatrix. It was thickened with tubercular material to almost the size of his thumb. The symptoms had been similar to those present in Dr. Gerster's case, but not so severe. There had been a discharge from the sinus. His impression was that in that instance the peritoneum when raised did not take the ureter with it. Yet without looking up the history he could not be positive on that point.

OPERATION FOR UNDESCENDED TESTICLE AND INGUINAL HERNIA.

DR. GERSTER presented a second patient, a young man, twenty-one years old, who had been admitted to Mt. Sinai Hospital March 1, 1897. For a number of years he had been troubled with a hernia in the right inguinal region, which had not descended to the scrotum. When this hernia was pressed upon or even touched the pain was intense. Even the pressure of the trousers could not be endured at times. When admitted to the hospital they found an incomplete inguinal hernia on the right side, the testicle not to be felt anywhere on that side, while the left one was normal, in normal situation. It was concluded that they had to deal with an undescended testicle on the right side and congenital inguinal hernia, which usually accompanied that condition. Next day, March 1, Dr. Gerster proceeded to operate, making an incision as for Bassini's operation. After the external inguinal ring had been exposed and the superficial fascia severed, the apex of the sac could be recognized. Of course the cord was not visible. The finger, when passed into the inguinal canal, could feel the testicle nowhere, and it was only after it had been introduced through the internal ring that a testicle of normal size could be felt within the abdomen, resting upon the symphysis pubis. There he hooked up the testicle with his finger and brought it out into the inguinal canal. The sac of the hernia was short and the cord of the testicle had a complete investment of peritoneum, which held no relation to the sac. He could not, of course, follow the ordinary rule laid down for Bassini's operation; the redundant portion of the sac was tied and cut away, a slit being left in the upper angle through which the cord was led out. Then the usual steps were taken to close the canal by su-

turing the conjoined tendon to the internal aspect of Poupart's ligament. The testicle was brought well down, though not completely to the bottom of the scrotum, yet far enough that a truss could be worn with comfort above it.

A large hæmatoma, which formed in the external wound under the skin, made it doubtful for a time whether the operation would prove successful. This hæmatoma broke down partly, the suppuration was not active, the wound soon took on a healthy aspect, a drainage-tube was left in for a time, the wound healed, the result was a good one.

EXCISION OF BOTH EXTERNAL CAROTIDS FOR SARCOMA.

DR. R. H. M. DAWBARN presented a young man, a physician, illustrating the result of excision of both external carotids and excision of the superior maxilla for malignant disease of the latter. The growth was also shown. It was a fusiform-celled sarcoma, of particularly malignant type, according to the report of the president of the Pathological Society, Dr. Ely, who had examined it. The growth completely filled the antrum on that side and pushed up the orbit slightly. The deformity was apparent to the observer. The detailed history was as follows:

August, 1895, he first noticed slight swelling opposite the first and second bicuspid teeth. In October of the same year he had some toothache and the swelling seemed a little greater. A dentist extracted the second bicuspid. When first seen by Dr. Dawbarn the swelling was scarcely sufficient to make one suspect malignant disease, but there was persistent dull pain, and Dr. Dawbarn resorted to a test which he had found of considerable value in suspected bony growths. That is, a needle was introduced, and instead of finding the bone hard and dense, as in health, it entered without any difficulty, indicating that the calcareous cells had been absorbed. Above the bicuspid the needle, instead of entering a cavity, continued in a growth which entirely filled the antrum. Dr. Dawbarn concluded that it was sarcoma, but to make sure he cut out a piece over the antrum and sent it to Dr. Ely for examination, who confirmed the diagnosis. In April, 1896, Dr. Dawbarn completely excised the left carotid, and intended to follow it with excision of the right external carotid, and then watch the growth carefully, and if it

should show any signs of advancing, it was his intention to excise it. But the patient was anxious to have another consultation, and the consultant advised removal of the jaw at once. Consequently this was done at the time that he excised the other external carotid, May 2, 1896, rather more than a year ago. The entire superior maxilla on the diseased side was removed with the exception of the orbital plate. The result had been highly satisfactory. There was no sign of recurrence. He believed also that simple excision of the two external carotids would have stopped the growth. There had not been recurrence in any case in which he had done this. One thing was certain,—namely, that simple ligation on both sides, without excision, was useless. There were too many sources of anastomosis which would permit of recurrence.

The first case in which Dr. Bryant succeeded, seven years ago, in starving a malignant growth of the naso-pharynx had ligation of both external carotids. He must have been fortunate in the smaller number of anastomoses in that case, for he had not been successful in any other cases since. The growth was checked temporarily, but began again.

Dr. Dawbarn noticed during the excision that there was particularly free anastomosis at the site of the infraorbital, and he was inclined to think that hereafter it would be well not only to excise both external carotids, but also to tie off the orbital.

One need not be afraid of starving the parts after complete double excision of the carotid. He had counted up about nineteen means by which anastomosis could take place after the operation. In no case had there been a fatal result. In each instance the operation was sufficiently tedious to require an hour or longer, and sufficiently grave that he thought it unwise to operate on both sides at the same sitting. He began below and worked up, and on reaching the external carotid had an inch and a half of artery without any branches. It would be very easy at one point to produce facial paralysis, but here he used only blunt dissection.

The patient presented had been fitted with a prothetic plate, which removed all appearance of deformity. Dr. Dawbarn added that the bicuspid, which the dentist had originally extracted, was soft at the tip instead of being of stony hardness. It felt like bone which had had the calcareous material removed by

hydrochloric acid. That fact should have made him suspect malignant disease.

ŒDEMA OF ANKLE PERSISTING FOR YEARS AFTER TRAUMA.

DR. ANDREW J. McCOSH presented a young woman, twenty-two years of age, who, in September, 1889, met with an accident, which was supposed to have broken the ankle. She was laid up for a period of two or three months, six weeks of which were spent in Bellevue Hospital. Since that time her ankle had been persistently and considerably swollen in spite of treatment. In February, 1897, she met with another accident. It was a question whether it was Pott's fracture or sprain. The swelling at once became much more marked than it had been, and had remained so ever since. After she lay in bed twelve hours, however, the swelling became reduced about 50 per cent., but it was always very marked. There was no pain, no temperature. Her general health was good. The swelling seemed to be due to some lymphatic obstruction. An x-ray picture of the ankle showed no deformity of the bone, and no evidence of fracture. She had been treated by massage, elastic bandages, plaster splints, counter-irritation, electricity, etc., but with no special benefit. When presented she had been in the recumbent position three weeks, with the limb bandaged. The swelling was not as great as it had been, but was considerable. When seen, six weeks previously, the swelling about the ankle had been almost as large as the adult head. The skin was reddish and slightly glazed in appearance. Tenderness was very slight.

SOME PRACTICAL POINTS IN CONNECTION WITH FRACTURE OF THE THIGH-BONE, ES- PECIALLY IN BABIES.

DR. DAWBARN read a paper upon the above subject.

DR. McCOSH said that with regard to suspension of the limb to a bar above the bed, he had had considerable experience with it in babies, and had found it, as a rule, a most admirable method for treating young children. Patients under two years of age had been more comfortable under it than under any other method. By other methods these young children had often not been at all comfortable; it was difficult to keep them clean, and the frag-

ments had not remained in good position. He had not met with any trouble from the condition named by Dr. Dawbarn,—vaginitis. He should think that would depend a good deal upon the care bestowed upon the patient by the nurse. He had found the same difficulty with plaster in babies, as mentioned in the paper; it was almost impossible to keep it clean and prevent chafing. Were it not for this it would be a good method.

INTRAPERITONEAL HERNIA, WITH STRANGULATION.

DR. HOWARD LILIENTHAL presented a specimen, consisting of mesentery and intestine, which had been removed at autopsy from the body of a man thirty-four years old, upon whom he had operated on April 27 for symptoms of intestinal obstruction; death on the 28th. The obstruction had existed for five days; fæcal vomiting for two days. There was an area of distinct dullness in the right groin, as compared with the rest of the abdomen, which was very tympanitic. On opening the abdomen he found a remarkable state of affairs, which was due to a hole in the mesentery. On introducing his finger he felt a peculiar band constricting the gut. On enlarging the incision and pulling the gut out the band came with it, and he saw that it was mesentery, with a hole through which the intestine had prolapsed. The hole reached from the insertion of the mesentery at the spinal column out nearly to the gut, and was quite smooth. In the slit were two coils of gut. One consisted of several feet of small intestine which began with an axial twist to enter the slit in the mesentery. The other portion was a big knuckle of large intestine. The gut was enormously distended. He finally got the thing unravelled and sewed up the hole in the mesentery. There was pretty severe peritonitis at the time of the operation, and nothing else was found at autopsy.

STONE IN THE KIDNEY FOUND AFTER DEATH FOLLOWING AN "INTERVAL" OPERATION FOR APPENDICITIS.

DR. LILIENTHAL also presented a renal calculus and the two kidneys in the case of a man, aged fifty-four, upon whom he had operated two weeks previously for appendicitis. Death two days after the operation. The operation was in the interval, was an

exceedingly simple one, and Dr. Lilienthal was greatly surprised that he should die. But death was due to acute suppression of urine. At autopsy both kidneys were found diseased. The pathologist had yet to make his report, but the interesting point was the absence before the operation of anything pointing to trouble in the genito-urinary tract. Prior to the autopsy he had supposed the anæsthetic, although chloroform had been used, might have had to do with the anuria. One kidney was much enlarged; the other was smaller, and contained a large, irregular calculus in its pelvis. It was possible the stone had obstructed the ureter, causing suppression on that side and sympathetic anuria on the other side.

EDITORIAL ARTICLES.

KRASKE ON CANCER OF THE RECTUM.¹

THE author's experience, since 1885, in this disease comprises 110 cases; of these eighty were subjected to operation.

The two sexes were affected in nearly equal proportions. The histological type of the disease was almost always the round-cell variety (seventy-four times out of eighty). The extent of the tumor presented marked variations. The annular form averaged five to six centimetres in length. The tumor was more frequently found in the upper portion of the rectum, necessitating opening the peritoneum during operation in two-thirds of the cases.

A definite history of antecedent trauma was never noted. In no instance was a cancer of the rectum found to have developed from some previous ulcer or cicatrix, or from hæmorrhoidal ulceration, or fistula. A family history of cancer was only elicited three times.

The course of carcinoma of the rectum is undoubtedly slower than is generally supposed. The disease had already existed two to three years in most of the cases prior to coming under treatment, and, judging by the history of some of these cases in which operation seemed contraindicated, the estimate of the average duration of life for the round-cell form must be placed between four and five years. The squamous cell variety affecting the anal region pursues a more rapid course, and the melanotic form still more so.

Cancer of the rectum usually exists for a considerable period of time without any marked symptoms. There is no pain, nutri-

¹ P. KRASKE (Freiburg), *Sammlung klinische Vorträge*, Nos. 183, 184.

tion is not interfered with, and there is no disturbance of defecation, the patient not observing or not attaching any importance to the occasional presence of a clear glairy mucus or of streaks of blood in the movements. It is only when the tumor begins, by its size, seriously to encroach on the lumen of the bowel, and ulceration sets in, that evident pain begins. The whole series of painful manifestations that ensue, when once stenosis has become established, is usually localized, as disturbances from metastatic deposits are almost never observed. It is a fact that cancer of the rectum is frequently attended with no secondary deposits, or only at a very late period of the disease.

The diagnosis in the early stage is naturally attended with difficulty, owing to lack of symptoms. When bleeding, painful defecation, etc., come on, the patients present themselves to the physician, with the assertion that they are suffering from hæmorrhoids, and this diagnosis is usually only too readily confirmed by ocular inspection, and the true nature of the case, which should at once become revealed by digital exploration, is overlooked. The fact that the subject is not of advanced years is no proof against the existence of cancer, as the author has observed it in a man twenty-three years old. The detection of the tumor by digital exploration is not always simple, and even an experienced surgeon will occasionally fail to recognize its presence. By examining the patient in the upright position a tumor previously inaccessible in other positions will occasionally be revealed. When the tumor is situated high up with a tendency to invaginate the bowel below, the sensation imparted to the examining finger is almost characteristic, resembling that presented by the eroded, indurated cervix. Lower down any considerable invagination is wanting. The differential diagnosis between cancer and syphilitic stricture should not be difficult. The stenosis in carcinoma is due to the protrusion of the tumor into the lumen, and frequently also by the resulting invagination. The stenosis in syphilis is due to cicatrization, and is therefore a true stricture. The difference between the two forms is made

quite plain by palpation. The syphilitic ulcerations never have the dense tumefied border present in cancer; they are, on the contrary, apt to be multiple, and separated from each other by intervening healthy portions, or by mucous membrane showing cicatricial changes. The specific ulceration presents a more diffuse character, while cancer remains for a long time as a circumscribed process. This difference is clearly manifested in the behavior of the contiguous organs and tissues. The syphilitic ulceration frequently sets up a proctitis, and abscesses and fistulæ opening externally. Such a sequel of cancer has never been observed by the author. While a cancer of the rectum, situated low down, may occasionally break through the skin surrounding the anus, the infiltrated edges of the opening will show its true character.

Recognition of the presence and nature of a tumor of the rectum is not alone sufficient, its extent must also be defined. It is of the first importance to determine whether or not it is limited to the rectal wall; its greater or less mobility will settle the question as far as regards tumors in the lower portion of the rectum. In the upper part such a recognition is more difficult, and may require anæsthesia or examination in the upright position. Naturally in women investigation must be directed towards the movability of the vagina and uterus over the rectum. It is of much more relative importance to ascertain the degree of mobility of the tumor than to define its upper limit; since opening of the peritoneum is no longer a contraindication to operation, the extent of the tumor does not count for so much. Moreover, experience has shown that it is extremely rare to encounter a cancer of the rectum longer than ten to twelve centimetres.

Treatment.—That the same principle—namely, to remove the disease thoroughly by an operation—applies to cancer of the rectum as it does in cancer of other organs is self-evident. The necessity of emphasizing this axiom would not be apparent were it not for the fact that there are yet some surgeons who reject

every form of radical operation, and limit their treatment to the formation of an artificial anus. The latter conduct is a step backward, for the curative results obtained by the radical treatment of cancer of the rectum are not only not worse but even better than in other forms of cancer, and the immediate danger of the operation is becoming less from year to year.

The author's views do not absolutely condemn the operation of colotomy, as he found it desirable to perform it in nineteen of his cases; but he nevertheless looks upon it as a last resort. For his experience has been that these patients drag out a most miserable existence, and eagerly look forward for death to free them from the misery of an artificial anus. The performance of colotomy is only indicated for the relief of complete or impending obstruction. To establish an artificial anus solely to prevent the irritation of the passage of the fæcal matter, and by the relief of the irritation to retard the growth of the tumor, is wrong, and the advantage gained does not overcome the extent of the objections. By careful local treatment, with mild astringents, the ulceration and foul discharge can be kept within bounds. Curetting the ulcerating surface may exceptionally be employed, but is not without considerable danger.

The indications for operation have, in the author's experience, become well established. In the first place, the high situation of a cancer of the rectum is no contraindication to operation. A tumor in the uppermost portion can be removed without difficulty, and the extirpation of a growth situated in the intraperitoneal portion of the bowel is easier than of one situated lower down, provided that it is strictly limited to the intestinal wall and freely movable. In general, a tumor of the upper portion, which is firmly adherent to the bladder, uterus, or sacrum, should be regarded as inoperable. Lower down the adhesions are less important, and the operation is still justifiable, provided no other contraindications exist, even when it is necessary to remove a large portion of the surrounding soft parts, or even the posterior vaginal wall, or a portion of the urethra;

an extensive implication of the bony structures is the only contraindication in this region. While the existence of secondary deposits will naturally forbid an operation as a general thing, still in some cases an extirpation is indicated even if metastases in the liver or abdominal glands are recognized. For if obstruction is to be anticipated, the patient will derive more benefit from a resection than from a colotomy. In estimating the pros and cons in regard to an operation, the patient's age, and what is still more important, his powers of resistance, and the presence or absence of intercurrent disease must be given due consideration.

If an operation has been decided upon, a preparatory course of treatment becomes all-important. Such a course consists in a thorough evacuation by cathartics and enemata. Accumulation of impacted fecal matter may necessitate three to four weeks of continued treatment. Failure properly to carry out this preparation is responsible, the author thinks, for several of his fatal cases. The accomplishment of the purpose of this treatment is ascertainable by palpation; still more reliable information is gained by estimation of the amount of ether-sulphuric acid (indican?) (Kast and Baas, *Münchener medicinische Wochenschrift*, 1888, No. 4) in the urine. The stenosis is occasionally of such a degree that the bowel cannot be properly emptied. The advisability of making a preliminary colotomy may then be entertained, but resort to it will seldom be necessary. If done at all, it should be as an actual preliminary operation, and not immediately prior to operation, as recommended by Schede. The opening is best made in the transverse colon, as here the artificial anus is more easily established, and can eventually be more easily closed, should resection of the intestine be necessary for that purpose.

The extirpation of the growth is, of course, extremely simple when we are dealing with a smaller circumscribed tumor in the lower portion of the rectum. In this situation, after dilatation of the anus, the base of the tumor can be extirpated,

hæmorrhage being checked at once, and the incision closed by suture. The conditions are even simpler when the tumor is situated at the anal orifice. The operative field is entirely visible, and it is only necessary to encircle the tumor by an incision in the healthy tissues and cut it away. With the smaller tumors, occupying only a portion of the circumference, part of the sphincter can be preserved, and by judicious suturing can be used to great functional advantage. Too much emphasis cannot be laid on the caution not to pay such attention to preservation of the sphincter as to jeopardize the chances of a radical cure, by not cutting sufficiently wide of the disease. In most of these cases it is to the patient's best interests to make a circular incision around the anus, dissect it upward, and cut away the bowel above the tumor. Such a procedure is called amputation or extirpation of the rectum, and requires no special description, except that in tumors approaching the anterior peritoneal reflection the author combines the anal and perineal incision with the sacral.

Tumors occupying the upper portion of the rectum, and leaving the anal region free, present the most important and interesting condition. In this situation it is possible and should be our aim to remove the growth by resection of the rectum, and fully to restore the function of the bowel by union of its divided segments. Such an ideal has become an actuality by the employment of the sacral method.

The operation for cancer of the upper rectum consists of three acts, (1) the preliminary sacral operation; (2) removal of the tumor (resection of the rectum); (3) the treatment of the peritoneum, of the ends of the bowel, and of the wound.

(1) The patient is placed on his right side, the knees and hips being well flexed. The incision begins at the level of the middle of the sacrum, two to three fingers' breadth to the left of the median line, and runs slightly concave to the left, to the coccyx, running from that point in the median line and ends a finger's breadth above the anus. The soft parts and the insertion of the sacro-sciatic ligament are divided. After cutting through

the fat lying in the ischio-rectal fossa, the levator ani, and lying above it, the coccygeus appear, this layer is divided close to the sacrum and coccyx; the latter is then dissected free posteriorly and on the right side and excised. The loose fat intervening between the upper pelvic diaphragm and the bowel is now pushed to one side with the finger, and the rectum is now plainly visible as it bulges out with the respiratory movement. In many cases the preliminary act is now accomplished. Occasionally more room will be necessary, owing to the firmness of the adhesions or to the relatively narrow space between the sacrum and the ascending ramus of the ischium. Resection of a portion of the sacrum is then necessary, and may be performed with the chisel, bone-forceps, or chain-saw, after separation of the soft parts in a line concave inward and downward, running from the third left sacral foramen to and around the fourth foramen to the lower angle of the sacrum. In cases attended with marked technical difficulties there should be no hesitation at making a transverse resection at the level of the third foramen. The procedure just described is the same as originally devised, except for Hochenegg's useful modification, of a curved rather than a median incision. Bardenheuer's so-called "method" consists simply in utilizing for all cases the transverse resection of the sacrum, which the author employs only in the more extensive cases. Rose has added an even more radical feature, by making a transverse section of the sacrum at the level of the second foramen, making an opening sufficiently large in one case to allow of palpation of the spleen. This method the author rejects, believing "that a cancer of the rectum for whose extirpation the whole arm must be introduced or the spleen palpated, had best be removed by some other method than the sacral or better left alone."

The attempted modifications in the direction of preservation of the bony structures, by temporary or osteoplastic resection, are founded on better judgment. Practical experience shows, however, that the conditions which these operations are devised

to remedy do not exist. The author has never seen any disturbance of function arise from the separation of the sphincteric insertion to the sacrum, or that the floor of the pelvis has lost its support with a resulting prolapse of the pelvic organs. There is no doubt that the osteoplastic operation is a more serious procedure, the incision more complex and bloody, and the wound more extensive. Permanent damage to the sphincter cannot be excluded, as the incisions run on either side of it. The sacral canal is always opened, constituting, the author believes, a most serious complication. The chief objection to all osteoplastic methods is that they are opposed to the purpose and principles of the after-treatment in a very important point. Immediately to close the necessarily large wound is to commit an error which is fraught with great danger to the patient. One of the chief advantages of the sacral method is that it admits of a liberal packing of the wound. Doubtless the osteoplastic method will ultimately be much improved, and the best results may eventually be expected from a combination of the osteoplastic with the original method. Acting in this line, the author has recently adopted a modification, consisting of a temporary resection of the coccyx.

(2) The resection of the cancer from the continuity of the rectum begins with the division of the bowel below the tumor. It is opened transversely, the left index-finger meanwhile pressing it up into the wound. Sutures are passed through the upper cut surface serving for traction, and more are placed as the incision is extended to either side, till the bowel is entirely divided. Blunt dissection precedes each step of the division, but should not be employed over zealously, lest the vitality of the gut be endangered. The same objection applies to freeing the gut entirely prior to opening it.

The bowel having been divided below, the patient is brought into the lithotomy position, and the dissection proceeded with on all sides, partly bluntly and partly with the scissors. On the anterior aspect great care is necessary, as the anterior

fold of the peritoneum soon appears. If the fold lies beyond the upper limit of the tumor it can be stripped off from the bowel, and sometimes to a marked extent; but if below the tumor, any attempt to continue before opening the peritoneum is bad judgment. The latter having been opened, two fingers are readily introduced and the incision extended laterally, the gut is pulled down and divided, and the sacral glands removed.

The operation is sometimes not so easy as just described, as the adhesions may give serious trouble or the tumor may have extended beyond the limits of the bowel.

(3) Treatment of the peritoneal wound. Should only a very small opening have been made, it may be closed by ligature or suture. When a more extensive wound has been made, and much manipulation of the parts has been necessary, suture of the peritoneum is not to be thought of, and the opening should simply be packed; this treatment giving the author a feeling of nearly absolute security. Suturing is, moreover, often attended with technical difficulties and unduly prolongs the operation.

Treatment of the Ends of the Bowel.—As opposed to amputation, resection of the rectum has the aim not alone to remove the disease, but also to restore the continuity of the bowel with preservation of its function. The author's method of obtaining this result has been modified from time to time by his experience. The first attempts to unite the gut completely by circular suture resulted so disastrously that the method was abandoned, and the anterior portions only united, permitting free exit of fæces into the wound. The plan was to make a secondary suture of the bowel after the peritoneal opening should have closed, but it failed absolutely, as did the attempt to bring together the broad granulating surfaces. Sometimes the opening could be closed down to a small fistula, and then cured by repeated secondary operations. The next attempts were made in the direction of invaginating the upper end into the lower, with or without circular suture of the cut ends. Unfortunately this procedure

always resulted in extensive gangrene of the upper end, and primary union of the bowel was never obtained. This procedure, when employed without preliminary suture, had the advantage of time saving, and performed by either method never gave rise to so complete an artificial anus as the earlier operation.

The author has finally returned to his early method, or the ideal, of immediate circular suture, as a successful result is perfectly possible, if a sufficiently careful preliminary treatment has been carried out, and if the bowels are kept constipated by opium for eight or ten days after operation. The anterior and lateral portions of the bowel are quickly united by passing sutures at half a centimetre's interval through the entire thickness of the bowel, and adding suture of the mucous membrane between. The posterior portion is closed from outside by tier sutures not involving the mucous membrane. While primary union is generally obtained, the fine fistulæ sometimes observed usually close spontaneously.

Treatment of the Wound.—Careful packing with iodoform gauze prevents infection, which in this region is especially dangerous. The packing should not be removed till it shows a tendency to become loose, about the end of the first week.

To attempt to estimate the direct danger of the radical operation for cancer of the rectum is an impossibility. The author would warn any one from attempting to draw a general deduction from his (the author's) statistics. Fifteen patients out of eighty died before complete closure of the wound. Early in the course of the author's experience in this operation he published ten cases, with four deaths. This mortality of 40 per cent. has ever after been used as a reproach against the operation. Dividing his cases into two periods,—the first five years when he was evolving the present improvements, and the last seven,—we have (1) twenty-nine cases, ten deaths, mortality equal to 34.5 per cent.; (2) fifty-one cases, five deaths, mortality equal to 9.8 per cent. No deaths have been thrown out because they were due to causes not in direct relation with the operation.

Such a course is usually pursued by others in making up statistics for cancer of the rectum; and were the author to follow this example, eight such deaths could be eliminated from his mortality, reducing the percentage to 8.75.

Four of the deaths were from peritonitis. All occurred prior to May, 1888. Septic infection of the wound, with emphysema of the tissues, was responsible for three deaths. The average time required for complete closure of the wound was four to six weeks. The author has failed to trace the after-history of his cases only five times. Excluding two cases of sarcoma, and three of squamous-cell cancer of the anus, observations of fifty-five cases are at hand.

Twenty-two cases died of recurrence, with or without metastases, in from six months to twelve and three-quarters years after operation. One patient died of metastatic cancer of the brain, without local recurrence, two and one-quarter years after operation. One is alive, with recurrence one and one-quarter years after operation.

Sixteen patients died from intercurrent diseases, without recurrence or metastases, from one and one-quarter to five years after operation.

Fifteen patients are alive and free from recurrence in from three-quarters of a year to eight and a half years after operation.

INDEX TO SURGICAL PROGRESS.

HEAD AND NECK.

I. Cerebral softening from Ligature of one Internal Jugular Vein. By DR. R. ROHRBACH (Tübingen). That, contrary to the general opinion, ligature of the internal jugular (without an arterial ligature) may result in such disturbances of circulation as to produce a necessarily fatal cerebral softening is shown by the following case:

Woman, age fifty-seven. Operation for metastatic glandular deposits. In dissecting out the chain of cervical glands resection of a portion of the left internal jugular vein was found necessary. After operation patient failed to recover consciousness. The next day coma persisted, and evidences of cortical irritation developed. Paralysis of sphincters. Her condition varied but slightly till time of death, six days after operation. Post mortem: The convolutions of the middle portion of the right frontal lobe appear flattened; at this point the cerebral substance, over an area the size of a silver dollar, is discolored and hæmorrhagic. The tissue is unusually soft; similar but less extensive appearances are seen in the second left frontal convolution. . . . The left lateral sinus is dilated, while on the right side it is only the size of a pin; the bony sulcus for the sinus being entirely wanting. On removal of the pia the cerebral substance at the points above described come away as yellow detritus. Besides these changes, the central portion of the cerebral cortex is occupied by numerous smaller deposits of similar appearance. Except on the right side, the lesions are confined to the cortex. The right internal jugular vein, from the mouths of the superficial veins to the base of the skull, presents a progressive diminution in calibre, admit-

ting only a crow's quill at the base. The left internal jugular, above the site of resection, admits a finger, and is obstructed by thrombi.

The conditions just described show how lesions, whose existence during life cannot be known, may determine a fatal stasis of the blood-current. Hence the possibility of an usually safe procedure being followed by a disastrous result, though such conditions must be of the greatest rarity. A review of ninety-one operations for isolated ligature of the internal jugular vein contains no similar observations.—*Beiträge zur klinischen Chirurgie*, Band XVII, Heft 3.

II. Muscular Wry-Neck. By DR. BRONISLAUS KADER (Breslau).

I.—(1) The pathological condition of the sterno-mastoid muscle in muscular wry-neck consists in a "myositis interstitialis fibrosa" (Mikulicz, Vollert).

(2) Such a myositis assumes the form of an extensive proliferation of the muscular perimysium and degeneration of the muscular parenchyma, with substitution of new-formed connective tissue for the diseased portion. As a result, not only are the layers of connective tissue thickened, but larger segments of the muscle undergo partial or total degeneration.

(3) The myositis may affect the whole or only a portion of the muscle.

(4) While the myositis runs a chronic progressive course, the initial stage may present the characteristics of an acute condition.

(5) The shrinking accompanying the change of the newly formed granulation tissue into old cicatricial tissue determines the contraction, thinning, and rigidity of the sterno-mastoid.

(6) In muscular wry-neck several other structures of the neck, besides the sterno-mastoid, are sympathetically involved. These also show the same chronic progressive inflammation with

acute onset. The resulting cicatricial contraction contributes to the development of the faulty position of the head.

(7) The changes observed in the nerves are the result of the extension of the muscular inflammation to the nerve-endings.

II.—With regard to the etiology,—

(1) The theory that muscular wry-neck owes its origin to an intrauterine contraction of the sterno-mastoid muscle, the result of an approximation of its points of insertion, or from other causes, has so far not been verified clinically or experimentally.

(2) When a new-born infant tends to hold its head to one side, the possibility of a physiological lateral curvature must be entertained, or possibly the rare condition of a congenital malformation of the vertebræ. A lesion of the sterno-mastoid may likewise have occurred during delivery, as it is a well-established fact that oblique deviation of the position of the head may be a direct result of such a lesion.

(3) The asymmetrical skull of the new-born child must be considered an incidental feature, and no attempt should be made to establish a connection between it and a torticollis.

(4) During delivery all grades of injury may be inflicted, not only on the sterno-mastoid but on the other muscles of the neck, the latter, however, are much less frequently involved. The lesion is almost always confined to one side, implication of both being extremely rare.

(5) These lesions occur in easy and spontaneous deliveries, as well as in the severer, whether these be spontaneous or artificial, but the latter condition is far more frequently the cause. The injury is either the result of direct pressure, exerted by the parturient canal, instrumentation, manual efforts, or of the stretching to which the sterno-mastoid is subjected in certain spontaneously assumed positions of the head (lateral torsion, bending towards the opposite shoulder).

(6) It seems most probable that the injury chiefly implicates such muscles as were in a state of contraction at the time of receipt of the injury (premature respiration).

(7) These injuries vary from trivial hæmorrhages and lacerations, recognizable only by microscopic examination, to severe hæmorrhages, extending beyond the limits of the muscle, extensive bruising, and even to complete rupture of the muscle.

(8) The injury may under certain conditions immediately destroy a portion of the muscular substance, and set upon it a condition of contraction analogous to post-mortem rigor (primary traumatic contraction).

(9) Such injuries determine, in either a part or the whole of the muscle, a set of secondary changes, to which, from their etiology and final results, the term "myositis interstitialis fibrosa traumatica" (Mikulicz) should be applied, whose onset is characterized by the occurrence of "induration."

(10) As a result of this myositis there is, in severe cases, a fibrous induration and shortening of a part or the whole of the muscle. Severe injury to the sterno-mastoid during delivery is responsible for a large proportion of cases of muscular wry-neck, as its healing is attended with fibrous induration and shortening. The less severe injuries, which are also the most frequent, heal without resulting disturbance of function, and the torticollis observed at times is only of a transitory nature.

(11) In a large proportion of cases, probably the majority, the changes in the sterno-mastoid, determining permanent muscular torticollis, are the result of a myositis developing in the injured muscle as a result of the infection by pathogenic micro-organisms.

(12) The induration (so-called hæmatoma) of the sterno-mastoid in the new-born is likewise frequently the result of an infectious myositis.

(13) In infants infection of the wounded muscle by hæmatogenous infection, originating in the intestinal canal, is quite possible.

(14) Muscular wry-neck, due to traumatic infectious myositis, may also occur in later life,—that is, independently of accidents attending delivery.

(15) Traumatic infectious myositis of the sterno-mastoid, both in its clinical features and in its morbid anatomy, is identical with the idiopathic myositis, and, like the latter, shows wide deviations in type.

(16) A myositis occurs in the sterno-mastoid in a more idiopathic primary form, as well as secondarily, in the course of various infectious diseases, which affects the muscle without any apparent previous injury, and exhibits in its course a complete analogy with the traumatic infectious form; it may heal completely (clinically), or terminate in suppuration, or result in a permanent muscular wry-neck.

(17) The traumatic infectious myositis of the sterno-mastoid may pass through an acute stage and cease almost entirely in a very short period of time, even in cases attended with the severest changes.

(18) While there is no evidence that muscular wry-neck can be congenital, there is a form due to congenital curvature of the cervical vertebræ that resembles the muscular variety very closely, and may easily be mistaken for it.

(19) Other circumstances, such as a spastic condition, ocular disturbances, and psychical aberrations, may give rise to a deflection of the head, which may be confused with true muscular wry-neck. In all these organic changes in the contracted sterno-mastoid are wanting. If the spinal accessory nerve is paralyzed, torticollis results from the action of the unaffected muscle.

Secondary Conditions.—(1) There are two principal types of muscular wry-neck.

First Type.—The head is inclined beyond the middle line of the body towards the shoulder of the affected side and forward; the face is turned in the opposite direction, the chin being slightly elevated. The shortened mastoid runs obliquely from the region of the sterno-clavicular articulation upward and outward to the mastoid process. The curvature of the cervical vertebræ has its concavity directed towards the affected side and extends to the upper dorsal vertebræ. The physiological kyphosis of the cervical vertebræ is increased.

Second Type.—The inclination of the head laterally and downward and forward is less than in the first type, from compensation by the occipital lordo-scoliosis and the dorsal scoliosis. The head and neck are entirely drawn over beyond the middle line towards the shoulder of the sound side. The shortened sterno-mastoid has a less oblique course, it is sometimes perfectly vertical. The cervical spine is kypho-scoliotic and more markedly curved than in the first type. There is an opposed dorsal scoliosis and a lumbar one, corresponding to that of the cervical vertebræ.

(2) With muscular wry-neck there develops in time a typical asymmetry of the skull, which has no relation to the congenital form.

(3) Asymmetry of the skull in muscular wry-neck is the result of the combined force of all the muscles inserted into the skull, the deflection of the centre of gravity of the brain towards the side of the affected sterno-mastoid, and in nursing infants from pressure by position.

(4) In the various morbid conditions which give rise to a permanent deflection of the head simulating muscular wry-neck an asymmetry of the skull develops entirely similar to that due to the muscular form.

(5) Asymmetry of the skull may develop at any period of life, but in more advanced age does not reach the grade observed in childhood.

(6) In long-standing muscular wry-neck, deformities of the vertebral bodies and joints, as well as of the occiput, may result.

(7) Severe muscular wry-neck may be followed by marked disturbances, not only in the bones but also in other structures, such as the eyes, nerves, and muscles.

Treatment.—(1) Only such cases of muscular wry-neck should be termed cured that, long after discontinuation of all mechanical treatment, show an erect position of the head, the movements free in all directions, and an absence of spinal curvature.

(2) A perfect result can only be expected in such cases in

which a radical cure of the contraction of the sterno-mastoid is obtained.

(3) Every new-born child should be examined with regard to the condition of the sterno-mastoid muscles.

(4) Subcutaneous tenotomy of the sterno-mastoid and of any other resisting band, followed directly by an energetic orthopædic after-treatment, is the procedure of choice for all mild cases of muscular wry-neck.

(5) Extirpation of the sterno-mastoid and of the other offending structures on the affected side by Mikulicz's method should be the routine operation for all severe forms of muscular wry-neck.

(6) When there are strong cosmetic considerations (in girls) repeated tenotomies may also be tried in the severer forms of this affection.

(7) Open division of the sterno-mastoid has the disadvantage over the subcutaneous operation of leaving an extensive scar, without possessing the certainty of result attending extirpation of the muscles; the operation should, therefore, be discarded.

(8) Treatment of muscular wry-neck by extirpation of the sterno-mastoid effects a cure of the vertebral curve generally without further orthopædic treatment. It is only in exceptional cases, in which the vertebræ have undergone marked changes, that the cervical scoliosis will require appropriate treatment, the dorsal and lumbar curves undergo a spontaneous cure.

(9) The deformity of the head improves in all cases of cured torticollis, but entire restoration of the normal appearance occurs only exceptionally and only in the cases subjected to an early treatment.—*Beiträge zur klinischen Chirurgie*, Band xvii, Heft 1, and Band xviii, Heft 1.

C. L. GIBSON (New York).

ABDOMEN.

I. Some Principles of the Treatment of Wounds of the Abdomen. By PROFESSOR MADELUNG (Strassburg). Every solution of continuity, greater than a needle-puncture, of the organs within the peritoneal cavity, stomach, intestine, biliary and urinary channels can give rise to extravasation of their contents into the abdominal cavity.

Escape of the intestinal contents into the abdomen results nearly always in a peritoneal inflammation, speedily resulting in death in the great majority of cases.

Normal urine, free from bacteria, and normal bile may be present in the peritoneal cavity in considerable amounts, and for quite a long period of time without harmful effects, but in practice we have no means of recognizing that urine or bile is in an aseptic condition or how long they may so remain.

The conditions for spontaneous cessation of hæmorrhage are particularly unfavorable within the peritoneal cavity.

The only certain method of closing wounds of the intestine and of the biliary and urinary tract, and of controlling hæmorrhage, is by the use of sutures or ligatures. It is almost impossible to prevent the fatal outcome of a general peritonitis.

Our opinion and treatment must always be influenced by the nature of the force producing the injury. Wounds inflicted by sharp weapons, pointed stakes, and fire-arms give rise to other indications than do contused wounds, and likewise subcutaneous lesions differ from open wounds. To-day the length of time between the receipt of injury and the beginning of treatment is of much greater importance than formerly.

Supposing that we have to deal with a wound of a few hours' duration, situated at any point of the abdominal wall that may communicate with the interior of the belly, What shall be our line of conduct? It is absolutely necessary immediately and certainly to ascertain whether we are dealing with a penetrating or non-

penetrating wound. Excepting wounds with a prolapse of the viscera, or an appearance of *fæces*, bile, or urine, knowledge of the above conditions cannot be obtained without operative interference. Probing or exploring with the finger is often impossible or insufficient: both are dangerous if done without sufficient antiseptic precautions. Laying the wound freely open is of assistance only in a certain proportion of cases. Such a course will be found impossible in wounds of the chest leading into the abdominal cavity, of the back in the obese, of the buttocks and perineum, and under numerous conditions will take too much time or not fulfil the indications. An abdominal section will then be found necessary.

Whenever possible, the patient should be removed to a hospital where all the necessary equipment and assistance are obtainable. The wound should be left entirely undisturbed even if there is a prolapse of the viscera; a heavy protective dressing should be applied. The administration of opiates is of doubtful value. When the checking of hæmorrhage is urgently indicated, a laparotomy may be hastily performed, and sponges and compresses packed around the site of bleeding, and a compressive dressing applied without closure of the abdominal wound. Generally speaking, transportation to a proper institution is indicated, provided that relief can thereby be obtained within twenty-four hours after receipt of the injury.

Whether the abdomen shall be opened in the axis of the wound, or in the median line, or at some other point is generally not important. Evisceration and the "piecemeal" exploration of the intestine are to be avoided. A study of the conditions attending the infliction of the wound will give valuable data as to the location of the injury. Senn's hydrogen-gas test is rejected as dangerous and uncertain. Extravasation of visceral contents is to be removed by mopping and not by irrigation. Prolonged search for projectiles is unwise.

An expectant attitude may be maintained in such cases as come under observation twenty-four hours after injury, when

no viscera are prolapsed, no symptoms of peritonitis present, and the general condition, especially as reflected by the pulse, is good.

Contusions of the abdomen are to be treated on the expectant plan, as single symptoms, even if of an important character, are unreliable, provided always that a careful observation and consideration of the general condition and the local signs authorize such an attitude. The patient should be carefully watched for some weeks lest a later perforation of the gut follow from injury to the intestinal walls.—*Beiträge zur klinischen Chirurgie*, Band XVII, Heft 3.

II. Plastic Operations for Cicatricial Stenosis of the Cardiac Orifice of the Stomach. By DR. ERNESTO BOZZI (Bologna). In a first series of experiments on the cadaver and on dogs, access to the œsophagus was obtained by making an incision convex above from the sternal insertion of the seventh rib to the tip of the twelfth. The soft parts having been reflected upward, a piece several centimetres in length was resected from the seventh, eighth, ninth, tenth, and eleventh ribs, thus permitting the lower portion of the thorax to be turned outward. The dissection was extended below the site of resection, so that the osteo-pleural-muscular flap could be laid back, exposing the entire region of the cardiac orifice. This operation was found to be attended with so many difficulties and disadvantages that it was abandoned. Further experience showed that sufficient room was obtained by an incision along the free border of the ribs.

The first experimental method of plastic restoration of the cardiac orifice consisted in making a longitudinal incision six to seven centimetres long, anteriorly through the entire thickness of the œsophagus and cardiac orifice. Then from the lower point of this incision two curved incisions were carried, forming a rounded flap of varying width and corresponding in length to that of the original incision, into which it was drawn and secured

in place by a triple row of sutures. The flap, however, proved to have very little vitality, and perforation invariably resulted.

The method finally adopted was based on the principle of the Heineke-Mikulicz pyloroplasty,—incision from the ensiform cartilage to the eleventh rib. Dislocation of the liver to the right by dividing the left lateral ligament. The stomach is dragged downward and outward, exposing the cardiac orifice and the œsophageal opening in the diaphragm. Separation of the œsophagus from the latter by dividing the intervening tissue with the scissors, both pneumogastric nerves being thereby sacrificed, but in animals this lesion has been shown to be of no consequence. After freeing the œsophagus the operative field is carefully packed with sterile gauze before proceeding to the second step. The gastric contents are “stripped” back, and a clamp applied to the stomach a little below the cardiac orifice. The cicatricial contraction is then dealt with as in pyloroplasty. Finally the edges of the œsophageal opening in the diaphragm are brought below the suture line and stitched there, thereby shutting off the thoracic cavity and diminishing the tension on the sutures. A strip of packing placed around the site of the plastic is brought out through the abdominal wound.

In order to obtain a successful result the operation must be done under certain conditions. (1) That the cicatricial stenosis is limited to the cardiac orifice and to the portion of the œsophagus adjacent to it, so that a longitudinal incision proportionate to the length of the stenosis can be made.

(2) Every ulcerative process which may hinder or prevent ready cohesion must previously be cured.

(3) The separation of the œsophagus must be possible,—that is, there should be no adhesions rendering the accomplishment impossible or too dangerous.

(4) The nature of the stricture must be such as to render the performance of the operation justifiable.

(5) The general condition of the patient should not be such as to make the result of the operation a matter of doubt.

Whether the first, second, and last conditions are fulfilled can be ascertained by physical examination and accurate measurement of the depth of the stricture, while the third can only be judged to be present from probabilities.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 2.

III. Multiple Constrictions of the Intestine of Tubercular Origin. By DR. F. HOFMEISTER (Tübingen). The literature of the subject has been difficult to classify, and is evidently far from representing the frequency with which the condition is found, as only eighty-three operations for intestinal tuberculosis have been recorded.

The great majority of cases present a striking similarity in their symptoms and morbid anatomy. The disease is most frequently confined to the ileo-cæcal region. The hypertrophic form of inflammation almost always causes a narrowing of the lumen, while such a change is seldom observed as the result of the usual circular ulceration. These peculiarities serve to explain why multiple tubercular ulcerations are so rare. Eisenhardt found only one such condition in 566 post-mortem examinations of intestinal tuberculosis.

The author records the following illustrative case:

Man, aged thirty-two years, with slight pulmonary changes, had suffered four years with frequent attacks of colic and constipation. Abdominal section was performed after persistence of obstruction for six days. Ten strictures were found extending over two and a half metres of the small intestine. The lowest (and narrowest) stricture was blocked by a lump of inspissated fæcal matter. There were two strictures in the ileo-cæcal region, these had apparently caused no symptoms. Entero-anastomosis was performed; the enormous distention necessitated puncture of the isolated coil, closure by suture. Death resulted from perforation at the site of the suture of the puncture.

Twenty more cases have been collected by Hofmeister. Most of the multiple strictures are found in the ileum. The dis-

tance between the strictures varies considerably,—a few centimetres to one and a half metres. The length also varies,—in two cases it was as much as eight centimetres. The degree of narrowing is often extreme, the opening sometimes barely admitting a probe.

The choice of treatment of these multiple strictures depends on their number and site. The conditions are simplest where the contractions are localized in a relatively short segment of the intestine. Here a resection of the whole tract is desirable. Where only a few (two) strictures are present and situated some distance apart, with healthy intestine in the interval, the ideal method is to resect each stricture individually. Such a procedure is seldom feasible, owing to the debilitated condition of the subjects.

The greatest difficulty is met when the number of the strictures prevents their individual resection, and the extent of their distribution necessitates the sacrifice of a considerable length of the intestine. Although Köberle successfully resected 205 centimetres of small intestine, operations of such severity are usually contraindicated by the condition of the patients. Entero-anastomosis yields better results, especially in the small intestines, the secretions directly or indirectly finding their way into the efferent portions of the bowel. A certain class of cases, owing to their great extent, are not suitable even for entero-anastomosis, and the operation should not go beyond the bounds of an exploration. An attempt at relief might be made in the case of some of the narrowest constrictions by treating them on the principles of the Heineke-Mikulicz pyloroplasty.

The conditions attending an attack of acute obstruction are particularly unfavorable. Entero-anastomosis alone does not succeed in emptying the enormously distended portion above the stricture, but puncture of the isolated segment is to be avoided if the latter is constricted at both ends. If an opening has to be made, it should not only be carefully sutured, but the bowel at the site of the opening should be treated extraperitoneally, lest

reaccumulation of gas should burst the sutures, as happened in Hofmeister's case, with a fatal result. Moreover, the intestinal portion so secured acts as a safety-valve, which may be opened if threatening symptoms develop.—*Beiträge zur klinischen Chirurgie*, Band XVII, Heft 3.

IV. Operations on the Intestines performed in the Heidelberg Clinic in the Past Four Years. By DR. ARNOLD SCHILLER (Heidelberg). This article is the continuation of the reports that have from time to time appeared of the statistics of gastro-intestinal surgery occurring in Professor Czerny's clinic. In this series only the chronic conditions are recorded.

TABLE OF SEVENTY INTESTINAL OPERATIONS.

	METHOD.	NATURE OF THE DISEASE.						SITE.			RESULT.			Total.	Mortality per-centage.
		Carcinoma.	Sarcoma.	Tuberculosis.	Actinomycosis.	Invagination.	Volvulus.	Artificial Anus.	Ileum.	Colon.	Cæcum.	Cured.	Not cured.			Died.
Entero-anastomosis. Resection.	Circular suture	16	1	14	1	3	7	7	13	22	29	1	12	42	28.6
	Murphy's button	..	1	1	..	..	..	..	..	2	1	..	1	2	..
	Linear suture . .	..	..	5	..	..	7	4	1	7	9	3	..	12	0
	Suture. . . . .	..	..	2	..	4	1	..	1	6	4	..	3	7	42.8
	Murphy's button	2	1	1	..	..	..	1	1	2	3	..	1	4	25.0
	Disinvagination	..	..	..	..	2	..	..	..	2	2	..	..	2	..
	Lateral implant'n	..	..	1	..	..	..	..	..	1	..	..	1	1	..

As regards the immediate result of the cases of intestinal resection, the mortality is 10 per cent. less than the figures established by Wolfer's statistics. (ANNALS OF SURGERY, May, 1897.) Professor Czerny believes that this mortality can be steadily diminished, and it is his hope that future improvement in technique will eventually reduce it to 10 per cent.

Of the eighteen fatal results, thirteen, or 72 per cent., were due to transverse resection. The latter is the most dangerous, difficult, and time-consuming operation. Of these thirteen deaths, six died of peritonitis without leakage of the suture,

while five died of peritonitis as a result of the insufficiency of the suture. Of the four fatal results after entero-anastomosis, three were due to defective suture.

The Murphy button was used in four entero-anastomoses and two resections. One fatal result was due to the button cutting through earlier on one side than the other. In the other fatal case the result cannot be ascribed to the button, but rather to the failure to respect Murphy's warning against the unnecessary Lembert suture.

On the whole, the advantages of the Murphy button outweigh its disadvantages. The ideal would seem to have been reached could an absorbable Murphy button be constructed. The objection raised against the present button by some—that its use entails a subsequent cicatricial stenosis of the gut—has not been verified in Czerny's clinic.—*Beiträge zur klinischen Chirurgie*, Band XVII, Heft 3.

V. Forty-five Cases of Colostomy performed in the Heidelberg Clinic (Professor Czerny). By DR. S. LEHMANN (Heidelberg). The operation is done under chloroform, usually in two stages, with two to three days' interval if the patient's condition allows of delay. If in one stage, incision on the left side parallel and two fingers' breadth above Poupart's ligament. Incision of the peritoneum and suture of the cut edges to the skin. Then suture (silk) of the serous and muscular coats of the colon into the wound. Opening of the gut; suture of the mucous membrane to the skin with silk. When done in two stages the peritoneum is united to the skin by a continuous catgut suture, the loop of gut (usually the sigmoid flexure) drawn forward and the mesentery transfixed with a Hegar dilator, No. 6. Four interrupted catgut sutures are used in addition for securing the gut to the skin and peritoneum. In two to four days cross-section of the intestine with the thermo-cautery. The resulting spur does away with the necessity of suturing the distal end, as recommended by Maydl, and through the opening the rectum can be thoroughly irrigated.

Neither of the procedures recommended by Witzel were employed in any case. A hard rubber plug covered with suitable material is generally found efficient in occluding the artificial anus.

In forty cases the operation was done for the relief of carcinoma. In thirty cases the operation was of a palliative nature, while in fifteen it was performed for the relief of urgent symptoms. The operation was in no case followed by death from sepsis. The prolongation of life after operations for carcinoma was from forty days to three and a quarter years,—the average being nine months.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 2.

VI. Multiple Polypoid Growths of the Rectum and Colon. By DR. JULIUS SCHWAB (Heidelberg). Polypoid growths of the intestinal mucous membrane occur in the most varied forms. The rectum, especially the lower third, is most frequently affected, the growths occurring as single-layer polypi, or, if multiple, their pedicles are attached in a conglomerate mass to a restricted space of the rectum. They are rarely found in the small intestine. If found, they have then a decided tendency to produce invagination of the gut.

The polypi of the large intestine are of especial interest from the variety of their resultant symptoms and consequences. That a great diversity of opinion exists concerning these polypi is evident from the varied nomenclature according to their clinical course and predominant symptoms,—“colitis polyposa cystica” (Virchow), “polypoid vegetations of the entire intestinal mucous membrane” (Luschka), “multiple adenomata of the colon” (Whitehead), “polypoid excrescences of the sigmoid flexure” (Letzerich), “polyadenoma tractus intestinalis” (Sklifasowski).

The etiology of these polypi is often obscure. It is quite certain that chronic inflammatory processes of the mucous membrane give rise to their growth. With a beginning growth the swollen mucous membrane with its dilated vessels is predisposed

to further growth, so that it is often a question which is the primary factor, the mucous membrane inflammation or the polypoid growth.

With regard to the pathological anatomy the growth may be classed usually as an adenoma with its various subdivisions. Ziegler regards the development of the polypi as a retrograde metamorphosis, as there is a loss of epithelium consequent on inflammation of the mucous membrane, and the epithelial remains begin to proliferate and protrude above the rest of the mucous membrane as polypi. Anatomically the polypi belong to the benign growths, showing no tendency to new growth in foreign tissue or to metastatic formation. The danger of these polypi lies only in the severe intestinal disturbances they set up and the hæmorrhage which the irritation of the passage of intestinal contents over them is apt to produce. The duration of the disease is generally protracted, the intestinal changes being very chronic. Frequent improvement is not uncommon, and the condition may last for years, simulating chronic intestinal catarrh, with renewed exacerbations, without endangering life. If both colon and rectum are affected, the symptoms consequent on the localization of the process in the upper part are entirely overshadowed by what takes place in the rectum, as here the polypi have a tendency to undergo carcinomatous changes, and the patient may succumb under the typical appearances of carcinoma of the rectum, the autopsy showing in addition polypoid colitis.

Treatment is, unfortunately, practically unavailing; the comparative rarity of the disease seldom affording an opportunity for diagnosis during life. The most valuable information is obtained by rectal examination, which should never be omitted. Should it reveal the presence of polypi, and if symptoms of intestinal derangement are very prominent, extension of the polypi into the colon may be considered as very probable. If the rectum is found free, a diagnosis of polypoid colitis is still justifiable, in the presence of continuous bloody diarrhœa, against which ordinary means of treatment have proved useless.

The best treatment would consist in the operative removal of all accessible tumors and the sustaining of the patient's strength by suitable diet. Anti-diarrhoeal remedies are generally useless, as they act chiefly on the muscle and but little on the mucous membrane. A point of extreme interest in the pathological anatomy lies in the fact that these polypi by no means invariably preserve their benign nature, but occasionally undergo a carcinomatous degeneration. Such a change naturally occurs in the glandular polypi, rarely in the vascular and connective tissue forms, where the glands take only a secondary part. It is perfectly natural, with marked proliferation of glandular elements, that the glands, in response to an as yet unknown stimulus, should take on an atypical form, and in the form of solid cell-nests should exhibit the characteristic tendency of malignant growths, to invade new tissue and set up metastatic processes. In a case reported by Handfort, when at autopsy 170 polypi were found extending from the middle of the transverse colon to four centimetres from the anus, the whole series of changes from the benign process to the advanced form of carcinoma (with secondary deposits in the liver) could be studied. Handfort, accordingly, applies the term malignant adenoma to the still undegenerated polypi. These showed the usual structure found in the cases not presenting malignant features. In the centre of the tumor there was connective tissue with numerous blood-vessels, and covered by normal mucous membrane, containing tubular glands. Some of the latter, however, were beginning to be irregular and to take on an atypical aspect. These appearances were especially well marked in the sigmoid flexure, where the tubular glands in some places had been converted into cysts lined with cylindrical cells. In other regions were irregular masses of cylindrical and round cells, promiscuously mixed together with little or no stroma intervening.

In all probability the development of such carcinomatous changes may be ascribed to continued irritation, just as in the typical example of epithelioma of the lip in pipe-smokers.

The best treatment must consist in an attempt to relieve any intestinal inflammation, and thereby overcoming the tendency of the mucous membrane to hypertrophic changes.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 2.

C. L. GIBSON (New York).

MALE GENITO-URINARY ORGANS.

I. Operative Treatment of Exstrophy of the Bladder.

By DR. A. TIETZE (Breslau). After a trial of various methods, Professor Mikulicz has finally adopted the plan given below.

As a rule, the operation consists of three stages, an interval of some weeks elapsing between each sitting.

(1) *Formation of the Bladder*.—Two lateral curved incisions are made three to six centimetres (according to the age) from the edge of the vesical mucous membrane and nearly parallel to it, and are carried down to the transversalis fascia or the peritoneum, thus forming two lateral bridge-like flaps containing the entire thickness of the recti muscles. The insertion of the recti are freed by removing a small fragment of the pubic bone with them, and then the entire flap is dissected up so as to be easily transplanted towards the median line. The bladder wall is then dissected free, care being taken not to injure the ureters or the peritoneum, till the bladder can be brought together as a hollow space. Suture of the inverted edges with Lembert sutures of catgut not involving the mucous membrane. When possible, the natural outline of the bladder should be preserved by making the suture line vertical. The lateral flaps are now united together in the median line with silver wire. The lateral wounds are allowed to heal by granulation. Injury to the peritoneum cannot always be avoided, but packing with iodoform gauze guarantees from any evil results. The vas deferens must be carefully separated and drawn to one side. Escape of urine is provided by having a catheter through the neck of the bladder.

(2) *Formation of the Urethra and Penis*.—Lateral incision on

either side of the urethral mucous membrane, which is undermined to a certain extent and converted into a tube by suturing with catgut (knots falling on the inside) over a catheter. Then suture of the raw surfaces of the corpora cavernosa (or labia) with silver wire. A catheter is again passed through the open neck of the bladder.

(3) *Closure of the Neck of the Bladder.*—The fistula persisting between the urethra and bladder is incised by two oval incisions carried again so deeply that edge of the cleft can be turned in and sutured together with catgut. Then a second row of cutaneous sutures of silver wire. A catheter is passed through the urethra into the bladder.

Besides the technical details of the operation, attention is called to the following points in the history of these cases:

(1) The operation is best deferred till the subjects are from five to ten years old.

(2) Preparation of the patient for operation is the same as for abdominal section.

(3) The different stages of the operation are performed at sufficiently long intervals to allow of firm union and for the scars to have already become soft and pliable. In each stage the bladder must be effectually drained by the catheter *à demeure*, for a possible leakage in this operation, where all the parts are brought together, would be followed by disastrous consequences

(4) The packing in the lateral wounds is gradually loosened and removed at the end of a week, when the wound is either re-packed or dressed with nitrate of silver ointment. The external wound dressing is only superficially renewed, when it becomes soaked with urine, it being wisest in children to allow the dressing to remain as long as possible, as the crying and straining do more harm in tearing through the sutures than is gained by its renewal. In like manner straining at stool should be avoided and the bowels kept constipated for six days by opium.

(5) If, as frequently happens, a hernia coexists, it should be operated on before undertaking the cure of the exstrophy.

(6) Should an intercurrent pyelonephritis or a cystitis develop, total closure of the neck of the bladder must be deferred.

Comparing seven cases treated by the method of Mikulicz, and six treated by Trendelenburg, according to his method, it may be said broadly that the method of freeing the mucous membrane and forming of labial flaps is a less severe operation than the method of bladder suture with prior division of the sacroiliac synchondroses, and that it so far has given as good or better results than the latter.

It must, however, be acknowledged that, except for the two deaths in Trendelenburg's series, his cases less frequently show mishaps or failures, for they certainly were subjected to a shorter period of treatment, and sometimes the entire cleft was closed at one sitting. The chief advantage of his method, however, seems to be in the use of deep single tier sutures, as the mucous membrane is not dissected up, but the edges are simply refreshed and brought together, and consequently necrosis of the suture line is not so apt to follow as in Mikulicz's method, where the sutures are apt to cut through the thin bladder wall permitting leakage of urine.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 1.

C. L. GIBSON (New York).

EXTREMITIES.

I. Reduction of Longstanding Dislocations of the Shoulder. By DR. J. FINCKH (Tübingen). The observations are based on 100 cases treated in the Tübingen clinic extending over a considerable period of time. The period elapsing between receipt of the injury and inauguration of treatment varied from three weeks to seven years. In a number of cases the deformity was attended with such a satisfactory functional result that intervention appeared unnecessary.

The methods of reduction employed were chiefly those of Bruns, Schinzinger, and Kocher. Out of seventy-three cases

where attempts at reduction were made, a failure was scored in twenty-five.

With regard to the irreducible cases, only two were met in the first four weeks, and these were complicated by fractures. The oldest dislocations that were reduced were respectively in the twelve and a half and fourteenth week.

Two to three weeks, twenty dislocations, 19 or 95 per cent., three to six weeks, twenty-four dislocations, 20 or 83 per cent., six to nine weeks, eleven dislocations, 7 or 64 per cent., in all 84 per cent. reduced.

If complications of any kind are absent, the prognosis of dislocations of the shoulder of two to four weeks' duration is absolutely good. Up to nine weeks quite good, as up to that time four-fifths of them can be reduced. Beyond nine weeks reduction by bloodless methods must be the exception.

Brief histories of these hundred cases are appended. It appears that only three were subjected to operative procedures. In one the head of the humerus was resected as a primary measure, while in the two others it was resected by a secondary operation. The functional results after resection were apparently quite good. (It seems rather remarkable that when reduction was found impossible, further attempts to improve the patient's condition should usually have been abandoned. No dates are given, hence it is not possible to judge whether opportunities have occurred in the Tübingen clinic to utilize the improvements in such conditions that have been effected by the method of McBurney.)—*Beiträge zur klinischen Chirurgie*, Band XVII, Heft 3.

II. Modification of the Wladimirow-Mikulicz Method of Osteoplastic Resection of the Foot. By DR. GEORGE LOTHEISSEN (Innsbruck). In the following method, lesion of the posterior tibial nerve and artery is avoided. Patient lies on his back, the extremity raised, and the foot extended to its utmost limit. Oblique incision from about one and a half centimetres above the insertion of the tendo Achillis into the tuberosity of

the calcaneum and midway between the tendon and the fibula, passing below the malleolus, and ending about two centimetres behind the tuberosity of the fifth metatarsal bone. A similar but more perpendicular incision is made on the inner aspect, beginning at the same height at the usual site for performing tenotomy of the tendo Achillis, ending at the lower border of the tuberosity of the calcaneum. An oblique incision on the sole of the foot unites the two, and the artery and nerve which pass below the tuberosity are left undisturbed anterior to the incision. The two points at the beginning of these lateral incisions are united, thus dividing the tendo Achillis. Removal of the astragalus is accomplished without difficulty; some care, however, is necessary to avoid wounding of the artery and nerve; but this is easily accomplished by not invading the sheath common to them and the flexor tendons. The leg bones and the scaphoid and cuboid are sawn through in the usual manner, and the opposed surfaces brought together by silver wire sutures.

The only other similar incision in use found by the author was that of Jaboulay and Lagaite. It begins a finger's breadth above the external malleolus on the inner border of the tendo Achillis, which it divides, and then passes downward along the external border to the middle of the cuboid bone. From this latter point a second incision passes down to and into the sole for a finger's breadth. A third incision is now made to unite the original incisions. The incisions thus directed remove the skin on one-half of the sole at the heel and laterally below the external malleolus. A separate incision, running from the inner aspect of the tibia above the malleolus to the scaphoid, serves to expose the inner aspect of the astragalus and to facilitate its removal; it also simplifies the suture of the scaphoid to the tibia, and can be utilized for drainage.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 2.

III. Technique of Osteoplastic Resection of the Foot by the Wladimirow-Mikulicz Method. By PROFESSOR

P. BRUNS (Tübingen). The typical resection has the disadvantage of dividing the posterior tibial nerve and artery, and has repeatedly been followed by disturbances of nutrition and even by gangrene. This drawback has led to the devising of various modifications. The most natural of these is the simple posterior median longitudinal incision which sacrifices no soft parts. Such an incision is recommended by Ollier, but he deviates his outward, in order to avoid the artery and the plantar nerve. This operation was devised and executed by the author without knowledge of Ollier's work. It is performed as follows: Longitudinal incision, beginning four fingers' breadth above the tuberosity of the heel and extending to the middle of the sole. The incision is carried down to the bone, and the ankle-joint opened from behind. The calcaneum and astragalus are removed subperiosteally, and finally the articular surfaces of the bones of the leg and of the lower tarsal bones sawn off. Suture of the bones with silver wire, and finally suture of the entire wound. The objections raised by Lotheissen and Ollier that the redundant soft parts make an objectionable fold posteriorly are not borne out by the author's experience.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 2.

C. L. GIBSON (New York).

BONES,—JOINTS,—ORTHOPÆDIC.

I. Resection of Vertebræ for Pressure Paralysis from Spondylitis. By DR. HANS WAEHENHAUSEN (Heidelberg). Considerable experimental work has been done to determine the changes which take place in the cord following pressure from without. While some observers assert that the paralysis is due to mechanical pressure and disappears upon removing the cause, others believe that it depends mostly upon inflammatory or degenerative changes and the cord is rendered incapable of resuming its function. Clinical experience shows that the paralysis may be caused by either of these conditions, and in many cases it

depends partly upon pressure and partly upon degenerative change. In Pott's disease the pressure is seldom produced by a spondylolisthesis, but a mechanical interference with the circulation, either by lymph, congestion, or anæmia, and this disturbance can persist a long time without irreparably damaging the cord.

An exact diagnosis of the condition of the cord cannot be made before operation, but in deciding for or against operation one should be guided by the progress of the disease. If sensation and motion are becoming more impaired, the bladder symptoms getting worse, and bed-sores threatening, operation should be done without delay. Prolonged use of orthopædic apparatus without improvement is also an indication for operation. If a diagnosis of spondylolisthesis causing pressure paralysis can be made, there should be no delay in removing the pressure by operation.

An operation is contraindicated by general tuberculosis, extensive bed-sores, and a low general condition which would make the operation in itself dangerous.

In thirty-six operated cases collected by the author, in fifteen the results were good and the patients were able to walk. Only a part of the cases were followed after leaving the hospital. Twelve others were improved. The best results were obtained in children.

The technique of operation depends upon the location of the disease. If it is in the vertebral arches or posterior part of the bodies of the vertebræ, Horsley's operation is preferred. This consists in making a vertical incision parallel with the spines of the vertebræ and cutting the fascia from its insertion to the dorsal spines, then making a transverse incision through the fascia about the middle of the wound. The dorsal spines are then cut off and the vertebral canal opened by a trephine. The opening is enlarged by a saw or Horsley's forceps.

When the bodies of the vertebræ are involved there are

several different modes of procedure. Kraske and Chipault remove the vertebral arches, draw the dura mater and cord to one side, and scrape out the diseased process from behind. Others lay bare the vertebræ by incisions on one or both sides of the spine and resect one or more of the ribs.

The after-treatment consists in putting on a Sayre's jacket or other orthopædic apparatus, and treating the sinuses until they heal.—*Beiträge zur klinische Chirurgie*, 1896, Band xvii. Heft 1, p. 75.

GEORGE R. WHITE (New York).

II. The Treatment of Deformities following Hip-Joint Disease. By DR. ALBERT HOFFA (Würzburg). The author reviews very clearly the present status of operative *versus* mechanical treatment of hip-joint disease, emphasizing the unsatisfactory results attending the frequent resections performed under the stimulus of aseptic wound-healing and the restoration of the conservative method to the favor it now enjoys. The conditions most frequently requiring treatment after the healing of the active process are, atrophy, limitation of motion, faulty position, and shortening of the limb. By far the most important are the two last mentioned, for which prophylactic measures are to be employed in the treatment of the active stage of the disease. Various forms of apparatus for this purpose are described quite fully. These failing the author describes an operative measure, a modification and adaptation of the operation recommended by Ollier for lengthening the tibia, then by Schede for the shaft of the femur, and Landerer in hip-joint disease. In his first operation the line of section of the bone was directed from above outward, downward, and inward. Result was unsatisfactory as regards correction of the adduction. He then adopted the following: External longitudinal incision from the trochanter major to the lower limit of the upper third of the thigh. The soft parts being divided down to the bone, the latter is divided with a broad

König chisel, the line of section running obliquely from the upper limit of the wound towards the lesser trochanter. The wound is packed with sterile gauze and extension in the direction sought for is applied. The weight must be considerable,—as high as thirty pounds. The packing is removed in five to eight days. A plaster-of-Paris cast is substituted for the extension apparatus at the end of three weeks and the patient allowed to stand and walk. All apparatus is disregarded at the end of six weeks and energetic massage and gymnastics instituted. The results of two such operations showed shortening of five centimetres reduced to two, two and a half to less than one. In five cases of congenital dislocation in adults this method produced an increase of four to five centimetres in length.—*Sammlung klinische Vorträge*, No. 166, 1896, p. 19.

C. L. GIBSON (New York).

REVIEWS OF BOOKS.

A MANUAL OF VENEREAL DISEASES. By JAMES R. HAYDEN, M.D., Chief of the Venereal Clinic at the College of Physicians and Surgeons (Columbia University), New York; Professor of Genito-Urinary Diseases, University of Vermont. 12mo, pp. 267, illustrated. New York and Philadelphia: Lea Brothers & Co., 1896.

In this little volume the author has tried to give in a clear and compact form a practical working knowledge of the three venereal diseases. The small size of the volume and the magnitude of the principal subjects necessitate the omission of many sections usually found in books devoted to the consideration of but one class of diseases, and also requires that the descriptions shall be brief. The history and statistics are therefore purposely omitted, and it is taken for granted that the reader has an accurate anatomical knowledge of the various organs involved.

Gonorrhœa is the subject of the first subdivision. An extremely conservative view is taken of the etiology of this important disease, for, while the gonococcus is recognized as the usual cause, it is stated that in some cases the menstrual discharge or secretions from an eroded cervix or perineum may also give rise to the disease. This certainly allows the physician a wide margin in explaining the origin of clap in family circles.

The symptoms and diagnosis of the primary disease and of the numerous complications that may arise are concisely stated, but here, and in fact throughout the book, the treatment of the condition receives far more attention. Anterior and posterior urethritis, phimosis, paraphimosis, inflammatory involvement of the various accessory glands, and, finally, the important subject of urethral stricture are each considered; three short paragraphs are devoted to the uses of the endoscope, and gonorrhœal

ophthalmia and gonorrhoeal rheumatism are briefly described. The most satisfactory chapters in the book are those devoted to the nature, diagnosis, and treatment of stricture. They are full of detail, are well illustrated, and a number of operative procedures are well described.

Part II deals with the chancroid and its treatment. It is short, but contains all necessary information.

The remainder of the book is devoted to the subject of syphilis, and is based largely upon Taylor's large work on venereal diseases. The initial lesion, the syphilides, the various portions of the body in which later complications may develop, hereditary syphilis, and the various methods of constitutional and local treatment now recommended, form the chief chapter of this part of the book.

For students who wish merely to pass examinations and not to cure patients the book will be an assistance. For physicians who are already thoroughly conversant with the diagnosis and symptoms of these diseases and who wish to have available a concise *résumé* of modern treatment the book will be of chief value. Practitioners of limited experience with the venereal diseases, or students seeking to familiarize themselves with professional work, will find that the lack of illustrations, especially of syphilitic lesions, the amount of knowledge of the subject that is presupposed, the little attention paid to the use of the endoscope, and the exceeding brevity of the text are all serious defects.

HENRY P. DE FOREST.

THE DISEASES OF THE MALE URETHRA. By R. W. STEWART, M.D., M.R.C.S., Surgeon to Mercy Hospital, Pittsburg, Pa. One volume of 229 pages, post-octavo, illustrated by numerous wood engravings. New York: William Wood & Co., 1896.

"It may be justly asserted that in no part of the human frame does an accurate conception of its structure and its func-

tions have so important a bearing on the proper understanding of its diseases as in the urethra, and it may be said with equal justice that in no other part of the human frame have such erroneous anatomical and pathological views been so obstinately maintained." The truth of this assertion, made by Dr. Stewart in the introduction of this book, will be conceded at once by most practitioners, and, as the book is perused, it will be seen that the writer has faithfully tried to substitute for the rather hazy notions which have prevailed concerning the urethra and its diseases the same sound reasoning, based upon the knowledge of pathology, that has been applied to other parts of the body.

Anterior urethritis or gonorrhœa is, of course, the first pathologic condition to be considered, and the chapters devoted to this subject immediately follow the short chapter on the anatomy of the male urethra. The gonococcus of Neisser is recognized as the cause of the ailment, and the technique used in the identification of this micro-organism is given. The etiology, symptoms, and course of the disease are concisely stated. In the matter of treatment Dr. Stewart is rightfully pessimistic. "It must be admitted that there has been less progress, in recent years, in the treatment of acute urethritis than in any other department of urethral surgery. It would seem as if gonorrhœa was constantly on the verge of being shorn of its terrors and reduced, if not to innocuous desuetude, at least to a par with the proverbial cold. But, frankly speaking, of all the specifics that have been from time to time introduced with a hurrah, not one has stood the test of time and experience, and the treatment of this malady is simply where our fathers left it." From this quotation it must not be understood that the "do-nothing" treatment is advocated; on the contrary, the methods of relief suggested are excellent.

Extensive extracts are made from the classic work of Finger, of Vienna, to whom belongs the credit of placing the pathology of chronic anterior urethritis upon a scientific and accurate basis. According to Otis, the relationship of stricture

and gleet is simply one of cause and effect; Dr. Stewart's views are diametrically opposed to this opinion, and certainly the arguments adduced to substantiate them are convincing.

Before describing the treatment of this most troublesome affection a chapter is inserted giving practical directions concerning the use of the endoscope, and also one upon urethral mensuration. Here, too, the views of Otis are overthrown, for, as has been often demonstrated, "there is no more justification in saying that the size of the urethra bears a definite relation to the size of the penis than there would be to say that the size of the cesophagus bears a definite relationship to the size of the neck."

The latter half of the book takes up the allied subjects of posterior urethritis, acute and chronic, cowperitis, epididymitis, vesiculitis, prostatitis, and stricture. The treatment recommended in each of these conditions will especially commend itself to those physicians who regard as unjustifiable the usual routine by which the patient is made to conform to certain fixed rules, the truth of which is now considered as far from being proven.

A word of commendation must be added for the publishers: the book is well printed with clear type on good paper, is well bound, free from annoying advertising matter, and altogether a welcome addition to a medical library.

HENRY P. DE FOREST:

CHIRURGIE DES VOIES URINAIRES (Surgery of the Urinary Passages). By DR. E. LOUMEAU. 8vo, Volume II, pp. 288, with seven plates of illustration. Bordeaux: Feret et Fils, 1897.

Three years have elapsed since Dr. Loumeau published the first volume of this series of clinical studies. (*ANNALS OF SURGERY*, March, 1894.) That the author has not been idle during this time is shown by the recent appearance of a second volume. Neither book claims to be a systematic treatise upon genito-urinary surgery, but each is really a series of clinical studies of cases that have come under the writer's personal observation

from time to time. With each case there is given the previous history, the course of the diseases, the treatment employed, and the ultimate result, together with an excellent bibliography in many instances, and such conclusions as have suggested themselves to the author. Although a large proportion have been published from time to time in current literature, the value and completeness of the records justify Dr. Loumeau in offering them to the profession in a more permanent form.

The complication is a chronological one, and it therefore happens that several chapters upon the same subject appear in different parts of the book. To obviate the confusion that might arise from this cause an analytic table of contents is given, in which is found a summary of each case reported.

Each part of the urinary tract furnishes its quota of patients. Of the lesions involving the urethra may be mentioned stricture, acquired and congenital, syphiloma, rupture, calculi, and tumors; of the bladder, cystitis, rupture, calculi in women, and a variety of new growths. A rare cancer of the kidney was also observed, and the various operations for the relief of prostatic hypertrophy are exemplified.

"A Contribution to the Study of Hypospadias" is the title of an important chapter, and this is supplemented by two others, one upon the morphology of this condition, and the other upon urethroplasty. Two double plates illustrate the mode of development and the methods of operation.

An unusually good example of the careful work done by Dr. Loumeau is afforded by the record of a case of paroxysmal hæmoglobinuria with chills occurring in a woman who was under the author's care for some time. This is strictly a medical case, but its great rarity and interest justify its inclusion. The record might serve as a model of clinical study, for besides the detailed account of the history, course, and treatment there were numerous examinations made of the blood, and also of the urine, thus affording as complete a record as could well be obtained.

HENRY P. DE FOREST.

A TREATISE ON OBSTETRICS FOR STUDENTS AND PRACTITIONERS. By EDWARD P. DAVIS, A.M., M.D., Professor of Obstetrics in the Philadelphia Polyclinic, and in the Jefferson Medical College, etc. 8vo, illustrated, pp. 553. Philadelphia and New York: Lea Brothers & Co., 1896.

"To furnish to the student a text-book and to the practitioner a work of reference" in the science and art of obstetrics has been the aim of so many recent writers that the production of still another book of this character would seem at first glance to be an unnecessary labor; but after a more careful examination of this new-comer it must be conceded that the domain of obstetric literature has not only been enlarged but enriched as well.

The treatise is divided into seven sections. The first of these is devoted to Pregnancy and Labor, and is, of course, the one to which the most attention is devoted. The first chapter deals with obstetric diagnosis, and after reading it and noting how many valuable suggestions it contains, one is convinced that the aim of the author is along the line of practice rather than theory.

It has seemed to the author that nomenclature and diagnosis have been rendered unnecessarily confused by complicated terminology and theoretical distinctions, and he has endeavored to avoid this by a method simple, direct, and practical. Extensive experience, both as a teacher and clinician, has familiarized him with the needs of both students and practitioners. These he has endeavored to meet not only in the manner of presentation, but in condensing the results of recent research, and in advising only those modes of treatment which have proved trustworthy in practice. In these various endeavors Dr. Davis has been successful. His manner of writing is essentially that of a teacher and friend; and while the book lacks some of the niceties of style that would add to its literary value, the arrangement of topics is a natural one, and the mode of expression is so terse and colloquial that a lasting impression is made upon the mind of the reader.

Especial stress is laid upon the value and use of the pelvim-

eter as an aid to reliable prognosis and a number of skiagraphs of foetal and maternal structures indicate the influence which Röntgen's discovery is destined to have upon diagnosis and treatment.

Section II deals with the Pathology of Labor. The chapters upon embryology, the physiology and pathology of pregnancy, the management of labor, both normal and abnormal, the induction of labor, and the treatment of eclampsia and of septic infection, are among the most important in these two sections of the book.

Obstetric surgery, which in late years has had so conspicuous a development, has received especial attention. In the sections devoted to this subject the descriptions given of various operations are complete and easily followed. Among the chief of these may be mentioned those concerning episiotomy, perineorrhaphy, the use and abuse of forceps, version, symphysiotomy, and obstetric curettement. Here, and indeed throughout the book, the numerous illustrations and full-page plates, reproduced for the most part from actual photographs, add to the clearness of the text.

Abortion, Extrauterine Pregnancy, and the Puerperal State are the subjects included in Section IV. These chapters represent a large amount of recent original investigations, and the plates introduced to show the minute anatomy of septic endometritis and allied lesions are among the most valuable in this book. The directions here given for the guidance of mother and child during lactation are also to be commended, and, if followed, will certainly give better results than the usual hap-hazard management during this period.

"As mothers, moreover, naturally regard the obstetrician as the proper adviser for the infant, the disorders of infancy have been considered as a necessary part of the subject." Normal infancy is, of course, the basis of this section, and after the conditions that ought to prevail have been described, the various pathologic conditions affecting the child before birth, at the time

of birth, and during the first months of its separate existence are considered. The treatment of asphyxia, the use of incubators, the best means of artificial feeding, and the disorders of digestion and of the respiratory organs are the most important chapters of the section. Among the illustrations of foetal malformation the series of plates showing the Siamese twins are of unusual interest.

The last section of the book deals with the Jurisprudence of Obstetrics. Legitimacy, Infanticide, Abortion, and Evidences of Pregnancy are the subjects of chapters, but the entire section is too short to be of any real value. The closing chapter, upon the Legal Aspects of Obstetric Practice, is also unsatisfactory. The title is a misnomer, for the discussion really concerns the old questions of physicians *vs.* midwives, dispensary practice, and the too common custom of sending students to assume charge of obstetric cases. The conclusions in the last case are excellent. "The familiar statement that the student will learn more in obstetrics by going alone to cases and meeting emergencies unprepared is a scientific absurdity, and is at utter variance with the best methods of instruction in other branches of medicine."

HENRY P. DE FOREST.

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ANNALS OF SURGERY,

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ON THE LOWER LIMITATIONS OF THE
PLEURAL CAVITIES WITH REGARD TO
CERTAIN SURGICAL OPERATIONS.

BY W. S. MELSOME, M.D., F.R.C.S.,

LATE SENIOR DEMONSTRATOR OF ANATOMY, CAMBRIDGE UNIVERSITY;
LATE FELLOW OF QUEEN'S COLLEGE, CAMBRIDGE.

SOME years ago it occurred to me that, in view of the many surgical operations which are performed in the vicinity of the lower part of the pleural cavities, their exact limitations towards the abdomen was a subject worthy of further attention than had hitherto been given to it. The various works on anatomy give the surgeon very little information. The surgical text-books point out the danger to the pleura in operating on the kidney, but none, so far as I know, give precise rules or guides which enable the surgeon to avoid wounding it. The most useful account of the relations of the pleura in the region of the kidney will be found in Mr. Treves's "Manual of Operative Surgery," vol. ii, p. 489. It tells the truth, but not the whole truth.¹

During the past few years I have had many dead bodies at my disposal, and have taken the opportunity of investigating this question.

The danger to the pleura in operating upon the kidney appears to me to depend upon the length of the last rib. In Fig. 1 I have represented by a dotted line the commonest position of the reflection of the pleural membrane in the neighborhood of the last two ribs. If this line is to be of any value, from a surgical point of view, it must be shown to bear

¹ Dr. Melsome is apparently not aware of the work already done in this important matter by Dr. Holl, of Vienna, and Dr. Lange, of New York, *ANNALS OF SURGERY*, Vol. 11, October, 1885, p. 286.—[EDITORS.]

a fixed relation to some substantial landmark. The point where the erector spinæ cuts the twelfth rib is an excellent landmark. It can be easily felt when a person is lying down, or when he is in a stooping position, trying to touch the toes without bending his knees.

Now the twelfth rib is sometimes absent; much more

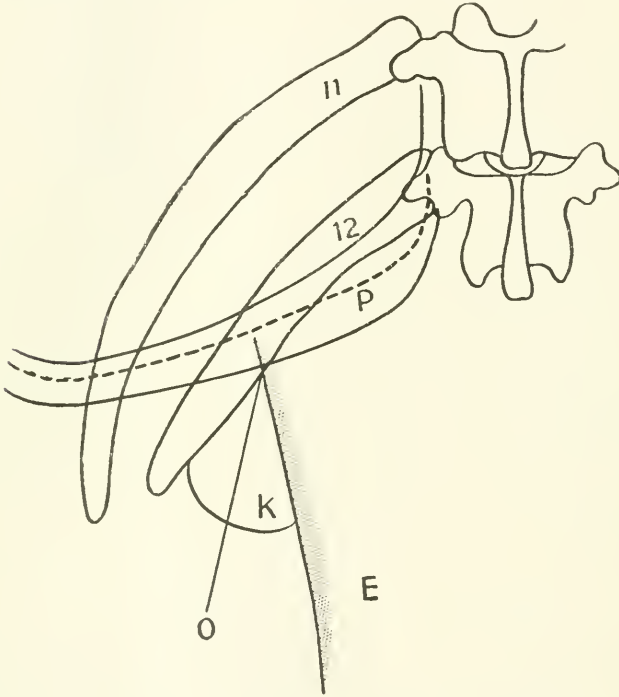


FIG. 1.—P, dotted line represents the mean level of the pleura, and the black lines its variations; E, erector spinæ muscle; K, kidney; O, oblique incision into the angle between the muscle and the twelfth rib; pleura not wounded.

commonly it is short and fails to reach the outer border of the erector spinæ muscle, but the commonest condition of all is a twelfth rib extending beyond the outer border of the muscle, and when this is so, an incision may be made upward onto the lower margin of any part of the rib which projects beyond the outer edge of the muscle without wounding the pleura.

In Fig. 1 I have represented by black lines the variations above and below the mean level of reflection that I have met with in fifty-seven examples. In not one of these did the pleural membrane extend below the lower border of the rib at the point I have mentioned,—*i.e.*, where the outer border of the muscle cuts the twelfth rib; and in no instance was the pleura wounded in making an oblique incision upward into the very angle where they meet, even though the knife was held perpendicular to the surface of the body. (See Fig. 1.) In two instances the edge of the knife was within a millimetre or so of the membrane.

If the knife be made to cut onto the rib nearer the spine (and to do this the erector spinæ must be notched or retracted) the pleura may be wounded, because that membrane in this region may extend as far downward as the transverse process of the first lumbar vertebra; indeed, it sometimes extends into the abdomen beneath the outer arcuate ligament, and is thus uncovered by the diaphragm at this spot. It would be interesting to know whether Mr. Thornton's incision ("Surgery of the Kidneys," p. 83) was altogether external to the erector spinæ. He does not say.

Now let us examine the condition of things when the twelfth rib is absent or falls short of the outer border of the erector spinæ. The relations of the parts I represent in Fig. 2, the oblique incision onto the eleventh rib, at the outer border of the muscle, always wounds the pleura, and the wound is usually a large one.

This fact will serve to impress upon us the importance of counting the ribs from above downward, and of ascertaining whether the lowest rib, which can be felt projecting external to the erector spinæ, is the eleventh or twelfth.

The chief danger to the pleura then depends much more upon rib variations than upon variations in position of the line of reflection of that membrane, which, though it may lie below the mean level, is always reflected from the inner surface of the twelfth rib, when present, at the spot I have mentioned, and this is true of both sides of the body. I may.

however, add that what little difference there is to be recorded in the extent downward of the pleural cavities on the two sides behind is in favor of the right being a little higher than the left. Incisions, therefore, which would be free from danger on the left side would certainly be free from danger on the right side.

How, then, shall we avoid wounding the pleura when the twelfth rib does not reach the outer border of the muscle?

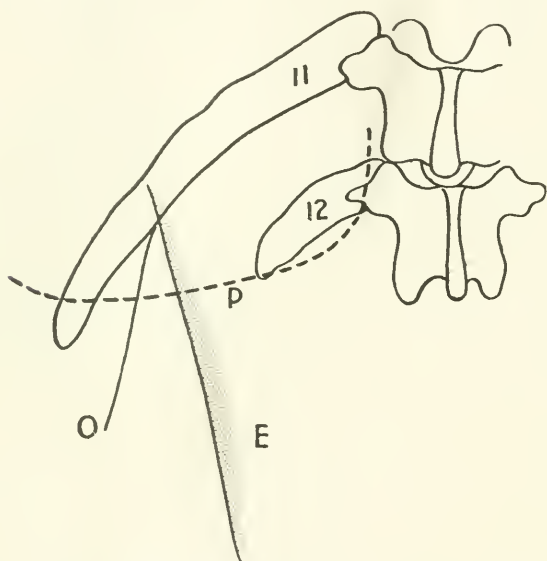


FIG. 2.—11 and 12 represent the two lower ribs, the twelfth being short; E, erector spinae muscle; P, the pleura freely wounded by O, an oblique incision onto the eleventh rib in the angle between it and the erector spinae muscle.

Fig. 2 shows the line of reflection of the pleura crossing the angle formed between the muscle and the eleventh rib. The distance from the apex of this angle to the line of reflection varies considerably. In eleven cases which I examined it varied between one-fourth to three-fourths of an inch. The line of reflection was never observed to occupy a lower limit than the point where the twelfth rib, had it been long enough, would have crossed the outer border of the

muscle. On the contrary, it was usually well above this point.

The surgeon, then, after having assured himself that the last rib which can be felt projecting beyond the outer border of the muscle is the eleventh, may form an opinion as to the position the twelfth rib, had it been present, would have occupied at the outer edge of the muscle, and keep the knife below this spot; or, remembering that the limit of the pleura downward may be three-fourths of an inch below the apex of the angle between the eleventh rib and the erector spinæ, should limit his incision upward to a point at least one inch below the apex of the angle.

The Lower Limit of the Pleura at the Side of the Body.—It will be remembered that the pleura extends farther downward at the side of the body than it does behind or in front: this is true when the pleura extends behind as far as the transverse process of the first lumbar vertebra. The relative difference in level varies with the obliquity of the ribs. Thus in deep inspiration the lateral limit of the pleura will be elevated, while the posterior limit remains constant. In emphysema the lateral limit is permanently raised, so that the relative difference in level is diminished, while in contracted chests, with greater obliquity of the ribs, it is increased.

It follows, then, that a horizontal line, drawn round the body so as to lie below the lowest limit of the pleura at the side of the body, will also lie below its limits in front and behind; and I at one time thought that if the lateral limit of the pleura could be easily determined, the horizontal line would be useful as a guide to the lower limit of the pleura behind, when the twelfth rib was absent or short. But I find that the relation between this varies so much with the obliquity of the ribs as to make it comparatively valueless.

In dissecting-room subjects, with the lower ribs and cartilages displayed, the first free cartilage is a very good guide to the lowest limit of the pleura downward on the side of the body. Its mean level is one and a half inches above this cartilage on the left side, and two inches on the right

side. If, as is most frequently the case, the twelfth rib extends beyond the outer border of the erector spinæ muscle, the tenth will be the first *freely* movable cartilage. It will, as Tillaux has pointed out, be attached to the ninth cartilage by fibrous bands. (See Fig. 3.) If, however, the twelfth rib is very short or absent, then, as a rule, the ninth will be the first freely movable cartilage. When the tenth is the first free cartilage, the measurement should be made from its

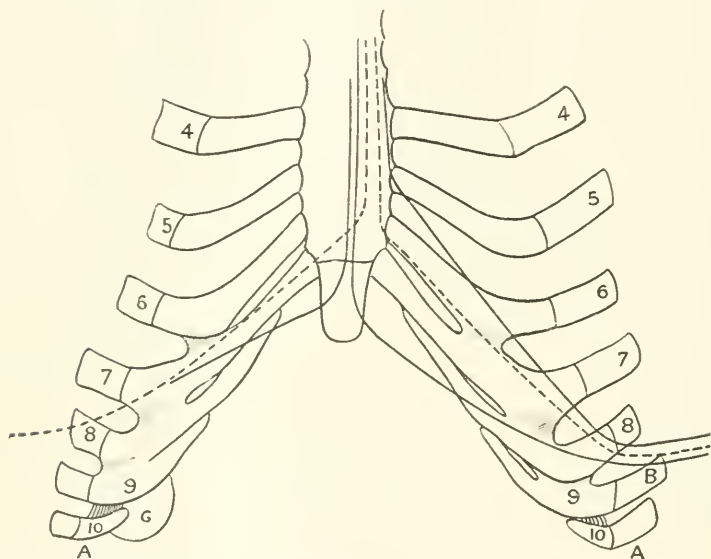


FIG. 3.—The dotted lines indicate the mean level of reflection of the pleura; the black lines represent variations from the mean; A, lower margin of first freely movable cartilage; B, placed on the ninth rib, opposite the lowest limit of the pleura, which is an average distance of one and one-half inches above A on the left side and two inches on the right side; G, gall-bladder.

free extremity; when the ninth, it should be made from the angle. In the living subject, owing to the varying degree of fixation of the ninth cartilage, it is not always an easy matter to determine which is the first freely movable one. If there should be any difficulty, the lowest lateral limit of the pleura may be taken to be in the eighth intercostal space, at a distance of one and a half inches from the costal margin,

on the left side, and two inches on the right, the measurements being made vertically.

The line of reflection of the pleura in this situation varies a little from the mean, but seldom extends much below it. I have, however, in two instances found it within an inch of the costal margin in the eighth space.

The line of reflection of the pleura between the lowest lateral limit and the sternum varies considerably. Its average position is indicated in Fig. 3 by the dotted line.

On the left side it is within half an inch of the extremity of the seventh intercostal space, crosses the extreme limit of the sixth space, and then follows the lower border of the sixth cartilage to the sternum. On the right side it lies behind the seventh cartilage, and is therefore nearer the costal margin than on the left.

The lower dotted lines show how the pleural cavities encroach upon the abdomen in emphysematous persons, and in some instances where the ensiform cartilage is unusually long. It will be observed that the pleura is well above the region of the gall-bladder, which lies opposite the angle of the ninth cartilage, or free extremity of the tenth. Thus these two cartilages can be removed, if necessary, in operating upon the liver or gall-bladder, without danger to that membrane.

The right pleura encroaches upon the sternum far more than the left; indeed, in some instances, the left pleura fails to reach the edge of that bone, so that a knife may be plunged into the third, fourth, fifth, and sixth left intercostal spaces close to the sternum without wounding it, but this is rare.

It will be seen that the fifth cartilage entirely overlaps the pleural sac, and unless that cavity is obliterated by adhesions, it will always be traversed before an incision reaches the pericardium in this situation, and when the line of reflection of the pleura occupies the commonest position, the same may be said of the sixth cartilage when the heart is enlarged, or the pericardial cavity distended with fluid.

CONTRIBUTION TO THE SURGERY OF HEPATIC ABSCESS.

BY GEORGE BEN JOHNSTON, M.D.,

OF RICHMOND, VA.

ON account of the obscurity of symptoms in a considerable number of hepatic abscesses and the difficulty in properly valuing those which are present, I have found it worth while to formulate those which I have most frequently seen, and upon which I have mainly relied for diagnosis.

A searching and accurate history should be elicited in every suspected case, and taken with a special reference to previous attacks of dysentery, diarrhœa, intestinal ulceration, gall-stones, inflammation of portal-vein region, typhoid fever, post-cæcal inflammation, intemperance, gluttony, syphilis, trauma, and chill.

The etiology of the disease is sufficiently distinct to enable us to say that these are the predisposing and exciting causes of hepatic abscess. Although many cases occur in which the etiological factor is either so obscure or so far removed from the onset of the symptoms as to throw doubt on its validity, yet in the main, diligent search will reveal the true cause.

Symptoms may for convenience of description be divided into subjective and objective. Of these the subjective are usually the first to appear, and shall therefore be the first considered.

Pain in the region of the liver is ordinarily an early and prominent symptom. Its exact location will be determined by the position of the forming abscess,—*i.e.*, in the right or left lobe on the upper or lower surface. It is usually constant from the onset and radiates backward and to the right

shoulder. Its degree depends somewhat on the situation of the abscess and the rapidity with which it develops. Those which are deep-seated cause less acute suffering, the pain being of a dull aching kind, than those which more nearly approach the surface, and thereby provoke perihepatitis.

When perihepatitis exists pain is much intensified, and the presence of acute pain generally betokens the advance of the inflammatory process towards the surface of the liver. By carefully noting the exact limits of pain and tenderness we may often locate the abscess with exactness. In such as are on the under surface or to the front of the organ (right lobe) the pain will be greatest just behind the free border of the ribs, and will be increased by upward pressure on the liver. Where the abscess is located on the upper surface, the pain will be felt most keenly at the upper part of the liver, and will be increased by pointed pressure made through the sixth, seventh, and eighth intercostal spaces. Here the respiratory movements augment pain, and so pronounced is this that in some cases hepatic abscess on the upper surface has been mistaken for pleurisy. When the abscess is centrally located, and no perihepatitis exists, pain is less prominent. In any case pain tends to radiate backward and to the right shoulder, but this is most marked in those cases where the abscess is upon the upper surface. Pain is increased by movements of any kind, especially such as jar or jolt the body. The pressure of bands or bedclothing is somewhat unbearable. Sneezing or coughing or straining at stool will often cause great suffering. Muscular pressure or an unfavorable posture will often provoke pain, as lying flat upon the back with the lower limbs extended, or upon the left side, if the abscess is in the right lobe. This is particularly true of large or rapidly forming abscesses, or when much perihepatitis is present. Frequently the sharp pain induced by the movement of the liver in the respiratory act greatly restricts breathing and provokes dyspnoea. Pain is in every case increased by digital pressure.

Nervous manifestations are rather common. Profound

depression and lassitude come on early, and are out of proportion to the apparent gravity of the disease. Insomnia may be an enduring symptom. Great restlessness, with headache, characterizes some cases, and is accompanied by unnatural irritability and peevishness of temper. In some persons, particularly in cases where the more acute symptoms have somewhat abated, lethargy and somnolence supervene. In cases where the abscess is upon the upper surface a dry, irritating, intractable cough exists. The recumbent posture increases the cough, which is somewhat diminished by elevating the body or assuming a sitting attitude.

Digestive Disturbances.—Loss of appetite appears early, and in most instances is complete, there being absolute aversion to food. In others the appetite is perverted with a peculiar craving for acid drinks, sour fruits, or succulent vegetables; thirst is usually much exaggerated; the breath frequently becomes fetid. There is eructation of gas and sometimes of acid fluids; nausea is a variable symptom; it is never constant, yet all cases suffer with it to a greater or less extent, and occasionally it is prominent. Vomiting will be observed in a fairly large proportion of cases, taking place usually soon after the ingestion of food. The vomitus is generally composed of bile-stained mucus. Diarrhœa may be present and persist throughout, or constipation of an obstinate character exist. In a few cases these opposite conditions will alternate. A bitter, slimy taste in the mouth is conspicuous. The teeth are foul, and thin, pale sordes form on them. The tongue varies much in appearance; occasionally it is fiery red, like raw meat, sometimes it appears denuded and glazed; again it is heavily coated with a yellowish-white fur resembling a smear of custard. When it is thus coated the margin and tip are usually free and red. The coating is rarely brown and dry, except in such cases as run a so-called typhoid course. Digestive disturbances are more surely present, and are more distinct in the cases where the abscess is situated on the under surface of the liver.

The most invariable *objective symptom* is *enlargement*

of the liver. This is rendered obvious by a bulging of the right hypochondrium. Enlargement may take place in any direction, this being determined by the seat of the abscess. If centrally located, the enlargement is in all directions. When nearer the surface, expansion follows the line of least resistance. Therefore, those upon the lower surface extend downward and towards the umbilicus. Those upon the diaphragmatic surface increase upward. Hence the direction of increase in liver dulness usually indicates the location of the abscess. With an increase in the bulk of the liver, especially if it takes place upward, the boundary between lung and liver is displaced upward, the displacement being usually quite convex, and there is lessened mobility of this boundary-line in breathing or assuming the left-side posture. The tumor may project so far downward that its lower border can be distinctly felt and the respiratory movements of the liver discerned. The inferior intercostal spaces are usually obliterated, indeed, may even protrude. There is pronounced muscular rigidity over the affected region, particularly noticeable in the right rectus.

When accessible to palpation the tumor appears hard, smooth, and elastic. Fluctuation, when present,—happily it is seldom seen,—is a most valuable symptom, but is only demonstrable when the abdominal walls are unusually thin and relaxed, the tumor projecting forward or downward, the abscess walls attenuated, and the contents quite fluid. Perihepatic friction is as rare as fluctuation.

Locally the skin is not changed except to appear tense over the swollen parts, and to assume a reddish, œdematous aspect in those cases in which adhesions have formed between the liver and abdominal wall. Redness and œdema appear more quickly in lean subjects than in fat ones. This appearance of the skin generally denotes formation of adhesions, but is not an *invariable* sign of their presence.

Although actual jaundice never exists except in those instances where the abscess by pressure either partially or completely occludes the common bile-duct, or where catarrh

of the ducts coexists, yet the skin assumes a yellow pallor that is quite characteristic. It also becomes contracted, harsh, and rough, and is frequently bathed in profuse and irregular sweats. Hectic is pronounced. Rigors, shivering, and actual chills appear frequently and at irregular intervals. High temperature, with flushed cheeks and rapid breathing, follows and passes off in copious and exhausting sweats.

The *posture* of a victim of hepatic abscess is almost characteristic. Every unconscious endeavor is used to relieve pressure and weight. The right side decubitus is maintained in those cases where the abscess is near the front or on the under surface of the organ. If upon the diaphragmatic surface, the body will be raised on several pillows or tilted to the right. A small pillow or cushion tucked under the affected side is a common sight. The thighs are flexed on the abdomen, and every movement is executed with great care and deliberation.

Emaciation is a conspicuous feature of the disease. Destruction of fat starts early and is rapidly progressive. Natural hollows deepen quickly and bony projections grow prominent.

In no disease with which I am acquainted does the *temperature* run a more erratic course. It may resemble the temperature of a quotidian type of intermittent fever or closely simulate that of typhoid fever, or noticeable elevations may be entirely absent. To me the most interesting thermometric readings are those in which the temperature ranges from 96.5° to 103.5° F. A considerable number of my own cases have exhibited repeated subnormal temperatures, so much so that I am obliged to regard an occasional subnormal temperature, in the presence of other symptoms, as quite suggestive of hepatic abscess. Can it be that the destruction of so much of the tissue of this great calorifying organ is responsible for this reduction in body heat? It is not so apparent in any other septic process.

My own observations on the behavior of the urine are insufficient for any well-marked conclusion. It is always

scanty, of deep color, high specific gravity, and in the majority of instances in which I have examined it, abundant deposits of urates were present.

In a fairly large percentage of cases the spleen has been distinctly enlarged.

The most constant and therefore the most valuable symptoms I have observed in this malady may be briefly summarized as follows: (1) A history in which dysentery and chill appear; (2) general malaise pronounced; (3) pain and tenderness over liver; (4) enlargement of liver; (5) hectic, sweats, and rigors; (6) right-side posture; (7) erratic temperature, running from 96.5° to 103.5° F.; (8) progressive emaciation; (9) gastric disturbances.

Treatment.—This should be prompt, bold, and radical. No measure will succeed which does not completely evacuate the abscess cavity and allow free drainage. This can be only done with precision and safety by incision. Aspiration, puncture with trocar, direct puncture with scalpel, opening by caustics or thermo-cautery are uncertain, insufficient, dangerous, and unsurgical, and are mentioned only to be condemned. The route by which the liver is entered may be either transperitoneal or transpleural. Where the abscess can be attacked from the front, the operation of incision and drainage is comparatively simple. The transpleural method presents greater difficulties, and the gravity of the situation is increased. The line of incision will be determined by the position of the abscess. It may be made below the free border of the ribs by an oblique cut, or a vertical one if the abscess points forward or downward; or, by resection of a part of one or more ribs, the abscess may be attacked from the side or behind. If an oblique incision is practised in front, it should be sufficiently removed from the border of the ribs to allow the wound in the liver to rise, as reduction in size takes place from subsidence of swelling, without passing up under the ribs to a point where it would be overlapped by the ribs, and thus interfere with drainage. On account of the actual occurrence of this accident a vertical incision is

preferable, especially in those cases where the tumor has descended far below the ribs, and thus allows an ample field for a liberal vertical cut.

In any case, the cut to reach the liver should be an abundant one. Through a large opening we work with greater ease, celerity, and safety, and easier access to the liver is obtained, and that part of the incision which is not needed for manipulation or drainage can be subsequently closed.

Upon reaching the liver, in a certain proportion of cases, it will be discovered that adhesions have already formed sufficient to protect the general peritoneal cavity and allow the immediate opening of the abscess without further care or fear. This may be done by sending in an aspirator-needle to locate the abscess cavity with accuracy, and, if the abscess is deep-seated, furnish a guide for the bistoury. If the wall is thin, this is superfluous.

Where no adhesions have occurred, provisions must be made to protect the peritoneal cavity against possible contamination, for while it is well understood that the pus of many hepatic abscesses is sterile, yet we cannot say in advance that the pus in any given case is sterile, and we should therefore take no risk, but seek to protect the peritoneum against any possible infection. This, in such cases, may be accomplished in one of two ways; either by doing the operation in two sittings, packing the wound and forcing adhesions, or else by providing against the possible entrance of pus into the peritoneal cavity at once, incising and draining the abscess, and then stitching the margins of the hepatic wound to the deeper portions of the superficial wound. This must be done with the utmost care and security, and even when thus accomplished, additional precautions should be taken in the arrangement of packing by which the line of contact is further secured against leakage.

In passing through the pleura, it will be found necessary to resect a portion of a rib, and sometimes two ribs, in order that ample access to the liver may be afforded the operator. The opening into the pleura must be made cautiously, and

the parietal layer of the pleura seized and held in the grasp of hæmostats in order that there may be no fumbling to find the cut margins when they are needed to be sewn to the diaphragmatic incision, and also that the wound may not gape unduly, as it is desirable to admit as little air into the pleural cavity as possible. The diaphragmatic pleura should be incised to correspond to the first opening, and the cut margins of the two incisions forthwith sewn together with a continuous suture of fine catgut. When the pleural cavity is thus shut off by this "button-hole" through it and the diaphragm opened, the remainder of the operation is identical with that from the front. The opening into the liver should be as free as safety will allow in order that the cavity may be thoroughly cleansed and drained.

The next step is to evacuate the cavity and cleanse its walls. This may be accomplished by irrigating with warm boracic or carbolic solutions, after which the cavity may be wiped out and dried with pledgets of cotton or gauze; or no fluid being thrown into the cavity, it may be merely mopped out. Drainage is now to be provided for. If the cavity is very large, this should be assured by the introduction of one or more large rubber drainage-tubes and a light gauze packing as well. In small cavities merely packing with gauze will suffice. When the cavity is large and much discharge is expected, a very voluminous dressing (outside) must be applied and changed as often as it becomes soiled.

In most cases healing occurs rapidly, the discharge of pus daily diminishes, and the cavity contracts perceptibly. The patient's general condition promptly improves also. It occasionally happens, however, that the process of repair is tardy and unsatisfactory. This may in some instances be due to cachexia, which will have to be overcome by judicious constitutional treatment, or to the state of the abscess walls, which may require stimulation to produce healthy granulation. Of all remedies suggested for this purpose, a weak solution of carbolic acid (two per cent.) I think best. The general methods of hygiene must be applied in every case, which, as a rule, will be properly responded to.

The accidents most likely to occur in opening a hepatic abscess are contamination of the peritoneal cavity by the premature rupture of the abscess in manipulation, or awkwardly opening it after exposure. Neither ought to occur, and will not, if gentleness and cautiousness prevail. Hæmorrhage from the wounded liver may be severe, and is most liable to occur in those cases where much liver tissue is traversed to reach the abscess. As a rule, such hæmorrhage can be controlled by forcipressure, packing, or the application of sutures with a curved needle, taking in sufficient quantity of liver tissue. On account of the brittle character of the liver substance, such sutures are never to be too tightly applied for fear of cutting through.

The advantage of incision over other methods of treatment will be demonstrated by a comparison of the following cases:

CASE I.—September, 1878. O. C., aged thirty-three years; blacksmith; born in Ireland; has resided eleven years in Richmond. He gives a history of excellent previous health, having had no serious illness prior to one year ago, when he suffered a mild attack of malarial fever. He had been confined to his bed two weeks when I saw him in consultation. Present sickness began six weeks ago, with loss of appetite, increasing constipation, occasional nausea and vomiting, prominent thirst, coated tongue, flushed face, "feverishness," some headache and two nose bleedings. Pain and sense of heaviness in region of liver; pain radiating to right shoulder and increased by any movement. Clothing seemed to exert disagreeable pressure. Rigors and sweats at irregular intervals. He had taken mercurials and large quantities of quinine with no abatement of symptoms. Patient prefers to lie on right side with thighs flexed. Turning to opposite side gives dragging pains over the liver. Skin sallow. Anxious expression of face, much emaciated. Voice weak and husky. Severe, dry cough. Tongue furred in the middle and at its base, but red at its tip and around margin.

Examination showed the lower portion of the abdomen somewhat retracted. A very distinct bulging of right hypochondriac region. Liver dulness increased in every direction. Great

tenderness over liver. Obliteration of intercostal spaces from sixth down. Border of liver felt four inches below margin of ribs. The skin over the swollen area appeared glazed and tense. Respiration hurried; pulse quick and feeble; temperature erratic, ranging irregularly from 97° to 103° F. Urine loaded with lithates.

Hepatic abscess diagnosed and aspiration advised. A medium-sized needle was chosen and introduced from the front. Eighteen ounces of fetid, chocolate-colored pus were withdrawn. Following this there was some cessation of pain and cough and sleeplessness, and an apparent general improvement for a few days. The cavity rapidly refilled, and sixteen days afterwards was again evacuated by aspirator, this time drawing off twelve ounces of pus of a deeper color but less fetid. Following each withdrawal of pus profuse sweating occurred and a subnormal temperature developed (97°), lasting for twenty-four hours. Four days after the second aspiration a diarrhœa set in, which could not be controlled, and death ensued. No autopsy.

CASE II.—January, 1879. C., aged twenty-eight years; puddler in iron works; born in Ireland; seventeen years in Virginia. He has enjoyed exceptionally good health. In the early autumn of 1878 had an attack of typhoid fever, during which there occurred intestinal hæmorrhage. Ever since this illness has had "weak bowels," having frequent diarrhœa. For the past three months has been incapacitated for even light work. Present sickness began with digestive disturbances, poor appetite, eructations of food and much gas, colicky pains, occasionally nausea and vomiting. Lost flesh rapidly. Skin became dry and sallow but never jaundiced. Deep inspirations were painful; could not lie on the left side comfortably.

Expression anxious; tongue red and raw-looking; very nervous and sleepless; complains of vague headache and dizziness; pulse rapid; temperature ranges from 99° to 103° F. Hectic with copious sweats and frequent rigors. Large swelling over region of liver. Tenderness exquisite; skin red and œdematous; liver dulness not increased upward but downward to as much as five inches below costal border. Lungs healthy; urine normal; tumor fluctuated.

Hepatic abscess diagnosed. Aspiration practised. At least two pints of creamy pus withdrawn. The operation caused great

faintness accompanied by profuse sweating. Little, if any, amelioration of symptoms. Cavity quickly refilled. Death occurred on fourth day after aspiration.

Autopsy, which involved only an examination of the abdominal viscera, showed the abscess to have been located in the right lobe of the liver. Adhesions to the anterior abdominal wall were extensive and firm. The abscess was burrowing towards a point two inches below the tip of the eleventh rib, this being the thinnest portion of the abscess wall. The wall was rough and irregular, and large fragments could be easily detached from it by sweeping the finger around it. The spleen was twice its normal size. There were several cicatrices in the intestine where the typhoid ulcers had healed. Kidneys healthy.

CASE III.—October, 1879. Mr. B., aged thirty-one years; farmer. Resided in Hanover County, nine miles from Richmond. Born in France. Twenty years in Virginia. Healthy as a youth; habits good. He had been ill six weeks when I saw him with what was thought to be malarial fever. Sickness began with violent chill, followed by high fever. Pain and great tenderness over the liver. Rigors frequent; fever in the beginning constant. Would not yield to large doses of quinine. Nausea a prominent symptom from the first; now and then vomiting of much bile. Tongue coated with white fur. Diarrhœa more or less severe throughout; stools yellow and thin. Loss of appetite complete; craves acid drinks. Some headache. Pain and tenderness over liver have been persistent. A gradual bulging below ribs in right hypochondrium was noticed. Rigors and night-sweats. Rapid emaciation. Skin the color of a frost-touched hickory-leaf, except face, which is dusky. Slight icterus. Temperature at this visit 96.5° F. Doctor in attendance told me he had several times found it subnormal.

During the early days of sickness laid on back; now lies on right side with small pillow tucked under the short ribs. Liver dulness not increased upward. Liver border reaches nearly to umbilicus. Indistinct fluctuation.

Diagnosed hepatic abscess. Aspiration from the front was practised on following day and a large quantity of lumpy, chocolate-colored pus pumped away. Symptoms were somewhat improved for ten days. Diarrhœa was lessened; temperature fell to normal, and remained so for the greater portion of the time,

although it would occasionally mount up to 100° and now and then go down to 97° . Pain and tenderness were much diminished. On the eleventh day after aspiration patient was seized with a second violent chill, and all unfavorable symptoms returned. I was called four days afterwards and went prepared to again aspirate. Death had taken place two hours before my arrival.

An incomplete autopsy showed a very large abscess in right lobe of liver. Adhesions in front were imperfect. Abscess had ruptured into the perirenal space, which was filled with the same character of pus withdrawn by aspirator. The abscess wall was mushy and very irregular and shreds of necrotic tissue suspended from it. The spleen and kidneys appeared healthy. The intestines were not opened.

CASE IV.—August, 1880. R., aged forty-nine years; farmer. Lived all his life on lower James River. He has had many attacks of chills and fever and three of well marked dysentery; otherwise has enjoyed good health. The last attack of dysentery began in June of the present year, and lasted three weeks. He has never been entirely well since; has not recovered flesh or strength; on the contrary, has steadily emaciated. When sufficiently convalescent from the dysentery to move about the house, began to have pains and tenderness over the region of his liver. These increased, and he called his physician's attention to them. Loss of appetite, furred tongue, headache, rigors and sweats grew more and more pronounced. A swelling occurred in the right side. For this he was brought to Richmond and put in my care.

I found the liver much enlarged upward, very painful and tender; tongue coated; bowels relaxed, occasionally discharging mucus, tinged with blood, straining at stool now and then. Temperature varying at most irregular intervals from 97° to 102.5° F. Pulse quick and weak. An exceedingly irritating cough; no expectoration. Intercostal spaces filled.

Hepatic abscess was diagnosed. Aspiration practised in mid-axillary line through ninth intercostal space. Twelve ounces of curdy pus withdrawn. All unfavorable symptoms decreased and improvement satisfactory for three weeks. Swelling then began to reappear, accompanied by a return in aggravated form of former symptoms. He was again brought to Richmond and

a second aspiration practised. No improvement after this aspiration. Exhaustion was rapid and death followed in two weeks with apparent refilling of abscess cavity. No autopsy.

CASE V.—In September, 1881, I saw a musician, aged twenty-six years. He had been confined to the house for eight weeks, and for the greater part of the last four weeks of this time was in bed. Acute phthisis was the diagnosis made by the physician who preceded me. Inquiry revealed the fact that he had enjoyed good health until the middle of June of this year. An attack of dysentery occurred then. This was severe and protracted. Never since this attack have his bowels been entirely regular.

In July had a severe chill, followed by intense pain in right hypochondrium; continued fever. Great sensitiveness over liver extending up chest wall to near the nipple. A large swelling rapidly developed, with bulging of intercostal spaces. A most distressing cough came on; no expectoration; hectic, sweats, and rigors. Could only lie on right side, nor on back without the body was propped on several pillows. Respiration much accelerated and painful. Very sleepless; pain in head; complete loss of appetite; some nausea and vomiting. Lost flesh rapidly.

Hepatic abscess diagnosed. Aspirated through ninth intercostal space. A quart of blood-stained pus withdrawn. Some abatement of septic symptoms. Cough somewhat lessened and nervousness diminished. Improvement lasted only a few days when cavity again refilled. He was again aspirated, and a third aspiration was determined on and the day appointed. On the morning of that day a violent fit of coughing and smothering came on and a quantity of bloody pus was discharged from the mouth. His condition was perilous for an hour, suffocation being imminent. After this the flow of pus began to diminish and he was much relieved. As long as he sat up there was no flow of pus. As soon as he attempted to lie down coughing came on and pus was expectorated freely. Rupture into bronchus was recognized. He was required to drain the abscess cavity by lying across a bed on his belly and hanging his trunk partly over the side of the bed. When such a position was assumed pus would flow freely from the mouth. If it came rapidly enough to strangle him, he would get immediate relief by sitting upright. This method of drainage was persevered in

steadily, and improvement was rapid. There was daily diminution of the pus-flow. Hectic disappeared; hepatic swelling subsided; digestive functions were restored, and at the end of three months the man was in robust health.

I have seen him within a fortnight, and he tells me that he has had no sickness since his recovery from the hepatic abscess.

CASE VI.—July, 1882. O., negro, aged thirty-three years; carpenter. Splendid health until May, 1882. He had then an attack of acute diarrhœa, for which he received no professional treatment. Diarrhœa subsided in two weeks. Soreness in abdomen did not disappear. Suffered much from digestive disturbances; loss of appetite; nausea and vomiting. Pain and tenderness over liver. Swelling below margin of ribs, on right side, extending half way to umbilicus. Some jaundice. For this swelling and pain I was called. Swelling was very visible. Tumor was smooth and firm. Could make out margin of liver. Rigors with very abundant sweats; had emaciated rapidly. Temperature ranged between 99° and 103° F.; pulse rapid and weak. Could not lie on left side, as it occasioned great distress as if "something tearing." Tumor grew rapidly. In a week had extended to umbilicus.

Hepatic abscess diagnosed. Aspiration resorted to. Needle entered from the front. A quart of chocolate-colored pus obtained. Great relief followed. Improvement continued for fifteen days, when swelling reappeared rapidly, with renewal of septic symptoms. Five aspirations were practised at intervals, varying from ten to fifteen days, with large quantity of pus removed at each aspiration, and each was followed by some amelioration of symptoms. When it was apparently time to aspirate the sixth time, on violently sneezing something was felt to "give way" in the abdomen, with almost complete subsidence of the swelling. Great shock ensued, from which he could not be induced to react, and death followed within twenty-four hours. No autopsy.

CASE VII.—December, 1882. C., aged forty-eight years; laborer in City Gas Works. Saw this patient in consultation. He had been gradually failing in health for six months. Health previously good. Symptoms chiefly referable to abdomen. Mild pains not localized. Complete loss of appetite; alternating diarrhœa and constipation. Sometimes fever; night-sweats, and oc-

casional rigors; tongue coated; breath fetid. Lungs and heart normal. Belly retracted. Mesenteric glands enlarged. No swelling or tenderness over liver. Death from exhaustion.

Autopsy showed mesenteric glands generally enlarged; kidneys healthy; spleen slightly over size; liver natural in outward appearances. Incision into right lobe opened into an abscess cavity as large as an orange, containing thick, greenish, curdy pus. The walls were dense and quite smooth. Hepatic abscess had not been suspected.

CASE VIII.—July, 1883. W., aged sixty years; laborer; very frail, delicate person. Health had never been good. All his life had suffered with dyspepsia. He had resided fifteen years in Arkansas. While there suffered severely from chills and dysentery, of which he had an attack every summer. He lived in Richmond since October, 1881. He was able to work until June 1, 1883, when a severe attack of dysentery came on, lasting three weeks. Before he recovered strength, after his attack, began to have tenderness and pain over the liver with perceptible swelling downward; wasting was rapid; exhaustion profound, accompanied by fever, sweats, and rigors. Swelling grew rapidly, extending to within one inch of the umbilicus, and pain and tenderness increased. Skin over the swollen area became red and œdematous; tongue fiery red and sore; complete anorexia; constant diarrhœa; temperature was many times noted subnormal to the extent of a degree and a half; pulse rapid, feeble, and thready. Could only lie on right side; when turned to left, felt a drawing, dragging sensation in right side.

Hepatic abscess diagnosed, and aspiration practised. Puncture made an inch below tip of ninth rib. Seventeen ounces of pus, much tinged with blood, withdrawn. Death occurred in four days. No autopsy.

CASE IX.—September, 1883. Mrs. W., white woman; aged forty-seven years; housewife; previous good health, never any serious sickness. She had chills and fever during the summer of present year. General health failed; lost flesh and strength; became sallow and slightly jaundiced; suffered much from nervousness; slept badly; had repeated "cold spells," but did not shiver. First noticed that rising from a chair or going downstairs "jolted" her right side under the short ribs. Lying on left side "pulled" her in same place; could not lie comfortably on

right side or on back with shoulders elevated. A dry, irritating cough soon developed. Could not "get under the phlegm to raise it." Had night-sweats. Outbreaks of diarrhoea lasting about three days spontaneously controlled; temperature varied from 100° to 103.5° F.; right hypochondrium greatly swollen. Liver dulness extended from fifth intercostal space to three inches below border of ribs; intercostal spaces obliterated; respiration rapid and difficult; voice much altered; pulse quick and feeble; hectic very pronounced. Could not discover fluctuation below ribs.

Hepatic abscess diagnosed. Aspiration practised. Puncture made in axillary line through ninth intercostal space. Two pints of blood-stained pus extracted. Cavity refilled rapidly and was again punctured, this time with trocar and canula, just below free border of ribs, and rubber draining tube inserted, and left in. Discharge of pus profuse. Symptoms much relieved for three weeks, after which time case remained stationary for a time. Discharge through tube continued. Notwithstanding apparently sufficient drainage, septic symptoms became aggravated, and death ensued from exhaustion one hundred days after first tapping.

CASE X.—November, 1885. A., negro man, apparently thirty years of age; farm-hand, working on the banks of the Chickahominy River since May of present year. Returned to his home in Richmond, because he had been disabled by sickness, only stated that he had had several "spells of bloody flux and ague." I found him much emaciated and weak. Conjunctivæ icterosed; tongue red; no appetite; bowels constipated; liver swollen and tender; skin over swelling œdematous; fluctuation could be made out over the swelling, which extended nearly to umbilicus. An aspirator-needle was introduced at most prominent point of swelling and entered at once into large abscess cavity. Twenty ounces of creamy pus withdrawn, which became streaked with blood as the last few ounces came away. The withdrawal of the pus was followed by a subnormal temperature, which lasted forty-eight hours. No improvement of symptoms, and death followed eight days after aspiration. No autopsy.

CASE XI.—July, 1884. Miss A., aged thirteen years. I saw this patient with the late Dr. R. T. Ellis. She had suffered an attack of dysentery in June. In August, when she was yet

incompletely recovered was seized with a violent chill, followed by high fever. Very soon pain and tenderness over the liver came on. Tongue coated with thick white fur; bowels relaxed; some vomiting; frequent nose-bleedings; respiration embarrassed from time of chill. She could not lie comfortably on left side; emaciation very pronounced; skin sallow; liver enlarged rapidly, chiefly in upward direction. Dry, irritating, exceedingly distressing cough; no expectoration; frequent shiverings; profuse sweating; temperature often subnormal and reaching 103° F. when highest.

Hepatic abscess suspected. Puncture with aspirator-needle in the ninth intercostal space withdrew seven ounces of greenish-yellow pus. Some abatement of symptoms. Cavity soon refilled. Death on twenty-seventh day after chill. No autopsy.

CASE XII.—September, 1890. R., little girl, aged six years. While running in the street tripped and fell violently against the curb-stone, striking her right side. Got up and walked home. Felt sick and painful and vomited some. A physician was called and pronounced the injury not serious. A large ecchymosis appeared; little superficial swelling. Soreness continued. Child would not leave its bed. On fourth day had a chill. Deep pain and soreness under area of bruise came on. Symptoms became tumultuous; face greatly flushed; conjunctivæ injected; pulse rapid; breathing hurried and painful; tongue red; diarrhœa, headache, and great restlessness. A pronounced swelling appeared, bulging from beneath the border of the right ribs, which in seven days reached to the umbilicus. Sweats and rigors occurred. Temperature from 100° to 104° F.

Traumatic hepatic abscess was diagnosed and incision recommended. The family declined any operative interference. On the fifteenth day after the injury was seized with a violent tearing pain in the side, followed by sudden and prolonged collapse. Pain lasted an hour, and swelling materially diminished. In twelve hours well-marked septic peritonitis developed and death occurred in four days. No autopsy.

CASE XIII.—August, 1893 (Dr. W. B. Towles, University of Virginia). A young merchant, aged thirty-three years; married; father of seven children. He had had five attacks of dysentery, and in the intervals between these attacks he enjoyed fair health. In March last he began to complain, and after two

or three days he was confined to his bed with an attack of dysentery, which was his last attack. This attack lasted until April 28. Recovering from that attack sufficiently to be about and attend to his business, he began to manifest symptoms in the region of the liver, which caused his physicians to suspect that he had abscess of the liver. The patient's health improved under Dr. Towles's care for a time, but soon began again to decline. The gentleman saw Dr. McGuire, who ordered him to go to a sulphur spring. He went to a sulphur spring in Virginia, and a short time afterwards Dr. Tiffany diagnosed abscess of the liver, and advised an immediate operation. He came home (Charlottesville); I was telegraphed for, and concurred in the diagnosis that Tiffany made, and advised operation. He was brought to Richmond two days afterwards and placed in the Retreat for the Sick.

An aspirating-needle was used for the purpose of locating the abscess cavity. The puncture was made through the tenth intercostal space, and after passing the needle in three directions, I finally succeeded in tapping the abscess-cavity and withdrawing pus. The general direction of the needle was borne in mind, and the patient prepared for a surgical operation. The anterior two-thirds of the ninth rib were excised, the pleural cavity was cut into, and the diaphragmatic pleura was incised in such fashion as to make the incision correspond with the cut in the parietal layer; the margins were stitched together, the diaphragm was incised, and we came at once down upon the liver. By palpation a bulging was detected in the part of the liver where the abscess existed. As far beyond the infected region as possible deep sutures of strong silk were passed with curved needles into the substance of the liver at each extremity of the wound, the liver being drawn up snugly into the wound. The surrounding parts were packed in such a manner as to prevent the escape of pus into the peritoneal cavity, the pleural cavity having been thoroughly cut off by the stitching of two layers of the pleura; the abscess was incised. An enormous quantity of pus escaped, and when the cavity was thoroughly evacuated and swabbed out, the margins of the wound in the liver were stitched to the margins of the wound in the diaphragm, so that the wound in the liver corresponded to the wound in the chest wall. A large drainage-tube was inserted and a voluminous dressing of gauze and cotton applied, which was renewed as it became soiled. At

first the discharge was free, but gradually diminished, and the urgent symptoms soon began to subside. The temperature, which in the morning was 103° , in four hours after operation, subsided to 96° F., and remained subnormal for four days, after which it became normal, and never passed beyond 99° F. during the remainder of convalescence. The cavity was flushed from time to time with a weak solution of carbolic acid. A nutritious diet was prescribed, and occasionally minute doses of deodorized tincture of opium administered, sufficient to relieve the trifling pain he suffered. In a week from the day of the operation it was manifest that the patient was taking on flesh and improving.

The operation was performed on August 27, and on October 21 the patient was discharged from the hospital with a tiny drainage-tube in the wound, which had been shortened from time to time until it represented nothing more than the depth of the tissues intervening between the surface of the liver and the exterior of the body. The remaining portion of the wound had thoroughly granulated and had cicatrized. This drainage-tube was finally removed at the end of the fifth week. At the end of the sixth week the patient had gained fifteen pounds in flesh, and was again attending to his business, absolutely cured.

CASE XIV.—(By Dr. C. A. Blanton, of Richmond). December, 1893. Kelly, aged fifty-five years; carpenter. Good health until three months ago; never had a serious sickness. Grew sick gradually: general indisposition: loss of appetite; bad taste in the mouth; furred tongue; constipation. No pronounced symptoms until December 4, when high fever came on, accompanied by delirium. Chills with profuse sweats followed. Consulted Dr. Blanton December 6. Temperature then 103° F.; abdomen distended; bowels steadily constipated; swelling and great tenderness over left hypochondriac region. Purgation with mercurials and counter-irritation relieved pain and reduced temperature to normal. Remained so twelve hours. Again rose to 103° F. Swelling increased rapidly, tenderness and pain became unbearable. Required morphine. Some nausea. Great muscular weakness. Saw patient December 11. Abscess of left lobe of the liver diagnosed. Removed to Old Dominion Hospital and operated on next day.

The tumor bulged from beneath the ribs and extended to umbilicus. Skin over tumor red and œdematous. Incision

over most prominent part of tumor. It was found on opening the peritoneum that adhesions had formed. An aspirator-needle was introduced into abscess cavity, the wall of which was thin. Pus flowed through the needle, a bistoury was inserted alongside of the needle and an ample opening made. It was estimated that at least a quart of thick creamy pus escaped. The cavity was carefully and gently mopped with gauze pledgets until it was clean, and then irrigated with a 2 per cent. solution of carbolic acid. A large rubber drain was introduced and a light iodoform gauze packing placed in as well. Voluminous outside dressing applied.

Temperature fell immediately after the operation to 97° F. and remained so forty-eight hours, when it gradually crept up to normal, from which it never varied during remainder of convalescence. There was practically no discharge from the abscess cavity afterwards, and only infrequent dressings were required. The cavity closed with wonderful rapidity and the patient's general condition steadily improved, and at the end of four weeks closure and cicatrization were complete. He recovered flesh rapidly, having an excellent appetite throughout, after the second day from the operation. The pus in this case was examined for amœbæ and none were found; had never had dysentery nor malaria.

CASE XV.—February, 1894, Allen, aged sixty-three years (By Dr. R. J. Ellis). Previous to one year ago enjoyed good health. For past year has never been well. In the spring and summer of 1893 had several attacks of dysentery, became emaciated and feeble. In October, 1893, had a severe sickness lasting four weeks; diagnosis, continued fever. February 1, 1894, took to bed after a severe chill. Temperature rose to 104° F., and remained above 102° for four days. Then began to fluctuate between 96.5° and 102.5° for four days, remaining at 97° for as much as twenty-four hours at a time. Severe pains in right side under short ribs. Much tenderness on pressure. Insomnia, headache, fleeting delirium. Bowels disordered; first constipated and then diarrhoea. Some nausea and vomiting. Tongue red and denuded and breath fetid. Great thirst. Skin sallow and harsh. Anxious expression. Urine loaded with urates.

Saw this case in consultation on February 23. Liver greatly enlarged downward. No upward increase. Could only lie on

right side with pad or small pillow under side. All movements provoked pain. Intense tenderness on pressure.

Diagnosed hepatic abscess of right lobe. Sent to Old Dominion Hospital same day. Operated February 24. Incision oblique, parallel to border of ribs. Peritoneum opened showed no adhesions. Packed about wound with iodoform gauze to cut off peritoneal cavity. Incised peritoneum of liver to correspond with external wound and stripped it back for a half inch. Guided by the needle of a hypodermic syringe introduced bistoury into abscess-cavity and evacuated its contents, which amounted to a pint and a half of chocolate-colored pus, having a very fetid odor. When this was done the walls were examined both by touch and inspection. They were found to be rough and irregular, and from them trabeculæ hung in festoons. The walls were washed with a 2 per cent. solution of carbolic acid, two large rubber drains and some iodoform packing placed, and an outside dressing put on.

The patient reacted promptly, except that his temperature remained subnormal for eight days, ranging from 96.8° to 97.5° F. In every other respect he did exceptionally well, making a complete recovery, and was discharged from the hospital March 17, with the cavity sufficiently closed to require no more packing than would fill an ounce measure. At the end of six weeks cicatrization was complete. The pus in this case was examined and found to contain large numbers of active amœbæ.

CASE XVI.—Mr. D., Ashland. In 1894 I was called to Ashland, Va., to see Mr. D. in consultation with Drs. Scott and Jones. He had been ill for six weeks with an obscure affection. He had had general failing health, with emaciation, and was now very feeble. Previous to this sickness his health had been good. The most notable early features of this attack were successive crops of boils, which did not slough through the skin. These appeared over his trunk and limbs and were very painful. He suffered distinct pyæmic symptoms. Emaciation came on early and was marked. Rigors, distinct chills, and drenching sweats. The skin was very sallow and the conjunctivæ icterosed. Pulse rapid and feeble. Three weeks ago began to complain of vague pain in the region of the liver, which radiated to right shoulder. A cough, which grew steadily worse, appeared; no expectoration. Breathing interfered with; could not lie flat in bed; had

to have shoulders raised and tilted so as to lie partly on right side. Temperature ranged from 99° to 103° F. Tongue greatly coated. Prominent diarrhœa.

Examination showed liver much enlarged, extending to fourth intercostal space, and two inches below rib margins. The side bulged perceptibly, and the intercostal spaces were obliterated. Fluctuation distinct.

Hepatic abscess was diagnosed, and immediate operation suggested. The recommendation was declined. I stated to his physicians my belief that the abscess would soon rupture through the bronchi and perhaps suddenly terminate his life. The prediction was verified, for on the third day after the consultation, in a fit of hard coughing, pus gushed from his mouth and nose. He became violently strangled, and expired in a few minutes, drowned in his own pus. No autopsy.

CASE XVII.—February 6, 1897 (with Dr. W. A. Lee). C. R., negro; aged forty-five years; porter. During the war was thought to have consumption, but went to the country and got well. About twelve years ago had epididymitis and had gonorrhœa after that. About eight years ago had pneumonia, and pleurisy about fifteen years ago. He has had piles off and on for eight or nine years. Some years would not be bothered at all. Bowels usually constipated, but would sometimes have diarrhœa, with passage of some blood; but this only lasted about a day and would yield to treatment. He had a spell of diarrhœa just before this illness, but at that time had not had piles for about three months. For a year previous to this attack would have occasional pains in the abdomen, usually in lower part, which he ascribed to colic, and would take Squibb's mixture with relief, but pains would come back. He was taken violently sick on January 7, 1897, but pain had moved up to pit of stomach. Pains were of an intense, severe cutting character. About a week later a lump appeared midway between ensiform cartilage and umbilicus. He was given morphine and blistered, but without relief. Lump continued to grow, and was exceedingly tender and hard, quite immovable, and apparently in abdominal wall.

He was operated on February 6, and trouble found to be abscess of liver. Left lobe of liver firmly adherent to anterior wall of abdomen. Cavity as large as hen's egg. Pus curdy and brown. Cavity drained by tube and gauze. Complete recovery.

It will be observed that fifteen of my cases occurred in adult males, twelve in white subjects and three in negroes. Three occurred in females, all white, one an adult and two in children.

Eight gave histories of dysentery, one of diarrhoea, and one of recent typhoid fever. In eight no previous attack of dysentery could be traced. One only gave history of trauma.

The results of treatment were as follows: In the first eleven cases, which were treated by aspiration, ten died, one recovered. The recovery in this case was brought about by a spontaneous discharge of the abscess through the bronchi. In the second group of seven cases, two declined operation. Both died. Five were treated by incision and drainage. Four recovered, one died.

The disastrous failures of treatment in my first eleven cases fill me with regret that the surgery of that day (1878-1884) was inadequate to cope with this malady, which, though always grave, is now so amenable to surgical intervention.

Agnew's "Surgery," 1878, devotes three-fifths of a page (362, VOL. I) to the subject of "Abscess of the Liver." Two lines and a half are given to prognosis. "The prognosis in hepatic abscess is unfavorable, a very large proportion of patients perish from exhaustion consequent upon the constitutional irritation which follows the liberation of pus."

Treatment.—Hepatic abscesses should not be prematurely opened. It is important that the work of inflammatory consolidation between the gland and the walls of the abdomen be thoroughly accomplished; and until this has been effected there is little to be done, except to sustain the patient's strength by proper nourishment and the administration of tonics, such as quinine and aromatic sulphuric acid. When pointing takes place, accompanied by fluctuation, and the skin over the swelling assumes a purple discoloration, the abscess should be opened by making a puncture with the ordinary sharp-pointed bistoury. The pus which comes

away is usually mingled with the biliary secretion. Many patients, after the opening is made, rapidly lose strength, and die in two or three weeks.

Harley ("Diseases of the Liver," 1883) devotes six pages to treatment, of which this is the opening paragraph:

"The treatment of a hepatic abscess, whether it be of the idiopathic, traumatic, metastatic, or pyæmic varieties, in so far as the local suppuration is concerned, is always the same. But the constitutional treatment varies according to the cause of the suppuration. Unfortunately, we can, at best, do but little more than alleviate the sufferings of the patient, for when once a collection of matter has formed in the liver, the pathological conditions upon which it depends are, as a rule, beyond the physician's control. However, notwithstanding that a cure, or even a recovery, may in the majority of cases be unattainable, we must in no case fold our hands in complacent idleness, but be 'up and doing,' for even in the very worst of cases, as long as the thread of life remains unbroken, there is always hope, and we have it within our power not only to soothe the patient's passage to the tomb, but very considerably delay the fatal issue."

He later recommends the use of the exploring needle. He says, "In no case would I recommend the adoption of the proposal of Begin and Recamier, to attempt opening a hepatic abscess with a scalpel; nor do I advise the use of a large trocar, not even when the abscess has pointed, for the same advantage may be gained with a small trocar (just of sufficient diameter to allow pus flocculi escape), and that too with less danger and inconvenience."

These two authors must be taken as types of the teachings of that day. Viewing the subject from our present advanced stand-point, is it remarkable that he who received his inspiration from these sources should have death to follow in his wake?

SPONTANEOUS DISLOCATION OF THE HIP-JOINT OCCURRING DURING THE COURSE OF THE ACUTE INFECTIOUS DISEASES.

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TRAUMATIC dislocations of the hip-joint have been so thoroughly studied and are of such relatively frequent occurrence that they excite but passing interest. It is not so, however, with those dislocations occurring during the course of and caused by one of the acute infectious diseases. These are so rare that a review of the literature on the subject, and the addition of another case to those already published, will not be devoid of interest.

Spontaneous dislocation of the hip was first discovered by Lorinser¹ in 1853, and shortly afterwards by Schotten.² The former reported a case occurring during an attack of typhoid fever. Helwig³ reported twelve cases in a dissertation published as early as 1856. A most excellent review of the subject was written by Roser⁴ in 1857. He states that Petit and Camper were the first of the modern writers to assume that a serous exudate was the cause of the dislocation, for among the older writers Hippocrates had already known of this affection and had ascribed it to hydrops of the joint. Several post mortems (Le Sauvage, Brodie, Parise, Stanley, Rokitansky) showed the correctness of these views.

Parise attempted to reproduce this dislocation of the hip-joint on the cadaver by injecting fluid into the joint, and observed that the head moved away from the acetabulum. The capsule, in order to gain more space, was obliged to stretch, and assume a spherical shape, pulling the head with

it; hence he believed that the head was not dislocated directly, but indirectly through the distending capsule. Roser claimed that a spontaneous dislocation was always a backward one.

Gueterbeck⁶ in 1874 wrote an able review, reporting one case of his own, two of Professor Wilms, and one of Professor Seitz. These all occurred during the course of an attack of typhoid fever. The variety of joint affection is that which occurs in the monarticular form. Strictly speaking, one joint alone is not affected, but always several; the symptoms of one being more prominent. He agreed with Roser and other writers that the dislocation occurs through relaxation of the capsule caused by the excessive distention. Its occurrence from a sudden movement in bed and accidental rotation of the thigh was most frequent. In his own case the dislocation occurred suddenly during the second week of a severe attack of typhoid fever, in which there had been pain and exudation in both knees and hips. In typhoid fever spontaneous dislocations are most frequently met with in the hip, although Meyerhoff⁷ observed it in the shoulder-joint. Verneuil⁸ was the next author to report his observations, and at a meeting of the Surgical Society of Paris, in 1883, he gave histories of six cases, the first occurring in 1845, during an attack of acute articular rheumatism following typhoid, in a girl ten years of age. On the eleventh day after the patient had severe pain in the left hip and in both knees, a dislocation of the former was found, which had taken place spontaneously while lying in bed. The remaining cases occurred in patients suffering from acute articular rheumatism. Verneuil states that distention and consequent relaxation play an important *rôle*, but maintains that a factor of equal value is paralysis and atrophy of certain groups of periarticular muscles and the action of their antagonists, pulling the head out of the acetabulum. Under normal conditions such a dislocation could not take place because the chief resistance to such an action was the capsule, which is here weakened through its distention. But few have accepted

this view of Verneuil, the majority believing in the theory of Petit,—that is, hyperdistention and relaxation of the capsule. Verneuil readily asks, Why, if this theory be true, dislocations backward should always be the case?

Delens,⁹ at a meeting following the reading of Verneuil's paper, admitted atrophy of periarticular muscles, but denied paralysis of the same. He reported cases occurring in boys, ten and sixteen years respectively, in which the hip was found dislocated during convalescence from typhoid fever.

Seinton¹⁰ quotes five cases reported by Dider, occurring after acute articular rheumatism. He states that the dislocation almost always occurs during convalescence; that when it occurs during typhoid fever the extreme prostration prevents its recognition. The difference between spontaneous and ordinary pathological dislocations is that the head and acetabulum remain normal. He quotes two cases occurring during an attack of scarlatina, observed by Forgue and Moubrac, and also one observed by Guersant and Nélaton on the seventeenth day of scarlatina. He himself reports the case of a boy, aged ten, who had had a classical coxitis, with suppuration and ankylosis one year previously. Some time after he acquired a scarlatina. At the end of several weeks a dislocation of the same hip was noticed. There were no signs of tuberculosis found on the dislocated side, and the dislocation was easily reduced four months after it happened.

Dittel¹¹ observed a case of spontaneous dislocation which occurred during convalescence from scarlatina.

In a thesis by Champonnière,¹² ten cases have been collected, in which the right hip was found most frequently dislocated. The eldest patient was nineteen, the youngest five years of age. These occurred during convalescence from typhoid, and had as adjuvants causes great prostration and feebleness of the patients.

Kirmisson¹³ reported a case, which occurred on the twelfth day of an attack of acute articular rheumatism, in a girl eighteen years of age. This dislocation was an anterior one, and the head had been felt distinctly over the ischio-

pubic junction. In 1892, Kirmisson himself observed a case of dislocation during convalescence from scarlatina. Phocas¹⁴ showed, during a clinical lecture, a boy, nine years old, suffering from dislocation of the hip occurring during convalescence from typhoid fever. The history of the case is typical. The father is dead; cause unknown. Mother is living and had lupus of the face. Two brothers living and in good health. The child was perfectly formed at birth, but at the age of dentition, following convulsions, acquired an infantile paralysis of the left (non-dislocated) leg. Three months before his presentation, November 15, 1894, the patient had one brother and mother stricken with typhoid fever during an epidemic of this disease. During the latter weeks of his stay in the hospital the child complained of excessive pain in the right hip, so that he could not step on the previously healthy leg. Phocas was called in soon afterwards, and found a typical backward dislocation of the right hip. The interesting point in this case was infantile paralysis of the other limb. In a second case, which he observed, a spontaneous dislocation occurred in a child, five years of age, on the eighteenth day of an attack of typhoid.

While in Vienna the writer saw a case of double dislocation occurring in a child four years old during convalescence from scarlatina. In 1877, Keen collected twenty-seven cases, the majority of which had occurred during typhoid. Freeman¹⁵ reports a case of spontaneous dislocation in a girl, aged ten years, who left her bed six weeks after severe attack of typhoid fever. At the end of the fourth week of the disease there were pain and swelling in the right hip, and when examined, nine or ten weeks afterwards, a dislocation of the hip was found.

The above-quoted reports of cases show that spontaneous dislocation may occur during typhoid fever, scarlatina, and acute articular rheumatism, especially in the first named. No cases of dislocation have ever been reported occurring during measles. The case which I had under my care in the surgical division of the new general hospital at Hamburg, in

the service of Dr. Sick, was one of spontaneous dislocation of the right hip, which occurred during an attack of influenza. That a hydrops of the joint sufficient to produce dislocation of the hip may occur during this disease is shown by the articles of Anders¹⁶ and Da Costa.¹⁷ The former observed swelling of the joint during epidemics of influenza similar to acute articular rheumatism, the only difference being less tendency to migraine. The latter made similar observations of mild cases of rheumatism, with temperature of 100° to 103° F., and swelling of the joints.

Franke,¹⁸ in a recent article upon diseased bones and joints in influenza, reports two cases in which there was severe pain and exudate in the ankle- and knee-joints. Since influenza must be classed as an acute infectious disease, it seems very plausible that after exudation into the hip-joint, which was probable in our case, a dislocation may occur quite as easily as in the diseases during the course of or following, which it has already been observed.

The patient was a girl, eleven years of age, who entered the hospital in October, 1894, complaining that she limped in walking. She was admitted to the service of Dr. Sick, with the following history: Her mother was living and in good health. Her father was dead; cause of his death was unknown. She had no brothers or sisters. At birth was perfectly formed and learned to walk at the usual age. Up to the time of her illness she could run, jump, and walk the same as her companions. Six months before her admission she was seized with severe pain in both hips, more so on the left than on the right side. Previously she had never had scarlatina, diphtheria, or measles. The physician who was called in made a diagnosis of influenza, an epidemic of this disease being prevalent at the time. He instructed the patient's mother to keep her in bed. This was done. The pain in the left hip (non-dislocated) continued much longer than in the right. After remaining in bed four weeks she tried to get up and walk, but found that this was difficult on account of deformity of the right limb, which appeared during the patient's stay in bed. She walked about with marked limp until her admission to the hospital, five months afterwards. Examination

at this time, October, 1894, showed a well-developed, robust, and intelligent girl. She could not remember any trauma which had produced the dislocation. She walked with a decided limp, due to the shortening of the right limb. The classical signs of dislocation were present. There was a difference of four centimetres in the length of the two limbs; there was some atrophy of the muscles of the right thigh and leg; the leg was adducted, flexed at the hip; there was some inward rotation, and she walked about without experiencing any pain in the limb. In the dorsal position the flexion of the hip-joint became more marked; it caused the leg to form an angle of about 30 degrees to the body. On attempting to correct this marked lordosis appeared. The leg could not be moved on the pelvis. There was almost complete fixation of the hip-joint. On using some force there was pain in the hip and slight crepitus. The trochanter was about two and a half centimetres above the Roser-Nélaton line. The head could not be felt above the outer surface of the ilium, but an indistinct body could be felt here which moved some upon forced flexion or rotation of the limb. The right trochanter was two centimetres behind its fellow at the opposite side, measuring both upon a line drawn from the anterior to the posterior superior spine of the ilium. A diagnosis was made of spontaneous backward dislocation of the femur (right) occurring during an attack of influenza. The treatment at first given was to place the child in bed and the application of extension to the leg. During the course of this treatment the child acquired scarlatina, from which she recovered without sequelæ. About four weeks after convalescence from scarlatina, after the usual preparations, an operation was undertaken for the reduction of the dislocation. The head of the femur was found embedded in a mass of fibrous tissue, firmly attached to the ilium above. The two acetabula (false and true) formed an exact right angle with each other. But little of the capsule was left, and that only upon the outer and posterior aspects of the head. Nothing could be seen of a ligamentum teres. The true acetabulum was found with difficulty, its cavity being filled with inflammatory tissue. After removing this it was found that the cartilage was eroded in several places, but the joint cavity corresponded exactly in size to the head, showing it to be a recent dislocation, and not a congenital one. There were no evidences of tuberculosis. By

strong traction the head was brought into the acetabulum and the wound sutured. Unfortunately, the wound did not heal by first intention, the result not being quite as satisfactory as desired. There was some ankylosis.

In reviewing the case there can scarcely be any question as to the diagnosis of a dislocation, and, moreover, of a recent one. Its occurrence during an attack of influenza would also seem most probable, since exudation into the joint is not at all unknown in this disease. Spontaneous dislocation, as the literature of the subject shows, may occur in scarlatina, typhoid, acute articular rheumatism, and influenza.

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THE SO-CALLED HOT-AIR TREATMENT OF PAINFUL AND PARTIALLY ANKYLOSED JOINTS, AND AN EXPERIMENTAL INVESTIGATION OF THE PHYSIOLOGICAL EFFECT OF THE LOCAL APPLICATION OF HOT AIR ON GENERAL METABOLISM.

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I. THE SO-CALLED HOT-AIR TREATMENT OF PAINFUL AND PARTIALLY ANKYLOSED JOINTS.

THE use of heat as a therapeutic agent for the relief of pain is one which has been availed of for many centuries past, and therefore cannot claim any originality in the practice of the nineteenth century. Poultices, hot fomentations, hot water-bags, steam baths, etc., are only a few of the numerous ways in which heat is applied. In the Russian popular medicine we read that hot sand-baths have from time immemorial enjoyed a high reputation as a remedy for certain diseases.

The particular phase of this subject, to which our attention has been directed of late, is the use of dry air heated to as high a temperature as can be safely employed.

Apparatus.—The apparatus which has been employed in the series of cases given below is one which was constructed for me by Lentz & Sons, of Philadelphia. (Fig. 1.) It consists of a copper cylinder, attached to the bottom of which is a Russian iron fire-box containing a Bunsen burner,

extending the full length of the fire-box and projecting through one end to permit of attachment to gas-tubing. On one end of the cylinder is a large door, which can be instantly opened, and to the other end is attached a flexible sleeve of cloth, with a double draw-string, so that it can be drawn closely and firmly around the limb. The upper two-thirds of the cylinder are lined with sheet asbestos, the lower third

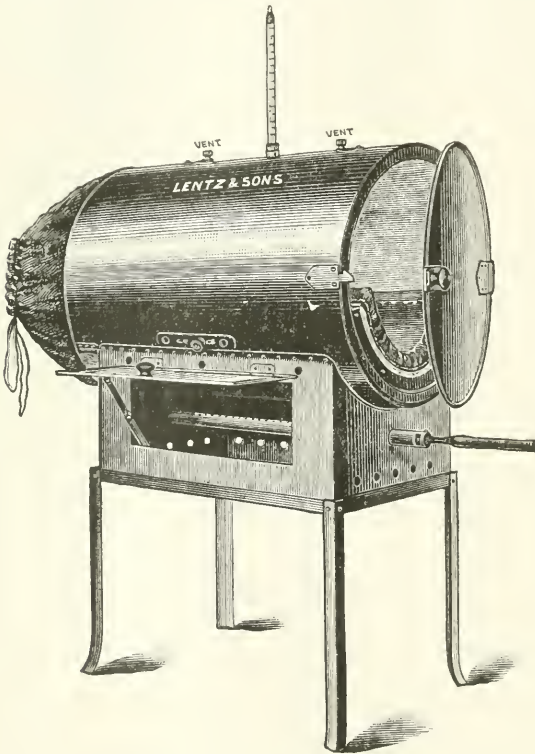


FIG. 1.—Frazier's apparatus for hot-air treatment.

is also lined with asbestos, but the latter is not attached directly to the cylinder, but is supported on three iron bars running the full length of the cylinder, and at a distance of about one and a half inches from it. On the cradle rests a very thick piece of magnesia. This material I found, from its non-conduction of heat, to be the most suitable, as the

limb could rest directly on it without the slightest danger of sustaining a burn. At the sides and top of the cylinder are small openings which insure free circulation of air, and thus prevent any accumulation of moist air within the cylinder.

The apparatus was constructed for the Out-Patient Department of the University Hospital, where some three hundred baths were given to test its efficiency. It was found to be most satisfactory, and we can justly claim for it many good features.

The required temperature can be obtained quickly in from ten to fifteen minutes; the ventilators at side and top prevent the accumulation of moist air, which, if present, would subject the patient to the risk of being burned; the large door at the end enables one, by opening it, to promptly reduce the temperature, if it is so desired; and, finally, it is substantially but simply constructed, and involves nothing that can get out of order or require repair.

The cases that were treated included acute and chronic articular rheumatism, gonorrhœal rheumatism, gout, traumatic arthritis, synovitis, tenosynovitis, and fibrous ankylosis.

Technique.—The routine employed in administering the bath was as follows: The patient's pulse and temperature were first taken and recorded. The limb, first being completely enveloped with a piece of lint, which was wrapped loosely about the part, was then placed in the cylinder. The time allowed for each bath was from three-fourths of an hour to an hour. At intervals of every twenty minutes the door of the cylinder was thrown open momentarily to allow of the ingress of a fresh supply of air. If the patient perspired freely this opportunity was taken advantage of to wipe the limb thoroughly dry. If this precaution is not taken, and the limb is allowed to remain bathed with sweat, there is possibility, if the temperature be exceedingly high, of a superficial burn resulting. This happened in several cases where the precaution was not taken. The degree of temperature that was employed varied; some patients bearing with per-

fect comfort a degree of heat which would be extremely painful to others. The average was about 300 degrees, although in one case the temperature reached 375 degrees, to which the patient seemed quite indifferent. The frequency with which the baths were given varied with the severity of the case, usually, however, they were administered on every other day.

The physiologic effect of heat has been carefully studied by the writer, and the results arrived at are embodied in a later portion of the present paper.

From our knowledge of this physiologic action of heat, can we draw any conclusions as to how these joint-affectations should be theoretically benefited? To do this intelligently we should have a clear picture in our minds of the general morbid anatomy of these joint-affectations, and for convenience we may adopt a classification which divides them into (1) those of rheumatic origin, (2) those of tubercular origin, and (3) those of traumatic origin. The lesions to be found in the subacute or chronic rheumatic joints may be briefly described as follows: The synovial membrane, the ligaments, the cartilages, and the periarticular structures are all or only in part involved, according to the gravity and chronicity of the particular case. The synovial membrane is usually thickened and slightly injected. Little fluid exists in the joint, except during an exacerbation. The fibrous capsule and ligaments become thickened, dense, and stiffened by hyperplasia, and sometimes the adjacent tendons and their sheaths, the fascia and aponeuroses undergo similar alteration, so that the movements of the joints become seriously interfered with. The cartilages are often rough and occasionally present erosions, which are either naked or covered with a layer of newly formed connective tissue. This may occasionally produce fibrous adhesions between the articular surfaces. This is a brief description of what we have to deal with in a rheumatic joint.

We pass on now to the pathology of the tubercular joint. The periarticular structures, ligaments, and synovial

membrane may all be attacked by this morbid process. If the synovial membrane is involved, it becomes covered with the infected granulation tissue which may extend to the capsule or surrounding structures. The parts become œdematous and gelatinous, and the joint-cavity itself contains either little or no fluid, or may be distended with a profuse serous effusion. The tissues of the joint are usually highly vascular.

In the case of the traumatic joint, we find in the chronic form the articular structures thickened with a plastic exudate, and afterwards with the newly formed fibrous tissue. Adhesions, the result of blood-clots or an exudation, form and bind together the folds of synovial membrane or articular surfaces. There may be a large effusion in the joint, or the effused fluid may have been entirely absorbed.

Here, now, in a concise form we have presented the factors that we have to deal with and the obstacles to be encountered in attempting to remove these pathological elements, and to restore to the joint normal functional activity.

We turn our attention now for a moment to what actually takes place when a joint is subjected to a temperature of 300° F., or thereabouts, for a period of an hour. In the first place, when the limb is removed from the apparatus we can plainly see a diffuse hyperæmia of the integument, indicative of a dilatation of the capillaries and arterioles therein. The patient himself will tell you that the part feels numb, a phenomenon due, no doubt, to the action of the heat on the superficial sensory nerve-filaments. The body temperature of the patient will be about $\frac{1}{2}^{\circ}$ to 1° elevated above normal, and the pulse will increase in frequency from 10 to 20 beats per minute, which of itself suggests the possibility of an increased blood-supply to the affected limb. The patient will also inform you that he, provided the joint be not ankylosed, experiences less pain and more freedom in the movements of the joint, the former fact explained perhaps by the anæsthetic effect of the heat on the nerve-supply of the articular structures. These clinical facts can be obtained by a gross observation on the part of patient and physician.

From the experimental observations referred to above we learned that certain physiological phenomena followed the application of heat, such as increased arterial tension, elevation of blood-pressure, dilatation of the lumen of the blood-vessels, diminution of the erythrocytes, decrease of hæmoglobin, increase in the elimination of nitrogen, increase in frequency of the heart's action, and, in the experiments on our own patients, a distinct retention of nitrogen.

Such are the clinical and physiological phenomena that we must employ in attempting to explain the influence of hot air on the pathological lesions that confront us.

In those cases in which there is a diathesis, either rheumatic or tubercular, we can comprehend no theory, and will discard at once any suspicion that this treatment could have any beneficial constitutional effect. So we must devote our energies to the discussion of the purely local influence. When we have tissues swollen and infiltrated with plastic exudate, as in rheumatic and traumatic joints, and we increase the lumen of the vessels, both veins and arteries, increase the blood-pressure and the frequency of the pulse, do everything, in fact, to increase the blood-supply, we are employing a method—are we not?—which should surely be instrumental in carrying off that exudate and in allowing the part to return to its normal state. Soon, however, this exudate becomes organized, both in the normal structures of the joints themselves as well as in the plastic bands or adhesions that have been thrown across, from one articular surface to another, rendering the capsule and ligaments less yielding, and thus, with the aid of the adhesions, limiting the movements of the joint. Later this newly formed connective tissue contracts, presses on the blood-vessels, and diminishes the blood-supply of the tissues involved. In these structures, so altered, a very much improved circulation might produce a temporary œdema, which would, to carry the idea still further, permit of a certain amount of mechanical stretching, and thus explain the improvement in motion that has been shown to follow.

As regards the relief of pain that has been noted, two explanations suggest themselves. One that the exudate, both around and possibly in the sheaths of the nerves themselves, is responsible by its presence for the pain, and when this exudate is all or in part removed the pain is correspondingly diminished. Another explanation is that the high temperature has an anæsthetic effect on the nerve-filaments themselves. This would account for the clinical observation that in some cases the relief from pain is only temporary, and after the lapse of an hour or so, when this anæsthetic effect has spent itself, the pain returns.

There are some cases that present themselves to us where the articular structures have undergone little or no pathological changes, and where we have purely the synovial effusion to deal with, an effusion composed chiefly of synovial fluid, but at times partially of blood and blood-clots, which, allowed to remain, may organize and form troublesome adhesions. Can we hasten the absorption of this fluid by the local action of the hot air? If our hypothesis be true, if dilatation of the blood-vessels does take place, and the vessels open their mouths, figuratively speaking, for the reception of the fluid; and if, too, as we have been led to assume, the lymphatic circulation is stimulated to more vigorous action, naturally, we are led to accept this method of treating an effusion as being at least a rational one. To my mind, the case is somewhat parallel to what happens after the removal, from an œdematous arm or leg, of an Esmarch bandage, which has been allowed to remain on the limb about ten minutes. What is a serious objection to employing Esmarch bandages in amputations — reactionary hæmorrhage — is converted into a distinct benefit in the swollen limb,—the stimulated circulation carrying away and flushing out the fluid that lies stagnant in the tissues. So we could go on applying the same line of reasoning to the effusion into the sheath of a tendon, as in tenosynovitis, as well as to that occurring in the synovial sac.

What of the tubercular joints, where the pathological

changes are due originally to an infectious material, and we have formed there, in many cases at least, infectious granulation tissue. Underlying the local lesion is the force of an inherited diathesis, which predisposed to the original attack, and acts as a constant barrier to the tissues regaining their normal vitality. In these cases it would be fruitless to search for a theory according to which benefits might accrue from the external application of hot air. That is to say, we believe that this treatment could have no curative effect on the specific lesions. After the active process has subsided and there remains behind troublesome adhesions, which cause more or less ankylosis, then, of course, we may expect some beneficial results, just as we would in an ankylosed joint, the sequel of any other affection. In the series of cases recorded below are four reported by V. P. Gibney,¹ of New York, which correspond exactly to the type we have just described.—namely, ankylosis following tuberculous affections.

Conclusions.—How much we ought to expect from this remedy is, after all, the practical side of the question. Ought we to look for any permanent results (or such brilliant results as have been reported by others) in treating a joint whose structures have been perverted by such constitutional diseases as gout, rheumatism, or tuberculosis? Do we not aim in gout and rheumatism to increase nitrogen elimination? Should we then reverse our methods, and resort to one which dams the nitrogen up in the system? The question is easily answered, for we can advance no theory to explain a possible beneficial result when such a physiological phenomenon, as has been proved, confronts us. As for the germs of tuberculosis, they are most fertile where a highly vascular soil is provided for their growth, therefore we claim for this treatment no specific virtues that would warrant its use in these cases.

Gonorrhoeal rheumatism, which so stubbornly responds to present methods of treatment, can hope for little more than the one just under discussion. The symptoms are kindled by the bacteria or their toxines, and while the latter

continue to be absorbed and keep alive the morbid changes in the articular and periarticular structures, no positive results should be anticipated. When the gonorrhœa itself has been cured and the activity of the morbid process subsides, and we are confronted with a joint crippled in its movements by bands of adhesions, in these cases we may rightly and reasonably expect that the adhesion can more readily be broken up and the function of the joint restored by the hot-air treatment.

Permanent cures of local lesions, symptomatic of diathetic diseases, let me repeat myself for emphasis' sake, are not to be looked for in the employment of hot-air baths. So much we can safely and positively assert without exciting any antagonism.

Excluding that large percentage of joint affections, there is left us only those of traumatic origin. For the relief of these, I claim, we have a most useful and sometimes indispensable method of treatment, and the results which we obtain can be called permanent, for when once the joint is restored to its normal functional activity, we have no latent flame of an inherent or acquired diathesis to kindle anew the inflammatory process.

I should not hesitate to recommend it in the treatment of the sequelæ of any joint injuries which have proved intractable to the more commonplace remedies. And in using it I should advise that it be employed as an adjuvant to the others, massage, passive motion, and the like, and you will find by calling all these to your assistance you have resorted to a method of treatment which will yield eminently satisfactory results. Shall we employ it in the treatment of rheumatism at all? Such a question may seem to some at first sight startling, when it is remembered that the original English apparatus was constructed chiefly for the treatment of this malady and the results it has reported to have attained seemed to follow almost like magic. To be conservative, however, I think, there is a certain field for its use,—namely, in these cases where internal remedies and local application

have failed to relieve the pain. Here, it seems to me, and my views are corroborated by others, we should use it, and the patient will surely be afforded temporary relief. In closing, I may say that I have employed the hot-air baths in a large and varied number of cases (abstracts of which are given below) purely from an empirical stand-point, and in drawing these conclusions it has been my aim to be as conservative as possible.

On glancing over the reports it will be seen that in some the good effects were permanent, in some they were temporary, and in others the results were negative.

CASE I. *Fibrous Ankylosis of the Metacarpal and Phalangeal Joints of Left Hand, due to Bullet-Wound of Hand, followed by Prolonged Fixation on Splints.*—There was extensive infiltration of lymph in the periarticular structures and around the sheaths of the tendons. This lymph had become wholly or partially organized, so that there was absolute immobility of all the joints of the hand. Number of treatments, nineteen. Result: Patient was able to almost completely flex all the fingers, and was enabled to resume his occupation as a farm-hand. Massage and passive motion, attempted before the treatment, had utterly failed.

CASE II. *Ankylosis of Thumb from Long-Continued Use of Splint.* Number of treatments, nineteen. Result: Function of thumb completely restored.

CASE III. *Tenosynovitis of Tendon Patellæ resulting from an Injury received about One Year Ago.*—Patient complained of pain when making any motion that called the tendon into play. Number of treatments, ten. Result: Complete disappearance of pain.

CASE IV. *Fibrous Ankylosis of Elbow following Fracture of Internal Condyle Two Months Ago.*—Radiograph taken showed that there was no outgrowth of callus to interfere with the articular functions. The joint was ankylosed at a right angle and was absolutely immovable. Number of treatments, twelve. There was a gradual return of motion while the patient was under treatment. He became discouraged, however, at the slow progress he was making and discontinued coming to the clinic. There was every reason to hope, in this case, for a useful limb.

CASE V. *Ankylosis of Elbow*.—This case is of a nature similar to the preceding one, but not so pronounced. Young mechanic sustained fracture of elbow-joint some months ago. Pronation and supination of the forearm were quite possible, but arm could not be flexed beyond angle of 90 degrees, and extension was very incomplete. An outgrowth of callus at the anterior articular end of humerus, beautifully demonstrated by the radiograph, explained the limit of motion in the direction of flexion, but the limited extension was evidently due to fibrous adhesions. Number of treatments, three. Result: It was possible with very little force to completely extend forearm on arm.

CASE VI. *Ankylosis of Knee*.—The patient gave a history dating back some years, of repeated inflammatory attacks of an unknown nature in the knee-joint, and presented himself with a joint which now admitted of very little flexion. Even employing much force one is not able to break up the adhesions that limit motion in the joint. After he had been given three baths, there being no sign of improvement, the treatment was discontinued.

CASE VII. *Disability following Colles's Fracture, sustained Six Weeks Ago, and Wrist-Joint Painful and limited in Motion*.—Number of treatments, four. Result: The pain was relieved and the function of the joint restored.

CASE VIII. *Acute Synovitis of the Wrist-Joint following a so-called Sprain*.—Two days after the injury was received, the wrist being then swollen and painful, the hot-air treatment was begun with gratifying results. After four baths the patient was discharged, all the symptoms having been relieved.

CASE IX.—This was a case resembling very much the preceding as to the nature of the injury and the results obtained.

CASE X. *Acute Synovitis of the Knee-Joint, which was Excessively Painful and very much distended with Synovial Fluid*.—The limb was placed in the hot-air apparatus and retained there for three-quarters of an hour, at the end of which time the joint could be flexed beyond a right-angle without eliciting but comparatively trifling pain. During the succeeding afternoon and night the patient suffered intensely, and on the following day, feeling in no way benefited by the treatment, it was discontinued.

CASE XI. *Chronic Synovitis and Partial Ankylosis of Ankle-Joint, the Result of an Injury sustained Three Months Before*.—The tissues of the part were quite œdematous. Ten hot-air baths

were given, at the end of which time the normal nature of the joint was partially restored; pain was very much relieved, and the patient, who had previously been treated by the usual remedies without improvement, was able now to resume his occupation as a carpenter.

CASE XII. *Chronic Synovitis of the Wrist-Joint of Traumatic Origin, the Joint-Capsule being somewhat thickened and distended with Synovial Fluid.*—The patient was incapacitated for work. The patient received nine baths, and after which was able to resume his occupation. He expressed great confidence in the efficiency of the treatment.

CASE XIII.—The nature of this injury corresponded quite closely with that just cited above, differing, however, only in the fact that the symptoms were more marked and of longer standing. The result in this case, after the use of ten baths, was not so gratifying. The restoration of the function of the joint was only partial when the patient discontinued his visits to the clinic. Perhaps a continuance of the treatment might have yielded better results.

CASE XIV.—This patient, an athlete, who was training for short-distance running, presented himself with a *chronic tenosynovitis of the extensor tendons of the leg* which handicapped him very much in his attempts at attaining high speed. Rest and counter-irritation had already been given a fair trial, but without success. He paid fifteen visits to the clinic for treatment and was then discharged, as he appeared to be entirely relieved. Whether there was a recurrence of the pain, on resuming his exercise, I have not been informed.

CASE XV. *Periarthritis of Metacarpo-Phalangeal Joint caused by the Hand being caught between Two Dumb-Bells.*—The patient, referred to me by Dr. J. William White, an artist by profession, was seriously hampered in his work by the injury. He was under observation for a week, during which time he used the hot-air bath four times, and expressed himself as being then somewhat improved. The treatment was continued at the patient's home, with what result is not known.

CASE XVI.—The lesion in this case was similar to the one just described. Four baths were given. Result: Slight improvement,—that is to say, the pain was somewhat relieved and joint more supple.

CASE XVII. *Gonorrhœal Rheumatism affecting both Wrists and both Knees.*—Particular attention was paid to this patient, in that he was suffering from a disease in which the usual form of treatment yields far from brilliant results in a great number of cases. The joints were subjected to the hot-air bath fifteen times, the patient at the same time receiving internal medication and urethral irrigation. Owing to this fact the intrinsic value of the hot-air baths cannot be definitely estimated. On glancing over the notes of this case I find that during the treatment the pain diminished in severity, the swollen joints decreased in size, and their functional activity improved. The results were by no means startling, however, nor was recovery by any means complete, a certain amount of pain and stiffness continuing. This much may be claimed for the treatment,—namely, that pain being in this case a prominent symptom, the patient was made comparatively comfortable. Inasmuch as the urethritis still persisted, it could hardly be expected that any form of treatment applied to the joints would be permanent in its effects.

CASE XVIII.—In this case we have the only case of *gout* that presented itself at the clinic. The patient, a painter, referred to the clinic by Dr. S. W. Morton, had suffered for some time with gout, which had so crippled him that he had been unable for a year or more to pursue his occupation. The results in this case were most gratifying. After three treatments the patient was able to walk to and from the clinic, a distance of some four miles, with comparative ease. This he had not been able to do for nine months. Thirteen baths in all were given, in the mean time the patient receiving no internal medication. He was so much benefited by this time that he discontinued his visits, and I learn from Dr. Morton that at the present time, some three months having elapsed, he is now following his occupation.

CASE XIX.—Margaret M., aged thirty-one years, presented herself with an *acute articular rheumatism of the middle phalangeal joint of ring-finger*, she having had previous attacks in other joints of the body. The joint in question was swollen and so extremely painful as to incapacitate her from work. The patient received some fifteen baths, at the end of which time, although the joint had not returned to its normal size, it was entirely free from pain, and she was again able to resume her occupation with perfect comfort.

CASE XX.—Edward G., aged thirty-eight years, a patient in the Medical Ward of the University Hospital, was referred to this department with *chronic articular rheumatism of both elbow- and wrist-joints*, of four years' standing. The hot-air treatment was persevered with for some time, the patient receiving twenty-one baths. In this case the permanent effect was practically *nil*. He experienced some freedom from pain and slightly increased mobility in the affected joints immediately after the baths, but the good effects soon vanished.

CASE XXI.—Mrs. G., aged seventy years, was referred to me from the Medical Dispensary, suffering with *subacute rheumatism of the knee*. The attack had lasted for about three weeks. After five baths the patient claimed to be able to go about with comparative ease. She then discontinued her visits.

CASE XXII.—James M., a coachman, referred to the clinic by Dr. J. W. Dick, has suffered for the past few months with *rheumatism*, almost every large joint of the body having been involved at one time or another. When first seen by us the ankle-joints were the chief offenders. Pain and stiffness were so marked that it was out of the question for him to attempt following his occupation. The improvement, if any, was so slight that after the seventh bath the treatment was discontinued.

CASE XXIII.—William S., a laborer, suffering with *rheumatic arthritis*, was admitted to the hospital with an extremely painful and practically useless shoulder-joint. The patient was so completely crippled in this joint that every effort was made towards alleviating the symptoms, and thus testing the efficiency of the treatment. The patient received eleven baths in eleven consecutive days, at the end of which time he was discharged from the hospital, with instructions to report at the end of a week. Certain it was that, on leaving the hospital, he had much more motion in the joint and much less pain, but on his return, he had relapsed into his previous state, none the better for the attention he had received.

CASE XXIV.—Miss R. came to the clinic from Ebensburg, Pa., with *chronic articular rheumatism of both elbows*. The right arm was but slightly affected, but the left so much so that she was forced to discontinue her work as a stenographer. The left joint was almost completely ankylosed midway between flexion and extension. The pain was intense, not only in attempts to

practise passive motion, but also when the joint was entirely passive. During the preceding six months internal medication had been tried and failed. As a last resort, she sought relief in the hot-air bath. She took thirty of the baths, during which time she showed signs of gradual improvement. At least she spent no more sleepless nights; she was able to feed herself with her left hand and arrange her back hair, a crucial test with women of return of function to the elbow-joint. It might be mentioned that during the course of the treatment massage was prescribed, but, being followed by a distinct relapse, was discontinued. The patient is now able to resume her occupation, although the joints have by no means returned to their normal state, and there is no assurance that, should the treatment be discontinued, the improvement would cease to continue. Iodide of potassium was administered internally.

CASE XXV.—Disability of shoulder due to a severe contusion, the injury having been sustained simultaneously with a fracture of the outer end of the clavicle. Union of the bone occurred in due time, but the function of the joint remained very much impaired. The general course of treatment had been massage and gymnastic exercise. In order to expedite matters it was decided to employ the hot-air baths. The patient, a physician, and therefore qualified to express an intelligent opinion, wrote me as follows: "There has been material improvement in the range of motion in my shoulder-joint the past two or three weeks, and I feel that I can attribute a not unimportant part of this to the several hot-air baths, etc."

Cases reported by V. P. Gibney,² of New York.

CASE I. was one of firm fibrous ankylosis after tuberculous ostitis of the knee. The patient had seven baths, the highest temperature of which was 280° F. As a result of the treatment, the patient has been able to do without apparatus and to use his limbs, the motion of which has become much easier and has increased 20 degrees.

CASE II. was one of fibrous ankylosis in a tuberculous knee. This patient received six baths. The knee has gained 12 degrees of motion, and there has been no pain.

CASE III. was one of ankylosis from a deformed knee, the result of tuberculous disease. In this patient adhesions had been broken up under the use of nitrous oxide. As a result of this

operation the patient experienced excessive pain. The limb was at once put into the bath, and in ten minutes the pain was relieved.

CASE IV. was one of a stiff and painful hip following tuberculous disease. After three baths the patient has less dread and apprehension in testing his limb and the steps are taken with more security.

II. THE PHYSIOLOGICAL EFFECT OF THE LOCAL APPLICATION OF HOT AIR ON GENERAL METABOLISM.

[From the *Pepper Laboratory of Clinical Medicine, No. 11.*]

The physiological effect of heat has been the subject of much work both in the clinic and laboratory. Nikolai and Parewsky studied the therapeutic and physiological effect of hot sand-baths on twenty-eight rheumatic soldiers in Russia. These patients were stripped to the skin and covered from head to foot with heated sand. Each bath lasted one-half hour. The results of their investigations may be briefly summed up as follows:

(1) The axillary temperature invariably rises,—average 0.53° C.

(2) Pulse becomes accelerated,—average increase 8.6 per minute.

(3) Respiration becomes accelerated,—average increase 3.4 per minute.

(4) Total loss of weight,—averaged 1.84 Russian pounds.

(5) Blood-pressure becomes elevated.

(6) On the whole, they most decidedly deserve an extensive employment for therapeutic purposes.

Dr. N. P. Belakovsky³ experimented on healthy young men to study the biological effect of local arenation. Temperature of bath, 55° C.; time of bath, one hour. The following conclusions are drawn:

(1) General bodily temperature always sinks.

(2) Cutaneous temperature of limb constantly marked by rises.

(3) Frequency of pulse always somewhat augmented. (In the case of the arm, the average increase was equal to 5.60; in the case of the hip, the average increase was equal to 5.40.)

(4) Respiration remains apparently unaffected, and arterial tension is more or less markedly elevated. (Average rise equalled 17.4 millimetres. Hg.)

(5) Elasticity of integument is increased.

(6) Tactile sensibility is increased.

(7) Body weight distinctly sinks.

The effect on metabolism, of an elevation of temperature, artificially produced, has been the subject of investigation by Simanowsky,⁴ who experimented with dogs. Simanowsky concludes that there was no increase in the elimination of nitrogen, through the urine in these cases, in contradistinction to the increased output, which is a characteristic and almost constant manifestation in fever.

Richter,⁵ on the other hand, found in his experiments on dogs, in the same manner as Simanowsky, that there was a distinct increase in the output of nitrogen, demonstrated in the twenty-four hours subsequent to the treatment, but completely disappearing on the second day. There thus is seen to exist a disagreement between the results of these two investigators.

Several observations have been made on the effect of excessive temperature, artificially produced, on the circulatory system.

Werhowsky⁶ found, in certain experiments on dogs, that the effect of this excessive temperature was a reduction in hæmoglobin and a diminution of the erythrocytes.

Subjected to a temperature of 44° C. for more than an hour, Maurel found that the leucocytes lost their amœboid movement.

Cyon⁷ found that a sudden elevation of temperature of the blood, streaming through the cerebral vessels, slowed the action of the heart by stimulating the vagus.

The influence on the heart itself was the subject of study

by Cyon, who determined that there was a pronounced acceleration and weakening of the cardiac contractions, both in systole and diastole. On the blood-vessels themselves, the effect of the application of heat is a dilatation of the lumen of both arteries, veins, and capillaries.

My own observations on the physiological aspect of this subject were made in connection with twenty-five cases that were treated by the hot-air method in the Out-Patient Department of the University Hospital. These cases included acute and chronic articular rheumatism, gonorrhœal rheumatism, gout, traumatic arthritis, synovitis, tenosynovitis, and fibrous ankylosis. The following phenomena were noted after the limb, either arm or leg, as the case might be, was removed from the apparatus, having been subjected to a temperature of about 330° F. for an hour. In the first place, there were noticed irregular erythematous patches and a certain amount of local anæsthesia, the patients complaining usually that the part felt numb. The general bodily temperature was slightly elevated, and there was an increase in the rate of the pulse. The following is a table of cases picked at random from the records illustrative of these two phenomena:

TABLE I.

Diagnosis.	Time of Bath.	Average Temperature.	PULSE.		TEMPERATURE.	
			Before Bath.	After Bath.	Before Bath.	After Bath.
Rheumatic arthritis of shoulder	1 ¼ hrs.	318°	80	96	99°	99 ½°
Ankylosis from Colles's fracture	1 hr.	321°	92	100	99°	99 ¾°
Gonorrhœal arthritis of knees	"	307°	92	100	99 ¼°	100 ½°
Rheumatic arthritis of elbow	"	322°	80	88	98 ½°	99 ¾°
Ankylosis of fingers	"	343°	80	88	99°	99 ¾°
Gonorrhœal arthritis of wrist-joints	"	344°	116	120	99 ¼°	100°

The maximum increase in the rate of the pulse was 16, and the maximum elevation of temperature four-fifths of a degree.

The cases on which I studied the effect of hot air on metabolism included three in all, one suffering with gout, one with rheumatic arthritis of the shoulder, and one with traumatic synovitis of the wrist-joint. The experiments were conducted in the Pepper Laboratory of Clinical Medicine, as follows:

The patients were placed in bed on a constant diet, which is contained in the following table, showing approximately the amounts of the several constituents:

TABLE II.

Articles.	Quantity.	Nitrogen.	Fat.	Carbohydrate.
Milk	1750 cubic centimetres.	8.75	52.5	78.75
Bread	300 grammes.	3.8	3.0	180.0
Egg	One.	0.9	4.4	. . . . .
Butter	50 grammes.	0.1	45.0	. . . . .
Sugar	50 "	. . . . .	. . . . .	40.0
Tea	Two cups.	. . . . .	. . . . .	. . . . .
Total		13.55	104.9	298.75

$$\begin{aligned}
 60 \text{ grammes milk sugar} &= 252.10 \text{ calories.} \\
 84.68 \text{ " albumen} &= 347.18 \text{ " } \\
 104.9 \text{ " fat} &= 996.55 \text{ " } \\
 298.75 \text{ " carbohydrate} &= 1254.75 \text{ " } \\
 \hline
 &2650.48 = \text{total calories.}
 \end{aligned}$$

This diet was selected as being sufficient for an adult male in a condition of health.

The experiments then proceeded as follows: daily estimations were made of the samples of food containing nitrogen, and also of the excretions, both urine and fæces. This was continued until a nitrogen balance was obtained. When this occurred the patients were given hot-air baths, in some cases of the arm and in others of the leg, one daily, lasting one hour; the temperature averaging about 300° F. The patients, except during the time the baths were being administered, remained in bed.

This is a general outline of the manner in which the experiments were conducted.

In the week preceding the baths the patients gained in

weight on the diet that was allowed them,—*e.g.*, in one case the patient weighing on admission one hundred and thirty-four pounds, and at the end of the week one hundred and thirty-seven pounds. The amount of urine excreted in the week preceding the baths is given in the table below.

TABLE III.

Day.	Case I.	Case II.
First	1830 cubic centimetres.	1935 cubic centimetres.
Second	1310 " "	2425 " "
Third	1030 " "	1770 " "
Fourth	1180 " "	1575 " "
Fifth	1135 " "	1730 " "
Sixth	1305 " "	1485 " "
Seventh	1380 " "	1165 " "

During the period of hot-air baths the amount of urine diminished greatly; the average amount passed before the baths being 1310 cubic centimetres, and the average amount during the baths 835 cubic centimetres.

Figures for the individual cases, cited in Table II, are as follows:

TABLE IV.

Day.	Twenty-four hrs.	Case I.	Case II.
First . .	Total amount	980 cubic centimetres.	885 cubic centimetres.
Second .	" "	765 " "	880 " "
Third . .	" "	690 " "	517 " "
Fourth .	" "	800 " "	595 " "
Fifth . .	" "	955 " "	1045 " "
Sixth . .	" "	820 " "	530 " "
Seventh .	" "	. . . . .	580 " "

The explanation of this is not difficult to determine, the copious sweating furnishing ample cause for such reduction. It may be that increased respiratory evaporations also played a part, and disturbances of circulation may also have contributed. The decided loss in body weight, in spite of the distinct nitrogen retention, to which reference will be made below, is demonstrative evidence of the fact that there was no water retention. The loss of weight coincident with the

nitrogen retention might at first sight seem striking, but is abundantly explained by the profuse sweating caused by the baths. The figures of the case above quoted, showing a gain of weight before the baths, are equally pronounced in demonstrating the loss of weight during the baths.

Weight of patient on first day of baths 137 pounds;
weight of patient on last day of baths 134 pounds.

In all of the cases careful analyses were made of the food administered and of the fæces and urine, the Kjeldahl method being employed. The nitrogen balance was readily obtained and the conditions maintained as nearly as possible after the baths were instituted. Unfortunately, it was discovered that the diet was not strictly observed by the first two patients, and some of the dejecta were lost during the night, so that the figures are valueless except so far as they could be compared with those of the third case, in which every detail was rigidly enforced. The difficulty of controlling patients (practically well in their general physical health) in bed and on a reduced and uniform diet will be appreciated fully by those only who have undertaken studies of metabolism.

It will be noted from the table below that a balance was practically established on the sixth day, the input and output being practically equal with free urination. On the seventh day for some reason the amount of urine fell off considerably, and there was a retention of nitrogen; but the equality was again approximated on the eighth day, after which the baths were instituted.

The following figures were obtained in Case III:

TABLE V.

Day.	Diet.	Nitrogen.	Excretion.	Nitrogen.	Balance.
First.	Milk	11.0250	Urine (1935 cubic centimetres) Fæces (average per day)	16.660 0.6504	
	Bread	4.2780			
	Egg	1.0455			
	Butter	0.0825			
Total . .		16.431	Total . . .	17.3104	+ 0.8794

TABLE V.—Continued.

Day.	Diet.	Nitrogen.	Excretion.	Nitrogen.	Balance.
Second.	Milk	11.6375	Urine (2425 cubic centimetres) Fæces (average per day)	21.8977 0.6504	
	Bread	4.2780			
	Egg	1.0293			
	Butter	0.0825			
Total . . .		17.0273	Total . . . 22.5481		+ 5.4208
Third.	Milk	10.2660	Urine (1770 cubic centimetres) Fæces (average per day)	19.204 0.6504	
	Bread	4.2780			
	Egg	1.0620			
	Butter	0.0825			
Total . . .		15.6595	Total . . . 19.8544		+ 4.1939
Fourth.	Milk	9.1875	Urine (1575 cubic centimetres) Fæces (average per day)	18.9630 0.6504	
	Bread	4.278			
	Egg	0.8509			
	Butter	0.8325			
Total . . .		14.5939	Total . . . 19.6134		+ 5.0195
Fifth.	Milk	10.2375	Urine (1730 cubic centimetres) Fæces (average per day)	20.555 0.6504	
	Bread	4.2780			
	Egg	1.0293			
	Butter	0.0825			
Total . . .		15.6273	Total . . . 21.2054		+ 5.5787
Sixth.	Milk	9.2400	Urine (1485 cubic centimetres) Fæces (average per day)	13.8255 0.6504	
	Bread	4.2780			
	Egg	1.0096			
	Butter	0.0825			
Total . . .		14.607	Total . . . 14.475		- 0.1320
Seventh.	Milk	11.6375	Urine (995 cubic centimetres) Fæces (average per day)	10.8654 0.6504	
	Bread	4.2780			
	Egg	0.9415			
	Butter	0.0825			
Total . . .		16.9395	Total . . . 11.5158		- 5.4237
Eighth.	Milk	10.2562	Urine (1185 cubic centimetres) Fæces (average per day)	12.8849 0.6504	
	Bread	4.2780			
	Egg	1.0928			
	Butter	0.0825			
Total . . .		15.709	Total . . . 13.5353		- 2.17373

TABLE V.—*Concluded.*

Day.	Diet.	Nitrogen.	Excretion.	Nitrogen.	Balance.
Bath 1. Ninth.	Milk Bread Egg Butter	10.2562 4.278 1.0840 0.0825	Urine (885 cubic centimetres) Fæces (average per day)	11.2130 0.7426	
Total . . .		15.7007	Total . . .		11.9556 — 3.7451
Bath 2. Tenth.	Milk Bread Egg Butter	10.4210 4.2780 0.9460 0.0825	Urine (880 cubic centimetres) Fæces (average per day)	12.1968 0.7426	
Total . . .		15.7185	Total . . .		12.9394 — 2.1737
Bath 3. Eleventh.	Milk Bread Egg Butter	9.1875 4.2780 0.9920 0.0825	Urine (517 cubic centimetres) Fæces (average per day)	8.2668 0.7426	
Total . . .		14.5400	Total . . .		9.0094 — 5.5306
Bath 4. Twelfth.	Milk Bread Egg Butter	9.4937 4.2780 1.1060 0.0825	Urine (559 cubic centimetres) Fæces (average per day)	9.1211 0.7426	
Total . . .		14.9602	Total . . .		9.8637 — 5.0965
Bath 5. Thirteenth.	Milk Bread Egg Butter	9.1875 4.2780 0.9767 0.0825	Urine (1045 cubic centimetres) Fæces (average per day)	15.5440 0.7426	
Total . . .		14.5247	Total . . .		16.2866 + 1.7619
Bath 6. Fourteenth.	Milk Bread Egg Butter	9.4937 4.2780 1.0254 0.0825	Urine (530 cubic centimetres) Fæces (average per day)	7.7910 0.7426	
Total . . .		14.8796	Total . . .		8.9336 — 6.3460
Bath 7. Fifteenth.	Milk Bread Egg Butter	9.1875 4.2780 1.0280 0.0825	Urine (580 cubic centimetres) Fæces (average per day)	8.1600 0.7426	
Total . . .		14.6760	Total . . .		8.9026 — 5.7734

As far as the figures obtained in the other cases could be relied upon they seemed to confirm this experiment; but I do not, for the reasons above detailed, urge their applicability.

Knowing that the local application of superheated air acts as a powerful stimulant or excitant to certain of the bodily functions (circulation, respiration) and induces more or less pronounced elevation of temperature, I was prepared to find increased metabolic activity in my cases. This expectation was, furthermore, in a measure supported by the reported cases, in which considerable adhesions and exudates have resolved under this treatment. The figures in my cases, however, do not support these preformed theories, and show conclusively that, whatever effect the hot-air treatment may have, it does not result from stimulation of general metabolism. For my own part, I am persuaded that the action is purely local, though, possibly, in a measure due to reflex nervous influences, and therefore akin to that obtained from hot fomentations, hot sand-bags, etc. The decreased output of nitrogen might be looked upon as an implication of the general metabolism. To this view, however, objection might readily be made. An increased output could have but one interpretation. On the other hand, however, the explanation may be given that the temporary retention is retention in the strictest sense. The abnormal activity of the dermal and pulmonary elimination of water, influencing unfavorably proper urinary eliminations. In a measure this view is supported by the fact that the urinary nitrogen was especially reduced, the nitrogen of the *fæces* being practically such as would occur under the same general conditions without baths. In point of fact, in this case the average nitrogen in the *fæces* was 0.6504 before and 0.7426 during the baths,—a very insignificant difference. Whereas the urinary nitrogen was about 14.3 before the baths and 10.2 during the baths,—a very marked difference. I regret that it was not possible to continue the estimations after the baths had been discontinued, for I suspect that the nitrogenous elimina-

tion would have been found greatly increased, commensurate with increased urination. To a certain degree the marked increase on the day of the fifth bath suggests the possibility of this discharge of surplus nitrogen after the system had become somewhat adapted to the new conditions, and the surplus had become excessive. It will be noted that the urine on this day increased from 575 cubic centimetres on the day before to 1045 cubic centimetres on the day in question.

The further consideration of the belief in the purely local action of the baths and the practical applicability of the treatment has been considered in Part I of this paper.

Conclusions.—The physiological effects of hot air are:

(1) Temporarily increased circulation, respiration, and fever.

(2) Moderate fugacious local anæsthesia.

(3) Loss of weight, probably due to loss of water from skin and lungs.

(4) Decreased nitrogenous output.

(5) The effects of hot-air baths are purely local in origin.

I am indebted to Dr. George D. Morton for the accurate records and the attention to details in the administration of the baths.—C. H. F.

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SOME PRACTICAL POINTS UPON FRACTURE
OF THE THIGH-BONE, ESPECIALLY IN
BABIES.¹

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IN general, fracture of the thigh, whether in the infant or adult, presents precisely the same problems for solution. In the course of my paper I shall indicate, in the matter of treatment, certain differences at different ages; but as to diagnosis, there are none, save, of course, regarding diastasis.

Dr. Royal Whitman has recently, at the Surgical Section of the New York Academy of Medicine, presented evidence of the comparative frequency of fracture of the femoral neck in children, where formerly diastasis was assumed to be the lesion. And yet both are of extreme rarity as compared with fracture of the shaft of this bone in children. Indeed, until about a year after birth there is no bony epiphysis, with a line of cartilage connecting an osseous head with an osseous neck, for up to that time the entire upper extremity of the femur—head, neck, and trochanters—is purely cartilaginous.

Bruns has collected evidence that if a diastasis does occur in the bone in question, it is much commoner at the opposite end,—in the proportion of twenty-eight cases of separation of the lower epiphysis from the shaft to one of the upper.

It must never be forgotten that the greater growth is

¹ Read before the New York Surgical Society, May 12, 1897.

from the lower end of the thigh-bone (about twice that from the upper end: Ollier), and diastasis here is correspondingly bad of prognosis,—not as to immediate union in good position, but because of promptly stopping the growth of the bone. Occurring in a little child, as much as nine inches of ultimate shortening is on record; whereas the similar injury at the upper end has only caused about one-half of this amount of final deformity. This matter is one of which it behooves the practitioner to warn parents at once, thereby avoiding subsequent lawsuits for malpractice.

It would seem that the classification of the various textbooks into intra- and extracapsular fractures of the neck is unnecessary, since the capsular ligament goes lower than the neck in front, and is attached to the anterior intertrochanteric line. Then, too, the treatment of both these varieties should be identical.

If impaction be not present, it is a simple thing to determine whether or not the neck of the thigh-bone is broken at whatever point. The relative length of the base-line of Bryant's ilio-femoral triangle, taken on each side, settles the point instantly. This is a better test than to observe whether or not the great trochanter is higher than Nélaton's diagnostic line, since it is necessary, in order to ascertain the latter point, to roll the patient over somewhat in bed, which means additional and needless pain. The three or four other contingencies, such as fracture of the tip of the great trochanter, or bending of the neck due to osteomalacia, or absorption of the upper part of the acetabulum, permitting the femur to articulate at a higher point than normal, or posterior dislocations of the femur, are all of them easy enough of recognition by a surgeon, with the aid of the patient's history, and need not here be further alluded to. They do not militate against the great value of Bryant's triangle in the instant diagnosis of fracture of the femoral neck.

As to shortening: We know that a full inch of difference in the two limbs may be present in the adult normally, and as much proportionately to the height, in a child, without

causing limping; the pelvis, by sinking or rising, equalizing the length of the two limbs. It is rather the exception than the rule to find legs of equal lengths.

Hamilton, "Upon Fractures," however, remarks with what would seem to be a gentle smile, that although this is true, it is a peculiar fact that the shortening is, after a fracture, almost invariably found to be on the injured side.

To the writer it has long seemed that both students and practitioners might be better equipped than at present with a clear formulation of rules for guidance in selecting a plan of treatment in the lesion under discussion. A moderate estimate of the number of the various devices for splinting a broken thigh, to be counted up in a few hours of reading in standard text-books, would be at least thirty; and the medical attendant, who is not a surgical specialist, may well be puzzled amid such an embarrassment of riches.

Upon reflection, however, it will be found that all possible varieties of thigh-splinting resolve themselves into four heads, as follows:

- (1) Immobilization.
- (2) Immobilization, plus horizontal traction.
- (3) Immobilization, plus elevation.
- (4) Immobilization, plus elevation, plus traction.

Immobilization in every case, of course, but according to the seat of fracture, and whether it be oblique in direction or transverse, one or other of these plans is indicated.

Suppose a patient to have broken his thigh anywhere in the lower two-thirds of the shaft and from direct violence. Here the break will be, as a rule, transverse; and upon reduction there will be little or no tendency for these more or less square ends to slide past each other, causing shortening.

Here No. 1 is our selection. A plaster-of-Paris splint, extending from the waist to and including the foot; or, if preferred, Lister's long side-splint, running from armpit to foot; or a Bryant or Hamilton long, double side-splint, with transverse foot-piece, splinting both limbs equally.

Suppose the break is in the same region, but is the con-

sequence of indirect violence,—a fall upon foot or knee. An oblique and not a transverse line of fracture will most likely now be found; and, consequently, unless steady traction be maintained, the ends will slip past each other, with consequent shortening.

Here No. 2 is the selection. We use, in addition to simple immobilization, either Buck's extension by weight and pulley, with counter-extension by raising the foot of the bed; or else elastic tension by rubber tubing, as used by Bryant with his bilateral splint; which latter should always be employed, of necessity, in such accidents at sea. This last, unfortunately, compels a perineal band for counter-extension.

When Buck's extension is employed we should, even for a child, employ a doubled thickness of the adhesive strips. On one occasion neglect of this point by the writer, and use of a single thickness of rubber plaster, supplied by a responsible firm, led to a sudden giving way, with much suffering to the baby and some days of further delay in union. The ordinary rough estimate as to the weight to be attached to the foot is one pound for each year up to twenty. Of course, as little is used as the case will warrant.

Method No. 2 is also applicable to the shortening from fracture of the neck of the bone. Also, even in occasional cases mentioned under No. 1, for not every transverse blow means a break that is transverse, although most do.

Incidentally, it should be emphasized that children are peculiar in that a much larger percentage of their broken thighs are transverse breaks than is the case with adults. "With children under five or seven years the fractures are pretty often so nearly transverse that when once reduced and well supported by lateral splints union without shortening may generally be expected." (Hamilton.)

Perhaps even more frequent than these in children are the green-stick or partial thigh-fractures.

Suppose, for the third presumable case, that the break with which we are dealing is in the shaft still, but is high up; also, that, being from direct violence, the break is transverse.

Here, now, No. 3 is almost essential. For the first time, now, we meet to an ugly degree the forward tilting of the upper fragment by the psoas-iliacus. It is much easier to bring Mahomet to the mountain than the reverse; and instead of trying to force down the upper end by shot-bags, *et id genus omne*, we, using No. 3, bring up (forward) the lower end. To this class belongs the famous plan of Dr. N. R. Smith, of Baltimore,—the anterior splint of stout wire, suspended from above, and running from navel to toe, the thigh and leg being semiflexed. This was used on the Southern side, almost to the exclusion of other plans, during the late war, in fractures of the thigh from whatsoever source; and in compound fractures, with the misfortune of sepsis and consequent repeated and frequent dressings, the position commends itself. It is more comfortable than the various double-inclined planes which come under the same head,—No. 3. This flexed posture is sometimes best, again, in fractures very low in the shaft, where the gastrocnemius tends to flex the lower fragment upon the tibia.

Still under plan No. 3 comes the device of flexing the baby's thigh sharply against its abdomen, and retaining it there by aid of bandaging, or pasteboard splints, or use of adhesive plaster strips; short coaptation splints of some kind being also employed. If shortening be absent or insignificant in amount in fracture, either of neck or shaft, in infants, this plan has obvious advantages; and especially so when the break is high in the shaft, with consequent angular deformity. Dr. Van Arsdale's method with a pasteboard triangle (recently described at the American Medical Association meeting in Philadelphia) is an exceptionally neat and effective way of splinting, coming under this heading.

Now let us suppose we have to deal with a break high in the shaft as before, but in this instance oblique in direction. Here threaten both angular deformity and shortening. N. R. Smith's plan overcomes the former, but not the latter; because his wire splint, running up as it does upon the trunk, renders traction useless against overriding of the broken ends.

Here we need method No. 4. Dr. Hodgen, of St. Louis, devised a splint which typifies this. Roughly speaking, it is the same as N. R. Smith's save that this anterior wire splint does not go above (*i.e.*, nearer the body than) the break. Lateral oscillation is stopped by short coaptation-splints wrapped around the thigh. And now the tackle can efficiently be made to pull, in the long axis of the thigh (which is still kept flexed and suspended), until shortening is overcome.

Under this head, too, properly belongs the plan of Schede, of Hamburg, devised for use in infants only. It applies to fracture of the thigh at any point, in babies. This is the method of vertical suspension. The feet, wrapped in cotton, are strapped together, and then by a tackle they are lifted until the buttocks rest but lightly upon the bed. Of course, a coaptation splint is used in addition; or, if preferred, one of plaster of Paris in fracture through the shaft.

The advantage of this posture is mainly ease of cleansing about the genitals, and of changing diapers, etc. Its objections are, first, that in females quite commonly it causes a sharp, muco-purulent vulvo-vaginitis; and, secondly, that the position is very tedious, and after a time renders the child fretful. Oddly enough, Schede thinks that one of its advantages is the easy change of position from back to side; but I should hardly like to risk this. As to the first objection, it may be due, as Hamilton suggests, to mucous fermentation from air entering the vagina; or, perhaps, and it seems to me much more probable, from the vagina (due to the position) becoming filled with urine. At least, it does not occur if the nurse syringes the vagina daily with a warm saturated solution of boric acid.

Perhaps even among surgeons as an audience I may be forgiven if I allude to one or two matters simply of personal preference in gypsum technique. First as to the weight. To those who lift the child daily this is not a trifling matter. I always place about the limb lengthwise a half-dozen strips of tin, each an inch or less wide, and punched full of nail-holes at inch intervals, the better to hold the plaster. These strips run

between two layers of gypsum bandage. More than two layers will rarely be needed; and even in the adult the weight of the splint may thus be reduced fully one-half with entire safety.

In dealing with plaster bandages a year or so old,—those which have been occasionally exposed to the air,—I have been glad to use a point known to all dentists, but apparently not to all doctors,—namely, to bake them well in the oven. Thereby the atmospheric moisture they have absorbed is driven off, and they will thereafter “set” as well as when first prepared.

To arrange for easy removal of the splint, a very good plan for those who have not a special plaster-shears is to apply beneath each layer of the gypsum, lengthwise of the limb, a strip of tape soaked in sweet oil; such tapes, two or three in number, being of course superimposed. At that point the plaster will not “set,” but will remain rather soft, and cut with ease.

In the case of babies, it is essential to varnish the plaster splint, thereby making it waterproof. One of the most annoying features of these cases is the difficulty of preventing urine from soaking in beneath the splint, of whatever kind, when it has to be carried close to the perineum.

The only really satisfactory plan which I have used is the following:

Take rubber tissue, preferably considerably thicker, and therefore less flimsy, than that employed in ordinary surgical dressings,—for instance, use dentists’ rubber dam. Now stick this to the outside of the dried plaster-of-Paris splint (first using a hot flat-iron to hasten drying), near the perineum, and also to the skin near the genitals, by the following solution:

℞ Balsam of fir,
Sandarac,
Mastic, ãã equal parts;
Alcohol, ad saturandum.

This is extremely tenacious, and has the advantage over

liquid gutta-percha, which would otherwise do as well, that it is not at all irritating to the delicate skin of an infant; whereas the latter, being a chloroform-solution, is very much so.

Except where vigorous extension is needed to overcome shortening (and, as previously remarked, such cases are in the minority in children), and except for fractures either very high or very low in the shaft, with angular deformity, the writer likes very much Hamilton's splint for babies (already mentioned by name under Method No. 1). This is the long, double side-splint, running from each armpit to below the foot, and making an obtuse angle where it leaves the trunk and begins to run down the outside of each thigh. It has a cross-piece below the feet, connecting these long side-splints; and it only differs from Bryant's in that Hamilton's cross-piece is so long that the feet are held quite widely apart, thereby allowing room to wash the genitals and change the diapers with ease. The long side-pieces are properly padded, of course, and the legs and thighs are held firmly against the inside of them by a few broad strips of sticking plaster. This has the advantage of leaving the seat of fracture always open to view; and the splint permits occasional turning upon the face or side without danger, or even allows the child to be carried out-doors for an airing in its baby-carriage.

These points of advantage are obviously not possible by Schede's suspension plan; but, on the other hand, if shortening threaten, Schede's posture is the better one; and if angular deformity be instead the main danger to the child, Van Arsdale's splint is an excellent reliance.

Regarding the question of a special bed or mattress: this will never be needed in children, as it is easy to lift and place a bedpan beneath them. In grown people, too, it is but rarely necessary; but occasionally with a very stout adult it is wise to use a cot-bed, with a hole cut just beneath the buttocks; and surrounding this and leading from it down towards a bucket beneath the bed,—an oil-cloth trough. This allows of irrigation and ease in thorough cleansing.

With patients willing to afford it, one of the patent beds permitting elevation of the patient by a special mechanism may be employed, for bedpan and toilet purposes.

In conclusion, it seems to the writer that in this and every other fracture, whether of the child or adult, it is the part of wisdom to use as a matter of routine, and for weeks, phosphorus in small doses, perhaps preferably in the form of zinc phosphide; since it has been so thoroughly demonstrated that phosphorus hastens bone-formation, and consequently shortens the tedious period of ossification of the callus.

LIGATURE OF THE INNOMINATE ARTERY
FOR HÆMORRHAGE, WITH THE REPORT
OF A CASE.¹

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THE history of the case is as follows:

E. I., colored, laborer, aged twenty-six years, was admitted to the Pennsylvania Hospital on the evening of May 31, 1896, with a pistol-shot wound of the neck. The weapon had been accidentally discharged at a distance of four feet, the bullet entering the neck on the left side about an inch above the level of the clavicle in the region of the anterior scalene muscle. The probe entered for a distance of about one and three-quarters inches towards the middle of the neck; it was there firmly arrested, and no manipulation or change in the position of the patient would advance it farther. The patient was unable to move the left arm towards or away from his side, or to raise it from the bed; but he had perfect control over the forearm and hand, though his motions were slow and deliberate. There was no anæsthesia of either arm or shoulder. The act of swallowing caused severe spasmodic pain in the throat. There was no change in the voice, and the patient had no difficulty in talking.

No attempt was made to extract the ball until it had been accurately located by a skiagraph, which was taken on the following day by Professor Goodspeed, of the University of Pennsylvania. The ball was found lodged on the right side of the neck in front of the seventh cervical vertebra. (See *ANNALS OF SURGERY*, August, 1896, p. 218.)

The patient was etherized and an incision was made on the right side of the neck, behind the posterior margin of the sterno-

¹ Read before the College of Physicians of Philadelphia, June 2, 1897.

cleido-mastoid muscle. The former was separated from the anterior scalene muscle, and the bullet was found in a small pocket of pus close beside the œsophagus, and behind the carotid artery a little above its origin. The wound was flushed with water and an antiseptic dressing applied. On the third day it was noticed that fluids which the patient drank regurgitated through the wound. All feeding by the mouth was discontinued, and the patient nourished by nutritive enemata. With enjoined rest, the œsophagus soon healed, and food was administered in the usual way.

On the eleventh day, July 14, the wound in the neck suddenly began to bleed and was packed with sterile gauze by the resident surgeon, Dr. Brinton. When I saw the patient the bleeding was perfectly controlled. A special nurse was ordered, who was instructed how to act in case of a recurrence of the bleeding.

July 16, at 3 A.M., without warning, a sudden hæmorrhage from the wound began. After removal of the packing the bleeding was controlled by digital pressure deep down to the bottom of the wound. On my arrival I found the patient's condition fairly good in spite of considerable loss of blood. An incision having been made in the line of the vessels, and exposing the common carotid artery, I passed a ligature around it, but was surprised to find that this did not control the bleeding; the blood continued to well up from the bottom of the wound, the blood apparently coming from an opening on the posterior side of the vessel; thus it was impossible to locate accurately the bleeding-point. I feared the subclavian or thyroid axis might be wounded, as nothing appeared to control the bleeding but direct pressure with the finger in the wound on the side of the neck; and, feeling that I must seek a lower point to place the ligature, I dislocated the sternal end of the clavicle and turned it out, this giving me a much better opportunity to deal with the bleeding vessel, and, if necessary, to ligate the innominate. It must be remembered that at the bottom of the wound was an old abscess cavity, from which the ball had been removed, and the surgical relations were consequently much altered. Before attempting to deal with the innominate, I passed another catgut ligature around the carotid a short distance above this bifurcation, which ligature completely controlled all bleeding.

All the steps of the operation were necessarily embarrassed by the fingers of my assistant in the wound and the use of artificial light. An antiseptic dressing was applied, and the patient soon reacted. In order to keep the patient quiet and induce as little movement as possible by the muscles of deglutition, all nutriment was given through a small stomach-tube, which was easily inserted through the nostril.

July 26, ten days after the operation, a second hæmorrhage occurred, without warning, about 3.30 A.M. I was hastily summoned, and found the patient had lost much blood and was in a poor condition. The bleeding had been controlled by digital compression.

The patient was again etherized, and the old wound in the line of the vessels reopened. It was found to be filled with plastic lymph, which obscured all surgical relations. A careful dissection, however, revealed the fact that the bleeding came from the stump of the carotid on the proximal side of the vessel. The sternal end of the clavicle was again turned out, the innominate exposed, and it was ligated with silk a short distance below its bifurcation. The right subclavian and carotid were also ligated in the same manner. The right internal jugular vein was found to be almost completely ulcerated, and ruptured under pressure. The bleeding was with difficulty controlled by a double catgut ligature.

The edges of the wound were then approximated with silk-worm gut.

During the operation the patient's condition was poor, demanding active stimulation. Failing to get much response in the way of reaction, a pint of normal salt solution was slowly thrown into the circulation through the median basilar vein, and this greatly improved the patient's condition. He was removed to the ward, but died suddenly in a few hours.

The post-mortem examination was made by the coroner's physician, which corroborated the course and position of the ball as above described; the œsophagus was ulcerated; the opening, one-quarter of an inch in diameter; ligature around innominate artery. The body of the cervical vertebra had been struck by the ball and its cancella opened; there was also some erosion of the fifth, sixth, first, second, and third dorsal vertebræ on their anterior surfaces. The exact course of the bullet could not be traced, owing to adhesive inflammation.

Brain.—Abscess cavity the size of a walnut was found in the anterior portion of the right temporo-sphenoidal lobe, and running into the fissure of Rolando. A transverse section through the right frontal lobe revealed another abscess cavity, smaller than the first, containing about a drachm of greenish pus. The surrounding brain tissue was not broken down. Other portions of the brain were pale, and the vessels were exsanguinated.

The abscess cavities were undoubtedly due to septic infarcts carried from the ulcerated coat of the carotid. At no time during the patient's illness did he complain of pain or show any head symptoms.

The first recorded operation for ligation of the innominate artery was that of Valentine Mott, of New York, in 1818, for an aneurism of the innominate, carotid, and subclavian arteries. The patient died from hæmorrhage on the twenty-sixth day. The idea of ligating the innominate artery was first conceived by Allan Burns on purely anatomical grounds, for he believed that the collateral circulation would be sufficient to supply the head, neck, and upper extremity with blood.

When one examines the literature of the subject, although it is not large, and sees described some of the difficulties of technique, as recorded by Banks, he will hesitate before attempting an operation which is followed by an almost unbroken record of fatal results. The cause of death after operation is either from shock, secondary hæmorrhages, usually from the distal side of the ligature, or sepsis. The operation for the ligation of the innominate artery has thus far been performed and reported, including my own case, but thirty times,—in twenty-six of which ligation was accomplished for the cure of aneurism, usually of the subclavian artery, generally involving the junction of the carotid and innominate arteries, and four times it was performed for trauma. Of these four, one was for hæmorrhage from the subclavian; one for hæmorrhage from the axillary artery and for secondary hæmorrhage following ligation of the subclavian; one for secondary hæmorrhage following the ligation of the common carotid (my own case).

Of these cases four might be reported as successful, but a careful analysis will relegate some to the list of fatalities. The first successful case reported was Smythe's, of New Orleans, in 1864. The patient lived ten years, and finally died from hæmorrhage from the sac of the original aneurism.

The second was Lewta's, of India, in 1889, reported cured at the end of forty-three days.

The third was Coppinger's, of Dublin, in 1893, reported cured at the end of forty-two days.¹

On another (Burrell's case) the patient died on the one hundred and fourth day following the operation. During that time the patient had been up and about, attending to business. The cause of death was hypertrophy and dilatation of the heart, with general arterial sclerosis.

The first case can undoubtedly be counted as a cure. The patient lived for ten years after the operation. The second and third cases had not been under observation sufficiently long to establish positive cures, for Graefe's case shows that death from hæmorrhage may follow this operation by nearly a month. Burrell's case may be fairly counted as one of cure, so far as the operation and aneurism are concerned, for his patient lived to the one hundred and fourth day, and died of heart disease.

As a great many of these reported cases belong to the preantiseptic era of surgery, it may be safe to say that if they had all been dealt with in a thoroughly aseptic manner and with the employment of animal ligature the results might have been more favorable.

Ligature of the innominate artery has been so fatal an operation that it has been questioned whether the operation is a justifiable one or not. There are many men who, in a lifetime of active surgical work, have never been called upon to deal surgically with the innominate artery. In fact, so far as I am able to learn, this is the first reported case which has occurred in Philadelphia. There are times, however, when the surgeon is necessarily obliged to deal with this vessel even under the most trying circumstances, and when neglect or timidity on his part is unpardonable.

The Operation.—The vessel is best reached by the triangular incision (Mott's operation), consisting of a transverse incision just above the clavicle and carried to a point over the sternal notch; and a second incision of about the same length, extending from the termination of the first along the inner edge of the sterno-cleido-mastoid muscle. The triangular flap thus formed is dissected up, thus dividing the sternal attachment of the sterno-cleido-mastoid and as much of the clavicular portion as may be necessary for the exposure of the vessel. Should this not afford a satisfactory field for operation, the sternal end of the clavicle may be either removed or dislocated and rolled outward. Cooper, of California, has employed this latter method of exposing the artery, and in my own case it gave an exposure without which the operation would have been impossible. Bardenheuer has several times removed the manubrium, the sterno-clavicular articulation, and portions of the first ribs in order to safely remove large tumors at the base of the neck; and he insists that a free access to the artery must be obtained in order to safely place a ligature about it. It is evident that this procedure permits the operator to place a ligature with a greater accuracy than when the ligature is slid down, in the dark, behind the sternum. After the vessel is exposed great care must be exercised in passing the ligature, in order not to wound some of the important tissues which are in close proximity to the innominate.

In the ligation of a vessel of the size of the innominate, the selection of a suitable ligature is of the greatest importance. Almost every variety of material has been employed, such as linen, silk, ox aorta, catgut, tendons of different animals, etc. It would seem that a ligature composed of animal substance, which would in time lend itself to the tissues and yet be sufficiently strong, would be most likely to meet with success; although there is always an element of uncertainty in the employment of such a ligature, for fear that it may become absorbed too soon or its knot become insecure through the softening processes of heat and moisture. Burrell em-

ployed two flat, braided-silk ligatures, passing one above the other about one-half an inch apart. His object was to rest the artery by severing the vessel between them, thus avoiding the tracheal tug.

In nearly all of these cases the hæmorrhage has come from the distal side of the vessel or from the sac. It is unquestionably better to ligate the vessels, the carotid, or subclavian on the distal side of the aneurism, thereby cutting off as much as possible of the diseased vessel from the general blood-current.

It might be supposed that the sudden withdrawal of the circulation from the right side of the head and arm would be followed with most disastrous results; but such has not been the experience of surgeons. That it is not disastrous has been proved also by the experiments of Spencer on Macaque monkeys;² and in monkeys arteries appear to bear the same relation to one another as in man, their relation to the surrounding parts being the same. The animals were etherized and the artery exposed by a median incision; a sterilized silk ligature used, and the carotid and subclavian tied. There was no shock. The wound healed by first intention before the animals pulled the dressing off. All that was found after the operation, beyond the loss of pulsation in the right carotid and right subclavian, was a disinclination on the part of two monkeys to use the right upper limb for some time, although it appeared to be as strong as the left and as warm. The animals were killed in five, ten, and twelve weeks respectively after the operation. The first was injected. The anastomosis was found to be complete, and, as it happened, the right upper limb was better injected than the left. The results on all these animals were identical.

In another case the method was varied by using a sterilized catgut ligature. Only the innominate was tied, not the carotid or subclavian. The animal died on the seventh day from hæmorrhage. The ligature had perfectly occluded the innominate on the proximal side; there was a small hole on the distal side opposite the bifurcation, and both carotid and

subclavian were patent—the exact condition of so many cases which have resulted fatally after operation.

It has been asserted that as animals differ so much from men these experiments are not conclusive. Nevertheless, the experiments are very instructive, showing as they do that the operation may be performed without much shock, and that when the vessels are healthy the collateral circulation is soon re-established.

Collateral circulation, as given by Sir W. MacCormac, "Ligature of Arteries," p. 75.

	CARDIAC SIDE.	DISTAL SIDE.
TRUNK .	{ First aortic intercostal with superior intercostal of subclavian. { Upper aortic intercostals with { thoracic branch of axillary and intercostals of internal mammary. { Phrenic with musculo-phrenic of internal mammary. { Deep epigastric with superior epigastric of internal mammary.	
HEAD . .	{ Free communication of vertebrals and internal carotids of opposite sides inside the skull. Communication of branches of opposite external carotids in median line of neck and face.	

In nearly all the operations that have been performed heretofore the patients have suffered from some constitutional disease which has affected the coats of the blood-vessels, rendering them unable to withstand the increased demands thus made on them.

The position of the innominate, with its close proximity to the heart, the shortness of its trunk, the force of the circulation to which it is subjected, the evil effects of disturbing the cellular connections which link together so many important structures in the cervico-thoracic line, and the uniform fatality of the operation are undoubtedly factors, all of which should be carefully considered in attempting to deal directly with the innominate for the cure of aneurism. It would seem, in the light of present experience, that Basedow's operation of tying the carotid and subclavian seems to be the most promising method of procedure, although in a case of

my own at the Episcopal Hospital the patient died suddenly from syncope about an hour after the tying of the vessels,—a result apparently due to too much back pressure upon the heart. As I have before stated, I cannot help thinking that, in the light of modern surgery, in the next series of thirty cases of ligation of the innominate artery, the results obtained will be much more favorable. Nevertheless, this procedure will always be an extraordinary operation, and one fraught with danger.

¹ Transactions of the American Surgical Association, 1895, p. 291.

² British Medical Journal, July 13, 1889.

PRIMARY SARCOMA OF THE THYROID GLAND.

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AND

BERWICK B. LANIER, M.D.,

OF BALTIMORE.

PRIMARY sarcoma of the thyroid is of sufficient rarity to justify recording the following example: Treatment up to the present time may be considered *nil*, yet it is to be hoped that recourse to serum may be of use in the future. An early diagnosis is very necessary.

A. M., white, female, unmarried, American, aged sixty-six years, was seen with Dr. Hundley, July, 1896. The history obtained from her indicated some disturbance with the freedom of breathing, dating back not less than a year. When seen by Dr. Hundley, during the previous April, there was whistling respiration, both when exhaling and when inhaling. It was reported that her neck had increased in size during a number of months, dates not very clear, however. She had been decidedly ill for the past three months, not being able to lie down, and for a month and a half had been subject to violent attacks of dyspnoea. Her complexion was dark and muddy, her lips rather darker than normal, dark-red, not pink in color, the face was a little puffy. She was sitting up and had had a very severe attack of dyspnoea during the preceding night, in which it was expected she would die. There existed an enlargement of the neck, extending from the sternum to the thyroid cartilage, vertically and laterally, the growth could be felt behind the sterno-mastoid muscles on either side. The swelling was hard, somewhat

elastic, not movable, either up or down, or from side to side, apparently resting against the vertebral column, and below it could be traced behind the sternum. It did not move in deglutition or in respiration. There was whistling as the air went in and out through the trachea. The voice was almost abolished, a whisper only being possible. A thyroid tumor, possibly malignant, seemed the most likely diagnosis. As it was impossible to remove the growth, and relief in breathing was urgently called for, a vertical incision was made over the tumor from the thyroid cartilage to the sternum, the sides of the incision were separated by retractors, and soon a firm white growth was exposed. Incision showed this to be not very vascular, so it was cut in the middle line vertically, and with a curette a good deal of tissue was removed; this relieved the pressure upon the trachea and gave the patient much comfort. The substernal portion of the tumor was not interfered with. At the end of the operation there was a long vertical groove in the neck, at the bottom of which the trachea was exposed. Not much bleeding was encountered. The sides of the wound remained well apart, and so matters were left. The patient lived ten days, cyanosis gradually coming on followed by coma. Even after the section of the growth was made as described, the lateral portions did not become movable. A sister of A. M. died of a malignant tumor of the neck, which was believed to have had its origin in the parotid gland. A portion of the growth removed at the time of operation was submitted to examination.

The small piece of tissue which was submitted to examination was about one centimetre long, and one-half centimetre thick and broad; it was quite pale and very firm, with no vessels apparent to the naked eye.

The tissue was hardened in ten per cent. formalin for twenty-four hours and then in alcohol and embedded in celloidin; it was stained with hæmatoxylin and eosin and also by Van Giesson's method.

Under low power the tissue shows a large amount of new-formed connective tissue, appearing as distinct spindle cells with large darkly staining nuclei; also many acini lined with deep cuboidal cells having large, rather pale nuclei, the majority of the acini are filled with a homogeneous colloid-like substance, which stains pink with eosin and red with fuchsin.

Some of these acini appear of the same size as those seen in the normal thyroid gland, while others are much compressed, and the lining cells have disappeared to a considerable extent; evidently due to a pressure atrophy. In others there has been proliferation and desquamation of the cells; here they appear swollen, paler, and somewhat granular. At no place does the new-formed tissue break through into the acini, but surrounds them completely.

Under high power the spindle cells are seen to have large, deep-staining, irregular nuclei, with many numerous points of deeply staining chromatin filaments, giving one the impression



FIG. 1.

of being in an active state of proliferation. There is no regularity whatever about the arrangement or distribution.

The acini are seen to consist of large cuboidal cells having large, pale nuclei, and resting on a fine basement membranum, which in some few places appears to be replaced by the connective tissue. Where the new growth has replaced the normal thyroid structure it has done so by causing atrophy of the acini and lobules, and one can by careful examination make out the small and compressed acini, somewhat suggestive in places of Friedländer's areas of cells in the fibroid lung.

Diagnosis of primary spindle-celled sarcoma of the thyroid gland.

As regards the sexes, the distribution seems to be quite even, —seven females, eight males, and one not stated.

As regards the age at which it most commonly appears, we cannot agree with Lücke that "sarcoma of the thyroid is most common among the young." Only two of the cases tabulated were under forty years, and the majority well past that. One is



FIG. 2.

struck by the rarity with which this condition supervenes on an old hypertrophied or cystic thyroid; only three of the cases having had any enlargement of the neck lasting over one year, and one of these (Cohen's), in which no microscopic examination was made, once diminished very considerably under the administration of sarsaparilla, thus leaving one to doubt the correctness of the diagnosis of sarcoma.

The type of tumor has generally been a spindle-celled sarcoma, although there have been both round-celled and mixed.

The following table gives the total cases which we have collected with the principal points of interest:

Sex.	Age.	Starting Point.	Result.	Duration of Trouble.	Pathology.	Reporter.
F. M.	55	Right side. Apparently isthmus.	Death. "	17 years.	Fibrosarcoma of isthmus and left side inflated neighboring glands.	Lücke. Doleris.
M.	56	Right lobe.	Death from asphyxia.	6 weeks.	No autopsy, no microscopic examination of tumor.	C. W. Sharples.
M.	62	. . . . .	Death.	1 year.	Spindle-celled sarcoma, with small metastases in liver and kidney.	Kobler.
M.	40	. . . . .	"	6 months.	A small piece removed from mouth before death showed a mixed sarcoma.	Gatti.
F.	69	. . . . .	"	3 months.	Sarcoma throughout the thyroid, between the alveoli, compressing them.	Mathieu.
F.	32	. . . . .	"	Not stated.	Spindle-celled sarcoma of thyroid not penetrating alveoli.	Bœcchat.
M.	45	. . . . .	"	17 years.	No microscopic diagnosis and tumor once diminished under sarsaparilla.	Cohen.
F.	42	. . . . .	"	3 years.	Spindle-celled sarcoma of whole gland, no epithelial cells anywhere.	Bowlley.
M.	65	Left lobe.	"	4 weeks.	No microscopic examination.	Pitt.
F.	59	. . . . .	"	50 years.	Round-celled sarcoma. This tumor grew rapidly for only six weeks.	Paget.
M.	42	Right lobe.	"	Not stated.	Spindle-celled sarcoma three times removed; recurrence.	Shattuck.
F.	66	. . . . .	"	1 year.	Mixed sarcoma. Spindle-celled sarcoma.	Lentz. Writer's case. ¹
M.	21	Right lobe.	"	1 year.	Spindle-celled sarcoma; right lobe obliterated	
F.	55	" "	"	6 months.	Spindle-celled sarcoma; no thyroid left.	

The foregoing case is of interest, owing to the rarity of primary sarcoma of the thyroid gland. As far as we can

gather from a careful examination of the literature there have been only fifteen cases reported up to the present; notwithstanding P. Koch's statement that they are not uncommon in Switzerland; and four of these may be classed as doubtful, since no microscopical examination of the tumor was made; and as carcinoma is a very much more common occurrence in the thyroid.

The most striking point is the mortality; not one of the patients having survived even an operation for the relief of the embarrassed breathing for more than a few days; this record probably being due to the fact that the patients have, with one or two exceptions, only consulted a surgeon when the growth had reached a point when suffocation was imminent; and most of these have died shortly after tracheotomy was performed; the interference with the metabolism of the thyroid seeming to impair the patient's resistance to shock or rapid infection.

¹ Since the above article was completed, there has been one other case of sarcoma of the thyroid reported by D. P. Allen, in the ANNALS OF SURGERY for June, 1897. A woman, aged twenty-two years, having had an enlarged thyroid for two years; operation for removal under cocaine; death shortly after. Round-celled sarcoma.

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VERY LARGE MYXOLIPOMA OF LEG, THIGH,
AND KNEE-JOINT; AMPUTATION AT HIP-
JOINT; RECOVERY.

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G. H., aged forty-seven years, a miner by occupation, was admitted to the General Hospital under my care on May 14, 1896, complaining of a large swelling in the left lower extremity and involving the knee. His history was as follows: He had noticed a swelling above the left knee for two years, but it gave him no trouble, and he continued at his work until December, 1895, when he twisted his knee severely. He continued at work for three weeks after this, but had then to lie up on account of pain in the knee. At this time he noticed a swelling in the upper part of the calf, and this increased rather quickly until the time of admission.

The family history contained nothing bearing upon his condition.

Present State.—The upper two-thirds of the calf is occupied by a large swelling, which is elastic and doubtfully fluctuating; the skin over this is red, shiny, and adherent, and threatening to ulcerate. Above this and separated from it by a distinct groove is another mass, occupying the popliteal space, and extending up into the back of the thigh. The skin over this is natural and is not adherent. To palpation this swelling seems almost, if not quite, fluid. On the front and external aspect of the thigh is another swelling, extending four and a half inches upward from the patella, and the skin over this is also healthy and not adherent. The knee-joint contains a great deal of fluid, and it seems as though this communicated by a narrow channel with



Dr. Barling's case of myxolipoma of leg.

the swelling just alluded to. Several photographs were taken of the limb by my dresser, Mr. Taplin, to whom I am much indebted, and one of which, herewith reproduced, shows the condition at this time.

All the swellings above described appeared to move over the subjacent bones. The patient's temperature was normal, and he appeared in good general health. At this time he declined to consider operative treatment, and left the hospital in a few days.

He was readmitted September 13, 1896, and it was found that there had been a marked increase in the size of the swelling in the calf, and that this was now scarcely distinguishable from the popliteal swelling. The skin over the lower third of the thigh and the upper two-thirds of the leg was now adherent, red, and cedematous, and in the calf there were several sinuses, from which a profuse discharge of stinking pus took place; and it was found that the measurement of the largest part of the leg was four and a half inches greater than in May. The knee-joint and the mass on the front and outer side of the thigh were much the same as when the patient was admitted the first time. The patient now looked ill and worn, his temperature was raised at night to 102° F., and there was sweating and delirium; the urine was from sixty to eighty ounces daily. Specific gravity 1008 to 1010; urea less than one per cent. Exploratory incision with amputation at the hip-joint, if this was found necessary, was recommended, and was carried out on September 16. Incision into the mass above the knee-joint showed lobulated masses well encapsuled, but of doubtful nature, and on the whole giving the impression of a growth that had undergone fatty degeneration. My colleagues, who were present, agreed with me in the necessity for amputation at the hip-joint, so as to get well away from the diseased portion, and this step was carried out by Wyeth's method. The shock of the operation, especially considering the huge size of the part removed, was extremely moderate; and though the wound suppurated for a long time, the patient eventually made a good recovery; whilst it is interesting to note that the quantity of urine passed was reduced to about forty ounces, and the specific gravity rose to 1012 to 1014.

Dissection of the Limb.—The main mass of the growth occupied the upper two-thirds of the calf, the popliteal space, and

the back of the lower third of the thigh, and was made up of lobulated masses, most of which were well encapsulated. Parts of these were of a dead white color, very like in appearance and consistence to caseating tubercles, only somewhat tougher. The lower part of this mass was red and œdematous, suppurating, and sloughing. It appeared as though this portion of the growth arose in the fat, over and between the muscles. There was a separate lobulated mass, the size of the fist, on the front of the thigh above the knee-joint; this was well-encapsulated, and presented the dead, white, caseous appearance and consistence already referred to. On opening the knee-joint a considerable quantity of clear synovial fluid escaped, and it was found that the joint, in all parts, contained a number of pedunculated tumors, varying from the size of a pea to that of a moderate-sized pear. These grew from all parts of the synovial membrane, and one large one originated from the periosteum, on the front of the femur, immediately above the line of cartilage. Microscopic examination showed all the growths to be nearly pure fat with a small admixture of myxomatous tissue.

This is the only occasion on which I have used Wyeth's method of amputation at the hip-joint, though I have several times assisted my colleagues when this method has been employed. I have no hesitation in saying that this is by far the best method with which I am acquainted, and I regard such a case as the one just described, a big, muscular man of forty-seven years with a huge limb, as a severe test.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, May 26, 1897.

The President, FRANK HARTLEY, M.D., in the Chair.

ANTITOXINE IN THE TREATMENT OF TETANUS.

DR. FREDERIC S. DENNIS read a paper with this title.

DR. HOWARD LILIENTHAL said he could recall two cases, recently reported, which were of considerable interest. One was by Dr. Cokemower, published in a recent number of the *Journal of the American Medical Association*. The patient had had as many as seventy-five convulsions in an hour. Dr. Cokemower gave him forty grammes of some one of the liquid antitoxine serums, and within twenty-four hours the convulsions were reduced to ten, and later the paroxysms were also much milder when the antitoxine gave out. More serum could not be procured, and the man died of a return of the symptoms.

The other case was reported in the *Centralblatt für Chirurgie*, by Helferich's assistant, Dr. Trapp. The symptoms had come on eight days after the injury, the patient had opisthotonos and extreme trismus. He recovered under the influence of antitoxine.

Dr. Lilienthal thought the ideal thing would be, if one knew in what cases tetanus would be liable to develop, to use antitoxine as a prophylactic. It was also of interest to note what the author had said of the danger of stopping the treatment too soon, and of giving too little of the antitoxine. Koch had remarked in his new paper on tuberculin that in tetanus, after all the symptoms had disappeared, and the patient had apparently been cured, the symptoms might return because the bacilli were present to manufacture more poison. As to the evil effects of the serum, of course they were very much like the evil effects of any serum. But they were going to diminish. Experience had shown that the serum of certain horses would cause various symptoms,—not

only urticaria, but nephritis, swelling of the lymphatics, etc. It seemed to be the serum of only certain individual horses which produced such results.

Dr. Lilienthal had had a case in which the question of diagnosis of tetanus arose. It was the case of a physician who had assisted in an operation upon a patient who subsequently died of tetanus. About three days after the operation, Dr. Lilienthal was awakened in the middle of the night by a violent ringing of his door-bell, and his friend called to him to come down instantly, for he thought he might be developing tetanus. He said he had thought nothing about the operation of three days before until he noticed that his jaws were getting stiff. He had seen no abrasion of his skin. Dr. Lilienthal found the jaws were undoubtedly somewhat stiff, the patellar reflexes were enormously exaggerated, and there was ankle-clonus. This was five years ago. Being alarmed at the patient's condition, Dr. Lilienthal kept watch of him during the night, gave him eighty grains of chloral within two hours, and one hundred and twenty grains of bromide of potassium within the same time. He remained for some time very nervous, and did not sleep. Some stiffness continued in the jaws, and the reflexes were still highly exaggerated. He was kept in the house two days, and the symptoms gradually subsided. It was probably a case of hysterical tetanus. Still, if he had such a case to-day he would give tetanus anti-toxine, and continue it until he felt pretty sure that all danger had passed.

DR. ALEXANDER LAMBERT said that he had recently collected from literature reports of one hundred and fourteen cases of tetanus, of whom sixty-eight recovered, forty-six died,—a death-rate of 40.35 per cent. Six were unclassified, owing to lack of details. Five of these recovered. One died with complicating pneumonia. It seems wise to divide the cases into acute and chronic. The first include those with a short incubation period, eight days or less, and great rapidity of onset. The chronic cases include those with a long incubation period, or a short incubation period with slow onset. If there is a long incubation but rapid onset of intense spasms the case should be considered acute. Of the acute cases, forty-seven in number, there were twelve recoveries, thirty-five deaths,—or a mortality of 74.46 per cent. Of chronic cases there were sixty-one, with fifty-one recoveries, ten deaths,—or a mortality of 16.39 per cent.

In estimating the value of any remedy it seems fair to cut out all cases that die within twenty-four hours after the remedy has been administered. In tetanus one should also cut out all cases which receive the antitoxine ten days or more after the disease has first shown symptoms, for they are likely to recover anyhow. The ordinary death-rate in acute cases seems to be about 80 per cent., for in about twelve hundred cases in war and two hundred in peace there was a death-rate of from 87 to 97 per cent. In chronic cases the death-rate was about 40 per cent. That rate holds fairly good for the city of New York, judging from his own observations during the last eight years,—the figures being fourteen cases without antitoxine with four recoveries, six cases with antitoxine, four very intense, with four deaths. The two that recovered were chronic cases. One great difficulty in judging of the effect of the antitoxine is the fact that patients are also given chloral or morphine. Still, it is evident that the antitoxine serum has a marked effect in reducing the number of spasms, the pain, and the rigidity. The relaxation becomes quite distinct after a short time. Recently he had seen a case in the Harlem Hospital, and also one in the Presbyterian Hospital. The one in the Harlem Hospital received the serum on the fourth day, the one in the Presbyterian Hospital within forty-eight hours. In both the incubation had been short, the symptoms intense. After using the serum the relaxation became quite marked, the number of the spasms very much diminished,—down to five or six in as many hours. The patients became comfortable, and were able to move the head with considerable ease. But suddenly they woke up out of sleep, had an intense convulsion, and died. In the acute cases seen by him, treated with the serum, such a termination has unfortunately been the rule: the patients relax, apparently are getting along well; there may be a little temperature, but the pulse has come down. Suddenly they develop a spasm and die. He knew nothing which would prevent this unless it be to keep them stupefied with chloral and morphine.

He emphasized the necessity of giving antitoxine as early as possible, as it can simply counteract the effect of the toxine on the parts of the body which are not already damaged beyond repair. It does not seem to have any power of neutralizing the toxine in the blood, as an acid might neutralize an alkali,—an

idea suggested at first. The death-rate in the chronic cases has certainly been tremendously lowered, but in acute cases it seems to be nearly the same, although it has been said that it has been lowered from 80 to about 61 per cent.

It cannot be too strongly emphasized that in this city tetanus from wounds of the extremities is very common, and in addition to keeping all wounds properly disinfected and cleansed the question of immunization by the injection of from five to ten cubic centimetres of tetanus antitoxine should receive serious consideration. The serum furnished by the Health Department of the city is quite good, being 1 to 400,000,000, while that of Behring is 1 to 100,000,000.

DR. J. D. RUSHMORE said that in the *Brooklyn Medical Journal*, October, 1896, the following case was reported: A boy over five years of age was brought to St. Peter's, Brooklyn, on May 1, 1896. A week before, while barefoot, walking in the yard, he had cut his foot. The wound healed promptly. The third day the boy began to have tetanoid symptoms,—the shortest time after an injury that he had ever seen tetanoid symptoms develop. They came on very rapidly. He was brought to the hospital four days later, not having had any treatment. He had the characteristic symptoms of acute tetanus. Antitoxine was obtained from the Pasteur Institute, and was administered in half-ounce doses at intervals of six hours for six days. The injections were followed by no trouble except at one spot, where a small abscess formed. The temperature at no time was very high, and it was a notable fact, in contrast with most experience with this remedy, that there was no appreciable effect except that the patient got gradually better from day to day. There was no reduction of the temperature; no apparent relaxation of the spasms followed the injections. Four weeks after entering the hospital he went out practically well. It is fair to state that he was treated with bromide and chloral. What the antitoxine had to do with the recovery he did not know, but in other acute cases in which he had used chloral and bromide alone all of the patients had died. It is important, he thought, to use the antitoxine as early as possible,—with the first rigidity of the abdominal muscles and before the development of lock-jaw.

ANEURISMAL TUMOR ABOVE AND TO INNER
SIDE OF KNEE; LIGATION; RECURRENCE;
EXCISION.

DR. RUSHMORE presented an aneurismal tumor with the following history: A man between sixty and sixty-five years of age had for two months preceding the middle of last January more or less pain in both knees. The pain got gradually worse in the left knee. Little by little a tumor formed at the inner side and just above the left knee, which caused attacks of agonizing pain at intervals of a few days, and finally laid him up. When Dr. Rushmore saw him, on January 17, he had a rather large, false, diffuse aneurism. It was growing so rapidly that it seemed unsafe to defer operation over night, and he tied the femoral artery about four inches above the aneurism with silk ligature. The wound healed kindly and there was no trouble for two or three months, when the patient began to have pain again, and another tumor developed, which was easily recognized as another aneurism at the point of the original operation. He cut down and found a false aneurism lying on top of the artery. He tied the artery with catgut above and below the aneurism which was excised, and found lying in the wound the black silk ligature which had been used in the original operation. It had cut its way through and left some contraction, but not occlusion, of the artery (as shown in the specimen). There was no doubt that the ligature had been the cause of the secondary aneurism. The artery above and below was very atheromatous, and he did not feel at all encouraged to think that the patient was permanently cured.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. The Mechanical Conditions attending the Absorption of Iodoform. By DR. W. HUBENER (Breslau). A study of the literature and the results of animal experimentation furnish the following conclusions:

(1) No essential difference in the toxic effects of finely powdered or coarse crystals of iodoform can be established by experimental research.

(2) Finely powdered iodoform is more quickly absorbed and diffused by the lymph-channels than the coarser form.

(3) Iodoform, when used in the peritoneal cavity, has a distinct tendency to produce an inflammatory process, resulting in an excessive formation of adhesions. Consequently its use under such conditions should be restricted, and the sterile gauze employed whenever feasible.

(4) The crystals of iodoform, to a large extent, become converted by the action of the tissues into minute vesicle-like granules.

(5) Prior to its ultimate breaking up into its chemical components iodoform undergoes a change into complicated iodine compounds, whose exact nature as yet remain unknown. It is not necessary that it should assume the form of a fatty solution before it can exert an influence on the tissues.—*Beiträge zur klinische Chirurgie*, Band XVIII, Heft I.

C. L. GIBSON (New York).

NECK.

I. A Case of Ligature of the Innominate Artery for Aneurism. By GEORGE W. GAY, M.D. (Boston). A woman,

thirty-nine years of age, who had been suffering for two years from the disabilities caused by an aneurism at the point of bifurcation of the innominate artery, was admitted to the Boston City Hospital October 19, 1896. To the right of the median line of the neck, just above the sterno-clavicular articulation, was a diffused pulsating tumor about an inch and a half in diameter. The pulsation was plainly seen as well as felt, and was much more violent than upon the opposite side of the neck. The pulsation in the carotid artery above the tumor and in the radials was normal to the finger. No difference could be detected between the arteries in the wrists, either in strength, fulness, or rhythm. No change could be felt in the coats of the superficial arteries.

The tumor was situated underneath the lower end of the right sterno-mastoid muscle, at the usual point of bifurcation of the innominate into the carotid and subclavian arteries. For her relief the following operation was done October 27, 1896. Under ether, a curved incision, commencing over the anterior border of the right sterno-mastoid muscle three inches above the clavicle, was carried downward and inward over the left sterno-clavicular articulation to a point three inches below the top of the sternum. This incision was joined by another three inches in length over the right clavicle. The triangular flap, composed of skin, superficial fascia, and platysma muscle was raised, exposing the double origin of the sterno-mastoid muscle. Both portions of this muscle were carefully divided upon a director close to the bones. The cellular tissue was dissected away, exposing the sterno-hyoid and sterno-thyroid muscles. The fibres of these two muscles were separated, not cut, and held aside with retractors. A medium-sized vein crossing them transversely was divided between two ligatures. This was the only vessel requiring ligation before reaching the innominate artery.

The right sterno-clavicular articulation, including about an inch of the clavicle and as much of the upper and outer part of the sternum, was removed readily and easily with bone- and gouge-

forceps. A direct and easy access to the innominate was thus obtained. The sheath of the artery was carefully divided between two small vessels plainly seen, thus avoiding any oozing at the bottom of the deep wound, which is always annoying besides consuming time. The innominate artery was easily separated from its sheath with the index-finger, which passed down to the arch of the aorta below, between the innominate vessels and the trachea and œsophagus behind, and between these vessels and the pleura to the outer side. The innominate artery was about two inches in length, and at its upper part was about an inch in diameter,—that is, nearly or quite double its usual size. It gradually increased in diameter from the arch of the aorta, its origin, to its termination. Nothing else abnormal was found in the exploration, and three ligatures of braided silk were applied in the following manner: the first was placed three-quarters of an inch above the aorta and slowly tightened. The second was applied half an inch higher up. The third was merely to reinforce the second, and was applied at the same place. The ligatures were all passed from within outward, although there was sufficient space to allow of their being carried in the opposite direction, if found to be more convenient. They were readily placed in position with a large aneurism-needle, tied in three square knots, and cut short.

The wound was closed with silk sutures, a few strands of silk at the angle serving as a drain for the first day or two, and a dry aseptic dressing applied. The right hand and arm were wrapped in cotton wadding, and the patient was removed to her bed. She was in good condition. Pulse 84 at left wrist; color good; respiration natural. The operation lasted about an hour and a half, but it was practically bloodless. Only one vessel was divided, and that was done because it was in the way. The innominate veins, the internal jugular vein, and the pneumogastric nerve were not seen during the operation.

The case pursued an uneventful course until the sixth day, when the operation wound was found to be suppurating. Under

treatment this degenerated into a sinus, without any disturbance of her convalescence, until the thirty-second day, when, after syringing out the sinus, blood began to flow from it in a moderate stream. This was easily controlled by a tampon of iodoform gauze. The right common carotid was then exposed and ligated. Renewed bleeding, however, occurred from the original sinus from time to time during the following days, with gradual failure of strength, until the eleventh day thereafter, being the forty-second since the original ligation, when a final severe hæmorrhage proved fatal. Autopsy revealed the aneurism sac converted into an abscess cavity.

Microscopic examinations of the tissues were made at various places, including the innominate. A section through a portion of the innominate included between the two ligatures showed the media of the artery folded upon itself and cut through at one point. The remains of the ligatures were found in the tissue. The ligature was infiltrated with pus-cells and with a few granulation-tissue cells. The artery appeared to be necrotic; it contained no cells, and only the remains of the elastic and muscular tissue could be made out in it. The wall of the artery contained very few pus-cells, an invasion having taken place at only a few points. In this section of the tissue there were numerous masses of micrococci. These were found principally in the wall of the artery at the point ligatured, and in the remains of the ligature. The section embraced the adventitia and the adjacent tissues. These were all infiltrated with pus-cells, bacteria, and hæmorrhage.

The author attributes the failure of the operation to sepsis due to imperfect sterilization of his ligatures.—*Boston Medical and Surgical Journal*, July 22, 1897.

ABDOMEN.

I. Treatment of General Suppurative Peritonitis. By J. M. T. FINNEY, M.D. (Baltimore). The author reports five

cases operated upon by the subjoined method, all of which recovered. He regards the methods usually employed as inadequate in that they do not remove the exudate with sufficient thoroughness, leaving the peritoneum but little better off than before operating. The steps of the procedure adopted with success by the author are as follows: Make a sufficiently long incision to admit of easy access to all parts of the peritoneal cavity. Quickly withdraw the coils of small intestine from the peritoneal cavity, beginning with the worst coils first. Remove all or as much as is necessary of the small intestine and place it outside the abdomen, covered with warm gauze or towels, thus practically disembowelling the patient for the time being. Then thoroughly and systematically wipe out the peritoneal cavity with large pledgets of gauze wrung out of hot salt solution, paying particular attention to the pelvic portion. In some cases it may be well in addition to flush out the cavity with warm salt solution, but this is rarely necessary.

Next the small intestine should be systematically examined loop by loop while still outside the abdomen, and rendered macroscopically clean by wiping with gauze compresses wrung out of hot salt solution. It is necessary to wipe with considerable force at times, in order to remove adherent flakes of partly organized lymph. It should be done thoroughly and conscientiously, however, as upon this depends, he believes, in great measure, the success of the operation. It facilitates the cleansing process, as well as lessens the shock of the operation, if the wiping of the intestinal coils is carried on under a constant irrigation of warm salt solution.

After being cleansed macroscopically of all foreign material, pus, fæces, lymph, etc., the intestine should be replaced in the abdomen,—the worst or sutured coil being the last, or most superficial, in order that it may be the better drained by being packed about with gauze, if necessary.

The abdominal wound is then tightly closed, leaving just

room enough between two sutures for the gauze drain. If there are any evidences of distention or pain the abdomen should have the Paquelin cauterly thoroughly applied, and the bowels moved early by calomel in broken doses, followed by salts and a turpentine enema.

It is not claimed for this method that it will cure every case of general suppurative peritonitis. He believes, however, that a larger percentage of cases will recover after this method than any other with which surgeons are familiar.

To insure success with any method it is essential that the operation should be performed within a few hours after the perforation has taken place.—*Johns Hopkins Hospital Bulletin*, July, 1897.

BONES,—JOINTS,—ORTHOPÆDIC.

I. Resection of the Wrist-Joint for Tubercular Disease.

By DR. O. WOLFF (Cologne). Bardenheuer removes the carpus *in toto*, avoiding the opening of the smaller joints and individual removal of bones. The operation thus performed is speedy and easy. Where the diseased conditions permit the trapezium is allowed to remain for the sake of securing mobility of the thumb. The special importance of the procedure lies in avoiding a dead space. The three metacarpal bones (two to four) are sectioned to form a wedge, whose apex is formed by the third metacarpal, the bones of the forearm are similarly treated, forming a V-shaped surface into which the metacarpal wedge is received. The wound cavity is thereby obliterated. An extensive bony apposition is secured and solidity insured by nailing the bones together, one nail being driven through the third metacarpal and radius, another through the fifth metacarpal and the ulna. The trapezium with the thumb nailed to the outside of the radius, the surface being previously refreshed. Tendons having undergone resection from implication in the tubercular process are easily reunited by suture. Eleven cases so treated bore evidence of the superiority of

this method of treatment over the usual method of packing the wound with iodoform gauze. A stiff bandage is applied and kept in place for five weeks. Ankylosis is the result, and is to be preferred, as experience has demonstrated that it is attended by fewer recurrences, greater power in the fingers, and impossibility of an undesirable flail-joint.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

II. Extensive Resections for Tuberculosis of the Foot.

By DR. O. WOLFF (Cologne). For more than two years Bardenheuer has successfully performed extensive resections where he formerly resorted to amputation, in cases where the disease not only affected the tarsus, but also the metatarsus and the peripheral portion of the bones of the leg. While the shortening, owing to the extent of the disease, is sometimes very considerable, the patient still preserves his leg and foot, and the gait is much better than after an amputation. Permanent healing without sinuses requires an absolutely thorough removal of all tubercular tissue. The incisions are made at every point in healthy tissue without preservation of diseased skin, tendons, muscles, and periosteum, and without regard to the extent of the bony defect. A dorsal transverse incision is always necessary for a clear view and easy performance of the operation. It necessitates obviously cutting the anterior tibial artery. Wounding of the posterior tibial artery is occasionally also unavoidable, in fifty-three resections for caries of the foot, wounding of both tibial arteries occurred five times, resulting three times in gangrene of the foot and secondary amputation. In one case, the toes and third and fourth metatarsals necrosed, but the rest of the foot was preserved and served as a useful stump. In another case, no bad results followed. The occurrence of gangrene entails no particular danger to the patient. It generally occurs in the dry form without constitutional symptoms, only once was the operation followed by moist gangrene when a speedy amputation effected

perfect healing. The good results of these conservative measures in extensive tuberculosis of the foot lead to the application of the same method in tuberculosis of other joints. For the last two years no primary amputation for joint tuberculosis was performed, and there were only nine secondary amputations out of 176 resections of the larger joints,—shoulder, elbow, hand, hip, knee, and feet.

The method cannot be held responsible for a single fatal result, and, on the other hand, numerous limbs which would otherwise have been sacrificed have been preserved by the conservative measure.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

C. L. GIBSON (New York).

REVIEWS OF BOOKS.

DEFORMITIES. A TREATISE ON ORTHOPÆDIC SURGERY. By A. H. TUBBY, M.S., (Lond.), F.R.C.S., Assistant Surgeon to and in Charge of the Orthopædic Department, Westminster Hospital; Surgeon to the National Orthopædic Hospital; Surgeon to Out-Patients Evelina Hospital for Sick Children. London: Macmillan & Co. Med. 8vo, pp. 598, Figs. 302, Pls. 15, 1896.

We owe our readers an apology for not having brought this excellent book under their notice before. Its publication is noteworthy from several points of view. The author is known as one of the most earnest and industrious of the younger surgeons in London. The book itself is "A Treatise on Orthopædic Surgery," written not by a specialist, but by a surgeon who has had excellent opportunities on far wider lines. The value of work on lines like these has been shown by the very valuable work on "Deformities of the Foot," brought out by Messrs. Walsham & Hughes, based on work done at St. Bartholomew's Hospital. Mr. Tubby, it will be seen, goes further and covers much more ground, his book dealing with most of the deformities of the trunk and limbs.

Throughout the book each subject, as it is taken, is fully and painstakingly reviewed, the arrangement is clear and comprehensive, the tone scientific, thoughtful, and temperate; the style lucid and scholarly,—no small attainment in this age of scrambled and hastily thrown off work in book-making as in everything else.

American surgeons will be pleased at the way in which the writings of Bradford and Lovett have been made use of and

acknowledged, and at the frequency with which that excellent periodical the *Transactions of the American Orthopædic Association* has been laid under contribution.

The value of the text is increased by the numerous reports of illustrative clinical cases, which are printed in smaller type.

In the matter of plates and figures Mr. Tubby is, as a rule, fortunate. Several, however, are practically useless from lack of letter press,—*e.g.*, Figs. 14 and 19,—showing Mr. Fisher's bed-frame and Mr. Dick's apparatus for spinal caries. And our readers will note with surprise and amusement that Mr. Tubby, though a trained and zealous worker on the broader lines of general surgery, has been unable to keep out of his pages the old and hitherto—in books written by orthopædic specialists—omnipresent illustrations of steel instruments with their laced shields and spring-plate apparatus, for lateral curvature.

There is an elaborate and comprehensive index both of authors quoted and subjects dealt with. Our space prevents our making more than one criticism. Why is the name of Ellis, of Gloucester, omitted? We are sure that in his next edition Mr. Tubby in his chapter on Flatfoot will give full credit to this authority for his views on the value of movement as opposed to pads.

The publishers deserve great credit for the way in which they have done their part. The type is large and clear, the paper smooth and good; the mechanical part of the book, taken altogether, affords a good example of the attainments of modern printing at the end of the nineteenth century.

W. H. A. JACOBSON.

THE MEDICAL ANNUAL. Bristol: John Wright & Co., 1897.

This useful publication has now reached its fifteenth year of publication. The plates which illustrate it are especially worthy of praise: they are models of life-like accuracy and clearness of definition.

There is no surgical article which this year stands out among its fellows as did the article on orthopædics last year, by Mr. R. Jones, of Liverpool, and Dr. J. Ridlon, of Chicago, one of the very best articles on talipes ever written, and one which, alone, makes the *Medical Annual* of 1896 worth having. One of the most instructive of the papers on surgical subjects this year is that by Mr. G. Harry Fenwick on Diseases of the Kidney, and more particularly the section dealing with renal calculi, the illustrations to which are admirable. Some of Mr. Fenwick's conclusions as to the site of renal calculus are worth quotation. "(1) Broadly speaking, there are two great groups of simple renal stones. In each class characteristic pain may be felt. In the true cortical the pain is fixed and continuous. It is liable to exacerbation upon movement, but not so much upon diet. It is relieved by rest. The patients usually are forced to sleep upon the stone-affected kidney. Those occupying the renal pelvis and obstructing the orifice of the ureter evolve classical symptoms of radiating pain and renal colics. Unluckily, our cases are not all so simple. There are many cases which do not fall into these two groups. On analyzing their symptoms and the positions in which the calculi are found, I submit that their characters partake partly of both primary classes,—the pelvic and the cortical; and that, apparently, they approach in similarity one or other of the two primary classes in proportion as they are situated nearer to the pelvis or nearer to the cortex. Thus in some patients the urine remains clear and normal for years, but the pain radiates into the testes; in others with healthy urine colics are suffered from, and suprapubic pain is complained of. In others, frequency of micturition and marked variation in the amount of urine daily secreted is noticed. The clue to these varying and mixed conditions lies, I believe, in the small hollow in the parenchyma which contains the stone having some fine channel of communication with the pelvis, or in the fact that the stone in the cortex presses directly on the lower opening of the pelvis."

The ingenious hypotheses of this writer are well known to his readers. Here is another with which this instructive article closes. "In some of the patients in whom I could not find any stone, and yet who were much relieved by the operation, possibly the manipulation of the cortex had enveloped the stone in a blood-clot, and so glued up the stone in its hollow."

The article on Scoliosis, by Dr. Otto E. T. Kiliani, of New York, is an interesting instance of the rapidity with which our go-ahead brethren on the other side of the Atlantic seize upon any recent mechanical improvement, any fashionable exercise, and modify it so as to play a useful part in practice. Bicycle exercise constitutes such a perfect combination of active and passive motion by means of an exactly constructed machine that it suggested itself to me to make use of it in the treatment of scoliosis. The oft-repeated accusation that the bicycle tends to develop forward curvature of the spine (kyphosis) was, of course, of no weight, and if so, it would rather have induced me to make use of this quality." In order to adapt the bicycle for the treatment of scoliosis, Dr. Kiliani has made use of a handle-bar, either half of which can be lowered to any degree desired, and held fast in this position. He further modifies the position of the patient by adding an inclined seat to the modified handle-bar. Some excellent photographs show that by these means it is possible to secure the position which we try to produce in a case of common habitual scoliosis with dorsal convexity to the right. First, a left convex dorsal and a right lumbar scoliosis of noticeable degree. Secondly, a decided twisting of the thorax, so to speak, round its longitudinal axis in an ascending spiral from left to right, the right shoulder being lowered, while the median edge of the left scapula stands out, and the curve of the ribs on the right side is flattened.

Dr. Kiliani's concluding remarks are worth remembering, on the advantage of this treatment. "First, a good many of the patients to be treated are in possession of a bicycle. Even for

those who do not own one, the expense is relatively slight in comparison with that of other orthopædic apparatuses. Secondly, it affords a physical exercise to which the patients will take kindly, and which they will carry out faithfully. This is a decided point of advantage, as the execution of gymnastic exercises always demands an unusual amount of patience and perseverance on the part of both patient and physician."

W. H. A. JACOBSON.

DISEASES OF THE EAR, NOSE AND THROAT, AND THEIR ACCESSORY CAVITIES. A Condensed Text-Book. By SETH SCOTT BISHOP, M.D., LL.D. Philadelphia, New York, Chicago: The F. A. Davis Company, 1897.

The authors of works treating of the diseases of the organs of the special senses, are wont to delight, as a rule, in the production of intricate expositions, whose very diction must be closely studied before one can hope to reach the truth sought. This work shows literary characteristics diametrically opposed to this rule. The style is clear. All ideas and methods are presented concisely. Opinions are given with impressive force. Pathologic and clinical studies are detailed but not elaborated. The illustrations have been prepared or selected with great care and are exceptionally instructive. The majority of them are new, and, of these, very many are taken from photographs or drawings of the author's cases, specimens, or apparatus. The lines on "Diagnosis and Treatment" convince you that the author is gifted with rare common sense and good judgment. The chapters on "Mastoid Operations" and "Diphtheria" are especially attractive, although we do not value them more highly than many other sections of the work.

To indicate the cardinal and, perhaps, the only grave fault in the book, mention must be made of the frequent exposure of nude egotism quite shocking to conventional professional modesty. Yet, when we consider that this oft-recurring blemish

does not furnish any significant detracting from the agreeable impression made by the work, we are more positive than ever of the remarkable value of the volume.

CHARLES H. GOODRICH.

THE EYE AS AN AID IN GENERAL DIAGNOSIS. A Hand-Book for the Use of Students and General Practitioners. By E. H. LINNELL, M.D. Philadelphia: The Edward & Docker Co., 1897.

Those of us, who are wont to make comparative studies of our professional friends, will doubtless agree that he is the most accurate in diagnoses who searches most thoroughly for symptoms, and is most observant of significant details in examinations. Frequent errors in diagnosis are made because of habitual reliance upon "glittering generalities." Many ocular changes are so regularly associated with various organic and functional diseases of other organs that in noting them is great help, and no one should slight them.

This book is as a tow-line for the general practitioner when his craft is "scraping bottom" in the region of the eye, a tow-line thrown out by the specialist, who thus hopes to prevent his generalist friends from running aground. The plan of the work is excellent. A chapter, or a fraction thereof, is devoted to each anatomic division of the eye (the eyelids, the conjunctiva, the cornea, *et cætera*), and various changes which occur in them in different diseases are detailed. Next the associations of alterations in the visual fields are defined. Then the author endeavors to fix the foregoing by reversing his system, giving a tabulated list of *diseases*, and under each its characteristic ocular changes. These thirteen concise pages contain much information. "Reflex ocular neuroses" and "ocular affections of toxic origin" are given careful presentations.

Throughout the treatise the language is simple, direct, effective. There is a conspicuous absence of involved sentences. The illustrations are few but good.

The size of the volume is ideal as compared with the bulky masses of medical literature now in style. The binding is neat and strong. The paper is of the best quality. The press-work is elegant.

CHARLES H. GOODRICH.

EYE-STRAIN IN HEALTH AND DISEASE, with Special Reference to the Amelioration or Cure of Chronic Nervous Derangements without the Aid of Drugs. By AMBROSE A. RANNEY. Philadelphia, New York, Chicago: The F. A. Davis Company, 1897.

Being a group of revised and elaborated monographs, written originally for current medical journals and dealing with subjects more interesting to ophthalmologists and neurologists than to the remainder of physicians, the average book-hunter from the ranks of the profession might pass this volume with a mere glance. However, it deserves the careful attention of every general practitioner.

Each chapter is an exhaustive study, generally of symptomatic-pathologic relations too infrequently considered by the family physician. Eye-strain is discussed in its relations to headache, chorea, insomnia, epilepsy, nervous prostration, and insanity, and to chronic gastric disturbances. Methods of testing vision and operation upon the ocular muscles are presented, and the etiological relations of eye-strain with many special eye lesions are defined. The author frequently substantiates his belief and statements by brief clinical reports.

CHARLES H. GOODRICH.

CORRESPONDENCE.

CYSTS OF THE MESENTERY.

AFTER reading the interesting article of Berkeley G. A. Moynihan on "Mesenteric Cysts," which appeared in the *ANNALS OF SURGERY*, Vol. XXVI, No. 1, I am induced to report the following case, which came under my observation (in conjunction with Dr. G. P. Rossman, of the hospital staff), as bearing upon the same subject.

Mrs. R. was sent into the South Side Hospital from one of the adjoining towns, about midnight on April 30, 1897. A note accompanied the patient, stating that she was suffering from a strangulated hernia of three days' duration.

When the patient arrived, although suffering somewhat, her symptoms were not as urgent as those one would expect to find in a case of strangulated hernia of three days' duration.

The following is a brief history: Aged fifty-five years, mother of grown-up children. For several years noticed a small lump in the left groin, which gave her no trouble, but during this time she was annoyed with what she denominated "dyspeptic troubles." Three days ago, during a fit of coughing, the tumor suddenly enlarged. Since then she has had no appetite, her abdomen has enlarged somewhat, she suffers from nausea, but has not vomited, and has had daily evacuations from the bowels. There is no temperature.

On examination, a tumor as large as a medium-sized orange was found at the location of a left femoral hernia. Taxis was not practised, as it was presumed that sufficient efforts in that direction had been made before the patient was sent in.

The patient was placed under ether and prepared for operation. On palpation a diagnosis of omental hernia was made. Before operating a brief attempt was made to reduce the tumor by taxis, but without success. On opening the sac it was found free from bowel, containing only the globular mass which we believed to be omentum. The neck of the sac was incised and the finger introduced, to be assured that everything was clear, when the pedicle of the tumor, which was as thick as one's finger, was doubly ligated and cut across. The canal was closed with a buried chromic catgut suture, and the superficial wound with silkworm gut. The patient made a good recovery.

After the operation the mass, which was almost identical in size and shape with Fig. 1 in the article above mentioned, was incised, and found to be a cyst with epithelial lining and contained a small amount of serum.

J. D. THOMAS, M.D.

PITTSBURG, PA.

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ANNALS OF SURGERY,

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SARCOMA OF THE KIDNEY IN CHILDREN: A
CRITICAL REVIEW OF THE PATHOLOGY,
SYMPTOMATOLOGY, PROGNOSIS, AND OPER-
ATIVE TREATMENT AS SEEN IN ONE HUN-
DRED AND FORTY-FIVE CASES.

By GEORGE WALKER, M.D.,

OF BALTIMORE,

ASSISTANT RESIDENT SURGEON IN THE JOHNS HOPKINS HOSPITAL.

THE object of this paper is to report three cases of sarcoma of the kidney occurring in the Johns Hopkins Hospital during the services of Drs. Halsted and Finney, and to make a partial review of the symptomatology, prognosis, and operative treatment of like cases found in the literature.

CASE I.—Minnie H., admitted January 18, 1893; aged six years; family history was good; no tuberculosis, cancer, nor tumors, so far as known. Patient was very well and robust until March, 1892, when she had an attack of pneumonia lasting seven weeks; her recovery was very slow; she never entirely regained her former weight, color, nor strength, and suffered a great deal from headache, but was playful and bright. In November, 1892, she began to complain of a pain in the left hip, which was of sudden onset, and was exaggerated on leaning to that side. She lost her appetite, became languid, fretful, and dull; this condition lasted one week, after which she improved. In three weeks her mother discovered a mass in the lower left side of the abdomen; from this time until date of admission there was slight loss of weight, but otherwise no disturbance of health. No blood had been noticed at any time in the urine.

On admission the patient was not noticeably emaciated nor anæmic, though she looked rather frail. The abdomen was large,

unsymmetrical, and very prominent in the hypogastric, umbilical, and inguinal regions. The whole of the left side was larger and fuller than the right, and did not show any respiratory movement. One prominence was noticed just below and to the left of the umbilicus; a second, less prominent, three inches below the costal margin in left nipple line; a third in the left flank just at tip of the eleventh rib.

On palpation, the epigastrium was soft, the right side was not resistant; the greater portion of the abdomen was occupied by a solid growth which completely filled the left side, and extended on the right fully two inches beyond the median line; behind it filled up the whole flank, and was in close proximity to the ribs. It was extremely firm, not freely movable, irregular in outline from definite and distinct projections, and slightly sensitive on bimanual palpation. The colon could be made out above it; and between the ensiform and umbilicus there was a soft, movable mass which suggested the curled omentum.

On percussion the abdomen was dull over the outline noted above, and flat over the most prominent portions. Heart and lungs clear. No increase in liver nor splenic dulness, nor palpable enlargement of either. Right kidney was not palpable. External genitals and rectum negative. No lymphatic enlargement.

Urinalysis.—Urine acid, specific gravity 1026; lemon-yellow color; flocculent sediment; normal odor; distinct trace of albumen; no sugar.

Microscopic Examination.—Red and white blood-corpuscles in moderate number; epithelial cells and amorphous phosphates; no casts.

Operation.—An operation was decided upon, and performed by Dr. Halsted, January 31, 1893. Under ether an incision was made in the median line extending from ensiform to very near pubis. A very irregularly nodular, pear-shaped mass appeared in the wound, over the surface of which ran a number of large and tortuous veins giving it a rather formidable appearance. Laterally and posteriorly it was adherent to the abdominal wall, and anteriorly to the overlying colon.

The veins were ligated, and the mass was enucleated by hand sufficiently to expose and ligate the pedicle, which was done *en masse* with heavy silk. The hæmorrhage throughout was slight,

probably not more than two ounces of blood being lost. The abdominal wall was closed by interrupted silk sutures, and the skin by subcutaneous silver wire. Condition at close of the operation was fairly good; pulse 140, regular, and of moderate volume and tension. The patient reacted quickly and without difficulty. The recovery was rapid and uneventful. She gained flesh and strength very rapidly, so that in two months she looked perfectly well. This condition lasted for a short time; then she began to decline, and died with a distinct recurrence in the abdomen at the end of four months. No autopsy was permitted. The pathological report of this case has unfortunately been lost.

CASE II.—Sydney C., aged four years; no family history of malignant growths. Had always been a strong and healthy child until present illness. Never had diphtheria, scarlet fever, measles, or mumps. Walked and talked at fifteen months.

Three months before admission, without apparent cause, the urine had for a period of three days contained a moderate amount of blood; the condition was unaccompanied with pain or other symptoms. It remained normal in quantity and character until ten weeks later, after which it was slightly turbid and micturition was increased in frequency.

One month after the hæmaturia a tumor, about the size of a man's fist, was discovered in the left lumbar region. It gradually grew, gave no pain nor discomfort, and was thought to be an enlarged spleen. The child vomited occasionally, and had some headache at intervals during the next two months, which later became more frequent and severe. No dyspnœa, œdema, constipation, diarrhœa, nor bladder symptoms noted. The appetite had been rather poor and variable, the weight and strength had noticeably failed, and the child had assumed a pale and sick appearance.

Examination.—Child was pale, sallow, and poorly nourished, though not decidedly emaciated; conjunctiva had a slightly bluish appearance; pupils slightly dilated; tongue clean and moist. Lungs: A few moist râles were heard over the backs of both lungs; otherwise they were normal. Heart: Distinct systolic murmur at apex; no enlargement perceptible.

The abdomen was very much distended by a tumor-mass which occupied mainly the left side; beginning in the lumbar region and under costal margin, and extending on the right side

as far as the nipple line, filling the epigastrium and part of the umbilical region; below it passed well down into the inguinal region, and to within four centimetres of the pubis. Its surface was smooth and rounded, with some tendency to lobulation; it had an elastic feel, and in the lower portion was decidedly fluctuating. It was firmly fixed, and uninfluenced by respiration, and on manipulation was not painful.

On percussion in front, it was flat over the most prominent portion, and in the lumbar region well back to spine. Colon tympany over the upper portion was indistinct. Splenic dulness could not be differentiated from that of the mass. Liver dulness was not increased, and between this and the tumor there was a tympanitic zone about four centimetres in breadth.

The body measured around nipple fifty-six centimetres; around most prominent portion, sixty-five and a half centimetres; ten centimetres below ensiform, sixty-six and a half centimetres; around umbilicus, sixty-two and a half centimetres; around pubis, forty-eight centimetres. The increase over the depression was due to the lateral swelling in the inguinal region. An examination of blood showed a diminution in the red blood-cells and hæmoglobin, otherwise negative.

Urinalysis.—Urine of pale-yellow color; specific gravity 1012; moderate quantity of white flocculent sediment; normal odor; neutral reaction; no blood nor sugar; trace of albumen.

Microscopically.—Urates, uric acid, calcium and magnesium phosphates, few leucocytes, no red corpuscles, nor casts.

Operation under ether, by Dr. Halsted, December 13, 1895. An incision was made in the left semilunar line, and a second at right angles extending into the lumbar region. The mass came prominently forward; and the incised abdominal wall retracted very markedly, owing to its great tension. The surface of the tumor was fairly smooth with regular outline; numerous very large veins, which appeared almost like sinuses, passed over the upper and outer portion. The stomach was in front of, and adherent to, the upper portion of the mass; the descending colon extended along and was adherent to the inner border; the small intestines to the lower portion, and the parietal peritoneum over an area the size of one's hand. The capsule was extremely vascular, and at places had become eroded by the tumor beneath.

On account of its size, adhesions, and extreme vascularity,

a removal of the tumor was impossible. Even the necessary manipulation produced a decided shock; the pulse became very weak, rapid, and intermittent; the extremities cold, and the body bathed in a clammy sweat.

The abdomen was closed with great difficulty on account of the bulging of the tumor. The patient failed to rally, and died eight hours after the operation.

Autopsy Ten Hours after Death.—Body not very strongly built, but fairly well nourished. On the left side was a wound twenty-seven centimetres in length, which extended from near the spine, along the costal margin, to the median line; from this a second passed off at right angles, and extended downward along the mammary line for a distance of six centimetres. There was no evidence of granulations at any place. Peritoneal cavity contained a small amount of bloody serum. The visceral and parietal peritoneum around the wound was deeply injected, and studded here and there with hæmorrhagic areas, and covered with a thick fibrinous exudate. The greater portion of the abdominal cavity was occupied by a tumor-mass, springing from the left kidney.

Lungs: Outer surface showed numerous areas of atelectasis; on section both were normal. Liver, heart, spleen, stomach, bladder, and right ureter were normal. Right kidney: Capsule stripped off very readily, leaving a smooth surface which in general was pale. On section the pallor of the organ was still apparent, and had a distinctly yellowish tinge; cortex normal in amount, the markings scarcely visible; glomeruli just visible, and very pale; the pyramids somewhat redder than the cortical portion; pelvis appeared normal. At one point in cortex there was a small, white nodule which was probably a metastasis. The small intestines were somewhat congested; solitary follicles were prominent and swollen. The left kidney was not to be demonstrated; its place was taken by a tumor-mass which occupied the whole of left side of abdomen, and part of right. It was adherent to the diaphragm above and externally, and closely to the peritoneum in front. The colon passed over the lower border, and was slightly adherent. General shape of mass was irregularly ovoidal, with some tendency to lobulation; the surface was smooth; color varied, over some areas it was a distinctly yellowish-white hue, over others, pale red, the latter apparently due to dilated superficial blood-vessels. It was about the size of a

man's head, and weighed 2680 grammes. In places it had a distinct capsule, made up of a thin connective tissue which stripped off readily, and varied in thickness from that of letter-paper up to four centimetres. This was traversed by numerous blood-vessels, some of which were large enough to admit the tip of little finger. On slitting up the ureter, the pelvis of the kidney was still to be made out, it was very pale and showed many dilated blood-vessels. In several places the mass had grown into it, forming a distinct globular projection. The consistency of the tumor varied greatly; in some places being quite firm, while in others it had a cystic feel.

On section it presented an heterogeneous appearance; as a whole it was solid, but the cut surface revealed a number of cysts varying in diameter from two millimetres to several centimetres. The walls of these were lined with a brownish-yellow material which could be scraped off. The appearance of the tumor-mass, between the cysts, varied very much; the yellowish white alternated with an hæmorrhagic appearance, of varying degrees of intensity. The best preserved portions, presumably representing the original type, were homogeneous; translucent in appearance, and slightly bulging.

The other appearances were probably due to retrograde changes which had occurred in the hæmorrhagic areas of tumor. The mesenteric glands were large, of a uniform color, and on section presented the same appearance as the original tumor.

Microscopic Section.—The soft portion was made up of a loose cellular material, in which there was interspersed a fine fibrous stroma and a large number of dilated blood-vessels. The stroma consisted of bands of yellowish-white connective tissue, which varied in density and cellular consistency from a dense sclerotic and pink-staining to a very loose structure. From these bands numerous very fine fibrillæ extended into the cellular portions, and lay between the individual cells. The cells were either of a round or spindle type, of different sizes. The round cells varied from the small cell with a deeply staining nucleus, like a lymphocyte, to a much larger one with a medium-sized, round, vesicular nucleus, and a relatively small amount of protoplasm; it being in some only a faint rim. The spindle cells presented different shapes, from those like an oat to a very long, narrow spindle; the nuclei were ovoidal and vesicular, some of the former

very deeply stained, while the latter were much lighter. Occasionally one saw both round and spindle cells in which the nuclei, owing to fragmentation, which had occurred, were replaced by poorly staining granules. The protoplasm in the last named was indistinct and coarsely granular; in the remainder it was rather large in amount and clearly staining. Scattered here and there were aggregations of small, round cells with very deeply stained nuclei, arranged around blood-vessels. Some of these presented a partially necrotic centre in which the cells had larger nuclei, less distinctly stained, and some definitely fragmented. Interspersed in these cell-aggregations were also seen small, round, highly refractive bodies which presented only an indistinct outline.

In certain areas the blood-vessels were very numerous and dilated, and so connected with each other that they presented a picture not unlike a cavernous angioma. Most of them had a distinct endothelial lining, outside of which there was a thin fibrous rim; in others this was absent, the wall being made up entirely of tumor tissue. The cells of the tumor were distinctly arranged around the blood-vessels, but nowhere could there be seen a proliferation of the endothelial lining. A few polymorpho-nuclear leucocytes were scattered in the cellular portion with no special aggregation.

The soft red portion of the tumor was made up of a partly organized blood-clot, showing fine threads of fibrin, and red and white corpuscles of various shapes, and different degrees of degeneration. In the firmer portion remains of the kidney tubules could be seen, which had become very much distorted and compressed; some of them were entirely filled with atrophied epithelial cells; others partially so; but in none was there any evidence of an epithelial proliferation. The capsule varied in thickness from a half millimetre to a centimetre, and was made up of a fibrillar and granular pink-staining tissue, the inner rim of which was very cellular; from the capsule septa extended into the tumor.

CASE III.—Mary S.; admitted July 10, 1896; aged thirteen years; Polish; family history rather indefinite. One brother died in childhood from a tumor which was clinically diagnosed sarcoma of the kidney. Up to within the previous two years she had been well and strong; gave no history of the exanthemata. At that time she began to fail in health, but was

unable to give any definite information as to the nature of her malady until eighteen months had elapsed, when she began to suffer with a moderately severe, and more or less continual, pain in the left side. One month after the onset of pain a tumor-mass was found in left lumbar region, size not stated; from this time on the pain was felt at intervals and described as a sensation like the pricking of needles; walking or lying on the back increased its severity very decidedly. General health soon began to fail, appetite became very poor, and cold sweats were present at night. There had been no vomiting, disturbance of the bowels, œdema, nor dyspnoea. No blood had ever been noticed in the urine, nor change of any kind until shortly before admission, when the flow had been diminished.

Examination.—Child was fairly well nourished and well developed; rather anæmic; complexion sallow, though the color of lips and mucous membranes was good; tongue moist and slightly coated; pulse 104, regular, of good volume and tension. No pigmentation nor jaundice of skin was present. Thorax was symmetrical, except its lower half, which was slightly pressed forward.

The abdomen was markedly distended by an irregular mass, which was most prominent in the right hypochondrium. On palpation this mass was firm, rounded, slightly irregular in outline, and occupied the whole right side of abdomen; to the left side it reached to near mammary line; below, on right side, to Poupart's ligament and crest of ilium; above, to near tip of ensiform; and on the outer side, it extended over the region between the last rib and crest of ilium; in which region it could readily be taken between the hands, but did not form a distinct protrusion. It was very tense, elastic, and throughout the upper portion distinctly fluctuating; in the lower left quadrant it was rather softer than elsewhere. In some areas it was slightly tender, but for the most part was insensitive.

On percussion, dulness was marked over the most prominent portion of the mass, and was quite continuous with that of the liver. A zone of tympany, of a finger's breadth, could be made out between the upper border and the ensiform cartilage, but no definite colon resonance could be obtained. Splenic and hepatic dulness were not increased. Heart and lungs were clear.

Examination of the blood showed 3,640,000 red and 4000 white corpuscles.

Urinalysis.—Urine of pale-straw color; neutral reaction; specific gravity 1018; no albumen, no sugar, no diazo. Microscopically, no red blood-cells, no casts, very few leucocytes.

Operation July 18, 1896, by Dr. Finney. Under ether an incision was made in the right side, extending from the median line transversely backward to within six centimetres of the spine. It was found necessary to open the peritoneum about eight centimetres. The tumor came prominently forward, and entirely filled up the wound; the surface was somewhat roughened, dark gray in color, and slightly nodular. The intestines were adherent to the lower border; and the antero-lateral parietal peritoneum was adherent over a rather large area. The colon passed over the upper half of the tumor, to which its mesentery was loosely attached. The superficial vessels were large, and bled to some extent at first, but not sufficient to cause any alarm; they were ligated, and the mass enucleated by hand and dissection. The vessels of the pedicle were ligated separately; the remainder of the tumor was separated and the whole removed. Hæmorrhage was very slight; certainly not more than two ounces of blood were lost, and that mainly at the beginning. Time of operation, one hour and thirty minutes, it being prolonged on account of the adhesions. The wound, though perfectly dry at the end of the operation, was loosely packed with gauze; peritoneum closed with silk; abdominal wall approximated with buried mattress silver-wire sutures, and skin with subcutaneous continuous silver wire, except at exit of gauze. The pulse towards end became rapid and weak; enemata of salt solution and stimulants were administered, which somewhat improved the condition, so that she was able to react, and entirely recover consciousness. Later she began to sink, and died twelve hours after the operation.

Autopsy.—Autopsy twelve hours after death. Rigor mortis well marked. Body moderately well nourished; some discoloration of the dependent portions. On right side there was a closed incision, which extended from within six centimetres of spine to very near median line; this formed the opening of a rather large cavity, the walls of which presented the appearance of a freshly made wound, showing no attempt at granulation. The bottom of this cavity contained about fifteen centimetres of blood-stained serum. Peritoneum for some distance around was congested, and showed many small ecchymotic patches, probably due to

operative interference; otherwise it presented no evidence of inflammation. Stomach and intestines were rather pale, but otherwise normal. Mesenteric glands were large, and on section appeared macroscopically to be invaded. Bladder and left ureter were normal. Left kidney was enlarged and firm; capsules stripped off very readily, leaving a moderately smooth surface. On section the organ was pale, cortical markings, moderately distinct; Malpighian bodies were visible but pale; pyramids somewhat pale; pelvis was normal: no evidence of metastases. Heart and lungs were normal. Other than the lymphatics of the mesentery, there were no metastases to be made out.

The right kidney was absent, and its place occupied by an irregular cavity, from which a growth had been removed at operation. The mass weighed 3030 grammes; measured $24 \times 19\frac{1}{2} \times 11\frac{1}{2}$ centimetres in thickness. Its shape was irregularly ovoidal, and slightly renal. The surface was gray red, and moderately smooth; somewhat lobulated in lower half. It had a distinct capsule like that of the kidney, adherent to which there was a second thicker one, carrying numerous large veins; this could be readily stripped off in most places, but in others it tore into the substance of the tumor. Wherever the capsule was injured a dark-brown, thick, granular material exuded. The pelvis was partly surrounded by a smooth outgrowth seven centimetres in thickness. The consistence was generally soft, except around the pelvis, where it showed a moderate degree of firmness. On section, the gross markings of the kidney were faintly preserved. The firmest portion was about the pelvis, where the tissue was gray, semitranslucent, and striated, interspersed throughout which there was a soft, yellow, gelatinous material which was probably a mucoïd change in the connective tissue. As one passed from the pelvis towards the periphery the tissue was softer and more faintly striated; the striae in places taking the direction of the tubules of the pyramids. Scattered here and there were large and small, irregularly shaped areas of a soft reddish-gray material, which appeared to be a mixture of degenerate and partly organized blood-clots. In the cortex the light and dark areas were larger and more numerous; also one saw scattered quite closely in this white tissue yellow masses similar to coagulation necrosis. All of the areas of softening were associated with hæmorrhage. The ureter was four millimetres in diameter,

and patent throughout. The mesenteric glands varied in thickness from eight millimetres to two centimetres; their capsules were normal; consistence soft, and on section they were quite hæmorrhagic, with yellow and finely granular areas, which were probably metastases.

Microscopic Examination.—On section the substance of tumor, which was very cellular, was separated by bands of fibrous tissue, giving it an alveolated appearance; these bands varied in thickness from three-tenths millimetre to a fine fibrillar reticulum, separating the cells. The larger bands of the stroma contained numerous blood-vessels and spindle cells, the latter being similar to those seen in the tumor meshes. The cellular portion was made up of both round and spindle cells, the former predominating. The round cells were of different sizes; the smaller had a rather large, round, deeply staining nucleus, and a relatively small amount of clear protoplasm. In the larger, the nuclei were proportionately smaller, not so deeply staining, and some were distinctly vesicular; the protoplasm of these was larger in amount, and in many was indistinct and granular; in a few it was very clear and well stained. A few of the spindle cells were short and thick, others long and finely pointed; their nuclei oval, large, and generally rather poorly stained; some were slightly granular as if fragmentation was about to occur in most of them; the protoplasm was moderately clear and well stained; in others it was distinct but coarsely granular. The different types of cells were mixed in about the same proportion throughout the cellular area. Small masses were seen scattered at different places, where a partial necrosis had occurred; the nuclei having failed to take the stain and the cells being surrounded by a pink staining material which formed a kind of capsule; in some places this hyaline degeneration was seen in discrete masses. The capsule was thick, and made up of dense connective tissue containing large oval and round cells, some of which were largely fragmented. At several points it had been infiltrated and nearly eroded by the underlying tumor. Several of the blood-vessels showed a decided endothelial proliferation, with a distinct aggregation of cells, on the outside not unlike endothelium. This occurred in but a few of the vessels, which were scattered at wide intervals in the tumor: it offers, however, a very suggestive origin of the new growth.

Character of Tumors.—From a study of these tumors, it would seem that they were pure sarcomata, being thus distinguished from the mixed and glandular types, which are present in a large number of cases, and serve to obscure their nature. The last case was interesting on account of its showing an endothelial proliferation, and suggesting the probability that it, with quite a number of others, might have originated in the endothelium of the blood-vessels. The possibility of such an origin was first suggested by Perivewseff. The result in the first case was not other than might have been expected, since the mesenteric glands were found invaded at the time of operation; it was favorable, however, in that the child recovered, and lived four months. The cause of death in the other two must be ascribed to that indefinite and non-expressive word shock, which will be discussed more fully later on.

To get a clearer understanding of the nature of these tumors, and their operative treatment, I have collected from medical literature 142 cases; from a careful analysis of which, in conjunction with the three foregoing, I have gleaned the following facts:

These cases have been reported in various journals throughout the past century; the first case described with any definiteness being recorded by Gardner in 1828. They appeared under a very diverse nomenclature,—cancer of the kidney, malignant tumors, fungus hæmatodes, medullary, encephaloid, and cerebriform cancer; the last two comprising the large majority. In all of these the name cancer or carcinoma is used; sarcoma is not spoken of until within the last few years. Péan (1880) in “*Diagnosis et Traitement des Tumeurs de l’Abdomen et du Bassin*” does not mention sarcoma. Robert D. d’Espine and C. Picot (1884) make no distinction between carcinoma and sarcoma. Rindfleisch (1883) says that in the kidney true carcinoma is only found. Rokitansky mentions carcinoma as forming the greater portion of kidney tumors. West (1884, “*Diseases of Children*”) makes no distinction between carcinoma and sarcoma. Cat-

tanni (1870, in "Frammenti Clinici Anatomici dei Rein") was first to recognize sarcoma in the kidney, soon after which it was observed by Tellegen, and in 1876, by Lancereaux. These observations did not receive much notice until 1884, when A. Jacobi, in a very able article, reviewed the literature upon this subject, and showed conclusively that the majority were sarcomatous. Their mixed nature was first observed by Eberth, who recognized striped muscle tissue in the tumor, and also in the metastasis. Very soon afterwards Cohnheim had a case of a similar growth, from the study of which he arrived at his hypothesis of the embryonic nature of tumors.

Etiology.—Various causes of the growth are given in this collection of cases, some being entirely irrelevant; the most common were trauma, heredity, irritation by calculi, diseased conditions brought about by the various infectious maladies, especially the exanthemata; and, lastly, Cohnheim's theory of misplaced embryonic tissue. Out of the 142 cases, trauma of some kind is noted in thirty; consisting principally of falls, kicks, strokes in the side, jumping, fright; and even violent vomiting is made responsible in three cases. In Manzolini's case, the boy received in the side a kick from a horse; hæmaturia immediately followed, and lasted fourteen days; some time later a malignant tumor appeared. Rindfleisch endeavored to explain the traumatic origin of these tumors by an injury done to the regulating nerve-fibres, thus permitting their abnormal growth. If an explanation is necessary, that of Weigert's, which will be mentioned in discussing the exanthemata, is a more plausible theory. On account of the protected position of the kidney it is very improbable that it would be injured by anything short of extreme violence. The symptoms, too, of the malignant growths were, in most cases, so far removed from the accidents that probably no real connection could exist between them.

Heredity.—In only eight cases could any malignant history be obtained, and those were rather vague. Strümpell cites a case where two brothers were affected, and thinks this

points to some hereditary influence. In one of my cases a brother was supposed to be similarly affected.

Irritation.—In none of this series has any stone preceded the growth, but in a case of Dickinson's, in an adult, a distinct history of a renal calculus, and passage of the same, preceded the growth by one year. In one of them a wandering kidney was observed some months before the development of the sarcoma; the irritation produced by this condition was supposed to account for the origin of the sarcoma. Cohnheim's theory, which supposes that in the development of the kidney embryonic cells from the surrounding structures are incorporated in its capsule, and that they subsequently give rise to a new growth, was not, at first, generally accepted; but now has a stronger hold. This is strongly borne out by a number of cases (Wentworth, Osler, Gardner, Jacobi, Kocher, Little, Monti, Williams) which presented tumors at birth; and by those of Geddings and Landsberger in seven-months fœtuses; also by the fact of most of the others developing within the first few years of life. In the development of the kidney it is probable that if Cohnheim's theory is correct, the inclusion of misplaced tissue occurs in the following manner:

The Wolffian body, which subsequently gives rise to the metanephros or true kidney, is developed from that portion of the nephrotome which is adjacent to the myotome. It can thus be readily imagined that since the capsule of the kidney develops first, and in such close proximity to the myotome, some of the mesothelial cells may become incorporated, and subsequently give rise to striped muscle tissue. The other connective tissue elements may also be caught in like manner. As proof of this, the cartilage and muscle found in the growths, as will be shown by the cases of Marchand, Eberth, Ribbert, Osler, and Hoisholt, corresponded to that of the embryo. This theory only partially explains the case, inasmuch as it offers no reason for the subsequent development.

Infectious Diseases.—In five cases the malignant tumor was preceded by the exanthemata; in one, the child had

scarlet fever, followed by albuminuria for four months; then the tumor developed. It is difficult to say, in view of the fact of the commonness of infectious diseases in children, whether or not they play any important rôle as a cause of the growth. It is possible, however, that, occurring in a kidney containing foreign tissue, the latter may be stimulated to proliferate by the irritation of the disease; and the inhibiting influence of the kidney being so lowered, the abnormal growth is permitted to develop. (Weigert.)

Pathological.—Of 142 cases, 119 had a more or less accurate description of the pathological condition; a few were complete, the majority, however, were indefinite as to the exact nature of the mass. From a study of the above I deduce the following: The organs were displaced according to the size and position of the tumor; the liver in those of the right side was pressed upward and inward; in one case (Dickinson's) it pressed the diaphragm up to the fourth rib. The stomach, spleen, and intestines were crowded to the right or left side, corresponding to the kidney affected. The peritoneal cavity usually contained a turbid, brownish fluid, varying in quantity from an ounce to several litres. The visceral and parietal peritoneum presented no marked change, except in the neighborhood of the mass, where it was thickened, congested, and more or less adherent; in three cases distinct peritonitis was present. The colon, in twenty-seven instances, was found to pass over, and be adherent to, the anterior surface; it is probable that this occurred much more frequently, the condition, however, not being noted. In small tumors, in the right side, the ascending and transverse portions passed across the front with no displacement; in the larger tumors these portions were pushed downward and inward, and lay on the inner border of the mass, thus forming a line from the cæcum to the splenic flexure. This greater misplacement is permitted on the right side, on account of the length of the mesentery and its lower attachment. In a few of the large ones it retained its normal position, the ascending passing on the outer side, and the transverse across

the top. In the left side both the transverse and the descending colon were usually in place, but occasionally the descending was pushed far inward. In the very large tumors both mesentery and intestine lay flattened out on the surface, and would have presented no tympany during life.

Adhesions.—Adhesions of the surrounding structures were noted in forty-five cases; that of the peritoneum being the most common; next in frequency came the stomach, liver, intestines, vena cava, omentum, pancreas, spleen, and diaphragm. These adhesions were usually light except where the growth of the capsule had broken through, and the organs had become invaded. Adhesions to the vena cava were noted in five cases (Krauser, Kann, Halloway, and others). Thrombosis of the pulmonary vein was found in two cases, and of the vena cava in five cases (Krauser, Bott, Pick, Fotherly). In two, erosion of the vertebræ had occurred, resulting in pressure on the cord. Ulceration into the duodenum was found in a case by Dickinson; into the colon, by Rayer; and in one case the ulceration extended through the abdominal wall.

The kidney which is not the seat of the growth is generally enlarged, but otherwise normal; in three cases it was the seat of interstitial nephritis.

Tumor.—Over the surface, in many instances, large veins could be seen coursing here and there and anastomosing with each other; these came in part from the tumor and from the overlying peritoneum. After removal, the mass varied from the shape of the kidney to a pyriform and oblong ovoidal. It measured (according to the accounts given in one-fourth of the cases) from $3 \times 2 \times 2$ centimetres (in Israel's) up to $50 \times 40 \times 30$ centimetres (in the case of Day), the average being $15 \times 11 \times 9$ centimetres. Weight and size ranged from that of a hazel-nut (Israel) up to thirty-six and a half pounds (Day); the average being six and one-tenth pounds. In Abbe's case the tumor weighed seven and a half pounds, the remaining child fifteen pounds; in Mackenzie's, the tumor weighed twenty-two pounds, the remaining child

thirty-nine pounds; in Buchanan's, the tumor weighed six pounds, the remaining child ten pounds. The surface was covered by irregular strands of connective tissue, which gave it a ragged appearance; and which, on being pulled off, exposed a glistening, smooth, dark membrane. In consistence the small, young tumors were mostly firm; the larger, soft, elastic, and in places distinctly fluctuating. In the exaggerated cases they almost gave the impression of immense cysts; usually firmer areas could be felt in places, and sometimes hard nodules projected from the surface. A certain degree of lobulation was present in most of them, being produced, in quite a number, by a partial erosion of the capsule and consequent bulging of the softer contents. The kidney in six cases projected, in part or in whole, from the side of the tumor underneath the capsule.

On section the appearance was very heterogeneous, and varied according to the amount of degeneration and blood extravasation that had taken place. In the young tumors the color was grayish white, translucent, and for the most part homogeneous; but on close inspection a delicately striated and alveolated structure could be made out. The material in the spaces between was somewhat softer, of a slightly yellowish-red tinge, and more uniform. The older ones varied from a grayish red to a dirty yellow, between which there was quite a variety of hues; in those where much extravasation had occurred the color was very dark, and in places nearly black. The very cellular variety was of a uniform reddish gray, resembling brain-substance. In the various degenerations each produced a distinctive appearance; the myxomatous, clear and gelatinous; the fatty, yellow; the coagulation necrosis, yellowish gray, and so on. Those containing muscle, presented a red, silky appearance; cartilage by its color and consistence could in like manner be recognized. The capsule varied in thickness from the thinness of letter-paper to two centimetres. It was of a yellow-gray color, tough, fibrous, and intimately adherent to the substance beneath. From it projections of connective tissue

extended into the mass; ramified and interlaced with each other so as to form a framework, and divided the interior into a mesh-work of lobules. The spaces between varied in size from a split pea up to an egg, and were occupied by a soft, uniformly gray-red material (composed mainly of cells), as before described. The greater part of some of the advanced tumors had become very soft, pultaceous, and of a dirty yellow color, from the coagulation necrosis which had occurred; some of which presented a typical yellow, cheesy material, as is found in tuberculosis. In the large tumors, a fourth to a half was sometimes taken up by a very friable, dark-red, semi-fluid material, which was made up of extravasated blood mixed with degenerate tissue. Areas of myxomatous degeneration were present in quite a number of the older tumors; a fourth of some of them having undergone that change. Hyaline changes were present in many of these, but in much smaller areas. Those which contained adenomatous tissue to any extent showed an homogeneous softness, and a deeper red color; the consistence, however, while being soft, was not of the granular, friable nature that was seen in degenerate portions. The blood-vessels were very large and numerous; on section the cut ends stood prominently open and were filled with blood; and in places, by their anastomosis, they formed a distinctly red, spongy substance, which was apparent macroscopically. Twenty-two of the cases were more or less cystic; the cysts varying in size from those containing one cubic centimetre up to 500. The smaller ones were filled with a pale, straw-colored fluid, having a uriferous odor; the larger, with a dark brown, viscid liquid, containing a soft granular *débris*, which, on examination, proved to be broken down and liquefied tumor tissue and blood-clot. In Jacobi's case the fluid amounted to several pints; another is recorded where it was about four litres. The smaller kind were sometimes true cysts; the majority, however, were of the retention type formed by the blocking of the tubules; the larger generally represented pseudo-cysts, being made by blood extravasation and tissue liquefaction.

In twenty cases a portion of the kidney remained; in two the whole was attached underneath the capsules to the side of the growth; in four one-half was similarly placed, the other half having been incorporated by the growth. In a few recent cases the point in the kidney from which the tumor sprang could be approximately made out,—to wit, five sprang from the centre; six, from the hilus; four, from the lower half; five, from the cortex; four, from the blood-vessels: two, from underneath the capsule; two, were perirenal; two, from the pelvis; one, from around the pyramid; and one, from the Malpighian bodies. One-fourth of the cases presented, on section, a very much firmer appearance, and contained large and small areas of a firm, red, silky tissue, which looked not unlike a uterine myoma. In others this was in such small quantity and so scattered that it was indistinguishable from the stroma. Bone is spoken of as occurring in these tumors, but none were found in this series. Calcification was present in only one (Krauser). In two cases only a single kidney was found. The pelvis in one case was very much dilated and ureter enormously distended (Wood); in the cases of Warner and Osler, it was occluded by a clot.

Microscopic Sections.—One is impressed with the very great inadequacy of the microscopic description; only a few cases prior to 1876 had any at all, and since then the majority has consisted simply in the statement of the kind of cells; no histological arrangement being mentioned. Among the American and English cases those of Paul, Sutton, Osler, and Wentworth are the best. In German cases we find very careful and exhaustive descriptions by Cohnheim, Eberth, Marchand, Ribbert, Manasse, and Birsch-Hirschfeld.

According to the descriptions which have been recorded in seventy-five cases, eighteen were both spindle- and round-celled; eight contained adenomatous tissue; six were cartilaginous (Hoisholt, Alsberg, Krauser, and Schuller); three were probably endothelioma (Periwerseff, Pick, Wentworth); three were of the alveolar type; two contained smooth muscle (Hoisholt and Eberth); one showed calcification; in one,

giant cells predominated; one was distinctly melanotic, and one very largely fatty. A large number of the earlier ones were described under such diverse nomenclature that no opinion can be given as to their nature.

Microscopic sections varied in the different parts; in the soft, homogeneous portion they consisted of small, round, and spindle cells, interspersed between which there was a very delicate fibrillar reticulum. The individual cells had large nuclei, rounded ovoidal, and some distinctly vesicular; in others, they were so faintly staining that their outline could not be made out. The protoplasm varied in amount; it was mostly small and finely granular. The soft, pulpy material was made up of a large number of degenerate cells with fragmented nuclei, swollen, pale-red corpuscles, and polymorphonuclear leucocytes.

The stroma was composed of large bands, which divided into smaller ones, and extended between the cellular masses; these in turn gave off finer branches, which formed a very delicate mesh-work between the cells. The larger bands carried numerous blood-vessels, interspersed around which were a few spindle cells. The stroma proper was composed of very long, slender, and delicate white and grayish-yellow fibrillæ; scattered irregularly along which there were very small and poorly stained nuclei. In quite a number, interspersed in this stroma, there was a variable amount of smooth and striped muscle tissue. The soft, yellow material showed only a poorly stained, homogeneous, granular mass, with a few cells scattered here and there. The gelatinous areas were made up of swollen, round, and spindle cells, scattered in a uniformly clear material in which there could be seen a number of stellate cells; the stroma between was very scant and poorly staining. The blood-vessels, except in the necrotic portions, were very numerous and very thin-walled, some showed an endothelial lining around which there was a thin middle coat; in others this wall was replaced by the tumor tissue. Giant cells were noticed in small numbers in many tumors, but formed the predominant type in only one. In

this case they were of various shapes, some rather long and spindle, others irregular and stellate; they contained from three to twenty nuclei irregularly placed, and a moderate amount of a granular protoplasm. Cartilage, as was carefully studied by Hoisholt, presented definite cartilaginous cells, but no matrix nor perichondrium, and resembled that found in the young embryo. The round and spindle cells of the tumors did not show any morphological difference from those ordinarily seen in sarcomata, except in being richer in glycogen (Marchand). Striped muscle tissue was found in one-fourth of the cases, and presented a striking likeness to embryonic muscle. The best descriptions of this tissue were found in the cases of Osler, Manasse, Marchand, and Eberth. It was arranged throughout the tumor in large and small masses, which were composed of bundles containing twenty to forty individual fibres, held together by a very delicate connective tissue. These were disposed in different directions, so that on section some were cut lengthwise, some crosswise, and others obliquely; they were quite delicate, long, slender, and finely pointed, varying in thickness from three to seven microns, and in length from a half to two millimetres. The fibres in some were arranged in rows, one behind the other, and situated near the periphery; in others, they were irregularly placed, with some aggregation towards the centre. Manasse observed a peripheral arrangement in a large number of the fibres in his case. In Marchand's case they were situated on the outside, and attached to an extremely delicate membrane, which was at first taken for a sarcolemma. The striation of the fibres was peculiar, not being complete in any; in a certain number it was seen only on one side; in others it was just beginning to appear near the nuclei, and in a few only at the tips. No completely striped fibres were observed in the specimens of Ribbert, Marchand, and Eberth; in those of Osler and Cohnheim a few were seen which nearly approached it; most, however, were of the typical embryonic type. A distinct longitudinal striation was noticed in most of the older fibres, sometimes

being more prominent than the crossed; this was especially noted by Manasse. The protoplasm was granular, probably from the yolk-granules which had not been absorbed: it contained clear spaces, which, presumably, had been formed by the falling out of the glycogen.

Interspersed between the crossed striped fibres were others of similar shape and size, but presented no striation; these were found in greater numbers in the younger portion, while in the older, the striated were the predominant variety. Manasse observed cells of a giant type, but they were more oblong and more pointed, and contained clear spaces filled with a glassy *débris* very rich in glycogen; there was also a faint unilateral peripheral striation. Among these were others of a very long spindle shape, faintly striated on the sides, and containing closed cylinders filled with the same glassy material. Both these types appeared swollen, had irregularly placed and very faintly stained nuclei, and contained glycogen in the same percentage as is found in the muscle of the embryo. They were considered by Manasse to be degenerate forms. No sarcolemma has ever been observed on any of the fibres; the nearest approach to it was a very indistinct membrane observed by Marchand. Smooth muscle was rarely found; it was present in quantity in only two cases (Ribbert and Hoisholt); in these it presented no striking difference from the ordinary type. It was at first thought by Eberth, and later by Ribbert, to have originated from the smooth fibres which were normally present in the pelvis and capsule; but this view is no longer held, it having been replaced by the hypothesis of its embryonic origin.

The origin of the striped muscle tissue has been, and still is, the subject of much discussion, and will probably remain unsettled, so long as the etiology of tumors is shrouded in such obscurity. Eberth was the first to observe such muscle, in 1872; it formed the principal bulk of his tumor, and was also found in a metastasis on the diaphragm of the opposite side; this latter still remains a unique observation. From a study of this case he concluded that the striped originated

from a distinct metaplasia of the smooth fibres, which were normally present in the capsule and pelvis; he considered all cases to have their origin in these regions of the kidney, and endeavored to explain those found in the central portions by supposing that they primarily began in the pelvis or capsule, and afterwards became disconnected. One year later, Cohnheim carefully analyzed a similar case, and arrived at his hypothesis of the etiology of tumors arising from misplaced embryonic tissue. He did not consider his tumor to be a sarcoma, but thought that the round and spindle cells were mesenchymatous and mesothelial, which later developed in the muscle and connective tissue. Cohnheim thought he observed all of the steps in this transformation: first, a round cell; second, slight projections appeared at either pole; third, these became longer and assumed a long spindle type; and, fourth, they showed faint striations which became more distinct in older portions of the tumor. In this way he explained the occurrence of muscle in the metastasis of Eberth's case. Ribbert (1873) adopted the view of Eberth, although he failed to find any direct proof of the metaplasia. In his latest article (1892) he rather favors the view of Cohnheim, though does not entirely give up the other; still, he states, that while a metaplasia may occur, it has not been proved to have done so; and the fact of their different embryological origin speaks strongly against it. Weber and Bostrom (1879) agreed with Eberth, and claimed to have observed almost actual proof of the transformation. Kollesnikow thought that it might develop from granulation and connective tissues, but he failed to give any proof to substantiate his hypothesis. With the exception of Arnold, John, Pernice, and a few others, who still hold to the view of the transformation of smooth into striped, all pathologists have discarded this theory and adopted that of Cohnheim. This latter is strongly borne out by the following facts: First, striped muscle tissue is foreign to the kidney; second, the theory of metaplasia has not been proven; and, lastly, in the correspondence of the fibres and cells of the tumor to those

of the embryo. Fat and myxomatous tissue may also be of embryonic origin, but in most cases they are probably the result of a degeneration.

According to Birsch-Hirschfeld and Sutton, a large number of these tumors contained adenomatous tissue; most of those described as encephaloid or medullary belonging to that class. In the adenomatous portion the acini branch and interlace, in a very irregular manner, so that, on section, it was sometimes difficult to find any glandular type; only a mass of cells being apparent. In others the glandular structure was distinctly visible; the branched ducts and alveoli of glands were seen; some of them being lined with a single layer of epithelial cells, others with several layers, while still others had their whole lumen crowded with a proliferated mass. These last named, though solid, still retained the racemose shape of the acini, and the basement membrane in all still remained intact. Occasionally a single acinus was seen to extend far into the tumor tissue, but remained entirely distinct. According to Birsch-Hirschfeld, the cells were distinctly epithelial, of the cylindrical and columnar type, and corresponded, for the most part, to those found in the Wolfian body; a few were more cuboidal, and presented the same morphology as the cortical portion of the adrenal. None of this glandular tissue was found connected with the renal tubules; nor did it correspond in epithelium. The stroma between was made up of a delicate, white, fibrous tissue, which was sometimes replaced by the cellular elements of the tumor. The cases of Döderlein, Schmidt, Barth, Hicquet, Rindfleisch, Stürm, and Kuhn are of the above variety, and those of Kocher and Langhans bear a decided resemblance to them. (Birsch-Hirschfeld.)

In the previously mentioned cases of Periwarseff and Pick the proliferated endothelium of the blood-vessels assumed a more or less glandular type, and by the pressure of the cells against each other they became columnar and cuboidal, thus resembling epithelium, and making it very difficult to differentiate it from an adenoma. In the light of

these cases, it is probable that some of those recorded as adenomata were of this type. The origin of the adenomatous class of tumors is held by Ambrosius and Birsch-Hirschfeld (1893) to be derived from the remains of the Wolffian body; by Waldeyer, to originate from the kidney tubules; and by Grawitz, to develop from adrenal cells that have become incorporated in the kidney. All of these views may be true in part; the first, however, answers best as an explanation for most of them, on account of the correspondence of the cells to those of the Wolffian body; only a small proportion show adrenal tissue, and a still smaller correspond to the kidney. These hypotheses are still further borne out by the fact of foreign tissue being found in a number of kidneys which were otherwise normal; Grawitz observed adrenal tissue and bits of kidney capsules in the central portion of the organ; Henle and Jardelet discovered smooth muscle fibres in the cortical portion, and Weichselbaum and Greenwich state that 6 per cent. of persons over twenty years of age have adenomatous nodules in their kidneys.

The fat was scattered here and there in small masses and appeared more or less discrete, like a new formation; in other places, perhaps the majority, it was dispersed throughout the tumor, and evidently, as shown by microscopic examination, was the result of a cellular degeneration. One case is reported by Steele as a distinct liposarcoma, but it is probable, from the description, that it was a degeneration and not a new formation.

Yellow, elastic tissue was described by Paul, but was not elsewhere found in this series. Angio-sarcoma is said to occur, but it was not observed in any of them, unless those described as endotheliomata were of this class (Waldeyer and Kolaczek). The melanotic types were seen in the case of Steele, and in one of mine: in the former it was apparent macroscopically, but on microscopic examination no mention was made as to the location of the pigment. In the latter, it appeared only on microscopic section, was of a dark-brown color, and situated in the large epithelioid cells around the

blood-vessels, but not distinctly in the perivascular tissue. Yellow and green pigment have not been noted.

It is evident, from a study of these tumors, that they cannot be placed either under the class of sarcomata or carcinomata, though they present many features of the former. Virchow placed them in the teratomata; Paul and Sutton called them "congenital renal tumors," resembling dermoids more than sarcomata; Birsch-Hirschfeld claims that they are specially prone to occur in the kidney, that organ being more frequently the seat of the growth than all the other organs collectively: and he proposes for them the name of embryonic mixed tumors.

That they are embryonic in origin seems to be almost beyond dispute; that they are mixed is shown by an examination; and that their malignancy is chiefly due to the sarcomatous elements is proven by the following facts: First, by their not affecting the general health until late; second, by not extending to the surrounding organs, nor involving them by contiguity; third, by tending to metastatize late, and through the blood-vessels; and, lastly, by the nature of the metastases, which are purely sarcomatous. In all of these points they differ from carcinoma; and it is questionable if the latter ever occurs in very young children. The cases reported as such, and which seem to have been proven by microscopic examination, were probably those of an advanced adenoma or endothelioma. Considering the foregoing facts, the name embryonic mixed sarcomatodes would probably be the most expressive term.

Metastases.—In thirty cases no statement was made in regard to the presence of metastases; in thirty, none were found; in fifty-one, they were present in the following order: eleven in the liver and lungs; eleven in the other kidney; ten in the retroperitoneal glands; six in the mesenteric glands; six in the vena cava; three in the pleura; four in the liver; one in the portal vein; once in the diaphragm; once in the scrotum; and once in the bladder. In a few cases the colon, adrenals, and intestines were invaded by contiguity. Roberts,

out of fifty-three cases, found metastases in twenty-six, in the following order: Mesenteric and lumbar glands, lungs, liver, adrenal, and omentum. Taylor out of 130 cases found that 50 per cent. of the fatal ones had metastases; and, according to his statistics, the lungs and liver were most frequently affected; then the retroperitoneal glands, and lastly the mesenteric glands. Rohrer found them present in fifty cases out of 115; Lachram, in twenty-six out of thirty-nine; Guillet, in thirty-seven out of fifty. In the two largest recorded tumors, those of Hawkins and Day, none were found. As to the time at which metastasis occurred no definite data could be obtained; it is probable, however, that, as it does not spread to any great degree through the lymphatics, it does not occur until after the involvement of the pelvis and blood-vessel. The renal vein and vena cava were directly invaded in six cases; by this it can be readily seen how small fragments are picked up by the blood-current and disseminated over the body; first reaching the lungs and lodging in the small blood-vessels, where they grow; and this probably accounts for these organs being the most frequent seats of metastases. The lumbar glands were more frequently involved than the other lymphatics, on account of the renal channels passing directly into them. The infrequency of the involvement of the ureter and bladder (it being noticed in only three out of 120 cases) is very striking when we consider the intimate connection between them, and the passage of noxious material through them; though the fact of there being no lymphatic connection probably offers some protection. The metastases were of a sarcomatous nature, in all except the remarkable case of Eberth's, where striped muscle was found in a metastatic nodule on the diaphragm; this has been recorded only once, and its occurrence is still very difficult to explain. The nodules found in the other kidney may be either a metastasis or a separate new growth.

Symptoms.—There is no pathognomonic sign of these tumors; the four most characteristic and commonly met symptoms are tumor mass, pain, hæmaturia, and cachexia.

The secondary symptoms which were produced by pressure on the surrounding organs were numerous; the following being most commonly met; gastro-intestinal disturbance, as shown by vomiting, loss of appetite, and constipation; dyspnoea by pressure on the diaphragm; œdema, ascites, varicocele, and hydrocele by interference with the circulation; jaundice by pressure on the liver and bile-ducts; pigmentation of the skin by involvement of the adrenals; incontinence of urine and paraplegia by pressure on and erosion of the spine. The others that occurred by accident were peritonitis, diarrhœa, and cystitis. Uræmic symptoms were infrequent.

In ninety cases out of 120 in which they were given, the initial symptoms were as follows: tumor mass in 38; pain, 14; hæmaturia, 14; general weakness, 10; vomiting, 7; morbid appetite, 2; jaundice, 2; constipation, 1; peritonitis, 1; albuminuria, 1; diarrhœa, 1; ascites, 1; cough, 1. The second symptoms most frequently noted were as follows: tumor mass, in 8: emaciation, 7; hæmaturia, 3; pain, 3; cough, 3; fever, 4; dyspnoea, 2; vomiting, 2; failure of the appetite, 2; albuminuria, 2; anæmia, 1.

Tumor Mass.—This was the most common and constant symptom; it was absent in only two cases; one reported by Osler, in a child, which presented no symptoms during life, death being caused by an acute intestinal disorder; in the other it was found at an autopsy, by Sailor, of Philadelphia, in a child which had died from static epilepsy. In 152 cases collected in the "Traité de Médecine," tome v, it was absent in three cases; Guillet, in 133 cases, found it wanting four times; Chevalier, in 100 cases, noted its absence in three. The above cases included adults, and it is not stated in which the absences occurred.

In my series, it formed the initial symptom in fifty-five cases, preceding the others by a period of from two days to one year, the average being three and one-sixteenth months. In about two-thirds of the series no note was made as to an early examination, so that it may have been present, as the initial symptom, in a number of them. In six cases it was

discovered accidentally, while bathing or otherwise handling the child; and once by a physician during an examination for hernia. Chevalier, out of 100 cases, found it the initial symptom in sixty; Roberts, out of fifty-two cases, noted it in thirty. When first detected, the mass varied in size from that of a hazel-nut to that of a child's head. The tumors were moderately firm and movable; first felt in the lumbar region, after filling up which space they extended obliquely downward along the costal margin to the anterior axillary line; thence, more obliquely, to the median line, intersecting it just above the umbilicus; from this region they curved downward towards the iliac fossa, thus filling up the entire flank and side. This description answers only for the moderately large tumors, the smaller ones remained in the flank, and the largest filled the whole abdominal cavity. They varied in weight from one ounce (Israel) to thirty-six and a half pounds (Day).

On inspection the abdomen was generally unevenly distended; point of greatest prominence was near the umbilicus; the skin was tense and shiny; superficial veins markedly enlarged and tortuous; and in one case (Huber) there were subcutaneous hæmorrhages. The smaller masses are influenced by respiration; the larger slightly, if at all. A transmitted, aortic pulsation was seen in a few cases.

On palpation the small ones were movable, rounded, not adherent, nor tender; the larger were fixed, the edges round, scarcely ever sharp or angular; general shape renal, ovoid, or globular, occasionally nodular, and surface for the most part smooth. In consistence, the younger ones were more or less firm; the larger and older, resisting, soft, elastic, and semi-fluctuating, with harder areas here and there. The hand could generally trace the growth into the renal region, where it presented a fulness, but scarcely ever a distinct prominence. No tenderness was present, except when some complication had occurred; it was noted in seven cases.

On percussion dulness usually began near the spine, was present over the lumbar region, and extended forward over

the most prominent portions of the tumor; the edges were sometimes covered by the intestines, so that dulness was markedly obliterated. By careful percussion there could usually be made out a narrow zone of tympany between tumor and liver dulness; and a second, about two inches in breadth, could be found at the inner, outer, or middle portions of the tumor, which was due to the colon passing over the anterior surface. In the large masses it was so flattened out that no resonance could be obtained. The position of the colon, as made out by the percussion, is a very important diagnostic sign, and forms the main differential point between renal tumors and those of the surrounding organs. It was first pointed out by Roberts, and has been strongly emphasized by Dickinson, Treves, and Baginsky. Where no tympany could be obtained, it was sometimes made out by careful palpation. Its presence was noted in one-fourth of these cases; no note was made in the remainder, except of its absence in four cases. In two cases the duodenum passed across the front and was made out by percussion during life. There was generally increased tympany over the flank of the opposite side, due to the crowding of the intestines in that region.

On auscultation a slight friction rub may be heard, due to peritoneal involvement, but it was not noted in any of this series.

On aspiration of the tumors, very little fluid, if any, was obtained; usually only a few drops of rosy, bloody serum, containing minute particles of a material which, on microscopic examination, showed round and spindle cells. If done with a moderately fine needle and due antiseptic precautions, it is absolutely devoid of danger; otherwise serious consequences have been entailed; peritonitis and death followed in three cases. Israel considers it very important to use a medium-sized aspirator, with a small needle; after the insertion of which he directs that the piston be quickly pulled out and the needle withdrawn; in this manner he claims that particles of tumor tissue can be obtained.

The growth of the tumors was generally extremely rapid; frequently filling the whole abdomen in a very short time. In Alsberg's case he failed to find any tumor on first examination; four months later it extended from ribs to ilium; Braidwood's case increased from the size of an apple to eight pounds in three months; Werder's, in the same time, from the size of an egg to one large enough to fill two-thirds of the abdomen; Cohnheim, on first examination, found a mass the size of a man's fist; three months later it filled the whole abdomen. Another was noticed to extend its margin five centimetres in five days.

Pain was present in thirty-four cases, being the initial symptom in fourteen; it varied in intensity from a slight, intermittent form to an agonizing paroxysm; in the majority it was a dull ache. Some suffered more or less continually (Hicquet, Patuyard, Berner, and Wood); one, to such an extent that it could with difficulty be relieved by anodynes; in others it was intermittent, and exaggerated only towards the end. It is caused in various ways; the severe intermittent paroxysms were probably induced by the blocking of the ureter with blood-clot or tumor detritus; the dull, continued pain, by the rapid distention of the capsule or pressure on the surrounding organs; a continued, rather acute one, by pressure on the twelfth dorsal nerve or lumbar plexus; a semiacute pain with marked abdominal tenderness, by localized peritonitis; a very acute type, which is exaggerated by bearing on certain parts of the spine, is probably caused by pressure, and consequent erosion of the vertebræ. (Dickinson and Cornil.) The sciatic nerve, according to Musser, is occasionally pressed upon, and gives rise to suffering attended with numbness and tingling of the lower limbs. Pain is in most cases more or less localized; in others it radiates upward across the chest to the neck and arms and downward into the lower extremities.

Sex and Age.—In 130 cases, fifty-five were boys, fifty-one girls, and twenty-four sex not stated. It is claimed by Birsch-Hirschfeld that these growths occur more frequently

in girls, and he endeavors to explain it by the earlier disappearance of the Wolffian body. In the other series of collected cases no marked difference of sex was apparent.

Hæmaturia.—Hæmaturia occurred in thirty-five cases, and was the initial symptom in thirteen. Quite a number had no note in regard to the urine, therefore it may be presumed that it was present in some of them. Rohrer, out of 115 cases, found blood in thirty-seven; Taylor, out of 130, found it in $37\frac{1}{2}$ per cent., it being present in 56 per cent. in those between one and five years. In 100 cases in the "Traité de Médecine," tome v, in infants, it occurred in twenty-five; Dickinson and Ebstein, in 128 cases, had sixty-one, and in forty-eight cases it was the initial symptom; Roberts showed thirty-one out of fifty-nine cases; Seibert found nineteen out of fifty. Most of the above include adults; in children it is not quite so high. Its occurrence is variable, sometimes being present only once at the beginning, as shown by the cases of West, Iliot, and Walsham; in others it was noticed towards the end, and in still others, perhaps the majority, it occurred at intervals varying from one to four weeks, throughout the course of the malady. In Fagge's case, it was noticed only once, four months after the onset; in Gardner's, it occurred just before death; in Buchanan's, it was present throughout the entire progress of the disease; and in the enormous tumor, thirty-six and a half pounds, reported by Day, hæmaturia was noted two and a half years before any other symptom, and occurred at intervals up to the time of death. In a few the attack was seen only during one micturition; in a number it lasted from one day to one week. Quantity ranged from a few corpuscles to pure blood, sometimes being great enough to cause death (Seibert); in Gardner's case one litre of nearly pure blood was voided at once.

Color of Urine.—This varied from a smoky tint to a dark red, nearly black; the intermediate shades were described as pale-reddish tinge, tawny, ashy-gray, red, deep red, blood-color, sherry and port wine, dark maroon, and chocolate colors. It was usually of uniform degree throughout, the

first voided being the same as the last; this uniformity is a distinguishing feature of blood from the kidney. On standing the color deepened, and a grayish-red, granular substance was precipitated. It was usually acid with a specific gravity of from 1010 to 1040. The sediment showed new and old blood-clots, some of which were small, long, irregular, and fusiform, appearing to have been moulded in the ureter; occasionally necrotic shreds could be seen, which showed definite tumor-tissue. Carr, of Washington, reports a case of this kind.

Microscopic Examination.—A variable quantity of red blood-cells could be seen, some swollen, others shrivelled with an indefinite stroma, the hæmoglobin having all been washed away; the albumen corresponded to the amount of blood present; phosphates, oxalates, and urates in varying amount; no sugar was found in any.

The passage of blood was usually unattended by other symptoms, its appearance being the first indication of disease; in a few instances it was preceded by, and attended with, more or less pain of a paroxysmal character; this was notably present in Taylor's case, where it was so severe that anodynes failed to give relief. This type of pain was probably caused by the blocking of the ureter, and produced suffering similar to that felt in renal calculi. In Pick's case, chills and temperature preceded the hæmaturia by several days, and in Jacobi's, convulsions occurred immediately before it; in these no definite connection can be said to exist between the symptoms and the blood, the former probably being incidental.

In the remaining twenty patients in which the urine was noted, seven had negative urine; seven contained albumen; two pus; one was alkaline, with a large quantity of phosphates; one showed hyaline and granular casts. Pus was present only where cystitis had occurred. The urea was diminished in Pick's case, and, according to Chevalier, most of them show a diminution; by Thiriar and Rommullaere, it is stated that if its excretion is twelve grammes or less in twenty-four hours, malignant growths should be suspected.

Hæmaturia may originate from any portion of the genito-urinary tract, and it is sometimes very difficult to locate with exactness. When coming from the kidney the blood is thoroughly mixed with the urine, giving it a uniform color, which is the same in degree at the beginning as at the end. Occasionally there are noticed coagulated blood-casts of the ureter, which are spoken of by Keating as pathognomonic. The blood is usually more or less intermittent, and sometimes alternates with entirely clear urine on the same day; so marked an intermission is not commonly seen, but when it does occur, it strongly suggests the kidney as its origin.

From the ureter it is more often attended with pain, but otherwise presents no peculiar features.

From the bladder it is not so intermittent; the first voided is very light in color, and becomes deeper and bloodier towards the end; the last sometimes being nearly pure blood, and is usually attended with decided pain and discomfort, being most marked at the end of micturition. The cystoscope should be used in all doubtful cases, and will reveal the condition of the mucous membrane; in two the bladder was excluded by its use.

From urethra and prostate the symptoms are opposite to those of the bladder, the first being bloody while the last is comparatively clear with no uniform mixing, and painful during urination.

After determining that the blood has its origin in the kidney, it becomes necessary to discriminate between the various other conditions of that organ which may give rise to it. First, calculus; in this the bleeding is more constant, more generally attended with pain, occurs more frequently after exercise, and is relieved by rest. Acute nephritis gives smoky urine, rarely decided or bloody, and is attended with constitutional symptoms. In tuberculosis the disease is never primary; is easily recognized by the involvement of the other organs; and shows purulent urine containing tubercle bacilli. Various parasites have been known to produce hæmaturia;

rhabditis genitalis in a child three years old was observed by Baginsky; an undescribed worm by Westphal; and filaria sanguinis hominis in a case by Berkeley Hill. In these the diagnosis rested on finding the ova or parasites in the urine. Severe injuries may produce it, but in such cases appearances may be deceptive; they answered for the cause in a number of cases where an undiscovered sarcoma was responsible; minor injuries cannot produce it unless there is some underlying disease.

Among the constitutional causes may be mentioned scorbutus, hæmatophilia, syphilis, and malaria. Dickinson saw four cases in which the bleeding was caused by a scorbutic condition; the urine was of a port-wine color, and microscopically showed red blood-cells and casts; the symptoms were very soon dissipated by proper food and hygienic surroundings. I have found no case among children caused by hæmatophilia. One was reported in a child five years old, who had distinctly bloody urine, supposed to be induced by malaria; the diagnosis of this case was probably not correct, for according to Thayer malaria never produces true hæmaturia in children. Berkeley Hill, and Mussi, of Bologna, speak of it as being occasionally induced by syphilis. Hæmoglobinuria rarely, if ever, occurs in malignant growths.

Turpentine, cantharides, and other irritant diuretics will cause dark-bloody urine; and rhubarb and senna, a very dark discoloration, but no blood; in these instances we would have to rely for a diagnosis on the examination and the history.

I have gone into the consideration of hæmaturia rather fully, because it occurred as an initial symptom on 12 per cent. of the renal tumors, being the first warning that is given us, and it should always be treated with the gravest consideration. When it occurs in a child a most careful examination should be made, including the cystoscope in the bladder, and palpation of the kidney under ether, in doubtful cases. If it is determined that the blood is probably renal, but nothing definite can be made out by the examination, the child should be kept under weekly observation for at least six or eight

months. If any enlargement or suspicious nodule of the kidney be felt, an exploratory operation should be made. Israel pursued this course, and in a very brilliant manner found the growth when it was no larger than a walnut; operated; confirmed his diagnosis; removed the kidney, and saved the life of the patient. Alsberg made a careful examination; failed to find anything abnormal; concluded that no serious trouble existed, and allowed his patient to pass out of sight for a period of four months, when the patient returned with a sarcoma the size of a child's head. He operated; but the child died some time afterwards from a recurrence. I cannot too strongly urge the greatest consideration of this symptom, for, in a number of cases, it is the only voice of warning while yet there is time.

The quantity of urine in the majority of cases remained normal; in eight it was diminished, the amount not being definitely stated (Lewi, Smith, Eberth, and Finney). This was probably due to involvement of the other kidney by the growth, or by the pressure of the mass. Difficult micturition was present in the cases of Iliot and Berner, and was probably due to pressure on the bladder. Complete suppression was noted in the cases of Wagner, Wood, Gay, Smith, and Rawdon. In one case it occurred in the course of the disease, was present for a few days, and passed off; in the others it appeared later; in Wood's, no urine was voided during the last five days; in the remainder it ranged from one to three days. This symptom is probably induced by pressure on the other kidney or ureter, the possibility of difficulty with the bladder having been excluded by the use of the catheter. Incontinence was noticed in two cases; it is regarded by Dickinson as a sign of pressure on the cord, and commencing paraplegia. Cystitis complicated the disease in four cases; it usually occurred late, remained to the end, and was very distressing and painful. It is not definitely known how it is set up, but it is probable that the irritation of the necrotic *débris* so lowers the resistance of the bladder that it is made susceptible to the invasion of micro-organisms.

Constitutional symptoms usually presented themselves towards the middle and latter part of the malady. In ninety cases in which symptoms were given, their appearance varied from a few days to one year after the initial symptom; the average being three and five-tenths months. Weakness and emaciation were the initial symptoms in ten cases; following in order of frequency were anæmia, rapid pulse, loss of appetite, and a train of pressure symptoms.

First, loss of strength was gradual during the first half, but later became very rapid and extreme, being so marked in some cases that the little patient was unable to turn himself in bed for weeks before death; several were able to walk almost to the end. The emaciation usually progressed *pari passu* with the weakness, sometimes being almost as rapid as in acute disease; towards the end it was very extreme and the patient became reduced to a mere skeleton. This condition results in a great degree from interference with the digestive organs, and from absorption of the toxic products of the tumor. Anæmia became very marked; the skin, in some cases, assumed a peculiar pearly sallowness, which is characteristic of the disease; in others it was of a dirty yellow; distinct pigmentation was observed by Dumont and Czerny; jaundice in three cases, one was intermittent, the others more or less continual. The pigmentation was produced by invasion of the adrenal; the jaundice by pressure on the common and hepatic ducts, and by involvement of the liver substance. The expression was dull and listless, the features pinched, the cheek-bones stood out prominently, the orbits were discolored and sunken, the nose pointed and nostrils dilated, the superficial veins of the forehead and temples prominent, and the skin dry and wrinkled in appearance; in short, the face presented the physiognomy of a malignant disease. As the disease advanced the pulse was increased to a rapidity which was out of all correspondence with the degree of weakness; this is spoken of as especially noticeable in this malady.

Pressure Symptoms.—These were generally brought

about by interference with the functions of the various viscera. First among them, vomiting; this was noted in twenty cases; in eight it was the initial symptom. It usually occurred towards the end, after the mass had attained considerable size; in a few it was present from the beginning, and occurred at irregular intervals throughout. Those of Neisley and Warner had pronounced vomiting at first, which later entirely ceased, digestion became good, and the appetite voracious. In Taylor's case it began early and continued to the end. In the majority it was exaggerated by the size of the mass; varied in frequency, usually being at irregular intervals after meals; occasionally was more or less continual, and permitted the retention of very little food. This extreme degree of nausea was specially noted in the cases of Jacobi, Fotherly, and Dickinson; in the last it was very obstinate and persistent, and was caused, as shown by the autopsy, by a perforation of the duodenum. The vomitus consisted of the ingested food, together with a glairy bile-stained mucus, and occasionally it had a coffee-ground appearance (Cullingsworth). The vomiting in the early stages is uræmic or reflex; later it is from pressure on the intestine or stomach, which causes partial obstruction.

The appetite was capricious; in the majority it failed as the disease advanced; in a number (Jacobi, Smith, and Taylor) it remained good nearly to the end; in four (Geddings, Neisley, Gardner, and West) it was voracious; in one it was morbid; the child ate large quantities of chalk and plaster from the walls. (Gardner, 1828.)

Constipation was mentioned in eighteen cases; was very marked in those of Smith and Ohre, and was the initial symptom in one (Kann). Generally it was a late symptom, and probably produced by interference with peristalsis by the large masses.

Diarrhœa was a late and not a constant symptom; it was present to a greater or less extent in quite a number; in a few, very prominent and persistent (Cullingsworth, Wood, Kann, Gay, and Taylor). In Kann's it was uncontrollable, and in

Cullingsworth's and Dickinson's the discharges were very profuse, and contained blood. This complication has for its origin a secondary infection, or an invasion and ulceration of the intestinal mucosa by the growth. Jaundice, as before stated, was a rare symptom, seldom pronounced, and occurred at intervals throughout the course; was present to some degree in five cases. Dyspnœa occurred in twenty cases, always late, usually after the masses had attained considerable size, and varied in intensity and persistency with the size of the growth. Two cases were recorded by Patuyrard and Taylor, where it was due to metastases in the lungs; in two other, which had not presented this symptom during life, an invasion of the lungs was found at autopsy. It may be said, therefore, that unless metastatic nodules are very large, or so situated as to press on the larger bronchi, no dyspnœa will result from them. In two cases dyspnœa occurred just before death; the autopsy revealed pulmonary embolism. (One by Osler.) After the dyspnœa commenced its course was progressive, and increased in severity as the end approached.

Œdema of the extremities was recorded in nineteen cases; was invariably a late symptom; began in the feet; extended slowly upward, and occasionally involved the whole body (Lewi). The cause being an interference with the circulation and an hydræmic condition of the blood. Swelling of the face occurred but seldom, and only in those cases which were complicated by chronic nephritis.

Ascites was present in six cases, always very late, and usually following the œdema, but in one case it preceded it. The amount of fluid varied from a few centimetres to several litres; it was usually of a pale, limpid, straw color, but in a number it was very dark, almost chocolate colored, with a finely granular, gray sediment. This complication is set up by an interference with the circulation or an involvement of the peritoneum.

Cough occurred in nine cases, usually late, and was of moderate severity; in Abbe's it commenced early, and lasted

to the time of operation: nothing abnormal was found in the lungs; in the remaining eight it was present only towards the end. Lung metastases, or pressure, may give rise to cough, but in most of these cases it was brought about by some intercurrent lung complication.

Uræmic symptoms were rare, the chief among them being convulsions, headache, and possibly vomiting; but since so many conditions may give rise to all of these in children, it was very difficult to say that they were of uræmic origin. It is known, moreover, that only one kidney can do the work of both, and prevent the retention of uriniferous products; it is probable, therefore, that, unless an interstitial nephritis be present, no symptoms will result. Convulsions were noted by Jacobi, Osler, Smith, and Hicquet; they began late, occurred at irregular intervals, with increasing severity towards the end, and in two ended fatally. Epilepsy was noted in two cases (Sailor and Manzolini); in the former no mass was discovered, nor other symptoms noted during life; in the latter the mass was plainly to be made out. No definite connection can be said to exist between them.

Peritonitis.—This was an accidental complication, of short duration, and ended in death in a few days. In three cases it was set up by the introduction of an aspirating needle; in two by ulceration of the growth in the intestines, and in a large number by operative interference.

Paraplegia, due to erosion of the vertebræ and subsequent pressure of the cord, has been noted in one case (Cornil). Incontinence of urine was the first symptom, which was followed in a short time by numbness of the legs, and finally complete paraplegia. Partial loss of sensation was noted in one case, caused by pressure on the sciatic nerve.

Varicocele and hydrocele appeared in two cases, but neither to a very marked degree; they were rarely present without other evidence of œdema. Extension by contiguity, involving the adrenals and producing pigmentation of the skin, was noted in two cases. Ulceration into the colon was discovered at autopsy in two cases; the symptom produced by it during life was a profuse, bloody diarrhœa (Rayer).

Pleuritis and pneumonia occurred as terminal complications in two cases; at the autopsy extensive metastases were found. Hæmoptysis (Patuyard) occurred in one case where the lungs were largely invaded.

Cause of Death.—In the large majority of cases death was due to general exhaustion; in a few, to intercurrent affections, and in the remainder to accidents and complications. Bright and Pick record cases where it was brought about by hæmorrhage from rupture of the capsule; in two by pulmonary embolism; which last is stated in the "Traité de Médecine," tome v, to be a frequent cause of death.

Ages.—The ages at which the tumors occurred, as seen in the 138 cases, will be shown in the following tables:

Age.	Patients.	Percentage.
Seven to eight months' embryonic life	3	2.17
At birth	9	6.52
Under six months	7	5.07
Six months to one year	18	13.04
One to two years	27	19.56
Two to three years	19	13.76
Three to four years	20	14.49
Four to five years	13	9.42
Five to six years	10	7.24
Six to seven years	6	4.34
Seven to eight years	3	2.17
Eight to nine years	0	
Nine to ten years	1	.72
Ten to twelve years	0	
Twelve to fourteen years	2	1.44

Rosenstein's thirty cases, including adults, were as follows:

Ages.	Patients.
Birth to one year	6
One to two years	3
Two to eight years	8
Eight to ten years	1
Ten to twenty years	4
Twenty to forty years	1
Forty to sixty years	6
Sixty to eighty years	1

In a series of fifty-four cases, collected by L. Starr, the ages ran thus:

Ages.	Patients.
Birth to one year	9
One to three years	17
Three to five years	18
Five to eight years	6
Eight to twelve years	4

In sixty cases of Roberts, twenty-four were children, the ages of which are not given. In 130 collected by Taylor 20 per cent. were under one year; 24 per cent. between one and two; 17 per cent. between two and three; 20 per cent. between three and four; 60 per cent. in the first three years of life; and 80 per cent. under four years.

Kidney Affected.—In 141 cases, seventy-three involve the left, fifty-eight the right, and ten both. The left occurs more frequently in this series than in some of the others, but in nearly all the preponderance is found on the left side. For this no reason can be assigned; there is no difference known in the embryological development.

Duration.—In fifty-six cases not operated upon it varied from seven weeks (Osler) to two and a half years (Broison and Gardner); the average was seven and sixty-seven-one-hundredths months. When the disease occurred between one and two years, the duration was five and sixty-six-one-hundredths months; between two and four years, it was eight and twenty-one-hundredths months; between four and six years, it was seven and thirty-two-one-hundredths months; between six and eight years, it was nine and one-half months.

Diagnosis.—Sarcoma of the kidney is to be differentiated, first from enlargements and tumors of the surrounding organs, and, secondly, from other conditions of the kidney itself. To recapitulate: Renal tumors have their swelling in the lumbar region; are more common than those of other organs; very rapid in growth; extend downward and inward towards the umbilicus and iliac fossa; have a moderately ir-

regular outline with a smooth rounded border; are not generally movable; do not produce bulging in the back; are not sensitive; are uninfluenced by respiration, and in the large majority of cases the colon can be made out passing over its anterior surface.

Liver.—New growths and enlargements of this organ present their chief prominence in the hypochondriac region; give uniform dulness with that of the organ; very rarely have the bowel in front; usually present a sharp border; and, lastly, are very rare in children. In one case the renal growth had in some way pushed the liver towards the front, so that during life it was taken for an enlargement of that organ; and even at autopsy it was at first supposed to be the liver.

Spleen.—Enlargement is very rare in children; does not extend downward, as do the renal tumors, but more inward towards the median line; the edges are sharp and sometimes distinctly notched; very rarely has bowel in front; permits tympany in the flank, and gives decided and distinctive blood-changes. During life several of the cases were supposed to be enlargement of the spleen.

Malignant growths of the retroperitoneal glands are sometimes impossible to differentiate from real tumors; they grow from the same regions; present about the same physical signs, and by pressing on the kidney and ureter produce urinary symptoms. The chief points of difference are: their more median situation, irregular nodular outline, and their rarity. Jenner says that in ten years of hospital practice he has never seen a case. Hensch reports two cases and Cullingsworth one; all of these were taken for renal tumors during life; in one, the growth was so extremely rapid that it filled the whole abdominal cavity in six weeks. The tumor in the case of Sydney C., reported in this paper, was thought before operation to be a growth of this kind.

Ovarian tumors are extremely rare in children; have their point of initial swelling in the pelvis, growing up instead of down; can be felt by rectal examination, and usually have bowel above them.

Intestines.—Tumors of this viscus are small, movable, and almost never seen in children.

Dermoid cysts are very slow in growth, regular in outline, present no constitutional symptoms, and are very rare. Omental growths are medical curiosities in any age. Retro-peritoneal fibromata and lipomata occur only in adults, and in them very rarely. Cysts of the urachus are only a possibility. In one case a malignant growth was taken for ascites.

The cystoscope is very valuable as an aid to diagnosis; serving to reveal the condition of the interior of the bladder, and, when used during renal hæmaturia, to show from which ureter the blood comes. This latter was beautifully done in a case by Nitze, before any tumor could be palpated.

The other conditions of the kidney requiring differentiation are (the classification of Harrison will be used):

Congenital	{	Sarcoma.
		Cystic disease.
		Hydronephrosis.
		Cavernous tumors.
Extra renal	{	Abscess.
		Cysts.
		Myxolipoma.
		Adrenal tumors.
Pelvis	{	Hydropyonephrosis.
		Villous tumors.
		Carcinoma.
Glandular	{	Hydatid cyst.
		Tuberculosis.
		Lymphadenoma.
		Syphilis.
		Lipoma.
		Sarcoma.
		Adenoma.
		Carcinoma.
		Secondary growths.

Of the above we will consider only the most important: First, congenital cysts are generally large, mostly movable,

distinctly fluctuating, and do not give rise to constitutional symptoms. Hydronephrosis is movable, more fluctuating than renal cysts, yields on aspiration a pale urine-like fluid, and varies greatly in size; sometimes almost disappearing by a large discharge of urine. Hydatid cysts are globular, mobile, give the hydatid thrill and fremitus, and, on aspiration, yield a pale fluid, which contains hooklets, scolices, or fragments. Tuberculosis of the kidney is never primary in children. Pyonephrosis and perirenal abscess produce a decided prominence in the back, and are always attended with constitutional symptoms.

Carcinoma.—There are very few, if any, authentic cases on record; in 100,000 sick children Steiner found four which were supposed to have carcinoma. Distinction is in no way important, except as a diagnostic nicety. Syphilis is shown by other constitutional manifestations. Villous tumors, lipomata, and fibromata are extremely rare, and seen mainly in adults.

Prognosis.—The disease tends invariably to a fatal termination, and can only occasionally be arrested by operative interference. The duration has been discussed above.

Medical Treatment.—Drugs are valuable in this malady only to alleviate the symptoms; they have no influence on the course of the disease. Tonic medication, good food, pure air, and proper hygienic surroundings are valuable in that they make the patient more comfortable, promote the bodily functions, and give tone and strength to the system, thus enabling the patient to withstand for a longer period the ravages of the malignant growth; but on the disease itself they have absolutely no effect. Coley's serum may be tried, but I have seen no report of its use.

Operative Treatment.—It is only within the last two decades that removal of these growths has been attempted. Rohrer in a very able, and otherwise complete, monograph (1874) does not mention operative interference. The mission of the surgeon is first to save life; second, if this cannot be accomplished, to prolong it; and, third, if it can neither

be prolonged nor saved, to relieve suffering during its existence.

It is in relation to these points regarding this malady that we have undertaken this study.

First to be considered is the operative mortality. Gross, in 1875, was the first to collect any reliable statistics in regard to this. He found in sixteen cases of children, ranging from one to seven years of age, on whom nephrectomies had been done, that seven died immediately from the operation; of the remaining, seven died of recurrence within eighteen months; and the others were lost sight of entirely. From this record he concluded that the operation should not be done in children. In 1882, Harris, in a series of cases, gave the operative mortality at 45 per cent. The following table shows the results collected by other writers:

1884, Weir	50	per cent.
1885, Gross	44.5	"
1885, Bayne	50	"
1888, Neumann	48	"
1889, Guillet	49	"
1889, Dumont	70	"

In 1889, Fisher gave the lowest operative mortality at 56 per cent., and states that in thirty cases there was only one real cure. Seigrist, in sixty-four cases, had thirty-four deaths, —52 per cent.; of the remainder, nine had recurrence within one and a half years; five were living and well at the end of two years, but only one at the end of four years. Of twenty-five cases in children, collected by Taylor in 1888, seven died from accidents during the operation; eight very soon afterwards, from shock and peritonitis; of the remaining ten, six died of metastases within eighteen months, the other four passed out of sight. Aldibert (1893), in a series of forty-five nephrectomies in children, showed the following results: twenty died from the operation; and in four the operations were incomplete. Of the twenty deaths, thirteen were from shock, one from peritonitis, one from volvulus, and two undetermined. Of the twenty-one that recovered, eleven had

recurrence within eighteen months, only one reaching that limit; eight were lost sight of in four months; and two were well at the end of three years. Aldibert concludes that, in the light of an operative mortality of 48 per cent., and an ultimate one of 75 per cent., and in view of the accidents that have happened in the hands of the best surgeons, the operation should not be done in children, except in the earlier stages. Chevalier (1893), in a very able and complete monograph, concludes that surgical intervention is not warrantable in children.

In England the operation is not looked on with much favor. Moullin (1895) says that it is very rare to meet a case in which operation is justifiable. Keith (1894) states that "in young children it is doubtful whether it is ever right to operate; indeed, such operations must be looked on as surgical possibilities rather than as operations of advantage to the patient." Butlin (1891) thinks that no thoroughly successful operation can be claimed. In America and Germany it is much more popular, and surgeons are disposed to operate, except in the last stages.

Of twelve operations in Czerny's clinic, prior to 1890, there were nine deaths; since this there have been nine operations and no deaths. This vast improvement, according to him, is due to the avoidance of the peritoneal cavity, and to the non-use of antiseptics in the wound. Koenig, in his last twelve cases, lost three; of these, seven were under nine years, only one of which died. In Israel's last twelve, only two died. In Czerny's twelve successful cases, only one was living five years afterwards. In a series of 150 cases, which he collected, including all ages, only five lived more than five years; which were as follows: Israel, child, five years and four months; Clementi, five years; Schede, five years; Israel, six and three-quarters; Krönlein, four and three-quarters years.

Heuter, a German surgeon (1876), was the first to do a nephrectomy in a child for a malignant tumor, but was not successful. The first successful case was done by Jessop, of England. The child, two and one-half years of age, had been

sick for seven months, and at time of operation was in a feeble condition. He made a lumbar incision, found the growth very adherent, had considerable bleeding during the enucleation, drained with whip-cord, and nearly closed the abdomen. The child made an excellent recovery; but died nine months afterwards, from a recurrence. The next successful case was by Hicquet, in 1881; then followed a series of fatal cases; Ollier, in 1882; Heath, in 1888; Reczey, in 1882; and Rawdon, in 1882. The first case operated upon in America was by Taylor and Stewart, in 1886; the child died in two hours. The first successful case was by Abbe, in 1892; this will be mentioned more fully later on.

The incision has been, and still is, a matter of much dispute; none having been found which is suitable for all cases; and the probability is that it should vary according to the conditions of each case. The lumbar seems to answer well for the small growths; but for the large, the transverse or abdominal is necessary. Czerny makes an incision from the twelfth rib, curving downward and forward, avoiding the peritoneum, if possible. Koenig extends from the lumbar region transversely along the costal margin to near the median line; the peritoneum is pushed down, and the kidney exposed. Israel prefers the lumbar incision. Schmidt makes a median in most cases. Abbe uses a modified Koenig, which extends more towards the umbilicus, and does not try to avoid the peritoneum. Kelly usually begins up towards the costo-vertebral angle and extends obliquely forward and downward in the direction of the iliac spine. Halsted and Finney prefer Koenig's.

Israel, Koenig, and Czerny lay considerable stress upon avoiding the peritoneum; it will be found, however, by a perusal of their cases that they seldom succeeded in avoiding it.

Prior to the improved methods of aseptic and antiseptic technique, the extraperitoneal method was followed by far better results, as will be shown by the following table of mortality:

	Abdominal.	Extraperitoneal.
Gross, 1855	50.83 per cent.	36.93 per cent.
Brodeur, 1886	50.00 “	37 $\frac{6}{10}$ “
Fisher, 1889	52.00 “	16.00 “
Seigrist, 1889	57 $\frac{9}{10}$ “	23 $\frac{3}{10}$ “
Guillet, 1888	62.00 “	33.00 “
Chevalier, 1891	59.00 “	24.00 “

It must be taken into consideration that the abdominal method was used for all the largest, oldest, more advanced, and adherent tumors, so that this accounts, in a large degree, for the difference in the mortality of the two methods.

The fact of opening the peritoneum, when it is done in an absolutely clean manner, should not add any more to the gravity of the operation than when the lumbar method is employed. Moreover, it gives the advantages of room and light, thus permitting a careful determination of the extent of the growth, its adhesions to the surrounding organs, the invasion of the lymphatics, and the presence of the other kidney. It gives also the ability to ligate the vessels with more facility and thoroughly to remove the perirenal fat, which, according to Israel, is very important. Seigrist points out that while the abdominal method is followed by a greater immediate mortality, it is attended by fewer recurrences; the extraperitoneal showing 15 per cent. of recurrences, while the lumbar runs as high as 40 per cent. The lumbar method, being extraperitoneal, is advantageous in case of accident; it also makes it easier to break up posterior adhesions; gives better drainage, and is less serious in rupture of the capsule. This, by the abdominal method, would permit the escape of the contents into the abdominal cavity; of itself this would probably not result in harm; but the material, which is broken down blood-clot and degenerate tissue, would form quite a good medium for the growth of any micro-organisms which might have been introduced into the peritoneal cavity during the operation. These would thus gain a foothold; and later involve the peritoneum, setting up a general peritonitis. Besides, the resistance of the peritoneum would be lowered by

contact with the necrotic material, and it would thus be made more susceptible to the invasion of the pyogenic micro-organisms. Of three cases which had this complication, two died very soon and one healed by first intention. The lumbar method is well suited to the small and movable tumors.

In seventy-four operative cases, which I have collected, the peritoneum was opened in the large majority; the exact number cannot be stated, but it will be seen, approximately, in the appended table. In the following series under "abdominal" are classed incisions in the median, semilunar, and mammary lines; the "transverse" includes the direct transverse, the oblique, von Bergman's, Koenig's, Abbe's, and Thornton's; under the "lumbar," only those that did not extend into the abdominal region. Of this whole series in which the incisions were given, forty-two were abdominal, nineteen transverse, and three lumbar; of these it is probable, according to the nature of the incision, that fifty-four were intra- and ten extraperitoneal.

In Class I of the series, where immediate death followed, nineteen were abdominal, four transverse, and none lumbar; of these twenty-two were probably intra- and one extraperitoneal. In Class II, in which there was recovery, but subsequent recurrence, thirteen were abdominal, eleven transverse, and one lumbar; of these nineteen were intra- and six were probably extraperitoneal. In Class III, where the patient recovered, but passed out of sight, nine were abdominal, four transverse, and one lumbar; of these, twelve were intra- and two extraperitoneal. In Class IV, where recovery has stood over three years, one was abdominal, two transverse, and one lumbar. The preponderance of the intraperitoneal method is so great that no definite statistics can be made; none, however, are necessary; for unquestionably the opening of the peritoneal cavity, when properly done, and with due care and protection of the viscera, is absolutely devoid of danger. In selecting the incision for each case, two things should be borne in mind: First, there should be plenty of room in which to work, and, second, a proper exposure of the mass and sur-

rounding parts. No attempt should be made to operate in a small incision, for a long one heals quite as readily, and is not attended in any way with disadvantage to the patient. Abbe urges these points, and attributes his brilliant success in a great measure to them.

After exposing the tumor, enucleation was done by the hand in the majority, the adhesions being usually light, and easily broken up. In a few they were stronger, and required considerable dissection; while some of the growths were so adherent that complete removal was impossible. When the condition of patient permitted, the vessels and ureter were separately ligated; but in other conditions the pedicle was tied *en masse*. The former method, except in two cases, where the ligatures slipped, seemed to do as well as the latter. Cat-gut and silk were used as ligatures in the greater number; the former in Germany and France, the latter in America and England. The pedicle was usually divided with a knife or scissors; in two cases the actual cautery was used. Only a few speak of carbolizing the cut end of the ureter. I consider this point important, since the stump may serve as a means of infection if pyelitis is present.

It is very important that hæmorrhage should be reduced to the minimum, since only a small amount tells strongly on the condition of the child; and it is probable that quite a number of deaths in these and other surgical operations, which were attributed to shock, were really from loss of blood. I do not mean to be understood that all shock comes from this cause; for in quite a number (Gussenbauer, Magueur, Stewart, Halsted, and Finney) there was very little bleeding, but death from shock resulted in a short time. In other instances the hæmorrhage was rather profuse, and still was not followed by any serious consequence. Most of the cases report little bleeding, and in some a remarkably small amount occurred; Abbe states that in one of his, the amount of blood was not over half an ounce. When it occurs to a considerable degree, it can be best met by enemata, infusion of salt solution, artificial heat, and lowering the head. Stimu-

lants are recommended very strongly, but it is questionable whether they have ever been productive of much benefit.

In the late cases no antiseptics were used in the abdominal cavity, on the instruments, or on the hands of the operator; the gauze used was not medicated, except in a few cases where iodoform strips were inserted as a drain. The discarding of the carbolic spray has been very advantageous, for two deaths (Czerny and Rawdon) and numerous complications were attributable to it.

Peritoneum.—Nearly all the operators closed the rent in the peritoneum when the condition of the patient would permit; for this purpose catgut was mostly used. In Schmidt's unique case it was not closed; Terrier sutures the peritoneum to the abdominal wall; Koenig does not separately sew it, but depends on its approximation by closing the abdomen.

When the abdominal method is employed, great care should be exercised in handling the intestines, in keeping them properly covered, and in preventing their being chilled; for the last two purposes gauze wrung out of warm salt solution serves admirably. Due precaution should be exercised in the division of the mesocolon, so as to injure the least possible number of blood-vessels, and not incur the risk of gangrene; this can be accomplished best by dividing it parallel with the vessels, or, as Israel suggests, in making a small incision and gently tearing it. In Werder's case it was necessary to divide it for a distance of six inches, parallel with the gut; this was carefully sutured as soon as possible, and no harm resulted to the colon. During the enucleation of the mass the capsule was ruptured in three cases, and the soft contents escaped into the abdominal cavity; the latter was completely cleaned, and in two cases no harm resulted. In the third case death from peritonitis occurred on the third day, which, however, cannot be positively ascribed to the rupture. When this complication does occur the peritoneum can be cleaned best by thoroughly wiping it with sterilized gauze wet in salt solution. In one case the contents were purposely evacuated to lessen the size of the mass.

Drain.—Most of the cases were drained, to a greater or less extent; in some the whole cavity was packed, in others only a small piece of gauze or tubing was inserted. Five (Little, Walsham, McDonald, Werder, and Dandois) were closed entirely, and did quite as well as the drained cases. Jessop used whip-cord; Werder, a rubber tube; McDonald, a glass tube, and a large number of other bits of gauze. If the bleeding has entirely ceased no packing is necessary; but rather than that the time of the operation should be lengthened it should be used. Taylor recommends making a lumbar opening for drainage; where the wound cannot be entirely closed I think this advisable.

Various sutures were used for closing the abdominal wall,—catgut, silk, silver wire, and silkworm gut; wire and silk being the most common. The manner of closing depended on the special taste of the operator.

The time of the operations varied with the different surgeons, and with the difficulties met in each case. In the successful ones, it was from twenty-five minutes (Brokaw) to one and one-half hours (Abbe). With proper operative technique, no loss of blood and good administration of the anæsthetic, it may be prolonged up to a certain point, probably two hours; after which the condition of the patient rapidly fails. I found no successful case after this limit; it is fair to state, however, that quite a number had no record of time.

Stimulants.—Strychnine, coffee, and whiskey were used, either separately or in combination, during and after the operation, in quite a number of cases. In the desperate cases, ether, nitroglycerin, and ammonia were resorted to; but the use of these is very questionable, for cases that do not respond to the first group are generally beyond hope.

The healing in some of the successful cases was remarkably rapid; especially so in Godlee's case, where the child left the hospital in six days, perfectly healed. In others it ranged from ten to thirty days. Slight suppuration was present in the majority, but in only a few was it excessive.

In the after-treatment very little is said about the nourishment, except in a general way. It should consist of liquids during the first few days, peptonized milk, albumen, and soups; after which a light, soft diet may be given. Four cases were found inoperable after making an incision; two of these recovered from the operation, and lived for some time; the other two died immediately.

Cause of Death.—Sixteen died from shock, varying from a half hour to sixty-one hours: six of peritonitis; two of carbolic-poisoning; one of hæmorrhage; one of ligation of the vena cava; one of invagination of the ileum; and one of septicæmia. Of these, peritonitis and septicæmia can be excluded by asepsis, and accidents prevented by careful surgical manipulation. Shock can be greatly lessened by preserving the warmth of the body; by preventing the loss of every possible drop of blood, from beginning to end, and by carefully handling and protecting the abdominal viscera. Still, with the greatest care all along the line, a certain number will be profoundly shocked. We say shocked, because we do not understand the condition that exists. It is possible that the removal of a large mass from the abdomen may produce such a change in the abdominal pressure that the venous channels become engorged with blood, and thus the patient is bled to death into his own veins. The same condition may also be induced by a vasomotor disturbance. There can be given no proof of the above theories: they are offered simply as possible explanations.

A short abstract of the four cases that have stood the three-year limit will now be given.

CASE I.—ISRAEL, *Archiv für Chirurgie*, Band xlvi, 1894. Boy, aged fourteen years; admitted July 7, 1888; family history was good. Had been moderately well and strong for most of his life. Some time before operation there was noticed in right hypochondrium a mass which was rounded, moderately firm, slightly movable, and not painful on manipulation; it gave no pain nor special discomfort, and had not produced any disturb-

ance of health. No distinct emaciation or anæmia; general condition good.

On August 31, 1888, under ether, Israel made a T-shaped incision in the lumbar region; the mass came prominently forward, was not adherent, and readily peeled out. Pedicle was ligated separately, and mass completely removed; after which the perinephritic fat was freely excised. Peritoneum was not opened. The healing was primary; recovery quick and uneventful; and patient left the hospital in one month.

The growth seemed to spring from the upper pole of kidney, and grew over the remaining portion, forming a kind of capsule. It was about double the size of a man's fist, irregularly shaped, slightly lobulated, moderately firm, and on section was gray-red in color, with yellow areas. Microscopically, it proved to be an alveolar sarcoma. Five years after operation the patient was well and strong.

CASE II.—SCHMIDT, *Münchener medicinische Wochenschrift*, No. 15, S. 256, 1892. Girl, six months of age; family history negative; apparently in good health; well nourished and good color. Palpable mass extended beyond median line, from margin of ribs to symphysis. In the main it was hard, with fluctuating areas here and there. No urine could be obtained.

Operation.—Incision was made two fingers' breadth to the left of median line; mass easily shelled out; artery and vein separately ligated; peritoneum not sutured, and abdomen entirely closed. Time, one-half hour. Rapid and good reaction from operation. On the fourth day an abscess developed in the abdominal wall; it was opened, evacuated, and packed; it gave no further trouble, and the wound healed readily.

The mass was the size of a child's head; no structure of kidney visible; it was firm and slightly nodular. Microscopic examination proved it to be a sarcoma. Four years afterwards the child was living and well.

CASE III.—ABBE, *ANNALS OF SURGERY*, Vol. XXII, 1894. Girl, aged two years; family history negative. Well and strong until five months before admission; at this time there was noticed a small lump in the abdomen, which had progressively enlarged. No disturbance of general health except that one day, three months before she had hæmaturia; two months later it occurred again, none afterwards. On admission she was in good

condition, though not very robust. Examination showed a large, solid tumor, occupying the right inguinal, lumbar, and hypochondriac regions. Colon resonance was distinct towards the median line. Urine contained a trace of albumen, specific gravity 1015; no cast, no blood, no sugar.

Operation. April 12.—Child was enveloped in cotton batting, etherized, and placed in Trendelenburg position. Transverse incision, extending from lumbar region to very near median line; very large veins appeared on the tumor; growth easily shelled out of its bed, and pedicle ligated with strong, white silk. Very little blood was lost, scarcely half an ounce; wound partially packed with iodoform gauze and closed. Time, forty-five minutes. Slight shock; rapid and uneventful recovery.

Pathological Report.—Large oval mass, weighed two and one-half pounds, and, on microscopic examination, proved to be an adenosarcoma. The adenomatous portions were distinctly epithelial structures; the remainder was made up of a fibrous stroma, in the meshes of which there were masses of round and spindle cells. Four years after the operation the child was living and well.

CASE IV.—ABBE, ANNALS OF SURGERY, Vol. XXII, 1894. Girl, aged one year and two months. Six months before admission the mother noticed an enlargement of the abdomen. There had been no constitutional disturbance save a slight loss in weight and a cough. No blood in urine nor difficulty in voidance.

Examination.—On palpation a large solid mass was found, which occupied nearly the whole of the abdomen, and apparently sprang from the right kidney. The child was well nourished, well developed, and appeared to be in good condition.

Operation, November 30, 1893.—Under ether, a long transverse incision was made from the median line to within six centimetres of the spine. The mass was rapidly enucleated, and in spite of the fact of its surface being covered with large veins, the loss of blood was not more than two ounces. Small bits of gauze were inserted as a drain, and the wound nearly closed with catgut. Trendelenburg's position was maintained throughout; time, one and a half hours. Very little shock; pulse quick but moderately good; the child rallied well, and seemed afterwards to suffer but little pain or discomfort. There was no diminution of urine, nor any untoward symptoms during convalescence.

Tumor weighed seven and a half pounds, the main weight of the child fifteen pounds. It was very dark, lobulated, moderately firm, and distinctly encapsulated. Microscopic section proved it to be a rhabdomyosarcoma, containing a large proportion of striped muscle tissue, interspersed in which were numerous round and spindle cells. Three and a half years afterwards the child was living and doing well.

The above cases are the only four of the series that have stood the three-year limit, and of these, we are proud to say, two were done by an American surgeon, one of whose cases was proportionately the largest which has been removed with recovery. Schmidt holds the palm in regard to age; his patient being the youngest on whom an operation was ever performed for this disease.

Of the seventy-four operative cases, as is shown in the appended tables, twenty-seven died from the effects of the operation; twenty-eight survived, but afterwards succumbed to recurrence; fourteen passed out of sight; and four remained well at the end of three and a half, four, and five years. An estimate of mortality in the cases in which the results are definitely known, shows an operative mortality of 36.48 per cent.; an ultimate one of 74.32 per cent.; the latter, however, being too low, for it supposes that Class III, which had incomplete histories, remained well. If this class is excluded we have a mortality of 93.22 per cent., which is probably too high, for all of the patients were well when last heard of, and it may be supposed that some of them had no recurrence. It is seen, therefore, that no exact ultimate mortality can be obtained, but it stands somewhere between 74.32 per cent. and 93.22 per cent. The percentage of cures is 5.40. According to the dates the operative mortality is as follows:

Dates.	Cases.	Percentage.
1876	1	100
1877	1	50
1880	1	100
1881	1	0
1882	5	100

Dates.	Cases.	Percentage.
1883	4	25
1884	4	75
1885	4	0
1886	2	100
1887	3	66 $\frac{2}{3}$
1888	6	33 $\frac{1}{3}$
1889	5	80
1890	5	0
1891	3	0
1892	6	16 $\frac{2}{3}$
1893	8	12 $\frac{1}{2}$
1894	5	0
1895	5	40
1896	4	25

It will be seen that the operative mortality has decidedly improved during the last six years, although for the past two it is slightly higher than the preceding. By comparison of these statistics with those of Fischer, Seigrist, and others, it will be shown that the improvement is from 15 per cent. to 25 per cent.; on the other hand, it is 7.98 per cent. higher than that of Lewi. The ultimate mortality is slightly improved, but, unfortunately, yet remains very high; still by operating the life period has been lengthened by 8.69 months, and 5.40 per cent. of cures has been obtained.

The average duration of the disease before operation, of cases that proved immediately fatal, was 9.78 months; of those that recovered and had recurrence, it was 5.82 months; of those that recovered but had incomplete histories, it was 6.87 months; and of those that remained cured, it was 2.83 months. The average known duration of life in all the operative cases was 16.77 months; in Classes I and II this duration dated from the time of first symptom to death; and in Classes III and IV it extended from time of first symptoms to last note. This is evidently much too low, for in Classes III and IV, comprising nineteen cases, the patients were well and strong, with no sign of a return, at the time of last note; it would be safe, therefore, to add several months to these, which would materially increase the average. Without oper-

ation, the duration was 8.08 months; the comparison proving that by operating we increase the life period by 8.69 months. The average duration after operation, excluding Class I, which proved immediately fatal, was 19.98 months. If we include that class, it is 6.20 months. Both of the above (6.20 and 19.98 months) are too low; for Classes III and IV, as before stated, were well and strong at the time of last note. In Class II, where there was recovery, but recurrence, the duration of life was 6.64 months.

In the selection of cases for operation it would be better to exclude those far advanced, in which the mass is large and adherent, and the child shows marked evidence of constitutional disturbance. In the earlier cases I would unhesitatingly advise operation; for one must remember that we have to deal with a certainly fatal malady, and the interference can, at worst, only slightly hasten the issue. On the other hand, it offers good promise of lengthening the life of the patient, relieving suffering, and one chance in eighteen and a half of effecting a cure. I think, moreover, that in view of the fact that metastases and adhesions occur in only 50 per cent. of the fatal cases, an exploratory incision should be made in all, save the very large and advanced cases.

It is probable that a cure can be made only in the early stages; it is, therefore, most unfortunate that a majority of the cases are brought late; still, in not a few, the earlier symptoms have not been recognized, although brought to the notice of a physician; and thus the disease has been allowed to cross the border-line. Any and all symptoms of malignant tumors, however slight, should arouse suspicion and lead to a most careful and painstaking examination. A mass in the region of the kidney, or any palpable enlargement of that organ, should be explored by an operation. Pain in the lumbar region, persisting or occurring at irregular intervals, should be treated with the greatest consideration, and a careful palpation of the kidney should be made under ether. Hæmaturia, on its very first appearance, should bring to mind sarcoma of the kidney, and give rise to the careful examination

that has been mentioned previously. The other symptoms, as a rule, present themselves too late to be of any use in regard to operative procedure, except to contraindicate it.

The anæsthetic used was not often stated. It was probably ether in America, and chloroform in Germany, France, and England. Unquestionably, ether is the safer, and, according to Eisendrath, who made observation on 120 cases, and Weir on over 300, it is followed less often by albuminuria; which was present, after ether, in 25 per cent., and after chloroform in 32 per cent.

Summary.—Malignant tumors of the kidney in childhood occur most frequently either congenitally or within the first few years of life.

All of them are probably embryonic in origin, as evidenced by the fact that they contain distinctly embryonic tissue.

While not being pure sarcoma they resemble it in their most prominent features.

They are very rapid in growth and are not attended with any distinctive systemic symptoms in the first half of their course; in the latter they are accompanied by rapid and great constitutional disturbance.

They occur most frequently between one and two years of age.

The left kidney is more often affected than the right.

The disease seems to occur with about equal frequency in males and females.

The average duration of life without operation is 8.08 months; with operation it is 16.77 months.

Operative treatment, to be successful, should be instituted as early as possible; but even in the late cases an exploration should be made.

Operation is followed by an immediate mortality of 38.25 per cent.; an ultimate one somewhere between 74.32 per cent. and 94.53 per cent.; 5.47 per cent. of cures; and a lengthening of the life period, by 8.08 months.

In conclusion, although the cures are very few, still in

consideration of the invariably fatal termination of this malady, without interference, I unhesitatingly advise operation, for it offers the only hope; and at worst it means only an accelerated death.

I wish to thank Drs. Halsted and Finney for the privilege of reporting these cases, and for many helpful suggestions in the preparation of this paper. Also Dr. S. M. Cone, for much valuable aid in the pathological examination of the tumors.

CLASS I.—NEPHRECTOMIES FOR SARCOMA OF KIDNEY IN CHILDREN,—
DEATH.

CASE 1.—Hunter, 1876: *Deutsch. Zeitsch. für Chirurg.*, ix, 527, 1878: sex, girl: age, four years: kidney involved, right: duration, one year: condition before operation, well nourished; movable mass; normal urine: remarks on operation, abdominal incision; large hæmorrhage: macroscopic, 2200 grammes; elastic and nodular: microscopic, paranephritic sarcoma: results, death from hæmorrhage.

CASE 2.—Kocher, 1877: *Deutsch. Zeitsch. für Chirurg.*, ix, S. 312: sex, boy: age, two and a half years: kidney involved, left: duration, two and a half years: condition before operation, swelling since birth; palpable mass; normal urine: remarks on operation, abdominal incision; large hæmorrhage; pedicle ligated with catgut: macroscopic, weight 1400 grammes: microscopic, adenosarcoma: results, death on second day from peritonitis.

CASE 3.—Czerny, 1880: *Deutsch. med. Wochen.*, xxxi, S. 422, 1881: sex, girl: age, eleven months: kidney involved, left: duration, six weeks: remarks on operation, abdominal incision; moderate hæmorrhage: macroscopic, size of child's head: microscopic, adenosarcoma: results, death on second day from peritonitis.

CASE 4.—Ollier, 1882: *Rev. de Chirurg.*, p. 898, 1883: age, four and a half years: remarks on operation, intraperitoneal method: microscopic, sarcoma: results, shock, death in one hour.

CASE 5.—Heath, 1882: *Brit. Med. Journ.*, Vol. ii, p. 100, 1882: age, young child: remarks on operation, abdominal incision; slight loss of blood; condition at end good: results, death, from shock, eighteen hours after.

CASE 6.—Reczey, 1882: Bohai, Broisi Hételap, 1882: sex, boy: age, five years: kidney involved, left: remarks on operation, intraperitoneal method: results, death in twenty-four hours from peritonitis.

CASE 7.—Rawdon, 1882: *Liverpool Med. Chirurg. Journ.*, September, 1882: sex, girl: age, sixteen months: kidney involved, left: duration, two and a half months: condition before operation, emaciated and

anæmic; large movable mass; normal urine: remarks on operation, median incision; colon adherent; vessels ligated *en masse*; one ounce of blood lost: macroscopic, cystic: microscopic, round-celled sarcoma: results, death in fifteen hours, due to carbolic-poisoning.

CASE 8.—Pughe, 1882: Liverpool Med. Chirurg. Journ, 1885: sex, girl: age, two and a half years: duration, one week: remarks on operation, intraperitoneal incision; moderate bleeding: macroscopic, weight one kilo: microscopic, sarcoma: results, death on seventh day from invagination of gut.

CASE 9.—Bohai, 1883: Broisi Hêtilap, 7, 1883; Chevalier, "Malignant Tumors of Kidney," 91: sex, boy: age, five and a half years: kidney involved, left: remarks on operation, median incision: macroscopic, large mass, one-fourth weight of child: microscopic, myosarcoma: results, death on second day from peritonitis.

CASE 10.—Meredith, 1884: Med. Times and Gazette, p. 627, 1884: sex, girl: age, four years: condition before operation, large tumor; rapid growth; extended from costal margin to Poupart's ligament: remarks on operation, long, transverse incision; mass ruptured: macroscopic, weight 1100 grammes; very soft, cellular mass: microscopic, round-celled sarcoma: results, death on third day from ligation of vena cava.

CASE 11.—Witzel Scheven, 1884: Chevalier, "De l'Intervention chirurgicale dans les Tumeurs malignes du Rein," 1891: sex, girl: age, four years: kidney involved, right: duration, six weeks: remarks on operation, abdominal incision; metastasis to retroperitoneal glands: microscopic, myosarcoma, strio-cellulare: results, death on sixth day from peritonitis.

CASE 12.—Little, 1884: New York Med. Journ., March, 1884: sex, girl: age, four years: kidney involved, right: duration, since birth: condition before operation, large mass occupying whole side and extending beyond median line; general condition very good; urine negative: remarks on operation, abdominal incision two and a half inches in length; two litres of fluid escaped from cavity; vessels ligated *en masse*; peritoneum closed with catgut; abdomen with silver wire: macroscopic, moderately large spheroidal mass six inches in diameter; very cystic; kidney structure visible; cysts contain serum and blood: microscopic, small, round-celled sarcoma: results, death in one-half hour from shock.

CASE 13.—Bardenheuer, 1886: "Mittheil. des Kolner. Bürger Hosp., Heft 5. 1890: sex, boy: age, three years: kidney involved, left: remarks on operation, lumbo-abdominal incision: macroscopic, weight two kilos: microscopic, round-celled sarcoma: results, death on fourteenth day from peritonitis.

CASE 14.—Taylor, Stewart, 1886: Amer. Journ. Med. Sciences, xxxviii, p. 401, 1887: sex, girl: age, one year and eight months: kidney involved, right: duration, six months: condition before operation, six months before admission mother noticed a mass in right side: no hæmaturia; no constitutional disturbance; three months later progressive growth filled whole side; slight nausea; dyspnœa; slight emaciation; anæmia: remarks on operation, Langenbeck's incision from ribs to ilium;

colon in front and adherent; enucleation by hand and dissection; pedicle ligated *en masse*; slight bleeding; considerable shock: macroscopic, weight one and a half kilos; firm, slightly nodular; gray-yellow, and translucent on section: microscopic, round- and spindle-celled sarcoma: results, death in two hours from shock.

CASE 15.—Thinar, 1887: Chevalier, Thèse de Paris, p. 135, 1891: sex, boy: age, one year and six months: kidney involved, left: duration, seven months: condition before operation, large, somewhat movable tumor; slight emaciation and anemia: remarks on operation, median incision; enucleation by hand; pedicle ligated *en masse*; ligature slipped; profuse bleeding: macroscopic, measured $10 \times 7 \times 8$ centimetres; weight 350 grammes; rounded and smooth: microscopic, round-celled sarcoma: results, death from shock in four hours.

CASE 16.—Koenig, 1887: Fischer, Deutsch. Zeitsch. für Chirurg., xxix, S. 594: sex, girl: age, one and a half years: duration, several weeks: remarks on operation, abdominal incision; metastasis to lungs: microscopic, sarcoma: results, death on day of operation from shock.

CASE 17.—Gussenbauer, 1888: Aldibert-Czerny, Archiv für Kinderheilk., xii, S. 247: sex, boy: age, three and a half years: kidney involved, left: duration, four months: remarks on operation, abdominal incision; slight hæmorrhage: microscopic, carcinoma (?): results, death on day of operation from shock.

CASE 18.—Magueur, 1888: Journ. Méd., Bordeaux, February, 1888: sex, boy: age, two years: kidney involved, right: duration, eight months: remarks on operation, abdominal incision; very slight hæmorrhage: microscopic, sarcoma: results, death from shock after the operation.

CASE 19.—Guyon, 1889: Aldibert, Rev. Mens. de l'Enfance, Vol. ii, 1893: sex, girl: age, two years: kidney involved, right: remarks on operation, abdominal incision: microscopic, round-celled sarcoma: results, death from shock on day of operation.

CASE 20.—Quénu, 1889: Aldibert, Rev. Mens. de l'Enfance, Vol. ii, 1893: results, death from shock on day of operation.

CASE 21.—Dumont, 1889: Chevalier, "De l'Intervention chirurgicale dans les Tumeurs malignes du Rein," 1891: sex, boy: age, five years: kidney involved, left: condition before operation, vomiting; pigmentation of skin; mass size of foetal head; general condition fair; urine negative: microscopic, round-celled sarcoma: results, death from shock on day of operation.

CASE 22.—Czerny, 1889: Archiv für Kinderheilk., 1889, 1890: sex, infant: age, three and a half years: kidney involved, right: duration, three and a half months: condition before operation, large, partly movable mass in hypochondrium; did not seem to be attached to viscera; general condition good; urine negative: results, death from shock in a few hours.

CASE 23.—Smith, 1892: Münch. med. Wochen., No. 15, S. 256, 1892: sex, girl: age, eight years: remarks on operation, abdominal incision: results, death from shock on day of operation.

CASE 24.—Burchard, Braun, 1893: *Deutsch. med. Wochen.*, Band xix, 1893: sex, girl: age, two and a half years: kidney involved, right: duration, eight months: condition before operation, tumor of eight months' standing; extended from ribs to Poupart's ligament and beyond median line; slight emaciation; no hæmaturia; no pain; diminished urine: remarks on operation, abdominal incision from eleventh rib to Poupart's ligament; easy enucleation; pedicle ligated with silk; time one and one-quarter hours; slight shock: macroscopic, size of child's head; soft, nodular, and gray-red on section: metastasis to lungs: microscopic, round-celled sarcoma containing muscle: results, death in a few hours from shock.

CASE 25.—Halsted, 1895: present paper: sex, boy: age, four years: kidney involved, left: duration, three months: condition before operation, general condition fair; slight emaciation; decided anæmia; some pain; hæmaturia; large mass nearly filled the whole abdomen: remarks on operation, Koenig's incision; very large and so adherent that operation was abandoned: macroscopic, weight three kilos; $19 \times 14 \times 11$ centimetres in diameter: yellow-gray on section; very soft and cystic: microscopic, mixed-celled sarcoma: results, death from shock in twelve hours.

CASE 26.—Lovett, 1895: Wentworth, *Archives of Pædiat.*, Vol. xiii, 1896: sex, girl: age, twenty months: kidney involved, left: duration, several months: condition before operation, slight emaciation and anæmia; hæmaturia; rounded mass; extended from twelfth rib to iliac fossa: remarks on operation, incision in left semilunar line; vessels ligated separately; extreme shock: macroscopic, mass $26\frac{1}{2} \times 23$ centimetres in diameter; weight 220 grammes; soft, gray, and homogeneous: microscopic, endothelioma: results, death in sixty-one hours from shock.

CASE 27.—Finney, 1896: present paper: sex, girl: age, thirteen years: kidney involved, left: duration, several months: condition before operation, pain; hæmaturia; anæmia and slight emaciation; large, fixed mass, extending from ribs passed umbilicus to Poupart's ligament: remarks on operation, Koenig's incision; slight adhesions; enucleation by hand and dissection; slight hæmorrhage; very little shock: macroscopic, weight three and a half kilos; moderately firm, gray-red, and yellow on section: microscopic, round- and spindle-celled sarcoma; pigmented: results, death from shock in twelve hours.

CLASS II.—NEPHRECTOMIES FOR SARCOMA OF KIDNEY IN CHILDREN,— RECOVERY AND RECURRENCE.

CASE 28.—Jessop, 1877: *London Lancet*, Vol. i, p. 899, 1877: sex, boy: age, two and a half years: kidney involved, left: duration, one year: condition before operation, hæmaturia and cystitis; emaciation and anæmia: remarks on operation, lumbar incision; free hæmorrhage; whipcord drain: macroscopic, weight sixteen pounds; encephaloid in appearance: results, death in nine months from metastasis.

CASE 29.—Hicquet, 1881: *Bull. de l'Acad. Royale de Belgique*, Rapp.

p. 91, 1886: sex, girl: age, six years: kidney involved, left: duration, one year and two months: condition before operation, large tumor, size of child's head; good condition; no hæmaturia: remarks on operation, abdominal incision; separate ligation of vessels; drained; time one and one-quarter hours; chloroform: macroscopic, weight 5000 grammes: microscopic, adenosarcoma: results, death sixteen months afterwards from general sarcomatosis.

CASE 30.—Godlee, 1883: Brit. Med. Journ., Vol. ii, p. 863, 1884: sex, boy: age, one year and ten months: kidney involved, right: duration, two months: condition before operation, slight emaciation; mass freely movable; no pain; urine negative: remarks on operation, Langenbeck's incision; no adhesions; easy enucleation; slight hæmorrhage; time one-half hour; rapid healing; left in six days: macroscopic, weight 1000 grammes: microscopic, mixed-celled sarcoma: results, death in seven months from recurrence.

CASE 31.—Koenig, 1883: Verhandl. der Gesellsch. für Chirurg., S. 68, 1895: sex, girl: age, six years: remarks on operation, lumbo-abdominal incision: microscopic, myxosarcoma: results, recurred in four months and death in five months after the operation.

CASE 32.—Schönborn, 1883: Fischer, Deutsch. Zeitsch. für Chirurg., Band xxix, S. 592, 1885: sex, girl: age, seven years: kidney involved, right: duration, one and a half months: remarks on operation, lumbo-abdominal incision: macroscopic, size of fist: microscopic, sarcoma: results, death in one year from recurrence.

CASE 33.—Bardenheuer, 1884: Mittheil. Kolner. Bürger Hosp., v, 1890: sex, boy: age, two and a half years: kidney involved, right: duration, one and a half months: remarks on operation, lumbo-abdominal incision: macroscopic, 775 grammes: microscopic, carcinoma (?): results, recurrence in four months.

CASE 34.—Koenig, 1885: Fischer, Deutsch. Zeitsch. für Chirurg., Band xxix, S. 594, 1889: sex, boy: age, two and a half years: duration, six months: remarks on operation, lumbo-abdominal incision: macroscopic, size of man's fist: results, recurred in two months and death in four months.

CASE 35.—Croft, 1885: London Lancet, Vol. i, 1885: sex, boy: age, three years: kidney involved, right: remarks on operation, lumbo-abdominal incision: macroscopic, size of fist: results, recurred in two months and death in four months.

CASE 36.—Trendelenburg, 1885: Witzel, Deutsch. Zeitsch. für Chirurg., Band xxiv: sex, boy: age, nine years: kidney involved, right: duration, four years: remarks on operation, abdominal incision; moderate hæmorrhage: macroscopic, weight two kilos: microscopic, adenosarcoma: results, five years afterwards was reported to have had a recurrence, but not definite.

CASE 37.—Alsberg, 1887: Deutsch. med. Wochen., Band iv, 1887: sex, girl: age, five years: kidney involved, right: duration, four months: condition before operation, hæmaturia once; no mass found until four months later; very rapid growth; emaciation moderate: remarks on

operation, von Bergman's incision from eleventh rib to Poupart's ligament; adherent to colon; separate ligation of vessels; slight hæmorrhage; very little suppuration; quick recovery: macroscopic, very large mass with soft contents: microscopic, round- and spindle-celled sarcoma: results, death from recurrence in eleven months.

CASE 38.—Fischer, 1888: *Deutsch. Zeitsch. für Chirurg.*, Band xxix, 1889: sex, boy: age, four and a half years: kidney involved, left: duration, eleven weeks: remarks on operation, intraperitoneal method; incision from eleventh rib to Poupart's ligament; great collapse; removal not complete; five weeks later second operation; primary healing; good recovery: results, recurred three months later.

CASE 39.—Schede, 1888: "*Meine Erfahrungen Nierenextirpationen*," Hamburg, 1889: sex, girl: age, two years and eleven months: kidney involved, right: remarks on operation, first operation in 1888; growth recurred and a second operation was done about two years afterwards; death resulted in a few days: results, recurrence in one and a half to two years after first operation; death in a few days after second operation.

CASE 40.—Koenig, 1889: Letter to Döderlein: sex, girl: results, recurrence.

CASE 41.—Koenig, 1890: Letter to Döderlein: results, recurrence.

CASE 42.—Brokaw, 1890: *Med. News*, lxiii, p. 313, 1891: sex, boy: age, three years and eight months: kidney involved, right: duration, three months: condition before operation, pain; general discomfort; slight constitutional disturbance; mass filled lumbar and one-half umbilical regions: remarks on operation, von Bergman's incision; slightly adherent; enucleation by hand; sac ruptured; slight hæmorrhage; time twenty-five minutes; very good recovery: macroscopic, very large mass filled with soft necrotic material: microscopic, sarcoma: results, death in four months from metastasis.

CASE 43.—Dohrn, 1890: *Centralb. für Gynäkol.*, Band xvi, S. 273, 1890: sex, girl: age, three years: kidney involved, right: duration, two and a half months: remarks on operation, abdominal incision: macroscopic, size of child's head: microscopic, round- and spindle-celled sarcoma: results, death in four months from recurrence.

CASE 44.—Czerny's clinic, 1890: *Jordan, Beiträge zur klinisch. Chirurg.*, Band xiv, 1895: sex, boy: age, thirteen months: kidney involved, left: duration, two months: condition before operation, slight anæmia, but well nourished; hard, nodular mass; extending from ribs to near Poupart's ligament; negative urine: remarks on operation, incision from twelfth rib forward and downward; sixteen centimetres in length; peritoneum open five centimetres; vessels separately ligated with catgut; peritoneum closed with catgut; gauze packing; uneventful recovery: macroscopic, mass $14 \times 8\frac{1}{2}$ centimetres in diameter; seemed to spring from pyramids; yellow-white on section: microscopic, adenosarcoma: results, death in three and a half months from metastasis to lung.

CASE 45.—Barth, 1891: *Deutsch. med. Wochen.*, S. 531, 1892: sex, girl: age, five years: kidney involved, right: duration, three months: remarks on operation, lumbo-abdominal incision: macroscopic, size of

child's head: microscopic, adenosarcoma: results, death in four months with recurrence.

CASE 46.—Koenig, 1891: Letter to Döderlein: sex, girl: results, recurrence.

CASE 47.—Czerny's clinic, 1892: Jordan, Beiträge zur klinisch. Chirurg., Band xiv, 1895: sex, girl: age, three years: kidney involved, left: duration, ten weeks: condition before operation, pain only symptom complained of; elastic mass extended from costal margin to pelvis: remarks on operation, transverse incision fifteen centimetres in length; moderate adhesions; vein thrombosed; peritoneum opened eight centimetres; primary healing; discharged in three weeks: macroscopic, soft, gray on section; capsule ruptured: results, one year afterwards had a large recurrence, and died in one month.

CASE 48.—Werder, 1892: Therapeut. Gaz., p. 734, November, 1892: sex, girl: age, two years: kidney involved, left: duration, four months: condition before operation, large tumor; marked emaciation; some dyspnoea; scanty urine: remarks on operation, abdominal incision; very little bleeding; vessels ligated *en masse*: macroscopic, weight eight pounds; lobular mass contained soft, grayish-yellow material: $8\frac{3}{4} \times 5\frac{1}{2} \times 6\frac{1}{2}$ centimetres in diameter: microscopic, round-celled sarcoma: results, death in four months from recurrence.

CASE 49.—Iliot and Walsham, 1893: Brit. Med. Journ., p. 694, 1893: sex, boy: age, nine and a half months: kidney involved, left: duration, one month: condition before operation, large mass extended from ribs to pelvis; and beyond median line slightly movable; child well nourished and healthy in appearance: remarks on operation, lateral abdominal incision; slight adhesions; vessels ligated separately; slight bleeding; no drain; great collapse; tedious recovery: macroscopic, tumor large and cystic; half kidney intact: microscopic, cystic adenoma: results, recurrence and death one year later.

CASE 50.—Halsted, 1893: present paper: sex, girl: age, six years: kidney involved, left: duration, two months: condition before operation, firm, large mass occupying whole left side of abdomen, and extending beyond median line; not movable; decidedly emaciated and anæmic; considerable pain at intervals: remarks on operation, median incision twelve centimetres in length; adherent to abdominal wall; vessels tied *en masse* with silk; abdomen closed with silk; no drain: macroscopic, large, solid, nodular mass: results, recurrence in four months and death.

CASE 51.—Israel, 1893: Langenbeck's Archives, Band xlvii, 1894: sex, girl: age, four years: kidney involved, right: condition before operation, fairly good condition: remarks on operation, incision from eleventh rib to border of rectus; good healing; recurred two months later, requiring a second operation; primary healing from second operation: macroscopic, large, soft, necrotic, hæmorrhagic, and fatty: microscopic, round-celled sarcoma: results, death two months after second operation; metastasis to liver.

CASE 52.—McBurney, 1894: ANNALS OF SURGERY, Vol. xx, 1894: sex, boy: age, ten years: kidney involved, right: duration, ten months: con-

dition before operation, vomiting, pain, emaciation, anæmic, and marked distention of abdomen: remarks on operation, transverse incision: colon invaded so that entire removal was impossible; partly closed and packed; very little bleeding: macroscopic, globular, soft, friable mass; grayish yellow on section; 5000 grammes in weight: results, death in a few months.

CASE 53.—Manderli, Courvoisier, 1895: Sarcombildung im Kindersalter, Inaug. Dissert., 1895: sex, child: age, one and three-quarters years: kidney involved, left: condition before operation, tumor size of child's head; hard, immovable, and smooth; scanty urine: remarks on operation, transverse incision; extending from umbilicus to back; adherent, so as to be inoperable: recovery: macroscopic, size and shape of spleen; very vascular: microscopic, spindle- and round-celled sarcoma containing myxomatous tissue: results, death some time later.

CASE 54.—Manasse, 1896: Virchow's Archives, Band cxlv, 1896: sex, girl: age, three years: kidney involved, left: duration, three weeks: condition before operation, tumor felt the size of a man's head: remarks on operation, abdominal incision: macroscopic, size of man's head; firm, with large red areas: microscopic, spindle- and round-celled with muscle: myosarcoma: results, four months afterwards had a recurrence and died in ten months, with a large mass $35 \times 27 \times 34$ centimetres in diameter.

CASE 55.—McDonald, 1896: Albany Annals, May, 1897: sex, boy: age, three years: kidney involved, left: duration, six weeks: condition before operation, hard, partly movable mass; general condition good; beginning emaciation and pallor: remarks on operation, oblique transverse incision; colon adherent; very slight hæmorrhage; peritoneum closed with catgut; pedicle ligated *en masse*; glass-tube drain; primary healing: macroscopic, weight two pounds: microscopic, small round-celled sarcoma: results, recurrence in five months.

CLASS III.—NEPHRECTOMIES FOR SARCOMA OF KIDNEY IN CHILDREN, —RECOVERY, WITH INCOMPLETE SUBSEQUENT HISTORY.

CASE 56.—Dandois, 1885: Bull. de l'Acad. Royale de Méd., Belg., 1885: sex, boy: age, twenty-five months: duration, five months: condition before operation, rapid growth; round, elastic, movable swelling; urine negative: remarks on operation, incision in mammary line; colon in front; pedicle ligated with silk; abdomen closed with silk; excellent recovery: macroscopic, 27×14 centimetres in diameter; very soft: microscopic, adenosarcoma: results, some time later well and strong.

CASE 57.—Roberts, 1888: Amer. Lancet and News, Vol. vi, 1888: sex, girl: age, five and a half years: kidney involved, right: duration, eight months: condition before operation, pain; great distention of abdomen; marked emaciation; urine negative: remarks on operation, median incision; slight adhesions; vessels ligated *en masse*; very little bleeding; slight shock; good recovery; chloroform: macroscopic, weight fifteen pounds; oval; slightly lobulated; seemed to spring from cortex: microscopic, very small, round-celled sarcoma: results, no history after second month.

CASE 58.—Neisley, 1891: *Annals Gynæc. and Pædiat.*, Vol. iv, p. 311, 1891: sex, girl: age, three years: kidney involved, right: duration, eleven months: condition before operation, late emaciation; slightly pale; no urinary symptoms; vomiting at intervals; large mass in right inguinal and hypogastric regions: remarks on operation, median incision; slight adhesions; pedicle ligated *en masse*; peritoneum closed with catgut; lumbar drain; time one and a half hours; chloroform; good recovery: macroscopic, weight five pounds; very cystic: results, some months afterwards was well and strong.

CASE 59.—Malcolm, 1892: *Brit. Med. Journ.*, 1892: sex, girl: age, two years: kidney involved, right: duration, one year: remarks on operation, abdominal incision: microscopic, adenoma: results, fourteen months afterwards doing well; no sign of recurrence.

CASE 60.—Israel, 1893: *Langenbeck's Archives*, Band xlvii, 1894: sex, girl: age, six years: kidney involved, left: duration, three months: condition before operation, hæmaturia; two months later small conical mass on left kidney size of hazel-nut; no disturbance of health: remarks on operation, lumbar incision; easy enucleation; rapid healing: macroscopic, $2 \times 3 \times 2$ centimetres (?); very soft: microscopic, round-celled sarcoma: results, one and a half years afterwards well and strong.

CASE 61.—Döderlein, 1893: *Embryonale Drusengeschwülst der Nierengegend im Kindersalter*, Verlag von Eduard Besold, 1894: sex, girl: age, eight years: kidney involved, left: duration, nine months: condition before operation, large tumor; pain; no appetite; slight emaciation; negative urine: remarks on operation, ether; median incision ten centimetres in length; enucleation easy; vessels ligated separately with catgut; no drain; good recovery; left in eighteen days: macroscopic, weight 1600 grammes; kidney-shaped; soft; grayish yellow on section: microscopic, adenosarcoma: results, five months later well.

CASE 62.—Brandt, 1893: Letter to Döderlein: sex, boy: age, one year: kidney involved, right: remarks on operation, abdominal incision: results, four months later well.

CASE 63.—Steele, 1893: *Chicago Med. Reporter*, Vol. vi, 1894: sex, boy: age, sixteen months: kidney involved, left: duration, two and a half months: condition before operation, well-developed and nourished; good color and healthy appearance; enormous movable mass: remarks on operation, chloroform; incision from end of last rib to near symphysis; pedicle ligated *en masse*; one ounce of blood lost; time thirty minutes; very little shock; rapid recovery: macroscopic, weight 4000 grammes, which was one-third that of remaining child; lobulated; firm on section: microscopic, small, round, pigmented celled sarcoma: results, four months later well.

CASE 64.—Heinlein, 1894: *Centralb. für die Krankheiten der Harn. u. Sex. Org.*, 1894: sex, boy: age, eight months: kidney involved, right: duration, eight months: remarks on operation, von Bergman's incision: microscopic, small, round-celled sarcoma: results, two months later well.

CASE 65.—Werder, 1894: *Amer. Lancet*, Vol. iii, 1894: sex, girl: age, two years: kidney involved, left: duration, three months: condi-

tion before operation, mass from the ribs to iliac fossa and beyond median line; good condition; well nourished and good color: remarks on operation, incision in left semilunar line; no adhesions; pedicle ligated *en masse*; one ounce of blood lost; wound closed with silkworm gut; very rapid recovery: macroscopic, weight 1250 grammes; irregular and nodular mass: microscopic, rhabdomyosarcoma: results, six months later well.

CASE 66.—Roberts, 1894: Amer. Pract. and News, Vol. xvii, p. 343, 1894: age, five years: kidney involved, left: duration, two months: remarks on operation, Abbe's incision; very slight bleeding: macroscopic, weight three and a half kilos: results, no history.

CASE 67.—Coley, 1894: ANNALS OF SURGERY, Vol. xxii, 1895: sex, girl: age, five years: kidney involved, right: condition before operation, good condition; no emaciation; mass filled the whole abdomen: remarks on operation, transverse incision; slight adhesions; two ounces of blood lost; pedicle tied with silk; gauze drain; nearly closed: macroscopic, weight one and a half kilos: results, one month afterwards well and strong.

CASE 68.—Lilienthal, 1895: Lewi, Archives of Pædiatrics, Vol. xiii, 1896: sex, girl: age, two and a half years: kidney involved, left: duration, four months: remarks on operation, Abbe's incision; slight hæmorrhage: macroscopic, weight one and a fifth kilos: microscopic, cystosarcoma: results, three months later no return.

CASE 69.—Buchanan, 1895: Med. and Surg. Reporter, Vol. xxii, No. 16: sex, girl: age, two years: kidney involved, left: duration, fifteen months: condition before operation, mass filled the whole side of abdomen; very little constitutional disturbance: remarks on operation, abdominal incision; pedicle tied with silk; thirty cubic centimetres of blood lost; some packing: macroscopic, weight three kilos; sprang from upper portion of the kidney: results, recovered; no subsequent history.

CASE 70.—J. C. Cotton, 1896: Med. and Surg. Reporter, Vol. lxxv, No. 20, 1896: sex, infant: age, nine months: kidney involved, right: condition before operation, general condition very good; no hæmaturia noted; large, slightly movable mass in right hypochondrium; circumference of abdomen twenty-five inches: remarks on operation, transverse incision eight inches in length; very little bleeding; slight shock: good recovery: macroscopic, seemed to spring from renal vessels or capsule; kidney not involved: results, eight months afterwards living and well.

CLASS IV.—NEPHRECTOMIES FOR SARCOMA OF KIDNEY IN CHILDREN, —“CURED.”

CASE 71.—Israel, 1888: Berl. klinisch. Wochen., 1888; Archiv für Chirurg., Band xlvi, 1894: sex, boy: age, fourteen years: kidney involved, right: duration, several months: condition before operation, general condition good; very little emaciation or anæmia; palpable mass in right hypochondrium: remarks on operation, —| shaped incision in lumbar region; peritoneum not opened; perirenal fat; completely re-

moved; very little bleeding; rapid healing and good recovery: macroscopic, sprang from upper pole of kidney, and extended over remaining portion forming a cap; firm and slightly nodular; one-half of kidney intact; on section grayish white: microscopic, alveolar sarcoma: results, five years afterwards living and well.

CASE 72.—Schmidt, 1890: Münch. med. Wochen., No. 15, S. 256, 1892: sex, girl: age, six months: kidney involved, left: duration, two months: condition before operation, apparently in good health; mass extended from ribs to symphysis; hard, in portion soft; semifluctuating: remarks on operation, incision two fingers' breadth to left of median line; vessels ligated separately; posterior peritoneum not sutured; time one-half hour; on fourth day had an abscess in abdominal wall; it was opened and packed; quick recovery: macroscopic, mass size of child's head; no kidney structure visible: results, three years later was living and well (Lewi).

CASE 73.—Abbe, 1892: ANNALS OF SURGERY, Vol. xix, 1894: sex, girl: age, two and a half years: kidney involved, right: duration, five months: condition before operation, hæmaturia once; very good physical condition, though not robust; large mass in right inguinal, lumbar, and hypochondriac regions which crossed to nipple line: remarks on operation, transverse incision eight centimetres in length from lumbar region to median line; no adhesions; pedicle ligated *en masse* with silk; one-half ounce blood lost; packed and nearly closed; time forty-five minutes; slight shock; uneventful recovery: macroscopic, weight 1250 grammes; oval and firm; grayish and translucent on section: microscopic, adenocarcinoma: results, five years living and well.

CASE 74.—Abbe, 1892: ANNALS OF SURGERY, Vol. xix, 1894: sex, girl: age, one year and two months: kidney involved, right: duration, six weeks: condition before operation, large mass occupying whole right side of abdomen, apparently springing from right kidney; no constitutional disturbance save slight loss of weight and cough; lungs clear; urine negative: remarks on operation, long transverse incision from median line to within six centimetres of spine; enucleation by hand; very slight adhesions; two ounces of blood lost; gauze drain; Trendelenburg's position maintained throughout; time one and a half hours; very little shock; rapid healing: macroscopic, weight 3500 grammes; the remaining child weighed 7000 grammes; very dark and lobular: microscopic, rhabdomyosarcoma: results, four years afterwards living and well.

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A NEW METHOD FOR THE RADICAL CURE
OF INGUINAL HERNIA: INTRAPERITONEAL
TRANSPACEMENT OF THE SPERMATIC
CORD AND TYPICAL OBLITERATION OF
THE INTERNAL RING AND INGUINAL
CANAL.¹

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THE dangers and inconveniences to which persons the subject of hernia are constantly subjected have led surgeons to devise operative procedures for the radical cure of this condition. In inguinal hernia the earliest attempts in this direction consisted of the removal of the corresponding spermatic cord and testicle, it being recognized that the presence of the former in the inguinal canal constituted the chief source of menace of a recurrence of the protrusion. A natural desire to avoid the mutilation inseparable from this method of cure, however, finally led to its practical abandonment, and no effort seems to have been made to follow out the indications embraced in the operation of castration without actually resorting to the latter until the publication of the work of Bassini in 1884.¹

The efforts of Bassini were directed to the removal of the spermatic cord from the inguinal canal proper, and, in addition, to the restoration of the normal physiologic conditions of the course which the cord should pursue in its new situation. His aim was to place the cord in a canal with two openings, an abdominal and a subcutaneous one, and two

¹ Presented at the Twelfth International Medical Congress, Moscow, August 24, 1897.

walls, an anterior and a posterior one. Along the new canal the cord was designed to pass in an oblique direction, corresponding to the original inguinal groove, to the scrotum. In his original description of the operation the aponeurosis of the external oblique is described as being incised from the external ring to a point above the internal ring, and loosened above and below. The spermatic cord and hernial sac are elevated *in toto* and separated from each other and from the surroundings by blunt dissection. After emptying the sac and isolating the latter the neck is tied off and the hernial sac cut away about half a centimetre in front of the ligature; the cord is held out of the way, and a new posterior wall formed upon which the cord is to rest in its new situation, by suturing together all of the structures from behind forward until the aponeurosis of the external oblique is reached. The spermatic cord is now laid upon the line of suturing which closes the formerly existing inguinal canal, and the aponeurosis of the external oblique made to cover the cord, its incised edges being united by sutures. By this procedure the aponeurosis of the external oblique is made to form the anterior wall of the newly formed inguinal canal. The skin edges of the incision are finally sutured. Catgut is employed for the deep sutures.

Postempski² modified this procedure by including the aponeurosis of the external oblique in the layer sutures, thus completely obliterating the inguinal canal. He then places the cord in front of the aponeurosis of the external oblique and towards the median line.

Halsted, who employed his method before the publication of either Bassini's or Postempski's operation, dissects the larger veins from the cord in order to reduce its bulk and places the latter in front of the aponeurosis and towards the outer side, or Poupart's ligament. In addition to this, Halsted, instead of ligating the sac, cuts the latter away and closes the opening as a laparotomy wound.

The object aimed at in all three of these operations is essentially the same,—namely, to accomplish the obliteration

of the inguinal canal and to provide a new route for the spermatic cord to reach its final destination in the scrotum.

Although the features of these procedures are well known to surgeons of the present day, for the reason that the operation of Bassini and its modifications has practically superseded all others, in this country at least, I have been particular to call attention to them in order to emphasize the weak points in these methods, and to point out a simple and to my mind an efficient way of overcoming them.

In Bassini's and Postempski's operations the neck of the sac is ligated at the internal ring, leaving the former *in situ* with its funnel-shaped dimple and finally more or less decided infundibulum, presenting upon the peritoneal surface. (Dia-

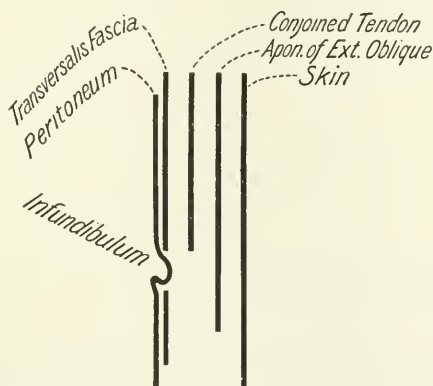


DIAGRAM A.—Showing the infundibulum.

gram A.) The general direction of this infundibulum is either forward, forward and downward, or forward, downward, and obliquely inward (medianward) in the general direction of the inguinal canal. The first named of these directions (forward) is the least mischievous of the three directions which the infundibulum may assume in this method of dealing with the neck of the sac, and the last named (forward, downward, and medianward) is the most harmful,—yet all of them directly and absolutely invite a recurrence of the hernia, as does its analogue, the depression which occurs at the site of the

internal ring following the completion of the descent of the testicle. (Diagram B.) The length of time which this takes will depend upon the support which the external structures give to the infundibulum at this point, the amount of intra-abdominal pressure, and the freedom of movements of the intestinal coils as governed by the length of the mesentery. Once, however, the depression upon the peritoneal surface becomes sufficiently marked to embarrass the convexly shaped surface of intestine in its movements at this point, the insidious and constantly exercised force from within the ab-

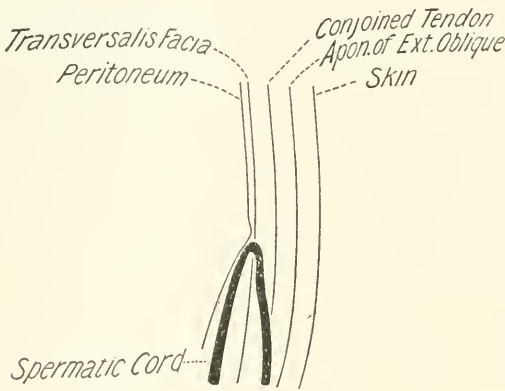


DIAGRAM B.—Showing the depression which occurs at the site of the internal ring, following the completion of the descent of the testicle.

domen exerted through this as a wedge, aided by peristalsis and the movements of the intestinal contents, and finally by gravity as the depression becomes more pronounced; with all these predisposing factors brought into play from the peritoneal side of the abdominal wall, there is but one thing lacking to complete the probability of the return of the hernia,—namely, an absence of support from without. This is furnished by the still-existing internal ring, the point at which the hernia, if an indirect one, protruded originally, and which the presence of the cord as it passes forward through the mus-

cular structures of the abdominal wall renders necessary, and the relaxed transversalis fascia at the site of Hesselbach's triangle, if the hernia has been a direct one. The smaller the cord the more contracted the ring, and hence the less the invitation for the passage of new hernial sac along-side the cord and through the ring. These well-known facts furnish an explanation for the comparatively successful application of the Bassini method in children, as shown by Coley's statistics. In addition to this, it is a well-known fact that almost any operative procedure that includes ligation of the neck of the sac close down to the internal ring, and approximation of the pillars of the canal will suffice, in the great majority of cases, for the cure of inguinal hernia in children. The crucial test of the merits of any operation for the radical cure of hernia, however, resides not in its applicability to a certain class of cases, and these of minor importance from our present stand-point, since these, the hernias of childhood, can and are quite frequently cured by simply wearing a truss; but in the success which follows its application to the hernias of adults, and particularly those of long standing, in which the entire posterior wall of the inguinal canal and, perhaps, the site of Hesselbach's triangle as well, is thrust forward, owing to loss of tone of the musculo-fascial structures, with, perhaps, pronounced atrophy of the latter.

The weak point relating to the gathering in of the circumference of the neck of the sac by a constricting ligature and the consequent formation of a dimple, the tendency of which is to finally enlarge into a decided infundibulum, not only pertains to the method of Bassini and its modifications, but to all those which include dealing with the neck of the sac by ligature, in the technique, as originally practised by Czerny, of Heidelberg.

The first important and decided modification of this defective method of dealing with the neck of the sac was made by Macewen in 1886, who separated the sac from the inguinal canal and from the circumference of the internal ring upon its abdominal aspect as well, and then reduced the sac into

the abdomen beyond the internal ring, where it is thrown into a series of folds. These folds constitute a pad or "boss" which takes the place of the infundibulum, formed where the neck of the sac is ligated external to or in front of the peritoneal level of the abdominal wall. The method is not easy of execution, and one cannot be certain, even when the steps have been accurately followed, as described by its originator, that the sac has been disposed of in the manner intended.

The next important modification of the older methods, and the first in which a systematic effort was made to so alter the primary direction of the sac as to minimize the tendency to relapse dependent upon the presence of the infundibulum, was that of Kocher, in 1892. The essential and characteristic feature of Kocher's operation consists in making a small opening in the external oblique above and external to the upper limit of the inguinal canal and drawing the detached sac through this opening. The anterior wall of the inguinal canal is not incised, nor is the cord displaced. Formerly Kocher twisted the bulk of the sac into a roll and sutured the latter over the site of the inguinal canal. More recently, however, he has abandoned this practice, and now directs the sac, after drawing it through the aponeurosis of the external oblique, outward towards the anterior superior iliac spine, and sutures it to the aponeurosis. Two deep sutures are placed, one between the upwardly displaced neck of the sac and the spermatic cord and the other above the sac. These penetrate deeply and include the entire thickness of the abdominal wall. The spermatic cord remains in the inguinal canal. The method is only applicable to hernias with considerable dilatation of the ring, and is excluded in pathologic alterations of the hernial sac, inflammatory conditions, the presence of adherent intestine or omentum in the sac, and in strangulated hernia, in which it becomes necessary, in order to reach the constriction, to incise the anterior wall of the inguinal canal. Besides which, the success of efforts to approximate the pillars of the canal without incision of the aponeurosis of the external oblique by means of the deep

sutures alluded to, to say nothing of the attempt to diminish the size of the internal ring by the same means, must be highly problematical, to say the least. This is particularly true of the attempt to lessen the size of the internal ring, which is apparently the object of the suture applied between the upwardly displaced sac and the spermatic cord, to say nothing of the danger of wounding the vessels of the cord attending the effort to thus blindly suture the internal ring. The method of subfascial suturing, suggested by Ekehorn, in order to avoid incision of the aponeurosis of the external oblique, from fear of gangrene of this structure, while possibly more efficient than the canal sutures of Kocher, are correspondingly difficult of application, and do not avoid the risks of injury to the cord incident to the attempt to closely approximate the margins of the ring to this structure without freely exposing the parts involved.

No one will deny the great impetus given to the surgery of inguinal hernia by the suggestion made by Bassini of displacing the cord in such a manner as to remove it entirely from the inguinal canal. The principle as carried out by Bassini was not original with that surgeon, inasmuch as this found its first expression in the earlier operative procedures in the application of castration for the cure of hernia. Here the presence of the cord was recognized as a most undesirable feature of the environment, and this was met by the efficient though crude measure of removal of the cord from the inguinal canal, and, incidentally, of the testicle from the scrotum as well. The end sought, however, was the getting rid of the spermatic cord in the inguinal canal, and it was the effort to accomplish this without sacrificing so important an organ as the testicle that led Bassini's introduction of this, the essential and peculiar feature of the operation which bears his name.

The method of restoration of the normal anteriorly directed obliquity of the inguinal canal and spermatic cord, as introduced by Marcy, of Boston, is worthy of note in this connection, for, although this surgeon did not attempt to

remove the cord from the spermatic canal, a most earnest and well-directed attempt was made to second these efforts made by Nature to compensate for the anatomical deficiencies in this neighborhood made necessary by the descent of the testicle, as well as to restore those safeguards originally designed to prevent the occurrence of hernia. Marcy's operation antedates that of Bassini, and, like the latter, finds its most favorable field of application in cases of children, and in comparatively recent and small hernias of adults. The method of broad approximation of opposing surfaces by continuous through-and-through suturing, as exemplified by Marcy's "cobbler's stitch," as well as the interrupted or "mattress suture" of Halsted, constitute valuable features of the hernia operations of these surgeons, and have contributed not a little to the success of their procedures.

In order to secure to the utmost the advantages offered by the alteration of the primary direction of the cord afforded by Bassini's procedure, I devised a modification of this operation, which consisted in carrying the cord directly through the aponeurosis after the manner of Halsted and Postempski, and thereafter leading it in an upward direction to a point above the internal ring, after which it was allowed to pursue a course parallel with the line of sutures which closed the inguinal canal, to its final destination to join the testicle in the scrotum. The part of the cord which was thus elevated was secured in position by sutures of catgut. It was discovered that the supposed advantages of this manœuvre were lost in the course of time, the weight of the testicle dragging upon the cord until the latter finally pursued the direct course which it follows in the Bassini, Postempski, and Halsted operations. Later on a further modification was made, in which it was sought to overcome the tendency of the cord to pursue a straight course from its point of emergence upon the aponeurosis of the external oblique, and at the same time make a more favorable disposition of the hernial sac than that formerly followed when it was ligated at its neck and cut away. It occurred to me to follow the indication of pre-

venting the dimpling of the sac by directing the latter upward immediately after leaving the internal ring, the manner of accomplishing this being suggested by the ingenious method of dealing with the sac introduced by Kocher. With this in view a point about an inch above the margin of the internal ring was selected, and a slender forceps forced bluntly through the aponeurosis of the external oblique, the internal oblique, and the transversalis muscle. The point of the index-finger was now forced up between the transversalis fascia and the transversalis muscle and made to serve as a guide for the forceps, which latter, after perforating the structures named, is pushed obliquely downward and medianward until its point emerges opposite the internal ring. The jaws of the forceps were then opened, the distal portion of the sac grasped, and the forceps withdrawn, carrying the sac along with it. The sac, after emerging from the small opening in the structures above the ring made by the passage of the forceps, was drawn taut in an upward direction, passed beneath the spermatic cord, and reflected upon itself, so as to form a suspension loop for the latter and compel the cord to assume and maintain an upward direction in its primary course after leaving the ring. The sac, now converted into a flat ribbon-shaped loop, was sutured with kangaroo tendon or chromicized catgut upon itself and the aponeurosis of the external oblique, sufficient room for the cord being left to permit the latter to play freely in its new position. The cord was then allowed to rest upon the aponeurosis of the external oblique and towards the median line, as in Postempski's operation, and there secured by two or three sutures of catgut.

The objects sought by this modification—namely, a more favorable primary direction of the sac and cord—were attained. Experience with this method, however, developed the fact that the spermatic cord, in a not inconsiderable number of cases, was too short to permit of this looping up or suspension procedure to an extent necessary to secure its fullest benefits, without elevating the testicle to an extent to bring the latter organ in a position where it was exposed to

injury against the pubic bone. In addition to this that ever-present weak point in the abdominal wall, the *bête noire* of surgeons since the days when the cure of inguinal hernia by castration was interdicted by legal enactments,—namely, the internal abdominal ring,—was still a menace to the patient, and an inviting factor to the recurrence of the hernia. As a final criticism upon this method of suspension of the cord by means of the sac itself, I would call attention to the possibilities of creating a new place of exit for a direct hernia at the point where the sac is passed through the abdominal wall above the internal ring.

Although the method last described has never appeared in print, yet I feel impelled to dwell upon and criticise this procedure, for the reason that I have described it in my lectures to my classes; and, in addition, in a paper read before the New York Surgical Society in February last I called attention to the indications for this or some modification of the methods theretofore in use, and illustrated this procedure by means of drawings. While, without doubt, it combines the advantages of the Kocher and Bassini methods, it does not meet all the indications of an ideal operation for the radical cure of hernia, and presents some decided disadvantages of its own.

Attention has been recently called to some alleged disadvantages arising from incising the aponeurosis of the external oblique, the claim being made that this is materially weakened in its function of supporting the underlying muscular fibres by this feature of the Bassini operation, and that many of the failures are due to the occurrence of gangrene of this important structure. It was upon the basis of this that some advantages have been claimed for the Kocher method, and Ekehorn introduced his method of subfascial suturing in order to avoid incising this aponeurosis. It cannot be denied that, as a result of intra-abdominal pressure, there is a tendency on the part of the cicatricial line of union to gradually stretch. This is more likely to occur, however, if the muscular fibres have undergone those peculiar changes charac-

teristic of old herniæ, in which the abdominal wall has been subjected to long-continued pressure from within, and from truss-pressure, perhaps, in addition. As a result of these changes a stretching or bulging of the muscular wall occurs in the constantly widening gap between the cut edges of the aponeurosis. It is probably true that, under circumstances of considerable tension, even the most careful suturing may fail to approximate the incised edges of the aponeurosis sufficiently to procure definite union, in which case the bulging of the muscular wall will occur early in the subsequent history of the case, and increase rapidly. Further experience may show that, while many of the immediate post-operative failures are due to septic conditions leading to premature removal of the sutures, or their early disintegration, if these are of an absorbable character, a certain proportion of cases of so-called relapse are in reality instances of separation of the line of union of the aponeurosis, and are to be classed with the cases of ventral or surgical hernia. On the other hand, an actual recurrence of the hernia can only be said to be present when a hernial sac and its contents protrude through one or other of the hernial openings. Again, while it is probably true that gangrene of the edges of the aponeurosis, if it occurred, would lead to either immediate post-operative failure, ventral bulging, or even actual recurrence, it is none the less true that septic complications arising from errors in technique are far more likely to lead to sloughing of the incised edges of the aponeurosis than any inherent tendency, on the part of this structure, to become the seat of gangrene. One of the strongest arguments in favor of Kocher's operation is the immunity from failure in the face of complicating septic conditions, from the fact that whatever happens the strong aponeurosis remains intact. As already stated, however, in the opinion of the writer, the failure in this last-named procedure to so alter the primary direction of the cord as to remove this as a further menace to recurrence, as well as the omission of efficient measures to strengthen the weak portion of the abdominal wall at the

site of the internal ring and inguinal canal will prevent the adoption of this as an ideal operation.

As a result of some recent experiences in cases in which a direct hernia occurred in adults following the application of the essential feature of the Bassini operation,—namely, displacement of the cord directly forward through the opening in the transversalis fascia known as the internal abdominal ring, and the muscular parietes,—I have endeavored to develop an operation in which obliteration of the internal ring and inguinal canal would be complete and absolute. It became at once apparent that a radical departure from present methods was necessary in order to accomplish this. If the conditions obtained in castration could be brought about without actual sacrifice of the cord and testicle, it would seem as if the problem was solved. So long, however, as the cord passed primarily in a forward direction the opening in the transversalis fascia must needs exist, for the reason that it would be physically impossible to obliterate this, and at the same time permit the cord to occupy it.

Abandoning, therefore, all thought of anterior displacement of the cord, I turned my attention to its posterior displacement. Here but two courses were open to me. The first was to double the cord upon itself by incising the transversalis fascia from the internal ring, and, following the general direction of the inguinal canal or groove, placing the cord behind the fascia, and permitting it to emerge at the site of the external ring, afterwards suturing the transversalis fascia from the upper margin of the internal ring, including the latter in the suture line. Theoretically, this would accomplish what was aimed at,—namely, closure of the internal ring. Practically, however, it was found that the transversalis fascia in hernia cases was so markedly attenuated and relaxed below the ring that it was difficult of separation to a sufficient extent to form a definite layer for suturing. Besides, this method would not strengthen the posterior wall of the canal, a great desideratum in old cases, nor would it overcome the relaxed condition of the tissues

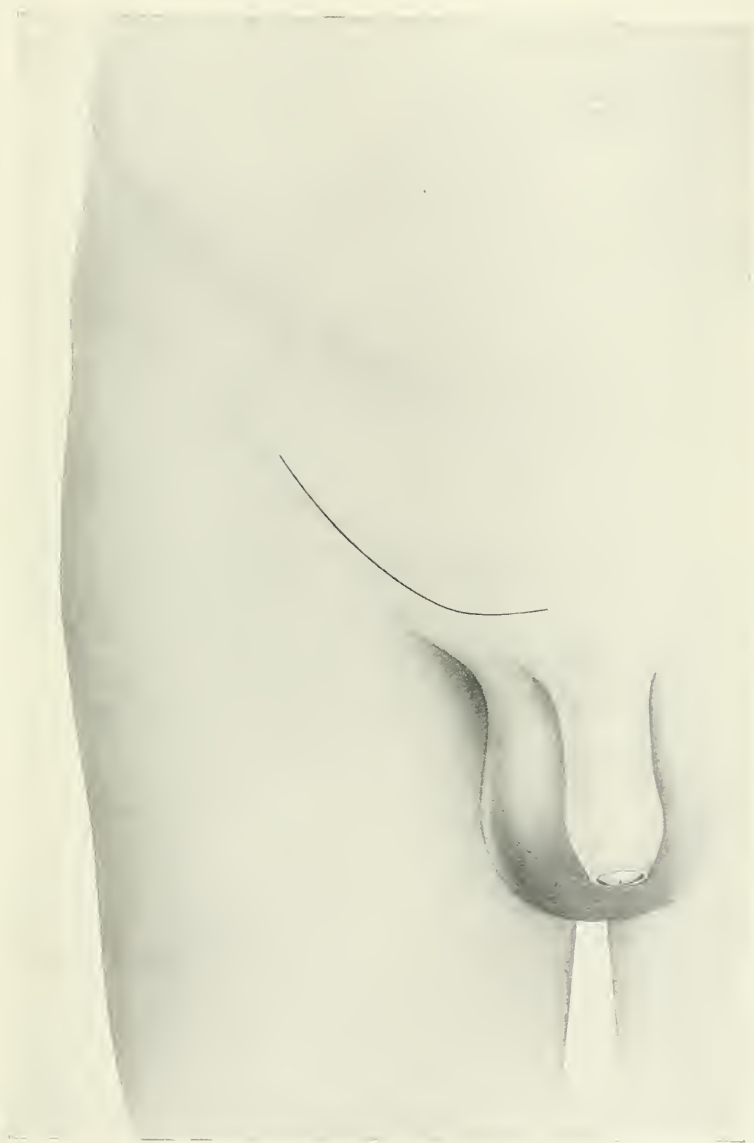


FIG. 1.—Incision from spine of pubis and parallel with Poupart's ligament to level of internal ring.

at the site of Hesselbach's triangle, a further object I had long had in view in devising an ideal operation for the radical cure of inguinal hernia of all varieties.

Following this line of reasoning, it was but a step further to the decision to incise the transversalis fascia, subserous connective tissue, and peritoneum, or the entire structures comprising the posterior wall of the inguinal canal, and intervening between the latter and the peritoneal cavity, and to divert the cord from its course in front of the transversalis fascia to a similar course behind the peritoneum and within the cavity of the latter.

The method finally adopted and herewith presented permits of complete obliteration of the internal ring and inguinal canal, and disposes of the cord so far as its relations to these are concerned, quite as effectively as castration itself can do. In addition to this, its employment admits of the correction of the relaxed state of the fascia at the site of Hesselbach's triangle, so often present in old indirect hernias, and one of the predisposing causes of direct inguinal hernia as well. It consists essentially of the transplacement of the spermatic cord immediately behind the peritoneum and into the peritoneal cavity for the distance represented by the space extending from the site of the internal ring to the lowermost reflection of the peritoneal investment of the abdominal wall behind the horizontal ramus of the pubes.

The operation in detail is as follows: The patient is placed in the Trendelenburg position, in order that the presence of the intestines may not embarrass the operator in the steps of the operation subsequent to the opening and emptying of the hernial sac. The incision commences at the spine of the pubis, is carried parallel with the os pubis for about an inch, and is then curved obliquely outward and upward upon the line which marks the general direction of Poupart's ligament, until a point is reached corresponding to the level of the internal ring. (Fig. 1.) Skin, fat, and fascia to the aponeurosis of the external oblique are included in the incision. The curved flap thus marked out is reflected, when the entire

region involved in inguinal hernia, including the inguinal or spermatic canal, as well as the site of Hesselbach's triangle, is exposed to view. (Fig. 2.) The anterior wall of the canal is now split up to the site of the internal ring. The cord and sac are first isolated together, the isolation commencing at the pubic bone, where the cord is usually easily identified and separated. These structures are next separated from each other, each being traced to the internal ring and thoroughly isolated from all structures in the neighborhood. (Fig. 3.)

The hernial sac is now opened, its contents reduced if reduction has not already occurred, and the sac cut away to the level of the muscular layer of the abdominal wall. Its incised edges are grasped by forceps to prevent these from slipping away. The cord being held out of the way, the place of crossing of the deep epigastric artery upon the transversalis fascia is sought, and both the artery and vein isolated and ligated in two places and divided between the ligatures. (Fig. 4.) The index-finger is now introduced into the peritoneal cavity through the neck of the sac, and the posterior wall of the canal, as well as the site of Hesselbach's triangle, lifted up upon the palmar surface of the finger. With the latter as a guide the entire intervening structures are divided with the scissors, the division including, from without inward, the transversalis fascia, the subperitoneal connective tissue, and the peritoneum. (Fig. 5.)

The spermatic cord is now placed into the peritoneal cavity; the gap in the incised posterior wall of the inguinal canal is held apart by grasping the incised peritoneal edges with forceps. In those instances in which the internal ring is greatly enlarged in all directions and a large neck to the hernial sac exists, a slit may be made in the edge of the latter towards Poupart's ligament, in order to lead the cord easily to the peritoneal cavity. (Fig. 6.) The edges of the opening are now drawn forward so that a broad approximation of their serous surfaces is obtained. While held in this position through-and-through sutures are passed from side

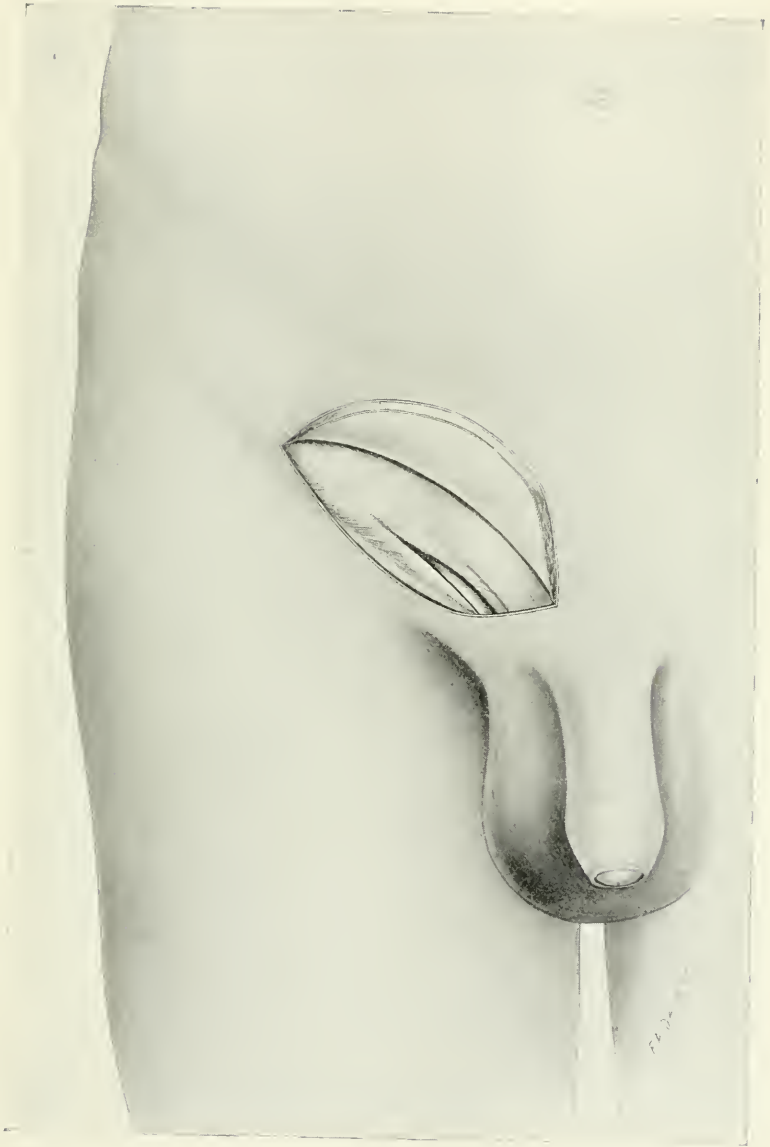


FIG. 2.—Flap turned back, showing aponeurosis of external oblique, external ring, and cord as it passes over pubic bone.

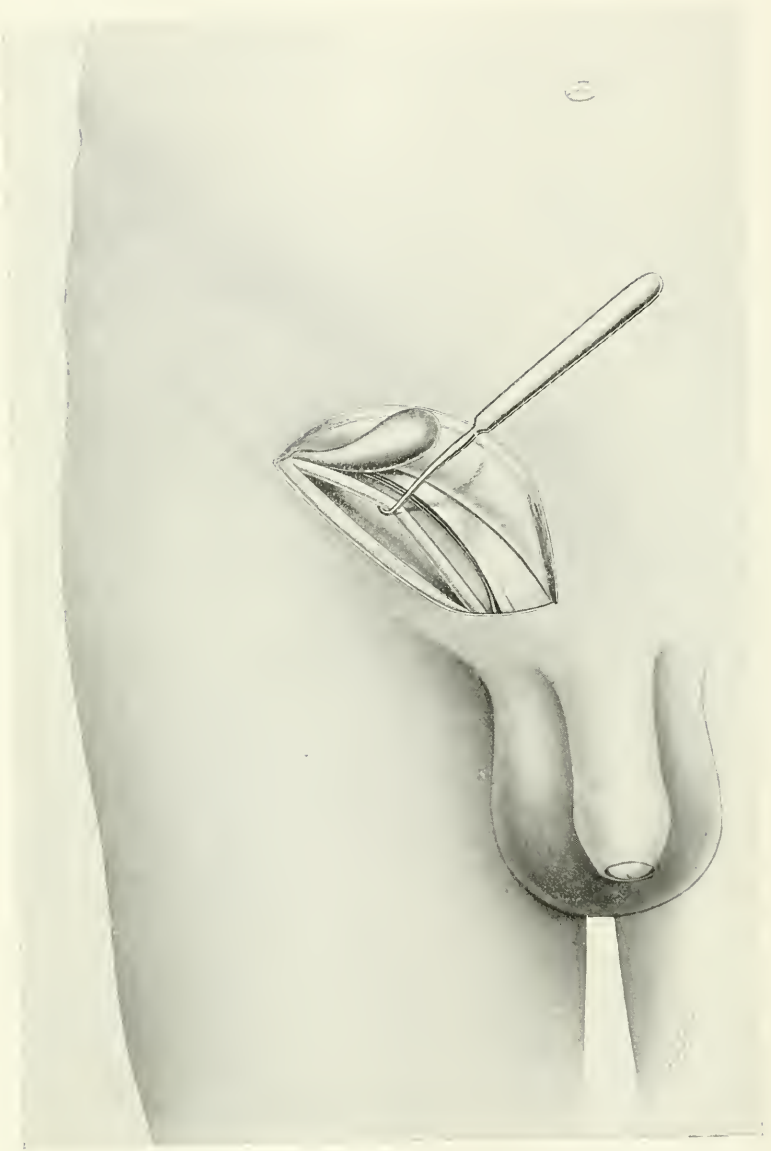


FIG. 3.—Inguinal canal opened up from external to internal ring, showing hernial sac and cord isolated.

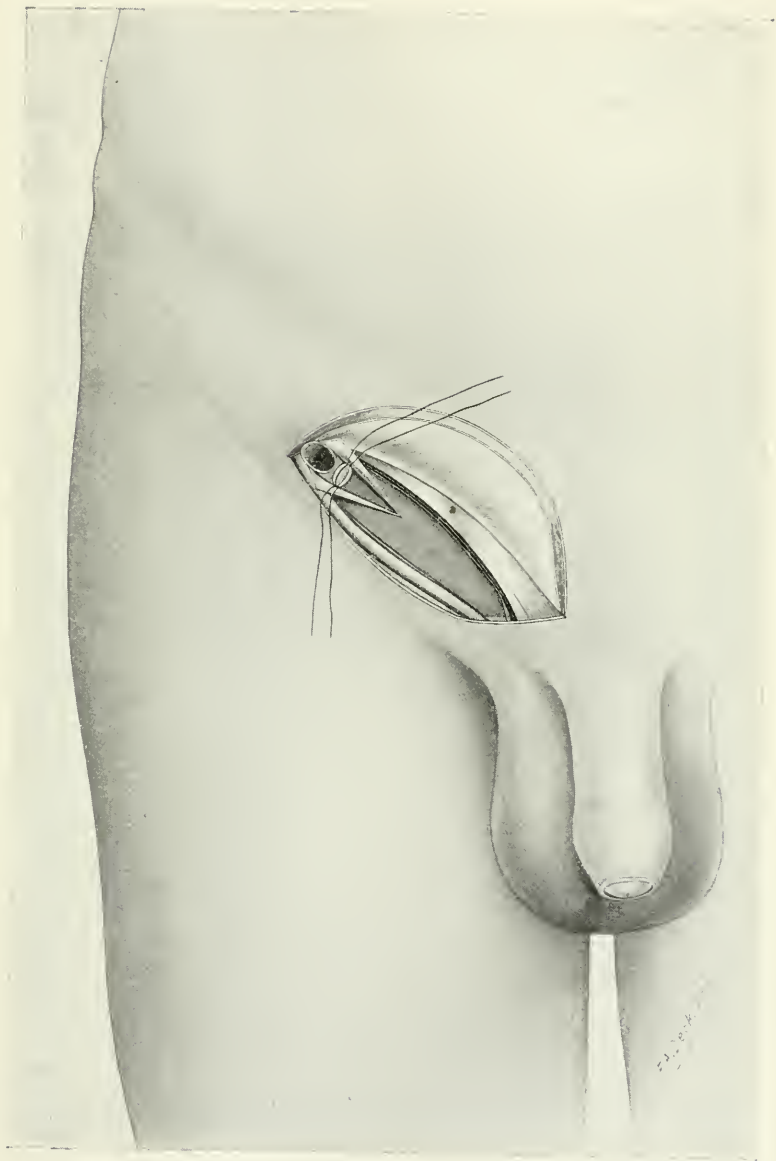


FIG. 4.—Hernial sac cut away, transversalis fascia opened, exposing deep epigastric vessels ligated in two places.

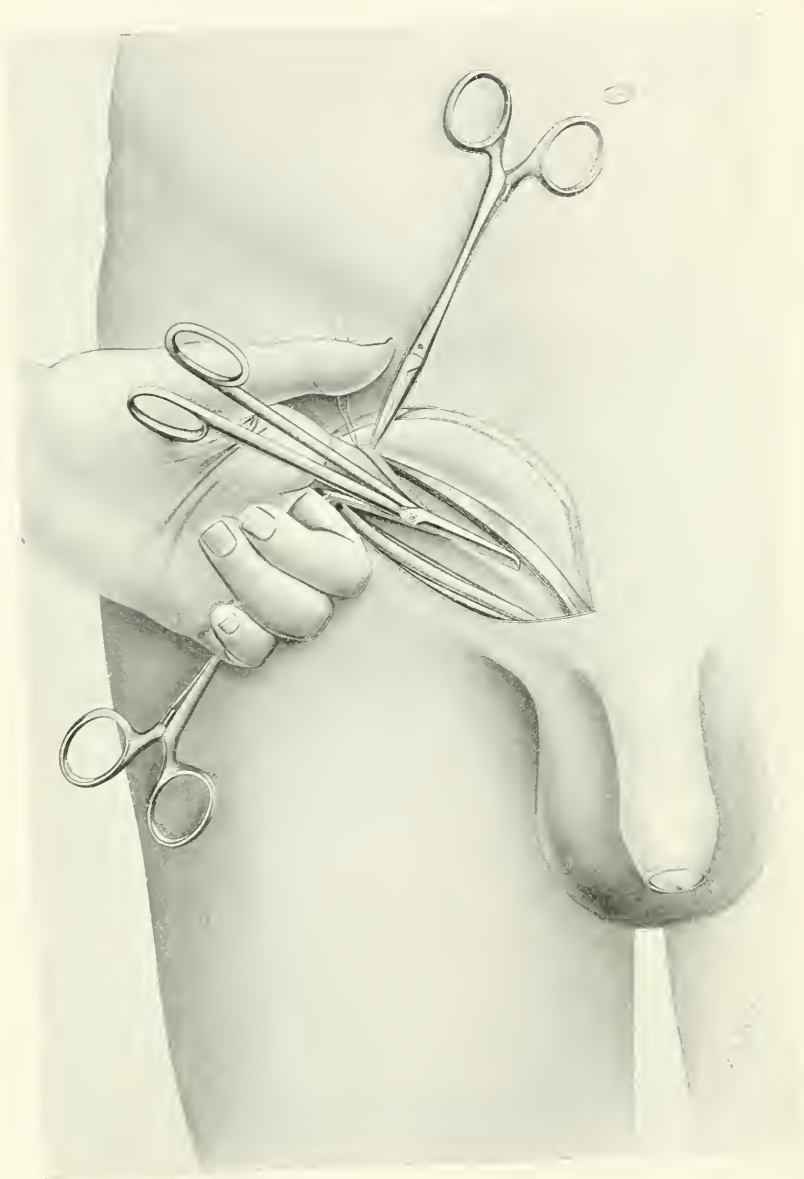


FIG. 5.—Incision of posterior wall of inguinal canal.

to side. By this manœuvre any existing relaxed state of this portion of the transversalis fascia is corrected.

The suture is first passed above the site of the internal ring, and includes the transversalis fascia, which is drawn downward and forward for that purpose. This serves to cover the point where the cord passes into the peritoneal cavity at the site of the internal ring, thereby obliterating the latter, the cord itself filling the small opening in the peritoneum. The position of the cord upon the peritoneal surface of the abdominal wall is such as to act as a "shunt," carrying any intestine in the neighborhood away from rather than towards the original weak point.

The suturing is continued until the lower angle of the



FIG. 6.—Illustrating the placing of the cord in the peritoneal cavity. Slit in sac.

gap in the posterior wall of the original inguinal canal is almost reached. This angle should be made low enough to compel the cord to curve slightly upward and forward as it leaves its place of exit from the peritoneal cavity at the newly formed external ring. (Fig. 7.) The cord should rest easily in the angle, and the suturing stop short of constricting it therein.

The inguinal canal, including the gap in the aponeurosis of the external oblique which represents the external ring and the skin wound are now to be closed. In effecting this the choice of material lies between absorbable sutures, such as animal tendon, catgut, etc., and non-absorbable sutures

applied so as to be *easily removable*. The fact that I have been called upon to remove suture material of the latter class, when buried in the tissues, at periods varying from three months to three years from the original operation, has led me to agree with Coley in discarding this class of sutures, in hernia cases at least. The uncertainty of the chromicizing process, as at present applied in the preparation of catgut, is such as to greatly impair my confidence in this as a suture material. There appears to be great difficulty in striking the exact balance between the cell-activity of the individual, upon the one hand, and the restraining influence of the chromic acid in preventing the disintegration of the catgut, upon the other. Simple unhardened catgut certainly breaks down too rapidly to be of service unaided. The recently introduced formalin gut may solve the problem, so far as the use of this as suture material for hernia cases is concerned.

The use of kangaroo tendon, introduced by Marcy, of Boston, as a hernia suture, has been attended with a large measure of success in closing the canal in the hands of Coley, of New York, following Bassini's method of radical cure in hernia. It does not appear to be open to the same objections as catgut, inasmuch as it will last sufficiently long, providing suppuration does not take place in the wound, to insure firm union of the structures before its final disintegration takes place. In some instances the tendon seems to serve as the basis for a definitely organized and firm connective tissue proliferation, which replaces the tendon and aids most efficiently in the final consolidation of the parts originally concerned in the suturing.³

The canal sutures include the conjoined tendon and aponeurosis of the external oblique upon the inner margin, and Poupart's ligament upon the outer. The two lower sutures should include the outer edge of the pyramidalis, if this be present, and if not, the rectus muscle. The effect of this is to displace a portion of the muscular tissue to a situation to guard the point of exit of the spermatic cord. A continuous suture is now applied to secure more accurate

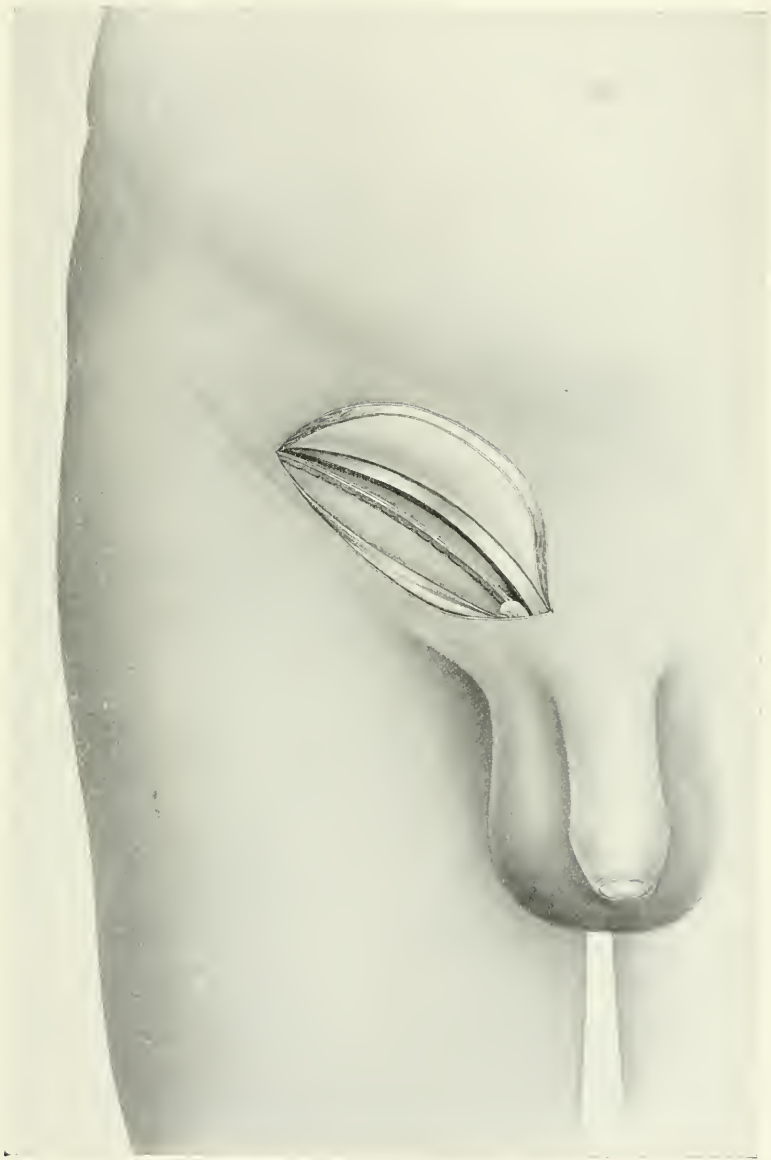


FIG. 7.—Posterior wall of inguinal canal restored.

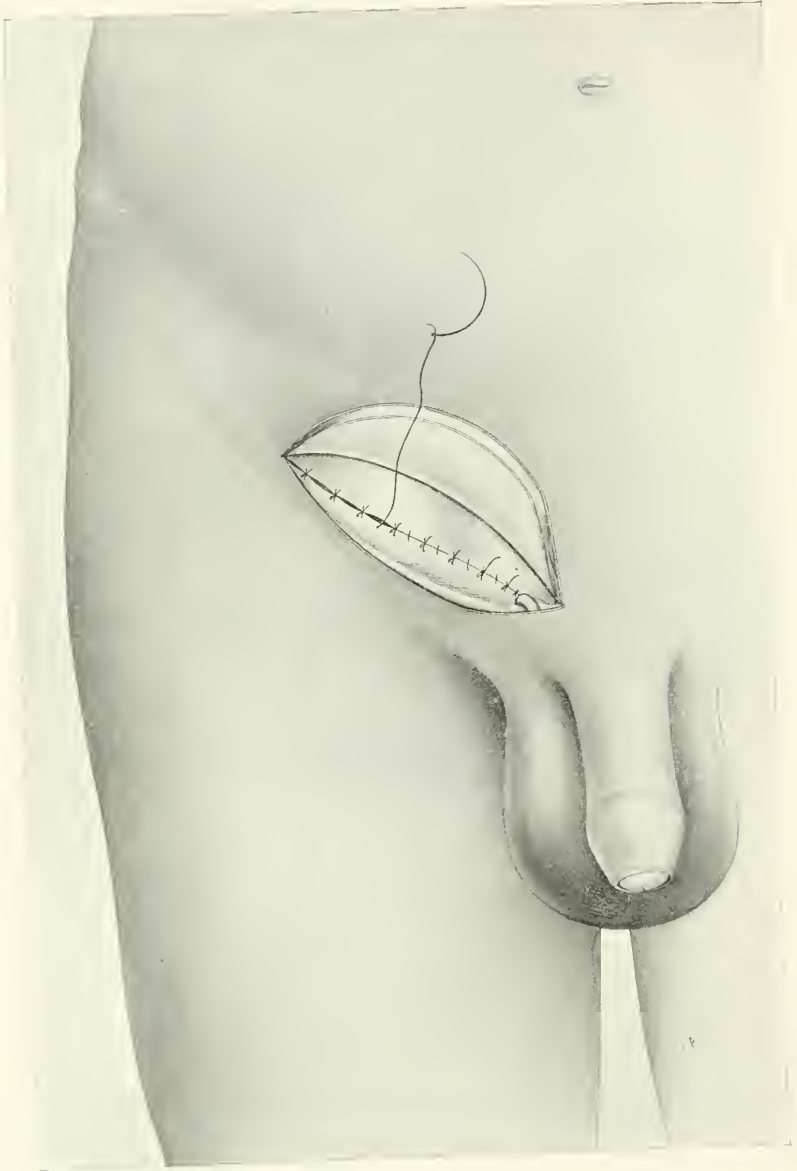


FIG. 8.—Obliteration of inguinal canal.

coaptation of the margins of the aponeurosis of the external oblique, the turns of the suture passing in the spaces between the interrupted sutures. (Fig. 8.)

The skin wound is closed by a subcuticular or other appropriate suture and proper sterile dressings applied.

I have operated upon six hernias, in five cases by this method, the histories of which are briefly as follows:

CASE I.—A young man, of nineteen years, entered the Methodist Episcopal Hospital on April 24, 1897, with a right-sided, indirect inguinal hernia. The operation revealed a hernia into the funicular process. The vessels of the cord were enlarged. The operation of intraperitoneal transplacement of the cord, obliteration of the internal ring and inguinal canal, and displacement of the rectus to strengthen the site of Hesselbach's triangle, was done as above described. In addition to this a ribbon-shaped portion of the sac was preserved and utilized to form a loose loop or sling for the cord within the cavity of the peritoneum. The patient walked about on the fourteenth day following the operation. Some disturbance of the circulation in the cord and testicle was experienced. Upon being discharged from the hospital he was enjoined not to wear a truss, and promised a monetary reward if he ever presented himself with a recurrence of the hernia.

The disturbance of the circulation in the testicle, in this case, was the result either of the removal of too many of the veins of the cord or the looping up of the cord by the ribbon-shaped band of peritoneum alluded to. In any event, the former is generally and the latter always unnecessary.

CASE II.—A boy, of ten years, was admitted to the Brooklyn Hospital on April 27, 1897, with an indirect, inguinal hernia, which had existed since birth. The operation revealed a hernial sac extending to the head of the epididymis. The cord was transplaced into the peritoneal cavity, the internal ring and inguinal canal obliterated, and the lower portion of the rectus displaced so as to strengthen the site of Hesselbach's triangle and the newly formed external ring. The recovery was uneventful, the patient leaving his bed on the fourteenth day.

CASE III.—A man, of twenty-six years, with an acquired,

indirect, inguinal hernia of six years' standing, finding himself unable to retain his rupture with the amount of truss-pressure that he was able to bear comfortably, applied at the Brooklyn Hospital for treatment. The operation of intraperitoneal transplacement of the cord, typical obliteration of the internal ring and inguinal canal, and displacement of the rectus was performed, as described. The patient was allowed to walk in fourteen days, enjoined to avoid wearing a truss, and promised remuneration if he ever presented himself to me with a recurrence of the hernia.

CASE IV.—A child, of three years, was admitted to the Bushwick Hospital with large, double, scrotal hernia. Both hernias were operated upon at one sitting on May 21, 1897, after the manner described, and the child secured in a double plaster-of-Paris spica. Primary healing took place. He was permitted to play about upon the fourteenth day, and was discharged from the hospital cured.

CASE V.—A man, of thirty-seven years, was admitted to the Brooklyn Hospital on May 31, suffering from strangulated scrotal hernia. The hernia had existed since childhood, and he wore a truss for several years. This he discarded, and for at least ten years the hernia had been unreduced. In this case the posterior wall of the inguinal canal and the site of Hesselbach's triangle was so stretched and distorted that it became necessary to make an unusually broad approximation at this point, in order to effect restoration of the normal condition of the parts. Infection of the parts took place from the contents of the sac, and I was finally compelled to drain the angles of the superficial wound, thus somewhat prolonging the convalescence.

The following additional case was operated upon in my service by Dr. R. S. Fowler, one of my assistants:

E. S., nineteen years old; German; admitted to the Brooklyn Hospital June 30, 1897; discharged July 16, 1897; congenital inguinal hernia, left side. Used a truss until twelve years old, since then nothing. Pained him on lifting weights, etc. Easily reducible. Operation July 1, 1897. Method as described. Primary union. Uninterrupted recovery. Patient left bed on fourteenth day and hospital two days later.

In reply to the criticism that the cases presented are too

few as well as recent to be of service in estimating the value of the new procedure, I would say that they are presented with the view of demonstrating that the obliteration of the internal ring and inguinal canal is possible without resorting to castration, the most efficient of the formerly practised methods of radical cure of inguinal hernia. This is made possible by the method of intraperitoneal transplacement described. The cord in its new position lies in close approximation to the line of suturing of the peritoneal surfaces. Adhesions occurring under these circumstances would be located similarly to those following an ordinary abdominal section, and as little likely to do harm as the latter.

As far as I have been able to ascertain from the experiences of other surgeons in the instances in which recurrence has taken place following the various methods of displacing the cord anteriorly, as in the operation of Bassini and its modifications, the course pursued by the hernia has been directly forward, following the cord in its course through the muscular wall of the abdomen.

In answer to the objection that the formation of a new external ring, made necessary in order to permit the cord to emerge from the peritoneal cavity, may lead to a recurrence of the hernia at this point, I would call attention to the fact that the new ring is so placed as to rest upon and somewhat posteriorly to the pubis. This is accomplished by terminating the incision through the transversalis fascia and peritoneum as low down as possible, the cord emerging from the new opening in such a manner that its first course is upward and forward before passing over the bone. (Fig. 9.) In addition to this the outer edge of the rectus muscle is carried outward by suturing, in order to strengthen Hesselbach's triangle, as well as the final place of emergence of the cord. Further, an osteoplastic transplantation of the pubic attachment of the rectus may be accomplished by chiselling away a portion of the bony attachment of the muscle. The latter would rarely become necessary.

A brief recapitulation of the steps of the operation would include the following:

(1) A curved skin incision which furnishes easy access to all the parts involved in inguinal hernia.

(2) Splitting the anterior wall of the inguinal canal from the external to the internal ring.

(3) Isolation of the cord and sac together from the surrounding parts, after which these are separated from each other and cleared well up to the internal ring.

(4) Double ligature of the deep epigastric artery, with sufficient space between the ligatures to permit of incision.

(5) Cutting away of the neck of the sac and incision of

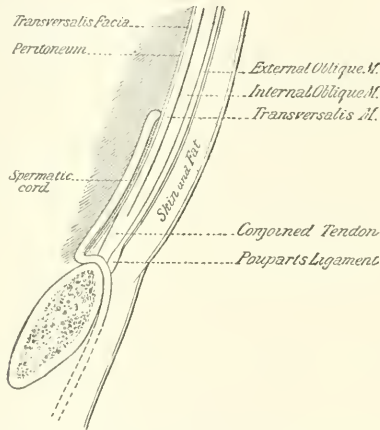


FIG. 9.—Showing new position of the cord.

the posterior wall of the inguinal canal and Hesselbach's triangle.

(6) The cord is transplacated into the peritoneal cavity from the site of the internal ring to a point below the level of the pubic bone.

(7) Broad approximation and suturing of the peritoneum and transversalis fascia in front of the cord for the space mentioned.

(8) Obliteration of the internal ring and inguinal canal by accurate suturing, and strengthening of Hesselbach's triangle and the new point of emergence of the cord by outward

displacement of the pubic attachment of the corresponding rectus muscle.

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¹ Ueber die Behandlung des Leistenbrüche, Archiv für klinische Chirurgie, Band XL, p. 429.

² Transactions of the Tenth International Medical Congress, Vol. III, p. 186.

³ The expense attending the procuring and preparation of kangaroo tendon has heretofore limited its use somewhat. It can now be obtained, put up in hermetically sealed "U"-shaped tubes, introduced by the writer several years ago for the sterilization and storage of ligature and suture material. The sterilization is completed after the tube is sealed. See Transactions of the American Surgical Association, Vol. IX, 1891, p. 485.

A NEW INCISION FOR THE REMOVAL OF THE APPENDIX VERMIFORMIS.¹

BY CARL V. VISCHER, M.D.,

OF PHILADELPHIA.

UNTIL recently, the peritoneal cavity was always opened by an incision through one of the aponeurotic lines, in this way dividing as little tissue as possible, and averting hæmorrhage. This incision was often followed by the development of so-called ventral or post-operative hernia,—hence the necessity for some method to obviate this difficulty. Among the various methods of suturing that were suggested, that of silver wire promised the most favorable results; yet the disadvantages accompanying the introduction of non-absorbable material soon became apparent. This led some operators to endeavor to overcome the difficulty by opening the abdomen through the muscular structures in place of the linea alba, or semilunaris, thus giving more tissue to approximate, and hence the formation of a thicker cicatrix. Then followed the suggestion of McBurney, to open the abdominal cavity by incising the integument and aponeurotic structures alone and separating the various muscles in the direction of their fibres. This method was first practised for the removal of the vermiform appendix. The incision here is located at a point, however, where the abdominal parietes are largely made up of aponeurotic structures,—*i.e.*, in the lateral portion of the anterior abdominal wall. That this incision presents some disadvantages every one who has had much experience with cases of appendicitis well knows. Whereas it answers admirably for the removal of the appendix “between attacks,” it is not so satisfactory in acute cases, particularly those accompanied by pus-formation, inasmuch as one is fre-

¹ Read before the A. R. Thomas Club of Philadelphia, 1897.

quently obliged to enter the peritoneal cavity to the median side of the inflammatory mass, and in this way drain and remove the appendix through a non-infected area. Again, at times it is quite difficult to locate the appendix, and, finally, the relation of the parts are not conducive to free drainage. It therefore occurred to me that if an incision were made through a more muscular and dependent portion of the abdominal wall the above disadvantages could be overcome, and, in consequence, I have recently been making an incision an inch above and parallel to the crest of the ilium, beginning at the outer edge of the external oblique, and running forward to a point corresponding to the anterior superior iliac spine, or, if necessary, slightly beyond this. Having divided the skin and aponeurosis, the external oblique, which is found well developed at this point, and its fibres running nearly vertical, is separated, after which the internal oblique and transversalis, which are also well developed and whose fibres run nearly on one plane, are separated, exposing the transversalis fascia. This, together with the peritoneum, is divided in a vertical direction. This will be found to have opened the peritoneal cavity at its lowermost plane and near to the attachment of the cæcum. A finger, now being introduced, invariably comes in contact with the caput coli, which can be readily drawn into the wound, and thereby facilitate the search for the appendix. In suppurative cases, the pus cavity being opened at this point, drainage follows at the most dependent point. Possibly the greatest disadvantage offered by this incision is the depth of the wound, which, particularly in those inclined to be corpulent, may make manipulation somewhat difficult; the hæmorrhage, which has been found to take place from a small muscular branch of the circumflex iliac artery, can readily be controlled. The advantages are, first, from the position of the wound, it is almost impossible for hernia to occur even when it is allowed to heal by granulation; second, it offers a dependent point favorable for drainage; third, the facility with which the cæcum and appendix are found.

A CASE OF ACTINOMYCOSIS HOMINIS, INVOLVING THE TISSUES OF THE BACK AND THE LUNGS.

BY W. H. HUDSON, M.D.,

OF LA FAYETTE, ALA.,

WITH PATHOLOGICAL REPORT

BY SIMON FLEXNER, M.D.,

OF BALTIMORE, MD.

THE case of actinomycosis, which it is the object of this paper to report, presents several interesting features of its own, and it is hardly of less interest as being the first instance, so far as I can discover, which has been published from this State. The history of the case in brief is as follows:

John G., aged sixty-two years, a negro of more than ordinary intelligence, consulted Dr. B. F. Rea, Jr., of this city, during the autumn of 1894, for a "running sore," located over his right scapula. Although the sore had been troubling him for several months, he had not found it necessary to quit his work, which was that of a vegetable gardener. He stated that about eighteen years prior to this time there had been a small tumor located in the same region of the back, which had been cured by local application of tincture of iodine.

Dr. Rea injected corrosive sublimate into the skin about the suppurating points, and gave the patient small doses of the iodide of potassium internally. This treatment was pursued for four or five months, apparently with some improvement at first, but, upon the whole, the patient gradually grew worse, the disease extending until eventually it involved much of the back on the right side of the spinal column and a less extent on the left. In March, 1895, thinking a surgical operation indicated, Dr. Rea requested me to take charge of the case.

I learned that prior to the last two years the patient had

been a man of all work about the house, feeding the cows or horses, driving the carriage or wagon, and therefore had had much to do with corn, fodder, wheat, oats, etc. He said that for years it had been his habit to sleep on the wheat-straw or fodder during the noonday rest hours. On examination I found him to be muscular, somewhat anæmic, without elevation of temperature, the breathing being slightly hurried, and the pulse about 90 per minute. He complained of neither chills nor fever, and had no cough. The examination of the back showed many ulcerating points, apparently sinuses, from which flowed a creamy pus, devoid of odor. The skin and subcutaneous tissues were indurated and perceptibly thickened, and, besides, two or three suppurating points as large as my thumb were discovered.

My opinion, which I communicated to Dr. Rea, was that the disease was either tuberculosis or actinomycosis. Examination of the pus from the open sinuses did not, however, disclose the characteristic organisms of the latter disease. The contents of the fluctuating abscesses gave, however, positive results. The pus itself was peculiar and thin; and floating in it were many yellow, sulphur-like grains, which, under the microscope, proved to be the organism in question. At this time nothing abnormal was discovered in the lungs.

Under ether-narcosis I scraped out all the sinuses with a sharp Volkmann's spoon, and injected a 10 per cent. nitrate of silver solution into the cavities. The loss of blood during the operation was considerable, and, on that account, it was not very satisfactorily done. The remaining treatment consisted of the administration of thirty grains, three times per day, of the iodide of potassium. A temporary improvement followed. However, during the summer of 1895 the patient began to suffer from cough, the expectorated matter containing the streptothrix from the beginning. Owing to this condition, I did not undertake a second operation. The subsequent progress of the case was one of decline, the patient gradually growing weaker, elevation of temperature was slight, the discharges continued to be odorless; much pain, which, however, yielded readily to opium, was complained of, until death, which occurred in March of 1896, some two years after the onset of the disease.

An autopsy was made soon after death. The abdominal organs appeared normal. The lungs, which were firmly united

to the thoracic walls, were removed. The right appeared extensively, the left to a less degree, diseased. The remaining viscera were, as far as could be observed, healthy. The brain was not removed. The lungs, pieces of tissues from the sinuses in the skin of the back, the heart and kidneys, were sent to the Pathological Laboratory of the Johns Hopkins Hospital. The report, which is appended, relates to the lungs and skin lesions, as described by Dr. Flexner.

The Lungs.—The preserved organs (Müller's fluid) show a general increase in consistence and a grayish mottling. The increased density is most marked at the apices and along the borders of the lungs, corresponding to adhesions to the chest wall. The right lung shows in its upper lobe a roughened and torn area about eight centimetres long, over which the pleural membrane is deficient. On incision, this focus is found to be dense, and a marked increase in the fibrous framework becomes at once apparent. At the apex a cavity, the size of a small walnut and lined by a dense fibrous membrane, exists. The upper lobe of the left lung is denser than the lower.

The main interest of the case centres in the microscopical examination and the consideration of the etiology of the disease.

The microscopical study was limited to the lungs and skin sinuses, for which purpose portions of tissues from these situations, which were hardened in 95 per cent. alcohol at once, at the autopsy, were found most suitable. The sections were stained in several ways; for the study of the tissues hæmatoxylin and eosin were used; for the demonstration of the parasite and the finer details of its structure, Gram's and Weigert's, but especially Mallory's methods, were employed. As the last procedure may not be generally known I shall give it in brief. Thin sections of tissue are transferred from water to a clean slide and firmly blotted. The section now adheres to the slide. Freshly prepared aniline oil, gentian-violet, is dropped on, and allowed to remain for five minutes, when it is removed by blotting. The gentian-violet is followed by Lugol's solution, which remains about the same length of time in contact with the section. This being in turn blotted off, the section is differentiated, dehydrated, and counter-stained by means of pure aniline oil, in which crystallized basic fuchsin has been dissolved to a cherry-red color.



FIG. 1.—Showing Hudson's case of actinomycosis.

The aniline oil is washed off with xylol, the latter blotted, balsam added, and the cover-slip applied.

Histology.—Lungs.—The lungs present a somewhat varying picture in different parts; but as the differences are in degree rather than in kind, it will not be necessary to treat separately of them. All the structures are altered; parenchyma, framework, bronchi, and pathological processes of different type are met with. The most recent and acute changes are, strangely enough, found immediately about the parasites. Even in specimens stained in hæmatoxylin and eosin the latter are clearly discernible, and their preservation is so perfect that many details of structure become evident. The parasites lie singly within air-spaces (alveoli), and are in groups of two or three in adjacent ones. (See Figures 1 and 2.) They are surrounded by polymorpho-nuclear leucocytes which fill the spaces, and thus give rise to microscopic points of solidification. Fibrin is absent from these foci; no considerable amount of connective tissue occurs in them, and active changes in the epithelium are quite wanting. The parasites are rarely found in the bronchi, where they lie among pus-cells. They must, therefore, have appeared in the expectorated sputa.

At different points, more or less widely removed from the areas of consolidation about the parasites, are large hepatized foci. These present very different appearances. They are older, and fibrin forms the chief element in their structure, and leucocytes are relatively few in number. The framework of the lung is thickened, and the exudate is itself being transformed into connective tissue (organization). The relation of the parasites to these foci is interesting. They never occur within the fibrous areas, for they are surrounded by pus-cells; but a clump may exist in the midst of these areas, being, however, separated by its collar of leucocytes.

The parasites, besides attracting pus-cells, exert a solvent action upon the framework of the lung; the alveolar walls disappear entirely from the immediate localities in which they lie.

Tubercles are also formed. Rarely definite ones with central giant-cells are seen. About an exceptional parasite (rosette) and just beyond a thin collar of leucocytes, the tissue elements proliferate, giving rise to the production of epithelioid cells, which surround these elements. In size they correspond with ordinary miliary tubercles.

Changes occur in the epithelial cells, such as proliferation and desquamation, which are common. A rarer and more interesting process is the formation of multinucleated and giant-cells, within the alveoli, some of which show the radial arrangement of nuclei, so common in tuberculosis.

The bronchi show exquisite inflammation. The exudate is, for the most part, composed of polymorpho-nuclear leucocytes, and is acute. But an older process, comparable to the older obliterative pneumonia, in which fibrin is undergoing transfor-

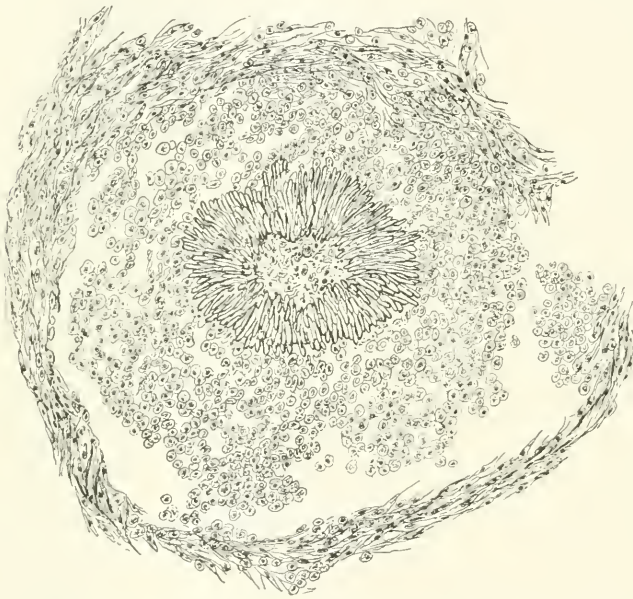


FIG. 1.—Minute structure of actinomycotic neoplasm (one-sixth inch objective); a single cluster of the ray fungus with zone of granulation tissue.

mation into connective tissue, exists. Actual polypoid and concentric masses of connective tissue project into or surround the lumina of these tubes.

Skin.—The tissue subjected to microscopic study extends to the superficial muscle. The sinus exists in all the depths of the sections and appears in communication with the external surface. The epithelial layer generally is of normal appearance; at the edges of the sinuses the interpapillary processes are in active proliferation and have undergone lengthening and branching.

The result is the not unusual picture of a typical epithelial growth seen about chronic skin ulcers. The deepest layer, that containing muscular fibres, shows a condition of chronic inflammation associated with increase in the sarcolemma nuclei. A marked interstitial myositis is here present.

The specific lesions partake partly of suppuration and partly of productive characters. The walls of the sinuses are made up of a granulation tissue, rich in vessels, with many new cells, among which multinucleated (giant) cells are not so uncommon.



FIG. 2.—Minute structure of actinomycotic neoplasm (one inch objective).

The parasites themselves are found not in this tissue, but included in pus-cells. They present all the characters of those found in the lungs. Tubercles were not found in the skin lesions.

The Parasite.—The micro-organism of actinomycosis was first seen in cattle by Rivolta and Perroncito, and accurately described by Bollinger (1876). The existence of a disease in human beings more or less resembling that in cattle, caused by a similar micro-organism, was proven by J. Israel (1885), although von Langenbeck had previously seen the bodies in a prevertebral

abscess. Since this time much study has been directed both to the organism and to the disease processes set up by it. But the most painstaking research upon the microscopical characters and cultural properties of the parasite we owe to Boström. It will not be possible for us to enter deeply into the consideration of the biological properties of the different organisms described. Suffice it to say that it is extremely probable that under the caption of actinomycosis pathological processes have been included which are due to two related, but doubtless not identical, micro-organisms (Kruse). The micro-organism of actinomycosis must now be included among the streptothrices. It is a pleomorphic and branching organism. Among its different forms are to be included cocci, rods (bacilli), and branching filaments. It has been proposed by Rossi-Doria to call the organism "streptothrix actinomyces," a suggestion that would be well to follow, in the present somewhat confused state of its nomenclature. It should be borne in mind that it belongs properly, not to the fungi but to the bacteria.

The characteristic rosette-like configuration of the parasite depends in part upon degenerative changes within it. The swollen flask-like extremities are involuntary or degenerative products of retrograde metamorphosis. In successfully stained specimens these swellings may be seen to sit upon, like a hood, the preserved filaments. Hence in rapidly growing forms this appearance may be quite entirely wanting, the micro-organism now appearing as spheres and branching threads. The swellings, too, are not very durable structures; in pus they may disappear upon standing for a few days. In general it may be said that where much new tissue (productive inflammation) is being formed, there the organism is growing least rapidly and undergoing most degeneration, whereas where the organism increases with most rapidity, there the destruction of tissue (softening) is most pronounced and the degeneration of the parasite least. In man suppuration is more common as a feature in actinomycosis than in cattle, where the new tissue formed tends to produce large tumor-like masses. Whether, as Baumgarten suggests, the difference depends upon the co-existence in man of a pyococcal infection with the actinomyces, while in cattle the infection is a monoinfection, further study directed to the solution of this interesting problem is needed.

Sections of the lungs and the skin of this case, stained by Mallory's method, showed the coccus, bacillary and branching forms, together with the clubbed extremities, of the most characteristic variety.

Location of Lesions.—The lungs are by no means a very rare site of actinomycosis. Israel was of the opinion that the infection of these organs followed from the mouth, and in one case he actually found in an actinomycotic cavity a fragment of a carious tooth. Habel (*Virchow's Archives*, 1896, Band CXLVI, p. 1) has just reported a series of five cases, in four of which the lungs or pleura were one of the sites of infection. In one instance tubercle bacilli and actinomyces were present in the sputum. Habel also describes a case of peritonitis due to this streptothrix, in the exudate of which the "sulphur grains" were found. The portal of entry of the micro-organism is believed to be the vagina, uterus, and Fallopian tubes. A single other example of a similar infection exists in the literature, and was reported in 1883, by Zeemann.

From the history of my case the skin lesion must be taken as having antedated those met with in the lungs. Whether the infection of the lungs resulted from the penetration of the pathological process to the pleura and the transmission of the bacteria to them by the lymph-current, or represented a primary inspiratory infection, cannot be certainly stated. I should consider it as probable that the lung infection followed the skin lesions, and had its origin from this source by the material being carried to the mouth and nose, or arose independently from inspired dust laden with the specific germs. The occupation of the man exposed him to this latter mode of infection.

The coincidence of the lesions of pulmonary tuberculosis with actinomycosis and the occurrence of anatomical tubercles in this case lead to the question of their association. Now that it is known that anatomical tubercles can be produced by a variety of causes, their mere presence is not sufficient warrant for a positive diagnosis. The tubercles in this case were not typical ones. They were associated with the specific parasite of actinomycosis, and finally tubercle bacilli could not be demonstrated in the sections of the lung. It seems just, therefore, to regard all the appearances described as due to infection with the streptothrix actinomyces.

A CASE OF VAGINAL ANUS, THE RESULT OF
A HYSTERECTOMY, CURED BY ILEO-
COLOSTOMY.

By WILLIAM J. MAYO, M.D.,

OF ROCHESTER, MINN.,

SURGEON TO ST. MARY'S HOSPITAL.

Mrs. A. J., aged forty-two years, Dane, was admitted to St. Mary's Hospital, March 18, 1897, with the following history: She was the mother of four children, the youngest eleven years of age. Since the birth of this child she has suffered from some pelvic trouble more or less constantly. For the past six months this difficulty has been accompanied by pain and swelling in the lower abdomen, and has caused chills, fever, and great loss of flesh. For five years she has had a chronic cough, expectorating freely at times. There is a tendency to diarrhœa. Menstruation has been irregular and painful.

Examination gave temperature, $102\frac{2}{5}^{\circ}$ F.; pulse, 116; tongue red and somewhat glazed; heart normal. Consolidation in the apex of the right lung. Sputum contained tubercle bacilli. There was a small amount of albumen in the urine; no casts. Blood examination showed leucocytosis. Uterus was fixed by a mass in each side, evidently due to suppuration in tubes and ovaries.

Considering the amount of pulmonary involvement and the condition of the patient, radical operation upon the pelvic suppuration was considered inadvisable, and for immediate relief vaginal section and drainage of the pus collections was thought best.

March 20, 1897, the patient was put on the table and anesthetized. During the preliminary cleansing it was noticed that pus was exuding from the rectum, and upon examination the mass on the right was found to be decidedly smaller. It was evident that an abscess had opened into the bowel, and as this

relieved the present necessity, she was returned to bed without operation. For a few days the symptoms improved, but soon returned with increased severity.

Observation showed that the abscess cavity discharged intermittently into the bowel, and that the drainage was ineffectual. The mass in the left side remained about the same.

April 4 the uterus was removed by the vagina, the pus-pockets being opened and drained. On the third day the lower bowel acted freely by enemata. On the fourth day thin liquid fæces from the small bowel began to discharge from the vagina. The constant escape of small bowel contents excoriated the buttocks and thighs of the patient, while a progressive loss of strength from the rapidity with which food passed through the alimentary canal was immediately manifest.

The abdomen became quite flat, the temperature subnormal, and the condition of ammoniæmia, described by Roswell Park as due to the development of ammonia compounds, was marked. Examination by vagina showed a large opening involving more than one-half of the circumference of the small bowel. The rectum was nearly occluded by the pelvic exudate.

On May 1, the abdomen was opened in the middle line, the lower ileum, about eight inches from the cæcum, was found to be the seat of the anus. The remains of the pelvic inflammation bound the cæcum and upper rectum into the mass. The ileum was divided ten inches above the vaginal anus, the distal end turned in and closed.

The proximal point of division proved to be too short for easy attachment to the transverse colon, and was therefore fastened by a Murphy button to the sigmoid, which was unusually well developed.

As the pressure against the rectum by the inflammatory products below might prove a sufficient obstacle to the fæcal current to direct the stream backward and so around to the vaginal opening, Dawbarn's method of passing a purse-string of silk about the colon, three inches above the anastomosis, and tie sufficiently tight to interrupt the fæcal passage, yet not to interfere with the circulation, was carried out. After the operation the bowels acted twice daily, and no further discharge took place from the vagina, except a moderate amount of mucus from the unused intestinal tract. Patient was discharged June 3, 1897, and, with the exception of the lungs, in fair condition.

It is probable that the original infection in this case was tubercular and the lung involvement was secondary, and that a mixed infection of the pelvic focus of more recent date determined the more rapid development of the pelvic symptoms.

The spontaneous rupture of pelvic abscesses into the bowel often results in cure, but too frequently the drainage is ineffectual, and the patient becomes worn out by exhausting discharges.

In four previous cases, in the experience of the reporter, in which this condition existed, vaginal hysterectomy had proved curative. Boldt and others have advocated a similar plan of attack. The unfortunate result in the present instance was probably due to the tubercular element. The frequency with which operations upon tubercular disease of the ovaries and tubes result in primary or secondary fæcal fistula is known. In the exhausted condition of the patient, attempt at direct operative relief by suture of the bowel defect through the abdomen would probably have resulted in failure.

Intestinal anastomosis by the Murphy button has a great advantage over other methods if the peritoneum is intact, and this is essential to the use of the button. Suture operations being of greater value when the state of the peritoneum would render rapid formation of adhesions uncertain, as the pressure necrosis of the button does not give time for primary union of tissues other than peritoneal. My own experience with seventeen button operations, of all varieties, leads me to believe that in properly selected cases Murphy's device has great merit. The method of Dawbarn, described on page 476 in *ANNALS OF SURGERY*, April, 1897, is a rapid and easy way of obstructing the fæcal current, and is a credit to its originator. Eighteen inches of the ileum, the cæcum, ascending, transverse, and descending colon, are of course thrown completely out of use in this case, but the vaginal opening permits of the escape of the very moderate amount of intestinal secretion, which might otherwise accumulate.

REPORT OF A CASE OF TOTAL LARYNGECTOMY FOR CARCINOMA.

By WILLIAM WOTKYNs SEYMOUR, M.D.,

OF TROY, N. Y.

N. F., male, laborer, sixty-three years old, and of extremely long-lived American stock, in September, 1896, began to have a troublesome tickling in the throat, which he ascribed to elongation of the uvula. Having tried in vain various household remedies, he, in November, 1896, consulted Dr. H. C. Gordinier, of Troy. The doctor found a decided enlargement of the right arytenoid cartilage, which he ascribed to perichondritis, and for which, in view of an ancient specific history, he prescribed mercurial inunctions and iodide of potassium. At the second consultation, so markedly had the mass increased that the doctor was convinced that the disease was malignant, and accordingly referred the patient to a throat specialist, in an adjoining city, for relief. This gentleman again subjected the patient, during December, 1896, to specific treatment, and then later, concluding the disease to be malignant, advised against all interference until a palliative tracheotomy should become necessary. In January, 1897, lancinating pains began in the throat, and radiated into the right ear, and almost immediately swallowing began to be painful and dyspnœa developed. During this time and until referred to me, in April, as to the propriety of operation, by Dr. Gordinier, whom he had the day before again consulted, his throat had been sprayed two or three times a week, and beyond this nothing done. The patient was of medium height, spare figure, with no evidence of disease save in the throat. At one time he had been very intemperate, but had become an abstainer. Tobacco he had for years used, preferably by smoking a pipe. His voice was husky, and attacks of dyspnœa were so frequent and so severe that my laryngoscopic examination was much hindered by it. Swallowing even of liquids gave rise to severe

pain. Two tender and enlarged but movable glands were to be felt each side of the larynx. Laryngoscopic examination disclosed a mass apparently starting from the interarytenoid space, projecting posteriorly and invading the larynx so as to shut out all view of the right vocal cord, and give but a glimpse of the anterior third of the left vocal cord. The posterior surface seemed ulcerated, and the color of the mass was a dull red. My diagnosis was epithelioma of larynx, and I advised immediate total extirpation. No form of operation, save total excision, seemed at all adequate to the conditions. A tracheotomy might for a time relieve the dyspnoea, but it would not relieve the dysphagia, and the sepsis consequent on the extending and ulcerating growth. In view of the excellent general condition of the patient and the excellent results shown from total excision of recent years, I believed I was justified in urging the total excision. After a few days' reflection, which I advised, the patient decided for operation. I determined to follow Solis-Cohen, in stitching the trachea into the integument and thus cut off the air-passages from the granulating wound, believing it to offer to the patient the best chance of recovery, and that the attainment of speech by an artificial larynx was not worth the increased risk of leaving a communication between the trachea and gullet. For a week before operation the patient received full doses of strychnine three times a day; his mouth and throat were sprayed with antiseptic sprays, and the field of operation shaved and thoroughly scrubbed. April 18, 1897, at the patient's cottage, I operated, with the assistance of Drs. D. and A. Buchanan, Gordinier, Morris, and Marsh. The Vienna anæsthetic mixture was administered by Dr. Donald Buchanan, to whose skill much of the successful issue of the case was due. The anæsthetization was made very difficult by the stenosis of the larynx, but I desired to delay the opening of the trachea as long as possible. A median incision was made from the hyoid bone to well below the thyroid isthmus, and the tissues freely separated from the sides of the larynx and below the cricoid cartilage. Suddenly breathing stopped,—the pulse remaining good,—and I was obliged to open the trachea, which I plugged with a conical curved vulcanite tube, attached to a funnel inhaler, and I then resorted to artificial respiration and rhythmic tractions upon the tongue. Respiration was speedily restored, and after Dr. Marsh



FIG. 1.—Tumor of larynx viewed from right side.



FIG. 2.—Tumor of larynx viewed from behind.

had injected 600 cubic centimetres of normal salt solution into the left arm I continued the operation. In so doing I made a transverse incision along the hyoid bone, and after laying open the thyro-hyoid membrane freed up the epiglottis, and continued the dissection from above downward. All vessels were either tied before cutting or immediately clamped, so that the dissection was practically bloodless. The mass was fully as large as I had estimated it, and seemed to spring from above the beginning of the œsophagus. After dissecting the œsophagus from the larynx and trachea, I passed through it silk sutures, with which it was subsequently stitched to the pharynx. The trachea was then divided from behind forward and stitched into the integument with silk. The skin wound was closed with interrupted silk-worm-gut sutures for one and a half inches above the trachea, and after the introduction of a feeding tube through the wound into the stomach, the remaining wound was packed with iodoform gauze, and over the whole a dressing of sterilized gauze. A simple tracheotomy-tube was employed in the trachea. The operation lasted a little less than an hour. The patient had a better pulse than before operation, and was put in a well-warmed bed, with the foot raised eighteen inches, so as to determine all drainage away from the trachea. The air was kept moist with eucalyptus vapor. Each day the stomach was washed out with sterilized water, as the patient complained of burning in the stomach, but only nutritive enemata were used for the first three days, and then food in constantly increasing amount was introduced through the feeding-tube into the stomach. The patient was kept inverted ten days, and then was allowed to sit up. The wound was dressed the third day and each day after. Only once did the temperature reach 100° F., and most of the time was practically normal. Once the patient had a violent suffocative paroxysm, owing to the plugging of the tracheal tube with viscid secretion, but the prompt action of Miss Veeder, of the Philadelphia Hospital School, relieved it. In fact, Miss Veeder's tact and vigilance was a great factor in the patient's recovery. The eleventh day the feeding-tube was removed, and only introduced for feeding. The wound was tightly closed eight weeks after operation, at which time the patient could swallow liquids and solids, and in a very erratic way phonate a little. Were I to do another such an operation I would employ the Trendelenburg

posture, as advocated by Professor Keen, and while keeping the patient inverted for several days for drainage, I would close with sutures to a far greater extent than I did the wound, both horizontal and median. In this way the convalescence would, I believe, be very materially shortened without increased risk to the patient. Should one desire to keep a communication between the trachea and gullet, I believe the drainage by inversion should be maintained for a longer time than in cases where Cohen's procedure is followed. The whole larynx was sent to the Harvard University Medical School for its museum, and I subjoin the report of Professor W. T. Councilman.

"There was sent for examination the entire larynx with the anterior wall of the œsophagus. There is a tumor-mass springing from the œsophagus and the rim of the glottis. The tumor is partially ulcerated on the surface, and is three and a half centimetres in diameter on its upper surface and three centimetres at its attachments. The border projects everywhere. On section it is one and a half centimetres in depth. It involves the upper portions of the rim of the glottis on the right side and has infiltrated the portion of the thyroid cartilage belonging to this. The mucous membrane of the larynx on the right side, below the tumor, is swollen and infiltrated with the growth. The appearance of the growth on section is distinctly alveolar. Microscopic section shows it to be a carcinoma, originating from the œsophageal epithelium."

September 6, 1897. A month ago the growth began to appear in the upper end of the wound, more particularly involving the right side, at the hyoid bone and the base of the tongue. Despite a markedly cauliflower-like mass now existent the patient breathes readily, swallows without difficulty, and has but a moderate amount of pain. Applications of a 2-per-cent. formalin solution to the mass give more comfort than anything, and although the outlook is now hopeless, the patient has had nearly five months of freedom from agonizing dyspnoea and pain, with perfect comfort in swallowing. Even as it is, the patient and his family both feel that the operation has been worth undergoing. The chief regret is that so much time had previously been frittered away. The photographs I owe to the skill and kindness of Dr. James P. Marsh.

EDITORIAL ARTICLES.

KRÖNLEIN ON CARCINOMA OF THE PHARYNX AND ITS OPERATIVE TREATMENT.¹

IN the past sixteen years of work in Zürich the author has had occasion to treat sixty-one cases of carcinoma of the pharynx. The number of cases in proportion to other varieties of carcinoma and other surgical affections is unusually large, and varies widely from Langenbeck's classical statistics.

The percentage of female patients was only $8\frac{1}{5}$. The greatest number of cases occurred between the ages of fifty and sixty-five. Etiologically, no important factor could be defined. The majority of the patients belonged to the educated and prosperous class of society. One patient had had several manifestations of specific throat trouble; but this was the only case with syphilitic antecedents. In one instance the growth was metastatic, the primary tumor being in the breast. One patient remained free from recurrence after operation for seven years, when another growth was removed from the opposite side. The latter was held to be a second primary growth and not a recurrence.

The details of the cases are studied according to their localization, in the nasal, oral, and laryngeal portions of the pharynx.

I. Naso-pharyngeal carcinoma,—two cases, one inoperable, —both pursued a very rapid course. Access to the tumor was obtained by osteoplastic resection of the nasal bone and the nasal

¹ Professor Krönlein, Zürich, Beiträge zur klinischen Chirurgie, Band XIX, Heft 1.

process of the upper maxillary on the side corresponding to the insertion of the tumor. The method, however, leaves much to be desired: a clear view is not obtained, and the hæmorrhage is at times very profuse.

II. Oro-pharyngeal carcinoma,—thirty cases. Their situation was on the lateral wall of the pharynx, 18; on the lateral aspect of the base of the tongue, 10; on the lateral aspect of the soft palate, 2.

The origin of the tumors on the lateral wall of the pharynx was from the mucous membrane of the tonsil in thirteen cases, from the retrotonsillar pharyngeal wall in five cases. Of twenty-seven cases situated on one side of the pharynx, twelve were on the left, and fifteen on the right. Mikulicz gives the proportion of eight left to one right.

The patients were frequently sooner aware of the presence of secondary glandular deposits in the carotid space and beneath the sterno-mastoid muscle than of the existence of the primary process. Early glandular infection is the rule in tumors of this region, and this fact emphasizes the gloominess of the prognosis.

Eleven cases proved to be inoperable, and their subsequent history showed that the average duration of the disease, when not subjected to operation, from the beginning of the first subjective symptoms to the time of death, is seven months.

The nineteen operative cases gave the following results: Four died from the immediate effects of the operation; two were alive at the end of 1896, one with, and one without, recurrence; one was alive and free from recurrence seven years after operation. In the others that died of recurrence, the average duration of life from the earliest subjective symptom was 14.3 months.

The method of operating in a period of sixteen years naturally presented variations. The underlying principles were:

(1) No preliminary tracheotomy.

(2) Only partial anæsthesia,—morphine-chloroform or morphine-ether.

(3) Head and upper portion of the body in an elevated position.

Access to the operative field was obtained: twice by transverse splitting of the cheek; twice by resection and exarticulation of the ascending ramus of the lower jaw; five times by lateral division of the lower jaw (Langenbeck); four times by lateral division of the lower jaw by the author's method (incision with curve downward from angle of the mouth to posterior border of the mastoid process).

III. Laryngo-pharyngeal carcinoma,—twenty-nine cases. In twenty-five the seat of the growth was on the anterior and lateral aspect of the wall of the pharynx; six on the left, eighteen on the right, one on both sides; seventeen were inoperable. The average duration of life in the patients not subjected to operation from the first subjective symptom till death was six months.

Of the eight operative cases, six died as a result of the operation,—broncho-pneumonia, 4; exhaustion, 1; secondary hæmorrhage, 1. One case is alive and free from recurrence two years after operation.

In five cases the author has employed a modification of Langenbeck's method, which he calls "pharyngotomia lateralis sub-suprahyoidia." In four cases in which preliminary tracheotomy was done, three died of broncho-pneumonia. In the three remaining cases, no preliminary tracheotomy; general (partial) anæsthesia till the stage of opening the pharynx, the operation being then concluded under cocaine (10 per cent.) anæsthesia, with full consciousness on the part of the patient. One death from broncho-pneumonia.

With increasing experience the author's confidence in the value of preliminary tracheotomy, with general and complete anæsthesia and packing of the larynx or trachea has steadily diminished. The hope formerly entertained that these measures would minimize or even abolish the danger of inhalation pneumonia has not been realized, and, in the author's opinion, the

reverse has been the case. During his six years' experience in Langenbeck's clinic, when these measures were first introduced, his impression is that the "schluch pneumonie" was observed oftener than before their introduction, and these he has now discarded forever in his practice.

CHARLES L. GIBSON.

INDEX TO SURGICAL PROGRESS.

LYMPHATIC SYSTEM.

I. Intermittent Inflammation of Lymphangiomata. By H. KÜTTNER (Tübingen). While our knowledge of the histological structure of the lymphangiomata has been considerably increased by recent investigation, a corresponding attention has not been directed towards their clinical history. The latter circumstance is rather remarkable, as the diagnosis of a lymphangioma is not always easy, and any distinctively characteristic symptoms would therefore be particularly welcome. In the intermittent inflammation we possess a symptom which most observers have looked up as an intercurrent feature, and not till lately has its importance been recognized.

Intermittent inflammation of a lymphangioma is not an uncommon occurrence. It is to be considered as an infectious process, the micro-organisms either finding their way through minute external wounds or through the lymphatics. Predisposing elements are a cavernous structure, and a situation within the oral cavity. The characteristic recurrence of the inflammation at irregular or regular intervals is due in some of the cases to repeated infection of a like injurious nature, in others to the resuscitation of remaining dormant germs with the development of favoring circumstances (lymph stasis), or by a certain disposition to inflammatory changes, as a sequel of the original infection.

The intermittent inflammation has a practical importance, owing to the threatening symptoms frequently accompanying an attack, in its influence as retarding or favoring the growth of

the tumor, and, most important of all, as a diagnostic factor.
—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 3.

C. L. GIBSON (New York).

VASCULAR SYSTEM.

I. Final Report of a Case of a very large Innominate Aneurism completely cured by Electrolysis through ten feet of snarled, coiled, fine gold wire, introduced into the Sac. By D. D. STEWART, M.D. (Philadelphia). The writer reports the result of a necropsy on the case of a very large innominate aneurism on which he, over forty-one months before, had employed galvanism through ten feet of coiled gold wire, which he had introduced, resulting in complete solidification of the sac. The case was one most unpropitious for any treatment. The patient had been a habitual spirit drinker. He was also a syphilitic, had pronounced aortic and mitral disease, with extensive cardiac enlargement, generalized endarteritis, and had also chronic nephritis. The aneurism formed a large and prominent swelling at the root of the neck. It was regarded as springing from and being limited to the innominate artery. The sac wall was of extreme thinness, and, at least externally, was unprotected by clot. This, which was apparent to the eye and touch, was further demonstrated by puncture with needles. At the time of operation the sac wall seemed on the point of bursting externally in several situations, over which the skin was extremely thin and bluish.

The result of electrolysis through the introduced wire was very decided. Clot-formation, leading apparently to solidification of the sac, was early manifest. The patient lived for nearly three years and a half after operation, and finally died as the result of the formation of a large thrombus in the middle cerebral artery, the result of the advanced endarteritis present.

The autopsy revealed the aorta dilated from its cardiac origin, but a separate and very distinctly outlined extensive fusi-

form dilatation existed from one and a half centimetres to the left from the origin of the left subclavian artery, at the junction of the transverse with the descending portion of the aorta, downward to a distance of ten centimetres. This fusiform sac at its greatest internal circumference is fifteen centimetres. This dilatation—a typical fusiform aneurism—is sharply defined above and below by concentric elevated rings or constrictions of the whole circumference of the aorta. The entire aorta, including the dilated portion, is uniformly thickened. The inner surface of the fusiform sac shows wide-spread atheromatous patches. The sacculated aneurism springs directly from the root of the innominate artery. The aneurismal sac is approximately the size of a foetal head at term; length, thirteen centimetres; transverse diameter, nine centimetres. The sac is completely consolidated with organized coagula in which lie the coils of wire. The consolidated sac has at its base a small cul-de-sac, the remains of the innominate artery. This, from the aorta, admits the little finger to a distance of four centimetres through an annular ring, sharply defined, two centimetres in diameter. The cul-de-sac was noted to contain in its interior a small coagulum, presumably of post-mortem formation. The sac itself was very firm and wholly solidified, and when cut into was found to be completely occupied by organized material, in the interstices of which lay the coils of fine gold wire. Brain: A large thrombus is evident in the left middle cerebral artery. Softening has occurred in the region of the corpus callosum, caudate, and lenticular nucleus, and in the internal capsule of the left side.

The method, as practised and advocated by the author, consists in introducing into the sac, under the strictest antiseptic precautions, a fine silver- or gold-coiled wire, previously so drawn that it may be readily passed through a thoroughly insulated needle of somewhat larger calibre than the wire, and, after introduction, assume snarled, spiral coils, that, with a moderate amount of wire, the entire calibre of the sac will be reached,

unless the cavity be already filled with coagula or the sac be of unusual size.

The wire must be neither in amount nor calibre too great nor too bulky or highly drawn that the results to be desired be interfered with. Nor should the wire be of a material so brittle as steel nor of hard-drawn iron, lest fracture occur in process of contraction of sac, with danger of rupture; nor should it be of soft iron, lest so great a quantity of detritus result, due to the decomposition of the iron and the formation of insoluble salts under the current influence, even with low ampèrage, that danger of emboli result.

Silver or gold wire is undoubtedly preferable material. Silver-coppered wire, employed by Loretta in his case, in which wire alone—without galvanism—was used, possesses no advantage over that of silver alone, and if it were used might be provocative of toxic symptoms through the amount of copper dissolved under the current influence.

The amount of wire required depends necessarily upon the calibre of the aneurismal sac, and must be decided upon with the greatest nicety of judgment, since with too small an amount little or no result will be obtained, and with too great a quantity permanent cure through obliteration of sac by contraction of clot cannot be expected. For a globular sac of approximately three inches in diameter, three to five feet are sufficient; for a sac of four to five inches, eight to ten feet. How readily these amounts comply with the conditions is shown by the introduction through a needle of a measured amount of spirally-wound snarled wire into globular corked bottles of approximately the size stated.

The anode or positive pole should invariably be the active electrode. This is connected with the wire, and the negative rheophore, a large clay plate, or an absorbent cotton pad of equal dimensions, is placed upon the abdomen or the back. The current is slowly brought into circuit and its strength noted by an accurate milliamperèmeter. The increase is gradual for a few

moments until the maximum strength supposed to be required is reached. It is maintained at this until the approach of the end of the session and then gradually diminished to zero, after which the wire is separated from the battery, the needle carefully withdrawn by rotation and counter-pressure, and the released external portion of the wire gently pulled upon and cut close to the skin, the cut end being then pushed beneath the surface. This latter procedure is facilitated by using care in the introduction of the needle to first draw the skin at the site of puncture a trifle to one side, in order to procure a somewhat valve-like opening.

Experience has shown that the current's strength must be rather high,—from forty to eighty milliampères, and the sitting long,—from three-quarters of an hour to one hour and a half. Thus used the following effects may be expected: The mere introduction of coiled, snarled wire without the conjoint use of galvanism, if practised judiciously, is in itself a method of value, since the presence of wire, if engaging all parts of the sac, acts both as an impediment to the blood stream and at the same time offers to the eddies set up multiple surfaces for clot-formation. Hence this method has more to commend it than that by mere galvano-puncture with needles. By galvano-puncture, although firm coagula are produced, they are of such trifling dimensions and engage such small areas of sac wall that, without impeding in the least the blood-current, their dissolution rather than their accretion quickly follows. By the application of a strong galvanic current through coils of wire so disposed that all areas of the sac are reached, it follows without exception, as has been noted in all recorded cases, that consolidation by virtue of clot-formation is promptly and invariably produced. The solidification is rapid, and is generally manifest before the end of the electrical session, through changes apparent to the eye and hand, in the pulsation, and in the degree of consistence of the sac wall. These changes become more decided in the course of a few days,

until after a time in the most favorable cases a hard nodule, with a communicated pulsation only, replaces the previous expansible tumor.—*British Medical Journal*, August 14, 1897.

HEAD.

I. The Origin and Nature of Ranula. By DR. RICHARD VON HIPPEL (Berlin). In this paper von Hippel discusses and criticises the various theories which have been advanced to explain the origin of ranulæ. The careful macroscopic and microscopic examination of numerous specimens leads him to very positive ideas on the subject. He agrees with Neumann and others that certain ranulæ arise from unobliterated portions or branches of the thyro-glossal duct, and reports one interesting and thoroughly convincing case in support of this view. To any one who has studied true median cervical fistula, the conception of such an origin presents no difficulties. Most cases of ranula have another origin. In studying this subject von Hippel makes free use of the excellent researches of Suzanne, with whose views he largely agrees.

Ranula is generally an affection of the sublingual salivary glands. As a result of a partial, chronic, interstitial inflammation of the gland, sclerosis occurs and causes pressure and stricture of the small tubules of the gland. Naturally, the peripheral gland lobules continuing work there is retention of the secretion and a slow dilatation of the tubules behind the strictures. This process has been observed taking place simultaneously in a number of neighboring tubules, and these tubules becoming wider and wider come in contact and ultimately melt the one into the other. While this is taking place the epithelium of the tubules proliferates; the surrounding connective hypertrophies, and, owing to pressure from the continued increase in size of the cyst, neighboring structures are now included in the cyst wall. There is no distinct external boundary to the now mature cyst, whose wall contains gland acini, elastic fibres, etc.; structures

which are located here by inclusion are certainly not newly formed.

The *continued* growth of the cyst is certainly not due to the secretion of saliva, because the affected acini are early atrophied and changed to an irregular mass of cells. The epithelium of the dilated tubules becomes swollen, glassy, and ultimately melts into a slimy, clear liquid. Around the cysts there are numerous dilated capillaries, especially situated in the inner layers of their walls. From these there is probably a transudation into the cyst cavity. The existence of these dilated vessels explains the blood-stained condition of the cyst contents which is occasionally met.

The above description shows how cysts originate and how they are enlarged from the simple increase in their contents. In many cases, however, this method of enlargement is aided by the confluence of cysts formed simultaneously in neighboring lobules of the gland. In this manner multilocular cysts originate.

Von Hippel considers the process in the small tubules to be primary in the development of ranula, while changes in the gland vesicles is secondary and incidental. Experiment and clinical observation show that closure of the principal ducts causes inflammation and atrophy of the gland tissue drained by them; the same must be true in the case of the small ducts or tubules.

From the explanation of the origin of ranula given above, it is easy to understand the peculiarities of the tumor.

The location of the tumor varies within somewhat wide limits. Generally it is near the frænum, and grows outward and backward, sometimes it spreads towards the other side, and so appears median. In other cases the tumor is from the first distinctly lateral and never approaches close to the middle line. All these peculiarities are simple when the topography of the sublingual gland is considered, and depend on the part of the gland attacked by the chronic interstitial inflammation. If both glands are attacked by this inflammation then cysts will develop more or less symmetrically on both sides of the frænum. Occa-

sionally, but rarely, cysts are truly median, and may lie close to the alveolus of the jaw. In these cases it is not the sublingual but the "incisor glands" which are diseased. [The *glandula incisiva* lies in the middle line of the floor of the mouth, immediately behind the incisor teeth.]

The only certain treatment consists in excision not merely of the cyst but of the whole affected gland.

Conclusions.—(1) Ranula is a retention cyst of the *glandula sublingualis*, in rare cases of the *glandula incisiva*.

(2) It originates in the small ducts of the gland.

(3) It is occasioned by a partial chronic interstitial inflammation, which leads to closure of the small ducts.

(4) The cyst formation is due, at first, to retention of secretion, later to proliferation, degeneration, and desquamation of the duct epithelium, on the one hand, and on the other, to transudation from new-formed capillaries.

(5) Increased pressure causes atrophy of the glandular tissue involved.

(6) Submental and acute ranulæ are only accidental varieties of the ordinary disease.

(7) The only radical operation for ranula consists in extirpation of the cyst, together with the whole of the gland diseased.

(8) In very exceptional cases, all the clinical features of ranula are exhibited by cysts of the unobliterated *ductus lingualis* or its branches.—*Archiv für klinischen Chirurgie*, Band LV, S. 164.

JOHN F. BINNIE (Kansas City).

REVIEWS OF BOOKS.

- I. A TEXT-BOOK OF DISEASES OF WOMEN. By CHARLES B. PENROSE, M.D., Professor of Gynæcology in the University of Pennsylvania. 8vo, pp. 529, 217 illustrations. Philadelphia: W. B. Saunders, 1897.
- II. THE DISEASES OF WOMEN: A Hand-Book for Students and Practitioners. By J. BLAND SUTTON, F.R.C.S. (Eng.), Surgeon to the Chelsea Hospital for Women, and ARTHUR E. GILES, M.D., F.R.C.S. (Edin.), Assistant Surgeon, Chelsea Hospital for Women. Small 8vo, pp. 436, 115 illustrations. Philadelphia: W. B. Saunders, 1897; London, Rebman Publishing Company.

These two books come together as claimants for attention, and the comparison of their respective merits is the more interesting since each may be accepted as a fair presentation of the present state of gynæcological teaching and practice in the respective fields occupied by their authors. The books are of convenient size; condensation of material, clearness of statement, and the omission of much that has only historical or developmental interest characterize both of them. Penrose precedes his chapter on Methods of Examination by a brief chapter devoted to the General Causes of the Diseases of Women; Sutton, by chapters on the Anatomy and Physiology of the Reproductive Organs of Women. In these matters the American author refers his readers to the general text-books. Sutton follows with two chapters on Malformations and one on Atresia; while Penrose defers the subject of malformations to a later portion of his book,

introducing it, without any apparent logical reason, between the subjects of ovarian tumors and disorders of menstruation. The subject is treated in a much more complete manner by the English author, as one would expect from the known bent of his predilections. A peculiarity of the English book is that descriptions of operative procedures are omitted from the particular connections in which they would be looked for, and are collected together in special chapters at the close of the volume. Penrose describes them more naturally in connection with the conditions for the relief of which they are performed.

Throughout his treatise Sutton is more systematic and more minute in the presentation of physiological data, and might, therefore, be given the preference by a student seeking to prepare himself for examination; Penrose gives more prominence to practical details, and describes more fully those things which a practitioner would be likely to have occasion to seek information upon. Thus the very important practical details pertaining to the perineum are much more fully and satisfactorily described by Penrose, while only meagre and unsatisfactory paragraphs are devoted to it by the other.

Both authors are alike in confining themselves in matters of treatment to those plans only which they believe are to be preferred: thus, in the matter of the operative treatment of retro-displacements of the uterus, they both suggest only shortening the round ligament, or ventrofixation, defining clearly the respective indications for the two procedures.

In the treatment of uterine myomata both authors take advanced surgical ground. Penrose says that the great majority of such tumors should be subjected to operation, and justifies such a dictum by the claim that the operative technique involved has become so perfected that the danger of operation is now much less than the dangers to which the woman is exposed from the various accidents that are liable to befall in this disease. Sutton is a little more conservative, but tends decidedly in the

direction of frequent operative interference, saying in one breath that if large myomata could be removed with the same ease and safety as ovarian tumors, there could be no doubt as to the advisability of their surgical removal, and, in the next breath, stating that each year results of such attempts continue to improve, and that there are now hopeful signs that the chances of success will soon equal those of ovariectomy. Neither author gives any place to the treatment by electrolysis, so recently so much in vogue. Penrose mentions it, only to condemn it, and Sutton ignores it altogether.

These notes will suffice to indicate the general scope and character, as well as the peculiarities, of these two books. It remains only to say that they are both excellent epitomes of present knowledge in the domain of the diseases of the special organs of the female pelvis, and present well the more advanced surgical methods of to-day for dealing with them.

LEWIS S. PILCHER.

VORLESUNGEN ÜBER KRIEGSCHIRURGIE. By DR. L. LÜKE, Surgeon-General (retired), pp. 230. Berlin: Verlag von August Hirschwald, 1897. (Lectures upon Military Surgery.)

This work consists of a series of lectures on the surgical conditions peculiar to military warfare. The first or general part deals most interestingly and instructively with the circumstances attending the receipt of wounds, their behavior, and the appropriate treatment. The consideration of the effects of the injuries inflicted by the modern small-bore weapons is dealt with very fully. The author has furnished much experimental investigation, and the work of others is given all proper consideration. Very interesting contrasts are shown in the tables of the changes resulting from the "improved" methods of destruction. It is also a certain satisfaction to learn that the effects of the modern bullets are more "humane." The injuries are considered in de-

tail regionally, and this part of the work deserves special commendation.

Part II, while illustrative of the admirable executive administration of the German army in regard to hospitals, field stations, ambulances, etc., does not possess the same interest for the civilian surgeon as do the opening chapters of the work. Throughout the text are scattered excellent tables, and the final chapter is entirely given up to statistical data.

CHARLES L. GIBSON.

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ANNALS OF SURGERY,

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THE TREATMENT OF TETANUS.

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RECENTLY the treatment of tetanus has been attended with very encouraging results. This is due chiefly to the application of antiseptic surgery and to the introduction of a new form of serum therapy. But these new remedies have engrossed the attention of the surgeon to such an extent that some of the essential features of the older methods of treatment have been overlooked.

The object of the present paper will be to call attention to the use of the older remedies which have been found to be most useful, and to consider in addition the therapeutic value of antitoxine. The treatment, therefore, will embrace measures applicable to the wound itself as well as a study of the best constitutional remedies.

The local management of the wound is a most important part of the treatment. It has been shown that in the majority of cases of tetanus the infection proceeds from the development of the spores rather than from the bacilli. It has also been demonstrated that the spores develop better under special circumstances of a mixed infection and, therefore, all tetanus wounds should be made at once aseptic in order to destroy the microbes of suppuration, notably the streptococci and the staphylococci.

In attempts to render the wound aseptic all scabs should be removed and at once burned, since the bacilli have been found in these crusts. The wound underneath the scabs should be thoroughly disinfected. For the purposes of dis-

infection Sternberg has shown that a 5-per-cent. solution of carbolic acid or a 1 to 1000 solution of bichloride of mercury, to which is added $\frac{1}{2}$ -per-cent. solution of hydrochloric acid, will kill the spores in ten minutes. Tizzoni and Catanni suggest the employment of a 1-per-cent. solution of nitrate of silver, which, they claim, will destroy the bacilli and the spores in about one minute. The actual cautery has also been suggested as a means of destroying the microbes, but this kind of treatment must be used under the influence of an anæsthetic. Iodoform is the best antiseptic powder to use as a dressing in the tetanus wound. In addition a $\frac{1}{2}$ -per-cent. solution of iodine trichloride should be used because this destroys the action of the toxines of tetanus in less than an hour. It often happens that the wound is situated on an extremity, notably on the finger or toe, and the question arises as to the propriety of amputation of the affected part. This operation is of no avail unless the sacrifice is made immediately after the infliction of the injury. But it is indicated if the wound cannot be thoroughly disinfected. It is better to live without a finger or toe or even a leg than to run the risk of tetanus with its attendant suffering, which leads in the acute cases so often to death. The small punctured wounds, which may seem insignificant, should be incised deeply, thoroughly cleansed, and then properly drained. It might not be inappropriate in this connection to call attention to the ligation of the umbilical cord. This is a most valuable preventive measure when done under rigid antiseptic precautions.

The elimination of the poison is the next step to consider in the treatment. The toxines of tetanus are chiefly eliminated by diuresis. To best utilize this channel of elimination the imbibition of large quantities of fluid is indicated.

The saliva has also been said to be a channel of elimination. The function of the skin has not been proved to be of any avail in eliminating the poison.

The employment of antidotes forms also a prominent part of the treatment. This step, therefore, should not be overlooked, since it is clearly proved that much suffering can

be relieved by certain drugs. Among the drugs that are found to be most useful are chloroform, morphine, chloral, bromides, physostigmine, antimony, and nitrite of amyl. Chloroform is a most valuable remedy, because it relieves the intense suffering and diminishes the intensity of the spasm, and also prevents suffocation. This agent must be used with every precaution and with every stimulant present, and ready for immediate use. Statistics show that when chloroform was employed in the treatment of tetanus that the mortality was 10 per cent. less than in the cases where the drug was not employed.

Morphine in large doses depresses the action of the spinal cord and diminishes the reflexes. This drug is therefore a most valuable adjuvant, since it meets the various indications of relieving pain, inducing sleep, and relaxing the tonic contractions of the muscles.

Chloral is a most important drug to be used in connection with the treatment of tetanus, since it depresses the motor tract of the spinal cord. To be effectual it must be administered in large doses, and the action of the drug carefully watched. It occasionally happens that its administration by the mouth causes convulsions, and in this case it should be employed in the form of a suppository. If the introduction of the suppository causes contraction of the rectum and expulsion of the drug, the surgeon should avail himself of the opportunity of introducing the suppository during the period of chloroform narcosis. That chloral is a most valuable drug in the treatment of tetanus is demonstrated by the fact that the mortality has been reduced 6 per cent. in those cases in which it has been used.

The *bromides* act by causing cerebral anæmia, and are most effective when used in connection with chloral.

Physostigmine acts also as a depressant of the spinal cord, especially the motor tracts of the cord. It also causes relaxation of the muscles and diminishes the reflexes.

Antimony was suggested by Bross, of Costa Rica. He gave the drug in one-eighth to one-sixth of a grain, every

two hours, in conjunction with morphine. If the latter drug is used simultaneously vomiting is prevented. The action of the antimony is to allay the convulsions and diminish the reflexes.

Nitrite of Amyl has been used with great benefit. It should be given between the spasms, as it cannot be inhaled during a spasm, since the respiratory muscles are then affected.

In the use of all of these physiological antidotes, clinical experience has shown that the continued employment of one drug soon causes it to lose its therapeutical effect, and in order to get the greatest benefit from these physiological antidotes they should be administered in rotation. The chemical antidotes are of no avail, since their use, to be of any value, must be so powerful that the damage from the remedy more than counterbalances any good that might be expected.

The surgeon must also bear in mind that there are certain things which he can do that greatly assist in effecting a cure. De Renzi has recommended absolute quiet as an essential condition in the treatment of tetanus. He confines the patient in a dark room, with no windows, and to aid in the enforcement of quiet plugs the ears of the patient. All manipulations are to be as quiet as possible in order to prevent undue reflex excitability. He insists upon the removal of all kinds of external irritation, and urges the surgeon to prevent the slamming of a door, the presence of draughts of air, and the moving about in the room.

During the progress of the disease the nutrition of the patient must be kept up at stated intervals. The patient, if unable to swallow, must be fed with a catheter introduced through the nostrils and preferably introduced during chloroform narcosis.

Attention must also be directed to the bladder, since the urine must be drawn from the patient at regular intervals. The bowels must also be carefully watched, and a daily movement secured.

With a view to preventing peripheral irritation Verneuil has suggested wrapping the patient in cotton, and applying splints after the fashion of dressing a fracture.

The *administration of antitoxine* is a new remedy. In order to study the value of this remedy it is necessary to carefully collect reliable data from which some deductions can be made in regard to the efficacy of this form of serum-therapy. The task has been attended by considerable difficulty, and the writer has been confronted with many obstacles in his attempts to reach the truth.

Among the difficulties which have been encountered may be mentioned the paucity of cases, the incomplete methods of publication, the use of other drugs in combination with antitoxine, the unreliable preparation of the serum, the fanaticism of some observers, the bitter antagonism of some clinicians, the lack of co-operation between the bacteriologist and the surgeon, the incorrect data recorded by many writers, the great diversity of opinions among surgeons as to the correct interpretations of facts, and, finally, the erroneous conclusions adduced by certain enthusiasts.

These are among the few obstacles, and they apply to no other remedy in the medical world. From this chaos and confusion it has been no small task to weigh each individual case on its own independent merits, and to group all cases in such a manner as to afford a basis upon which an unbiased opinion can be formulated.

The surgeon is confronted with a condition and not with a theory, and to present the whole truth and to make the proper deductions is a task which has required much research, careful elimination of cases, and unbiased judgment.

At the outset it may be stated that the writer will endeavor to present impartially the facts in regard to the treatment of tetanus by antitoxine, and to add that, from a study of the cases up to the present time, no absolute, unchangeable opinion can be formed as to the efficacy of antitoxine in all the varieties of tetanus.

The conclusions to which the writer has come are those which only could be scientifically arrived at from careful investigation of the limited number of cases in which the antitoxine alone was employed. The cases are too few under this essential category to establish a fixed law from which no deviation is to be made. The facts thus gathered do not warrant the conclusion that in antitoxine a remedy exists that will invariably cure tetanus. The facts, however, do justify the conclusion that under certain conditions antitoxine is a remedy of the greatest service to mankind, notably in the matter of immunization.

Antitoxine can be employed either for the purpose of immunization or as a remedy during the progress of the disease. Antitoxine as an immunizing agent will be first considered.

All surgeons agree that it would not be justifiable to immunize a patient on the vague supposition that tetanus might develop. The use of the antitoxine as a prophylactic measure is, consequently, limited to those cases where the wound has been inflicted in such a manner as to allow garden-earth, a plaster from walls or manured soil to come in contact with it, or where the traumatism has been caused by a rusty nail upon which the bacilli are discovered, or in a given locality where tetanus is prevalent or where the wound is a lacerated one with entrance of foreign bodies into it.

Mention of the results of immunizing against diphtheria might afford some useful information as to what might be expected in the immunization against tetanus. For example, Biggs has collected 17,576 cases in which antitoxine as a prophylactic was resorted to, and only 131 cases developed diphtheria, although all the patients were exposed to the infection. In the 131 cases, 129 had a mild attack, and two only died. In these two fatal cases the dose was supposed to be too small or else the infection was a mixed one.

If such results follow from the use of antitoxine as an immunizing agent in diphtheria, it is logical to expect that

even more brilliant results will ensue in the adoption of this treatment in tetanus, since the antitoxine of tetanus shows even better results in lower animals. Under such conditions immunization is a proper line of treatment, and one from which success is sure to follow.

Bazy, a French surgeon, had four fatal cases of tetanus in his practice in one year, and subsequently began injecting twenty cubic centimetres of serum into all patients who suffered from lacerated wounds into which extraneous matter had of necessity entered. Since he adopted this practice tetanus has not followed in those cases in which a strong probability existed that this dreaded disease might develop. Lambert mentions that Nocard, in veterinary surgery, immunized 375 animals, and in no single case did tetanus develop, while he had fifty-five cases of the disease in animals in the same environment.

Antitoxine does not affect in any way directly the life of the bacilli of tetanus or the spores. Both the bacilli and their spores, when they penetrate the tissues by a wound, live for days or weeks. In these cases, when antitoxine is given for the purpose of preventing the symptoms which would be caused by the toxins during the first few days, it will destroy the action of the toxins. If, however, some of the spores remain quiescent, they may only develop into bacilli at a time when the antitoxine has been eliminated, and if they then develop into bacilli the toxins produced will be absorbed and cause symptoms just as if they had received no immunization dose of antitoxine. For this reason the immunizing dose should be repeated after the first week, and again after the second week, and even after the third week. The immunizing dose is about ten or twenty cubic centimetres, or about half of that required during the progress of the disease.

Antitoxine as a remedy during the progress of the disease has an important influence upon tetanus; but not to the same extent as when employed for immunizing purposes. Welch believes that the longer the period of incubation the

better will be the results from the use of antitoxine, and that this remedy is of little value with a short incubation period,—that is, less than seven days. When antitoxine is used under these conditions it should be continued long after the symptoms of tetanus have subsided. The writer feels convinced that the treatment of tetanus by antitoxine would have even a better showing, if the serum were used in a proper way; for example, one surgeon reports three cases of tetanus treated by antitoxine, but in all three the serum was only given once in one case, twice in another, and three times in the third. All these patients succumbed, but the test was not a fair one as the remedy was improperly used.

Under such conditions the serum is of no avail, and the conclusions drawn from such treatment are erroneous, because the antitoxine was not used in large enough doses or persisted in for a sufficient time or employed early enough,—such treatment would bring any remedy into disrepute. The dose should be at least twenty cubic centimetres, three times daily, and in some cases even larger.

Lambert has also called attention to a most important point in the treatment of tetanus, and that is, the great care the surgeon should exercise after all symptoms have disappeared. For example, absolute quiet should be insisted upon long after the patient has become convalescent, since he knows of five deaths recently in this city where the patients were awakened suddenly out of a sound sleep and a convulsion was brought on from which the patients died. The necessity of not discontinuing the antitoxine too soon is illustrated by a case which Marson reported, in which the patient steadily improved and was so much relieved that on the eighth day the injections of antitoxine were discontinued. The improvement continued during the ninth day; but as soon as the effects of the antitoxine had passed away the patient relapsed into a delirium, and died on the eleventh day.

Failures to cure tetanus by antitoxine are therefore to be attributed to too small doses, to doses not repeated often enough, and to doses not persevered in for a sufficient time.

In addition, the surgeon should not become careless and allow the patient to be aroused suddenly out of sound sleep before all danger has passed.

The results which have been obtained from the use of antitoxine in tetanus are scarcely large enough at the present time to establish any fixed statistics. This fact is made more apparent when reference is made to the various statistics that have been given in regard to the mortality of tetanus when treated by the older methods. For practical purposes, however, Lambert has given the mortality as 80 per cent. for acute cases, 40 per cent. for the chronic cases, and 60 per cent. as an average for all cases.

As to the mortality of tetanus in which antitoxine was employed Lambert reports in the acute cases that the death-rate was about 75 per cent., and in the chronic cases about 16 per cent. Some of these cases died of intercurrent affections, others within twenty-four hours after the injections were begun, and still others are included in which the course was mild and the antitoxine was not used about two weeks after the onset of the disease. These cases are, therefore, to be excluded, and when this is done there remains a mortality of 61 per cent. for the acute cases, 5 per cent. for the chronic cases, and 30 per cent. for all cases treated with antitoxine.

CHRONIC INFLAMMATION OF THE SPERMATIC
CORD, WITH HÆMORRHAGIC INFILTRA-
TION AND GANGRENE OF THE TESTIS
FOLLOWING THROMBOSIS OF THE
VESSELS.

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THE cases published in the older literature under the names orchitis acuta, subacuta, and chronica, ending with necrosis, are no longer of value for comparative purposes, since syphilis, tuberculosis, neuralgia, etc., were often included in this terminology. Likewise, no communications regarding the histological nature of the organs removed by operation are given. The reports by Percival Pott,¹ of four cases of "spontaneous necrosis" of the testis, are, however, worthy of mention. As even in the later and more recent literature, but few cases of primary necrosis of the testis, in which trauma and constitutional diseases are excluded, can be found, the following case operated upon may be of general interest.

H. W., aged seventeen years, laborer, says that in March, 1896, he was treated for a painful swelling of the left testis, stating the cause of his malady to be "a cold." Patient wore a suspensorium and anointed himself locally with a salve prescribed by a physician. After a period of eight days, he claimed he had fully recovered. Sunday night previous to March 1, 1897, he experienced pain in the left testis, and from the symphysis pubis along Poupart's ligament, and on the following

Monday the left testis was swollen. A physician ordered an adhesive plaster bandage. As after a number of days the patient noticed no improvement in his condition, and being unable to stand, he entered the hospital. Syphilitic and gonorrhœal infection is denied, and evidences of these are not demonstrable.

Status Præsens.—Strongly developed young man. Heart and lungs without demonstrable pathological alterations. Left testis compared with the right almost imperceptibly enlarged, feels hard, dense, and stretched; no fluctuation. The epididymis lies upon it as a flattened plate, only indistinctly palpable, not enlarged, not painful. The vas deferens and accompanying vessels feel like hard, dense, thick cords in comparison with the right



FIG. 1.—Section of spermatic cord, showing organizing thrombi in vessels; endothelium in proliferation; fibrous portion of cord in cellular proliferation. (Zeiss. ocul. 2, object D.)

side. The left scrotal covering is easily movable over the testis, not altered. Adhesive plaster strips were applied according to the method of Fricke, under the influence of which the size of the left testis became perceptibly smaller; nevertheless, the organ remains hard and dense as before. Fluctuation not demonstrable. As the treatment employed during the period of three weeks has not produced an alteration in the condition, and as it was assumed a tuberculous alteration in the depth of the spermatic cord existed, an exploratory incision is decided upon. In-

cision of the skin over the left testis, reaching to the peritoneal covering of the same. A complete obliteration of the lumen arteriæ spermaticis is revealed. (Figs. 1 and 2.) The vessels themselves are inflexible, dense, lumen no longer discernible. The parenchyma shows only an insignificant macroscopic alteration; its consistence is firm, indurated, and leathery; *no hæmorrhage on incision*. Extirpation of the testis with its appendages. Stitched with catgut sutures. Introduction of an iodoform drain at the lower portion of the incision. Bandage. Apyrexial course. After two weeks the wound is healed, except a small fistulous opening at the lower margin, which extends inward for

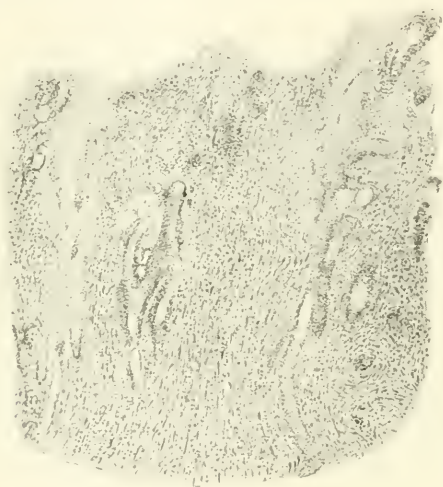


FIG. 2.—Section of spermatic cord, showing infiltration in connective tissue, and induration of vessels; hyperplasia due to chronic inflammation resembling sarcoma very much. (Zeiss. ocul. 2, object D.)

a distance of two centimetres. From this fistula a few drops of thin, yellowish pus is discharged on pressure. After four weeks the patient is discharged as cured, the wound having closed completely.

Microscopic Examination.—The epithelia of the testis are in all parts of a pronouncedly homogeneous character, and without nuclear stain; the basement structure of the testis in the central portions is likewise devoid of nuclei. In the periphery

nuclear stain very plain, but is confined to individual zones. (Figs. 3 and 4.)

The tunica vaginalis greatly thickened and shows very good nuclear stain. The seminal cord appears thickened and much distended. Veins completely filled with blood-corpuscles, in the tissue around the vessels extensive fresh hæmorrhagic extravasation, also dark, granular clumps of pigment in the interstices of the connective tissue. The intima of the arteries is much thickened, the endothelium in proliferation, the lumina filled with

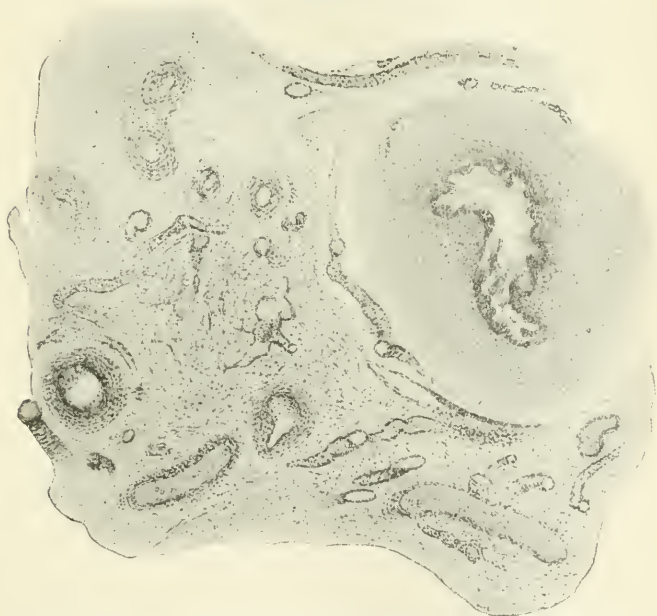


FIG. 3.—Section of globus major, showing chronic inflammation of vasa efferentia and hyperplasia of vessels. (Zeiss. ocul. 2, objectiD.)

organized and organizing thrombi. The fibrous parts of the seminal cord in a state of cellular proliferation, such foci being present especially in the small vessels. The vas deferens is without deviation in its individual windings. In the muscular portions occasional calcareous concretions composed of transparent clumps, whose peripheries, in contrast to the blue stain, have assumed a reddish color. The epididymis shows a homogeneous character only in isolated parts; the glandular epithelium shows

good nuclear stain almost throughout; the vessels are strongly filled and dilated; the intima and media thickened. Repeated examinations for tubercle bacilli were always negative.

(I take advantage of this opportunity to thank my friend Dr. Henry T. Brooks, demonstrator of pathological histology in the New York Post-Graduate Medical School, for his review of my specimens and verification of the pathologico-anatomical diagnosis.)



FIG. 4.—Section of body of testicle, showing the tubuli seminiferi in a state of necrosis; the fibrous septa also devoid of coloring, while the tunica albuginea is very much thickened and presents a good nuclear stain. (Zeiss. ocul. 2, object D.)

The case is especially worthy of mention because the etiology, to which the cases of necrosis of the testis in literature are referred, does not enter into the question here.

(1) In most of the published cases there was history of trauma, though even the number of these cases is very small. The reason the testis does not become necrotic, in spite of the exposed position in which it is placed, even after trauma

accompanied by extensive alterations, may be attributable to the branches of the *arteria spermatica interna*, and to the *plexus pampiniformis*,² which are capable of re-establishing the blood-supply of the testis. Ludwig compares the vascular portions of the spermatic cord to a lancet-shaped leaf whose apex is directed towards the external abdominal ring, and whose base is directed towards the testis. If the blood-pressure is increased in the arterial septum, then the lumen of the vein remains open, because the windings of the arteries are separated from each other by the pressure; but the arteries surround the space in which the veins are enclosed, so that an interruption of the discharge of the blood is not produced by this action. In addition must be considered the course of the *arteria spermatica* upon the testicle itself. Its course is described by Ludwig as follows: "The artery enters the testicle immediately beside the exit of the *ducti efferentes*, from the *tunica albuginea*. Without branching, it then runs under the epididymis to the cauda of the same, and in this manner penetrates the *tunica albuginea* in a slanting direction, similar to the entrance of the ureter through the bladder wall. After it has reached the lower pole of the elliptically formed testis it gives off branches to the seminiferous tubules. In consequence of this, any pressure exerted from within outward towards the *albuginea* diminishes the supply of blood. Each branch of the artery supplies only a small area, and corresponding to each area is a vein of large calibre which penetrates the *tunica* in a straight direction, and then runs to the outer side of the same, immediately under the serous covering, to the point at which the artery gained entrance to the testis. Here the veins divide to form the fine branches of the *plexus pampiniformis*. Therefore a distention of the *tunica albuginea* can only cause a dilatation of the lumen of the efferent vessels.

(2) Other cases of necrosis were caused by disturbances, either by ligation of the afferent or efferent vessels. For the *arteria spermatica interna* has been shown, by the experiments of Miflet,³ to be a terminal artery in Cohnheim's ac-

ception of the term, although Ranke⁴ could not notice any changes in the testis after intra-abdominal ligation of the artery. But, as it is well known, small branches of the artery are sometimes given off as this vessel passes through the internal abdominal ring, which may establish a collateral anastomosis. If, on the contrary, the artery after its exit from the inguinal canal is doubly ligated and divided between the two ligatures, the experiment upon the animal will always result in necrosis of the testis within a short time. In this category belong two cases, which Miflet has published as being caused by spontaneous necrosis. In one case the *arteria spermatica interna* was resected with the dilated veins of a case of varicocele, and in the other case there also seems to have been made a *resectio arteriæ spermaticæ internæ*, as at the time of operation there were found two arteries, of which one was resected, causing necrosis of the testis while the epididymis was retained. That the epididymis was saved is due to the fact that it is supplied by the *arteria vasi deferentialis*, and not the *arteria spermatica interna*. This preservation of the epididymis is desirable and always possible in those cases where the area supplied by the *arteria vasi deferentialis* is not involved in the pathological process.

Even if the compensatory hypertrophy⁵ after lateral ablatio testis has been proven, it is desirable, on account of the psychical effect on the patient, to retain something of the testis or its adnexa. This is desirable, though the organ may have lost its function entirely or undergo atrophy later on.

(3) A third cause of necrosis is torsion of the *funiculus spermaticus*. This is very rare, and only four cases due to this cause are published. One of these cases is of especial interest, as the testis was not wholly destroyed as in the others. This case was operated by Mikulicz,⁶ after the diagnosis was previously determined. It was a child, aged four years, who fell from a loft twelve feet high, and was apparently hurt only on the head. Two days after the accident the child complained of pain in the left inguinal region. The

left testicle and spermatic cord were very much swollen, extremely painful. At the operation, the testicle and cord presented a dark bluish-red discoloration, the cauda of the epididymis and the first portion of the cord was twisted on its axis 360 degrees.

(4) Schumacher⁷ has published a case of gangrene of the testis, caused by pressure resulting from adhesive-plaster strapping after the method of Fricke.

All the cases in regard to the etiology can by no means be compared with this case, as neither in the history nor physical examination of the well-nourished and apparently healthy individual was there a record of trauma, or organic disorder.

(5) On the other hand, Englisch,⁸ in his publications of orchitis, assumed the cause to be abdominal pressure, since no other etiological factors could be determined. His cases wholly comprised strong, healthy individuals at puberty, belonging to the working class. They had always been healthy, the circulatory apparatus normal, and in none was there a history of previous disorder of the generative organs.

In his cases, pain was acutely developed in the inguinal region after lifting heavy weights, or other violent bodily exertion, and was succeeded, in a short time, by swelling of the testis. An appropriate treatment was followed by complete restoration of the affected parts.

The conditions in our case were similar, with the exception that it was not acute, but took a chronic course and ended, not in restitution, but in necrosis of the organ. According to the history, about a year ago the patient experienced sudden pain, followed by swelling of the testis. Under medical treatment the swelling subsided, but, as was shown by the histological examination, the process did not stop but it progressed, though in a chronic form, without the patient manifesting any symptoms so long as the circulation was not disturbed. But as soon as the process attacked the endothelial lining of the vessels, and the function of the latter was

suspended, the blood-supply was suspended, and the testis became the seat of inflammation and necrosis.

According to Cohnheim,⁹ the coagulation of blood is prevented so long as the endothelium is intact, and functions physiologically, wherefore, in sclerosis of the arteries, in which the media and often the intima is in the state of calcareous, fatty, and amyloid degeneration, thrombosis does not occur so long as the diseased portions are covered with healthy endothelium.

Older surgeons have considered the question of pressure exerted by muscular action of the abdominal parietes; while Delomme did not think it possible that the abdominal pressure could exert such an action. Roux, on the other hand, explained the action by assuming that individual fibrous bands proceeded from the rectus abdominis which run behind the constituents of the spermatic cord to the inner lip of the *cristæ ilii*. If these fibres contract, they compress the spermatic cord from below upward against the fibrous sheath of the external abdominal ring, and cause contusion of the spermatic cord. Englisch¹⁰ has assumed the contraction of the abdominal muscles to be similar to what is above described, but explains the mode of action in a different manner,—*e.g.*,

(1) By pressure on the constituents of the spermatic cord, especially the vas deferens.

(2) By compression of the veins of the spermatic cord.

(3) By contusion of the testicle and epididymis, by pressure of the same against the abdominal wall through contraction of the cremaster, which causes extravasation of blood into the substance of the parts.

In our case the abdominal pressure can be assumed as the cause of the inflammation, and the accompanying affection of the vessels, and the subsequent thrombosis, since, as has already been stated, no other cause could be determined in either the anamnesis, or the objective examination.

The corroboration of our assumption, as to the etiology in this class of cases, must be left to further observation.

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THE RÔLE OF THE CERVICAL FASCIA IN
PRODUCING ANTERO-POSTERIOR CURVA-
TURES OF THE SPINAL COLUMN.

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It is impossible, with our present knowledge, to define accurately the degrees of normal antero-posterior curvature of the spinal column. That there is a normal standard is unquestionable. In view of the fact that it is impossible to flex the spine towards the concavity of a spinal curvature, I do not think there is a normal lumbar curvature. There is, undoubtedly, an angle at the junction of the sacral and lumbar vertebræ, but the degree of this angle is not known. If there are normal antero-posterior curvatures in the dorsal and cervical vertebræ they are very slight. The so-called "normal lateral curvature" of the spinal column does not exist. Perfect physical development cannot admit of a deformity.

Before entering upon the pathology, I wish to say a word about the ascent of the spinal column from elongation by growth. The sacrum is comparatively fixed. It does not, under normal conditions, change its position to accommodate the elongation of the spinal column from growth. It, however, elevates the spinal column somewhat by its growth. This will be readily understood if we notice the greater distance from the centre of the dorsal surface of the sacrum to the last lumbar vertebra in adults than in children. The relation of the sacrum to the innominate bones, under normal conditions, does not change from growth. The growth of a vertebra elevates that part of the spinal column

above it. Therefore, the higher a vertebra the greater its elevation from growth. A vertebra sustains the weight of the superimposed tissues. The growth has to overcome the weight of the superimposed tissues, and the resistance of the tissues attached to the spinal column. Under normal conditions this is readily done, as it is perfectly physiological. Any addition to this resistance is pathological.

The primary lesion of this disease is in the cervical aponeurosis and the fascia that surrounds the muscles (the levator anguli scapulæ, rhomboidei, and trapezius) that elevate the scapulæ and shoulders; and also the sheath of the muscle (the part of the trapezius which is attached to the spinous processes of the dorsal vertebræ) that draws the shoulder backward. The aponeurosis and muscle-sheaths are too short, and are often bound down in that condition. It soon causes changes in the remaining fascial connections of the shoulders with the body and arms, and also in the fascia and common connective tissue of the entire body. The short cervical fascia prevents the shoulders from descending to their normal position. The angle between the upper border of the scapula and the clavicle is more acute than normal. This more acute angle is maintained by the cervical aponeurosis, which is too short from before backward as well as from above downward and the process of it that is reflected over the supraspinatus muscle. The tissue in front and below the anterior margin of the glenoid fossa approximates the neck of the scapula. This approximation continues for a short distance over the anterior surface and down the axillary border of the scapula. The outer end of the clavicle being higher than normally, this bone crosses, obliquely, the scaleni muscles and the cervical vertebræ, while the subclavicular tissues approximate these muscles, and the lateral processes of the cervical vertebræ. The tissues in front and below the anterior margin of the glenoid fossa, and that under the clavicle, become bound down in their abnormal position.

The head is extended in proportion to the cervical flexion minus the cervical curvature. The abnormal cer-

vical curvature is secondary to the flexion. The flexion and curvature may be so marked that the vertical axis of the head is on a plane in front of the body. In cases where the disease develops before the upper jaw is fixed, the face is somewhat depressed over this bone. With the proper poise of the head upon the spinal column, the lower teeth strike the upper and push the upper jaw forward; and contact with the malar bones converts this forward movement into a forward and downward movement. Extension of the head interferes with this action, as it draws the lower jaw somewhat backward. The amount of depression depends upon the duration of the cervical flexion before the cervical curvature develops. The depression is made very apparent if recovery takes place after the upper jaw has become fixed.

The obliquity of the ribs is increased. There is less eversion of the ribs than normally. The thoracic space is lowered and carried somewhat backward. There is a real as well as an apparent flattening of the chest. The former is due to increased obliquity of the ribs, the latter to the position of the shoulders, which project upward and forward.

In stooping, the flexion of the spinal column is higher than normally. It is usually in the lower dorsal region instead of the lumbar region, and forms an angle in stooping. In other cases it is a general bending of the dorsal vertebræ in stooping.

The sacrum is drawn upward in the line of its long axis; the upper end moving upward and somewhat forward, and the lower end moving upward and somewhat backward. The parts of the innominate bones above a line passing through the acetabula are carried backward and slightly downward, and the parts below this line are carried forward and slightly upward. The penis in men, during erection, is elevated and approximated to the belly in proportion to the deformity of the pelvis. The vulva in women is carried forward and slightly upward, in proportion to the deformity of the pelvis. Coition, obviously, is difficult or impossible. All the diameters of the pelvis are diminished, except the

antero-posterior of the outlet, which is either relatively or absolutely increased. Here is a contracted pelvis, with a defective posterior bony wall, which, during labor, if the head enters the pelvis, subjects the soft tissues in this part, the perineum, etc., to sudden and extreme distention.

The lower extremities are everted. It is due to the position of the acetabula, and to the maintenance of the equilibrium. The eversion becomes somewhat fixed. The thighs are enlarged, especially in the upper parts. The buttock is large and flabby, particularly in women. It is due to a deposit of fat around the very much relaxed glutæi muscles. The relaxation of the glutæi muscles is due to the eversion of the lower extremities. The belly is prominent. It is due to the lordosis, and a diminution of the vertical diameter of the abdomen from the deformity of the pelvis and lowering of the chest.

As stated above, the essential lesion is a short cervical fascia. But what causes the short cervical fascia, and how does it produce curvatures of the spinal column? The weight of the shoulders is a stimulant to the normal growth of the cervical fascia. This can only act after the erect posture has been assumed, but an equal amount of tension of the cervical fascia can be produced by lying on the back upon a horizontal surface. Faulty positions in the cradle and bed are the primary causes. Supporting the elbows upon desks, lack of proper shoulder exercise, clothes made tight under the arms, wearing shoulder-braces, and carrying the hands in the trousers-pockets, are also causes. Supporting the right forearm in writing, sleeping constantly on one side, and the greater use of one arm, are causes of lateral curvature of the spinal column. They may act at any time before growth is complete. I think that in most instances the primary shortening from lack of normal growth of the cervical fascia begins in the cradle. Children, upon assuming the erect posture, in most instances, have an abnormally short cervical fascia. The same stimulant applied now will neither have the amount of effect, nor the same effect, as

if it had been applied at the proper period,—namely, when the fascia was less mature. The weight of the shoulders acts as an irritant to the short cervical fascia, and produces, at first, a slight clonic and, later, a slight tonic contraction of the elevators of the shoulders. The tonic contraction of the elevators of the shoulders can be demonstrated by asking people to relax their shoulders.

Any addition to the physiological resistance to the ascent of the spinal column from growth is pathological. The short cervical fascia modifies the normal weighting of the cervical vertebra by the shoulders, which resists the ascent of the spinal column. Elevation of the shoulders by tonic muscular action is often followed by slight tonic contraction of the depressors of the shoulders, particularly the pectoral muscles. The depressors of the shoulders are the serratus magnus, latissimus dorsi, and pectoral muscles. In most cases it does not overcome the action of the elevators, but is sufficient to prevent the complete ascent of the spinal column; and also to prevent the shoulders from wobbling. If it overcomes the action of the elevators, spontaneous recovery will take place. I have often seen tension of the elevators, and, in several instances, tension in the depressors of the shoulders. It was usually greater in the elevators. I have, however, found the tension greater in the depressors, and in two cases it was unilateral. The shoulder on that side was lower than the opposite, and there was a slight lateral curvature, with the convexity of the upper curvature towards the lower shoulder. The cervical vertebra is often flexed, when the cervical fascia is too short, to relieve a feeling of tension in the sides of the neck. When the cervical fascia is too short, part of the weight of the shoulders is sustained by the anterior chest wall. This weight tends to increase the obliquity of the ribs. When there is an increase in the flexion of the cervical vertebra, part, if not all, of the force of the action of the depressors of the shoulders, and an additional part of the weight of the shoulders, are sustained by the anterior chest wall; and when

the anterior chest wall yields, either by an increase in the dorsal curvature, or an increase in the obliquity of the ribs, the weight is transferred to and sustained by the cervical fascia, and in turn the elevators of the shoulders, to be again transferred to the anterior chest wall, when there is an increase in the cervical flexion, whether primary or secondary. An increase in the obliquity of the ribs tends to increase the curvature in the dorsal vertebra. When the ascending force of the spinal column is not sufficient to overcome completely the resistance produced by the cervical fascia, the dorsal and lumbar vertebræ yield; while pelvic and cervical compensations follow. The lumbar curvature is more extensive from elongation by growth, while the dorsal curvature is more extensive as a result of spontaneous efforts to straighten out the spinal column. An increase in the curvature in the dorsal region tends to increase the obliquity of the ribs. The increase in the dorsal curvature is followed by cervical compensation. Part of the weight of the shoulders is sustained by the adherent subclavicular tissues during flexion. It tends to increase the cervical flexion through the scaleni muscles. Cervical flexion is followed by compensation. This consists of a slight movement of the upper part of the body (the dorsal vertebra) in the opposite direction. Later curvatures develop in the cervical above, and in the dorsal and lumbar vertebræ below. There is thus a cycle of forces around the shoulders during the development of this disease, one or more of which is constantly acting. Most of the growth of the spinal column is compensated by ascent, but in the vast majority of people there is some compensation by curvatures. In a minority of the majority there is a great deal of compensation by curvatures. As long as there is growth there are efforts at ascent from elongation by growth. There is ascent of the spinal column from efforts to straighten out the curvatures, which begins with the origin of the curvatures and continues till the deformity becomes fixed. Fixation is not complete till growth is complete. There are certain conditions that I shall call exciting causes,

which increase the ascending force before fixation, prevent fixation, and after fixation break it up. They tend to bring about spontaneous recovery.

Among the exciting causes of spontaneous recovery are any increase in weight, especially from fat, pregnancy, and the habits of life as regards exercise and position. Labor that exercises the shoulders, such as lifting and chopping, bring about spontaneous recovery by tearing the cervical fascia. In pregnancy and obesity it is an effort to find a new equilibrium that brings about spontaneous recovery. Efforts to stand erect will, in a feeble way, produce the same anatomical lesions as obesity and pregnancy. Probably the earliest sign of efforts at recovery is bending the body backward, with eversion of the lower extremities. Not infrequently the convexity of the lumbar curvature yields and the lordosis is increased. In most cases, however, there develops a posterior angle at the point of abnormal flexion of the spine in stooping. Prolonged bending of the spine backward causes the lateral parts of the lumbar fascia to yield. The body is immediately carried backward beyond the equilibrium, and to neutralize it, the upper part of the body is tilted forward. Hence the angle. Tilting of the thorax forward relaxes the abdominal muscles, and makes the belly more prominent. This causes an apparent depression over the lower part of the thorax. The apparent depression involves the lower part of the sternum, and extends laterally and inferiorly immediately above the margin of the ribs. It is more marked laterally than in the median line. Successive small tears of the lumbar fascia, and straightening out of the lumbar curvature, supply the angle, while the angle is dissipated in one of the following ways: (1) Yielding of the cervical fascia, and straightening out of the curvatures. It is rarely complete when unaided. (2) The angle is converted into a general dorsal curvature, the lumbar curvature is straightened out, and the angle between the sacral and lumbar vertebræ is lessened or abolished. The lumbar curvature may be transferred to the dorsal ver-

tebra without the intervention of an angle. It is in those cases where there has been a general bending in the dorsal region in stooping instead of an angle. This is the curvature of old age, and is the most frequent. (3) Excessive lowering of the sacrum. Partial spontaneous recovery is very frequent. Complete spontaneous recovery is very rare. Partial or complete spontaneous recovery is more frequent in males than females, on account of the use of the corset by the latter, and their sedentary habits.

When the cervical fascia (the aponeurosis and muscle-sheaths) yields, the shoulders descend; when the sheath of the part of the trapezius that is attached to the spinous processes of the dorsal vertebræ yields, the shoulders move forward, and the spinal column ascends, while the curvatures diminish. There is an immediate ascent of the spinal column, after a tear in the cervical fascia, if the spinal column has not become fixed in its abnormal position, or if the fixation has been broken up by spontaneous efforts at recovery, till the ascending column meets the resistance of the cervical fascia. If the spinal column is fixed, when the cervical fascia is torn, the ascending column meets the resistance of the fasciæ and ligaments of the thorax, spine, and pelvis, which must yield before it again comes in contact with the resistance of the cervical fascia. The time it requires to overcome these varies from a few hours to a week or more. When the cervical fascia is torn again the process is repeated.

In one case I was able to trace the tear in the cervical aponeurosis. It was alike on both sides, although on one side (the right) it tore first, and a lateral curvature with rotation developed. The lateral curvature was corrected when the aponeurosis on the opposite side (the left) yielded. The tear in the cervical aponeurosis began above the middle of the clavicle, and extended forward and backward. The former to the external border of the sterno-cleido-mastoid muscle. The latter to the spine of the scapula, from which it was detached. The fascia above the tear remained continuous with the inner three-fourths of the process of the

cervical aponeurosis, that is reflected over the supraspinatus muscle, and which was subsequently detached from the upper border of the scapula. A line of tenderness could be traced down the vertebral border to the spine of the scapula. None of the muscles were injured, and the shoulder had a wider range of movement after than before tearing the cervical aponeurosis. There was a small part of the cervical aponeurosis left between the clavicle and acromion process; and also the outer one-fourth of the process over the supraspinatus muscle. It was with difficulty that these were torn. They are factors in maintaining the abnormally acute angle between the upper border of the scapula and the clavicle.

After yielding of the cervical fascia the shoulders descend till they rest upon the adherent subclavicular and subglenoid tissues, and the abnormally acute angle between the clavicle and the upper border of the scapula rests upon the chest. The subclavicular and subglenoid adhesions, aided somewhat by the position of the shoulders from the abnormally acute angle between the clavicle and the upper border of the scapula, everts the clavicle. The eversion carries the shoulders somewhat forward and upward; and rotates the process, over the articular facet at the sternal end of the clavicle, upward and forward. When the abnormal angle between the outer end of the clavicle and the upper border of the scapula is relieved, by yielding of the fascia between the outer end of the clavicle and the acromion process, and the outer one-fourth of the fascia over the supraspinatus muscle, the shoulder descends considerably, while the clavicle is slightly inverted, and the shoulders, in proportion to the inversion, are carried backward and downward. When the subclavicular and subglenoid adhesions yield, the shoulders descend, while the clavicle is completely inverted, and the shoulders, in proportion to the inversion, are carried backward and downward. For the shoulders to rest perfectly upon the sides of the chest, it is necessary for the entire fascial connections of the shoulder with the body to be modified. There will be some change in the direction of the fibres of

the muscles connecting the shoulders with the body. The axillary vessels are safe, as they have no sheath, except a small quantity of areolar tissue.

As the cervical column is extended the head is flexed, which causes the skin, with the subcutaneous fat, to roll up under the lower jaw. Part of the roll of skin is carried upward over the face. The remainder disappears as the cervical curvature straightens out. The last to disappear is beneath the chin. Flexion of the head pushes the lower jaw somewhat forward, the lower incisors strike, and push the upper incisors somewhat forward. In one case the upper incisors and canines were pushed forward more than the thickness of the teeth.

For the obliquity of the ribs to diminish the second lamina of the lumbar aponeurosis, and the fascia in the intercostal spaces must yield; and the weight of the shoulders removed from the anterior chest wall. The second lamina of the lumbar aponeurosis and the fascia in the lower intercostal spaces yield before the fascia in the upper intercostal spaces. The weight of the shoulders, till late, not only prevent ascent of the upper ribs, but, combined with the ascending force of the lower part of the chest, may diminish or even obliterate the upper and middle intercostal spaces. This occurred in one case. With the diminution of the obliquity of the ribs there is a slight eversion of them.

The sacrum is forced downward in the line of its long axis; the upper end moving downward and somewhat backward, and the lower end downward and somewhat forward. Straightening out of the lumbar curvature follows yielding of the lumbar fascia and stretching of the interspinous lumbar ligaments. As the lumbar spine is restored to its normal position the point of principal flexion of the spine in stooping is lowered. Eversion of the lower extremities diminishes coincidentally with the restoration of the innominate bones to their normal position and the fascia in the gluteal region is stretched. The buttock becomes an outline of the *glutæi* muscles, and the thighs are reduced in size. One of the

cases, who, at first, wore an eight B shoe, now wears a ten A. The feet were elongated by lowering the plantar arch. The belly is gradually restored to its normal position, from straightening out of the lumbar curvature, and from elevation of the thorax and correction of the pelvic deformity.

While the shape of the body is changing from straightening out of the spinal curvatures the skin is loosened. After the spinal column has straightened out the skin will refit itself to the body. During the loosening of the skin there are important changes taking place in this structure. The skin and subcutaneous tissue are made tense. Numerous small, light lines can be seen on the surface. They are the points of attachment of the tense subcutaneous connective tissue. By pinching up the skin these lines are somewhat depressed and made more distinct. Rupture of these fibres in great numbers, as sometimes occurs in massage, causes crepitation. Papules develop at the points of rupture of the tense subcutaneous tissue, if the lesion involves the true skin. The papules are often masked by hæmorrhages. Striæ, similar to those found on the abdomen in pregnancy, occur over the upper anterior part of the thighs while the lower extremities are inverting. They have a faint purplish color. Traction on the skin in different directions causes the striæ, according to the direction, to become more or less distinct. Between the light lines there is a mechanical hyperæmia. If prolonged, some of the vessels dilate, and, if still farther prolonged, hypertrophy or hyperplasia of the tissue. The mechanical hyperæmia persisted in one case in the skin over the cartilages of the nose for some time, but finally yielded to massage. A similar condition to that of the skin occurs in many of the mucous membranes, particularly the urethral during erection, the tracheal, laryngeal, buccal, conjunctival, pharyngeal, and nasal. Hypertrophic rhinitis is but the manifestation of prolonged hyperæmia from the tense submucous tissue. All of these conditions of the skin and mucous membranes were present in one case. The lesions of the skin, from rupture of the tense subcutaneous tissue,

if superficial, may be infected with the staphylococcus epidermidis, when small pustules follow. One case developed pustules that contained cocci. Pustules may develop in the mucous membranes, but more often the inflammation is general in this structure. Infection occurred in one case in the following mucous membranes, pharyngeal, nasal, laryngeal, and tracheal.

After the skin has been loosened there seems to be too much. As the skin of the lumbar and lower dorsal regions stretches it seems to glide downward and forward. Above the crest of the ilium it seems to divide and takes two directions. The line of division passes in a curved direction, convexity downward, across the lower part of the abdomen. The skin above this line centres around the umbilicus and epigastrium, where any excess probably atrophies. Part of it may be carried upward over the chest, where no atrophy seems necessary. That below the line passes downward for a short distance, where it is broken up by the inverting of the thighs. Unusual physical exertion should be avoided when the skin is loose, as a hernia may develop. The wrinkles of old age are largely due to an imperfect loosening and re-fitting of the skin.

The height is at first increased; later it is diminished. The increase is due to straightening out of the curvatures, the subsequent loss to lowering of the sacrum, and thinning of the bodies of the vertebræ on the convex side of the curvatures. The increase in height in one case was two and one-half inches, while the subsequent loss was three-fourths of an inch. On the whole, there has been an increase in weight, but from time to time there has been some fluctuation. In one case there has been a loss of seven inches around the pelvis and lower part of the abdomen.

There are probably no mechanical lesions of the central nervous system. There is irritation of the cerebro-spinal nerves, either at or after their exit from the central cavity, from tension or tearing the connective tissue, or from muscular action. The sympathetic nervous system is subject

to the same irritation. The irritation may manifest itself in various ways, depending largely upon the character of the lesion, and the nerve involved. Most of the clinical phenomena were derived from two cases, aged respectively twenty-eight and twenty-nine years.

Vasomotor disturbances of the central nervous system may occur. Unilateral and bilateral headaches with nausea occurred in both cases. Cathartics did not relieve them in one case, but yielding of the cervical fascia did. Cerebral vomiting occurred twice in one case. Both cases were very irritable. The pupils were frequently dilated in both cases. Inequalities of the pupils occurred several times in one case. The pupils responded to light but not accommodation. Twitching of the muscles of the face occurred in one case. Tinnitus aurium was present in both cases. Vertigo, lasting two weeks, developed in one case. Spasm of the œsophagus developed occasionally, in one case, on attempting to swallow. It occurred more frequently with liquids than solids, probably on account of the rapidity of swallowing liquids. It continued about one or two minutes. More often, before it relaxed, air was forced down the œsophagus to relieve it. I have noticed it in many people. The voice, in one case, became husky upon attempting a high-pitched note.

Palpitation of the heart occurred in both cases. Tachycardia was present in one case. The increase in number per minute was about twenty. In one case there was a sudden rise in temperature to 104° F., with profound vasomotor disturbances after a tear in the cervical fascia. It gradually disappeared. In the other case there was a rise of temperature to 100° , with slight flushing of the face. It continued several months. Later there were several slight elevations of temperature of short duration. Dyspnœa occurred in one case. Dyspepsia was present in both cases. Constipation was present in both cases, and required the frequent use of cathartics. It was probably due to anæmia of the intestinal wall, or imperfect tetanus of the muscles of the intestines.

Contraction of the plantar muscles occurred in both cases, causing the shoe to run down at the heel. While this symptom was almost constant it was not continuous, as there were times when the patient walked squarely on the bottom of the feet. Relaxation of the plantar muscles should not be confused with yielding of the plantar arch. One of the cases had writer's cramp. General muscular inco-ordination occasionally occurred in one case.

Various sensations occurred in the skin. Tingling sensations were present in both cases. Areas of itching were present in one case, which were only relieved by loosening the skin. Ticklishness was very marked, especially in certain areas, such as the sides of the thorax, over the pectoral muscles, and over the back and inner surfaces of the thighs and buttock, when the skin was loosening. There were two small trophic ulcers at different times, in one case, on one hand. They lasted several months. Vasomotor hyperæmia of the skin was frequent. It should not be confused with the mechanical hyperæmia from tension of the skin. It was occasionally general in one case. At other times it was limited to small areas as one side of the face and neck.

There were three severe and many mild attacks of neuralgia in branches of the brachial plexus, that were immediately relieved by the shoulder gymnastics; and several attacks of sciatica, some of which were severe enough to cause limping, that were also immediately relieved by the exercise to restore the sacrum to its normal position. Both cases suffered from one or more attacks of herpes zoster. One of the most distressing symptoms was a profound sense of fatigue. I believe that metabolism is increased, but that it is imperfect.

There is an irregular periodicity in the symptoms of irritation. It depends upon the vigor of the ascending force of the spinal column and the frequency of the tears in the cervical fascia. The symptoms are usually more severe immediately before a tear in the cervical fascia, and while the spinal column is straightening out, and less severe or absent.

afterwards. They gradually return as the ascending column meets the resistance of the cervical fascia, and become severe in proportion to the vigor of the ascending force.

Treatment.—Special gymnastics. Traction should be made on the shoulders by the latissimus dorsi, serratus magnus, and pectoral muscles within the following limits: forward and slightly upward, and downward and slightly backward. By varying the angle of traction within these limits only part of the fascia is made tense at one time. The prevailing direction is forward, and somewhat downward, with, at the height of traction, a slight inward movement of the anterior angle of the scapula. The object of this exercise is to stretch or tear the cervical aponeurosis, and the sheaths of the muscles that elevate the shoulders and draw them backward; and to detach the adherent subclavicular and subglenoid tissues. These muscles are the levator anguli scapulæ, the rhomboidei, and the trapezius. During the special exercise the clavicle forms a lever of the second order. There are several adjuncts to this leverage power. (1) Lie on the back, upon a hard mattress, draw the shoulders downward, and slowly turn on the side, causing the weight of the body to be largely supported by the upper and back part of the tip of the shoulder. (2) By the opposite hand. (3) By leaning the body, supported by the acromio-clavicular junction, against some solid, upright substance. (4) Stand behind the patient, grasp the shoulders in the palms of the hands, and carry them in the direction indicated. To prevent the development of this disease the exercise should be continued as long as there is growth.

The dorsal decubitus, upon a hard mattress, without a pillow, should be maintained while one is in the cradle or bed. This position may be assured by means of a Bradford frame. To prevent the development of spinal curvatures it should be begun at birth and continued as long as there is growth.

The special gymnastics and the dorsal decubitus form the essential treatment, but there are forms of exercise that

may hasten recovery after the cervical fascia has been torn. (1) Lateral flexion of the spine; (2) massage; (3) walking; (4) hanging at arm's-length with the shoulder muscles completely relaxed; (5) stretching the interspinous lumbar ligaments in stooping; (6) sit upon a bench, place the feet under a bar, somewhat lower than the bench, and carry the body backward to or below the level of the bench (this exercise may be accomplished in the erect posture by bending the body backward); (7) stand on one foot and attempt to rotate the pelvis around the upper part of the thigh. This tends to correct the eversion of the lower extremities.

CASE OF CYSTIC DILATATION OF THE COMMON BILE-DUCT IN A CHILD.

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THIS case is, so far as I have been able to ascertain, unprecedented.

George S., aged eight years, was admitted to the Melbourne Hospital for Sick Children, March 23, 1897.

On the 18th, five days previously, he became feverish and ill, and on the next day became jaundiced, and complained of pain in the stomach and right side; on the evening of the next day, the 20th, the mother noticed a swelling of the right side of the abdomen. There was constipation, and the one motion, passed during the five days prior to admission, was putty-like and offensive; the urine was deeply colored with bile.

On admission, the patient was a well-nourished child, with the history of having enjoyed excellent health up to the onset of the present illness. Jaundice was general and marked; temperature 102° F.; pulse, 128. Examination of the abdomen revealed the following: The right flank was occupied by a large, tense, elastic tumor, dull on percussion, being continuous with the liver dulness above; extending downward an inch below the iliac crest, reaching inward nearly to the midline, and posteriorly occupying the entire lumbar region. There appeared to be distinct tenderness on palpation of the tumor; there was a slight increase of the liver dulness upward. A second, smaller tumor projected visibly immediately beneath the rib-cartilage about the right linea semilunaris; this tumor was rather larger than a pigeon's egg, round, soft, elastic, and painless. Both heart- and lung-sounds were normal.

The view taken as to the nature of the case was as follows:

The larger tumor was believed to be an echinococcus cyst, which had escaped notice until the onset of the present illness; the smaller tumor was either a second cyst or possibly a distended gall-bladder. The relationship between the great cyst, the obstructive jaundice, and the fever was, however, by no means clear; hydatid cysts frequently cause jaundice, but we should hardly expect fever, unless on the assumption that suppuration was going on in the cyst. This hypothesis received some support from the tenseness and tenderness of the cyst, but it appeared to be negatived when the temperature fell to normal as the result of a smart calomel purge. On the other hand, it seemed likely that the case might be one of simple catarrhal jaundice (this affection happened to be prevalent in Melbourne at the time) in a patient the subject of hydatid cysts of the liver, and it was resolved to await the course of events in the hope that the jaundice might pass away, and place the patient in a more favorable condition for operation. With this object the child was kept in bed and treated on general principles for sixteen days, but with no good result; the biliary obstruction remained complete; the temperature was variable, but ranged mostly between 99° and 100° F. Furthermore, the child suffered daily from attacks somewhat similar to hepatic colic; these attacks took place always in the afternoon, and at no other time, and were attended with severe pain, but no vomiting. As there seemed nothing more to be hoped for from expectant treatment, I decided to remove what I believed to be the hydatid cyst or cysts.

Operation on April 8. The abdomen was opened by a four-inch incision in the right linea semilunaris, extending downward from near the costal margin. The smaller tumor at once presented, and was found to be the gall-bladder distended with colorless contents; there were no adhesions, so that its entire contour could be readily felt. Turning now to the larger cyst, this was found to be retroperitoneal, and the colon was bound to the face of it, being nearer the inner than the outer side of the cyst. An exploring syringe was now used, and perfectly clear, limpid fluid obtained, having all the physical appearance of hydatid fluid. The cyst was next emptied in great part by aspiration and then incised, when three surprising discoveries were made: (1) in the fluid, as it flowed, there came several blackish

masses looking like cinders; (2) there was no echinococcus cyst; (3) at the end of the flow the fluid was observed to suddenly change in character, and in place of the clear limpid fluid there came one or two ounces of less clear and distinctly mucinous fluid. It was now ascertained that this mucinous fluid had come from the gall-bladder, which was collapsed, having emptied itself into the larger cyst. Thus it was evident that this large retroperitoneal cyst had a communication with the common bile-duct, and the only conclusion I was able to arrive at as the result of much speculation, with which I need not weary the reader, ascribed to the cyst a pancreatic origin; the possibility did not occur to me that in a child of eight, who had never suffered a day's illness until three weeks previously, this enormous cyst could itself be the dilated common bile-duct.

The operation was completed by stitching the opening in the cyst to the musculature of the abdominal wall, and closing the abdominal wound. After the operation the whole of the bile commenced to flow from the opening; with the view of ascertaining whether there was any admixture of pancreatic fluid with the bile, its digestive properties were investigated by my colleague, Dr. Stawell, with a negative result, nor was any excess of fat discovered in the stools. The child died four days after the operation, from hæmorrhage, the result of uncontrollable oozing from the stitches and into the cyst.

Autopsy.—The body was universally jaundiced, and had the waxy appearance characteristic of death from hæmorrhage; the cyst was filled by a mass of normally clotted blood, with some bile. On opening the body, the intestines appeared to be lightly smeared with blood, and the points of contact of neighboring coils were marked by lines of blood; all the organs were healthy with the exception of those concerned in the operation. The liver with the system of biliary vessels, including the cyst, the duodenum, pancreas, and spleen, were removed in one piece, and are portrayed in the accompanying illustration. The cyst is seen to communicate anteriorly with the gall-bladder, the cystic duct being dilated so as easily to admit an ordinary penholder. At the transverse fissure the dilated hepatic ducts are seen opening into the cyst. The duodenum and the head of the pancreas are spread over the outside of the cyst. A careful search for the terminal portion of the common bile-duct reveals



PLATE I.—Under surface of liver with attached organs; *a*, gall-bladder laid open; *b*, cyst; *c*, duodenum laid open; *d*, pancreas.

a small valvular opening on the interior of the cyst through which a probe can be passed into the duodenum, on the surface of which it appears through the usual papilla; that this is the normal termination of the common bile-duct is proved by passing a second probe through the same duodenal orifice into the pancreatic duct; this can be easily done.

Remarks.—The possibility of any such remarkable affection of the common bile-duct does not appear to be recognized or suspected by writers on the pathology and surgery of the liver, so far as I am aware. In considering the case, we are struck by certain points of analogy with the condition of hydronephrosis. As in the latter condition we have the choice of two alternative views,—viz., (1) that it is congenital; (2) that it has been produced by an obstruction of either a partial or an intermittent character of the bile-duct at its duodenal end. The second view it would seem that we may put aside, for no obstructive cause could have produced any such effect on the biliary passages; both the magnitude and the asymmetry of the distention forbid the belief; furthermore, the patient had never suffered previously from biliary obstruction of the smallest degree. It seems to me that we may safely conclude that the affection was congenital; and as in the analogous condition of congenital hydronephrosis, we must then confess that we are at a loss for the ultimate explanation.

The congenital theory of the affection being accepted, the sequence of events leading up to and terminating in the illness of the child would appear to have been as follows: During the eight years of the child's life the passage of bile through the cyst in its course to the duodenum proceeded uneventfully up to the onset of the illness; what doubtless occurred now was some obstruction, probably catarrhal, of the duodenal end of the duct, with the immediate result that the cyst, together with the other biliary passages, would be rendered tense by distention with bile. If now we examine the duct leading from the cyst to the duodenum, it will be clear from its anatomical disposition that increased tension

in the cyst would effectually occlude the duodenal end of the duct, which will be found to run for fully an inch very obliquely in the wall of the cyst, so that the walls of the duct would be pressed together with a firmness in direct ratio with the increase of tension in the cyst. The passing away of the catarrhal swelling, which we assume to have been the original cause of the obstruction, would therefore not result in re-establishment of the biliary flow into the duodenum, unless the tension in the cyst could first be reduced. Whether aspiration of the fluid once or repeatedly would have been productive of cure of the biliary obstruction is a matter on which we can only speculate. As regards the nature of the fluid met with in the cyst and the gall-bladder, it would appear that three weeks must have sufficed in the case for the reabsorption of the bile-coloring matters; the difference in the nature of the fluid contained in the gall-bladder and the cyst is easily explained by the presence of mucous glands in the former and their absence in the latter. As to the diagnosis, it would appear to be scarcely conceivable that a correct judgment should be made as to the nature of this case; even had the exploring needle been used (as it was during the operation), we should have been only confirmed in our error that the case was one of hydatid cyst, and even chemical examination would have afforded no evidence that this limpid fluid was of biliary origin. Had the child lived and had the whole of the bile continued to flow from the wound, it was my intention to have performed cholecystenterostomy with closure of the opening in the cyst; had this been successful, we should have been left in much perplexity as to the real nature of the condition.

The fluid from the cyst was examined by Dr. C. J. Martin, professor of Physiology at the Melbourne University, and it was found to be a strongly alkaline fluid; specific gravity 1012, with traces of albumen, globulin, and bile pigment. The cinder-like masses were composed of crystals of bilirubin.

For the photograph, I am indebted to Dr. Herbert Hewlett.

REPORT OF CASES OF CIRCULAR RESECTION,
RESPECTIVELY, OF PYLORUS, CÆCUM
WITH ASCENDING COLON, AND
SIGMOID FLEXURE.

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THE three cases here reported are all examples of malignant disease of the gastro-intestinal tract. They were all operated on by circular resection of the portion involved, no mechanical aid to the suture being employed.

Acute Intestinal Obstruction from Carcinoma of the Sigmoid Flexure of the Colon; Circular Resection; Recovery.—The patient, a woman forty-nine years of age, had been somewhat constipated at times for a year or more before the acute attack which necessitated operation, and had had an attack of obstruction four months before, from which she recovered under medical treatment. With this exception, no great inconvenience, however, had been felt, nor was any serious condition suspected till March 25, 1896, when symptoms of acute obstruction appeared. These consisted of pain, slight vomiting, moderate distention, and obstipation. She was treated by home remedies, chiefly purgatives, for a few days, when Dr. Bair, of Braddock, was called. He recognized the dangerous nature of the case, and, having stopped the administration of purgatives and everything by the mouth, employed repeated high rectal injections.

The symptoms continuing and fæcal vomiting having begun, she was taken to Mercy Hospital on April 2, where her abdomen was opened in the median line, there being no sign to indicate the seat of obstruction. After a brief search, a small mass was discovered in the region of the sigmoid flexure, and it was with

great difficulty brought into view. The abdominal wall was very fat and the manipulation of the growth extremely difficult, owing to the tension of the mesocolon and the depth of the incision, through which the mass could not be delivered.

A circular resection was made and the ends of the bowel united with a double row of sutures, which were applied with great difficulty, owing to the dilated condition of the bowel above the growth and the contraction of the part below. The abdomen was closed without drainage. A large number of semiliquid passages came away the night after the operation, and the patient left the hospital well on the twenty-eighth day. When last heard from, eighteen months later, she was in good health and without any sign of recurrence. Microscopical examination showed the growth to be a carcinoma.

The Specimen.—The growth occupies the circumference of the intestine for the space of about one inch, and the lumen is so much encroached on that a match passes with difficulty. The specimen is much shrunken by alcohol, but the stricture was of no larger calibre when the growth was removed.

Remarks.—The difficulty of restoring the continuity of the large intestine, after its resection for obstruction due to cancer, so that it will successfully resist the violence of the passage of the large accumulations above, is well recognized by all surgeons, and some of the most experienced have given up the practice of completing the resection at one sitting, preferring to form an artificial anus for the time and complete the operation later, when the intestines are empty and the patient in better condition. The quantity of fæcal matter that passed the point of resection in this case was enormous, and it seems certain that, if the ends of the bowel had been brought together by any mechanical device which obstructed the lumen even slightly, it would have been swept away by the fæcal stream and the resected ends would have been torn apart.

Excision of the Cæcum and Entire Ascending Colon for Carcinoma; Implantation of Ileum into Transverse Colon; Recovery.—This patient, a man, thirty-four years old, stated that his father

and sister had died of cancer of the stomach. His illness dated back for two years, the chief symptoms being dyspeptic. He had vomited none, nor had he passed blood. His bowels had always been regular. He had recently had some attacks of colicky pain. In the last year he had lost twenty pounds in weight.

Condition prior to Operation.—Patient much emaciated and extremely anæmic. Pulse weak but regular. Bowels moving daily. On the level of the umbilicus, in the line of the ascending colon, could be felt a movable mass, painless on pressure.

The operation was performed August 11, 1897. Incision external to right rectus muscle. The mass was seen to involve the middle of the ascending colon. There were no adhesions. The colon was cut between Kocher's intestinal clamps at the junction of the ascending and transverse portions, especial care being taken to have an oblique incision of the intestine and secure a good blood-supply to its stump. The ascending mesocolon, which was well developed, was cut in sections between forceps and the sections secured by ligature. All the mesenteric glands in reach were removed. They were slightly enlarged but not indurated. The ileum was divided between clamps about an inch from the ileo-cæcal valve, the same precautions being taken as to direction of incision and to securing sufficient blood-supply. The tumor with the entire ascending colon was thus removed. The clamp was removed from the end of the transverse colon and the bowel closed by a double row of continuous silk sutures. The cut end of the ileum was stitched by a double row of sutures to the borders of a slit made in the transverse colon a little above its blind end. The abdominal incision was closed without drainage. Gas passed *per anum* the same day and the bowels moved spontaneously on the third day. The patient was out of bed in three weeks, and left the hospital one week later.

The Specimen.—Dr. J. DeV. Singley, pathologist to the hospital, reported the specimen as a carcinoma. The growth involves the entire circumference of the ascending colon at its middle, and presents in the lumen of the intestine a fungating mass the size of a large lemon, which occludes it so completely that no passage can be felt with the finger.

Remarks.—It is remarkable that this man's bowels

should have moved regularly, with such a condition, up to the day of operation. The most important part of the technique of this operation and of the pylorotomy next described is the use of Kocher's clamps, described in his work on "Operative Surgery" ("Chirurg. Operationslehre." Jena, 1897).

Circular Excision of the Pylorus for Massive Sarcoma, growing from the Wall of the Stomach into the Great Omentum, intimately attached to the whole Length of the Transverse Colon and firmly Adherent to the Right Side of the Pelvis; Death at the end of Five Days.—The patient, a man, sixty-two years old, had for some months been treated for dyspeptic symptoms, but the existence of a tumor was unknown till six days before operation, when he first consulted Dr. C. H. Smith, of Uniontown, who referred him to me for operation. There had at no time been any vomiting, and the chief complaint of the patient was of tenderness in the right iliac region. The man's general condition was good. The growth lay under the abdominal wall, was movable, except at its lower extremity, on the right, and occupied about one-half or two-thirds of the abdominal surface.

Operation.—September 11, 1897. On account of his age and the possibility of pulmonary complications, chloroform was given. Long median incision. The growth was separated from the wall of the abdomen and pelvis and delivered, bringing with it the transverse colon and pyloric end of the stomach. Separation of the growth from the transverse colon was made between ligatures. It was then discovered that it grew from the pylorus and adjacent anterior wall of the stomach. There was no involvement of the liver or neighboring parts. Kocher's clamps were applied and the growth cut away, bringing with it the diseased portion of stomach wall. The edges of the wound of the anterior wall were united by a double row of continuous silk sutures, and the stomach lumen united to the adjacent duodenum in the same manner. Abdomen closed without drainage, with buried kangaroo tendon and superficial silkworm-gut sutures.

Result.—Slight regurgitation of gastric juice on the second and third days, but no vomiting at any time. Abdomen remained scaphoid throughout. Bowels moved spontaneously. After the third day liquid nourishment was taken and retained.

Temperature rose on the third day to 103° F., and remained between 101° and 102° thereafter. The physical signs of pneumonia could not be detected by such examination as could be made, but harsh breathing and râles could be heard over the chest posteriorly. Death occurred at the end of five days.

The post-mortem examination was made through the abdominal incision, which was slightly enlarged upward to the ensiform cartilage. The adhesions were quite firm. The peritoneum had a normal appearance and contained no fluid, thus excluding peritonitis and leakage from the suture line. No abscess nor any pus could be seen in the wound and none in the abdominal cavity. The line of sutures was well covered with peritoneal tissue and the stitches were not plainly visible, as they were well covered by plastic lymph. The duodenum and the new pylorus were adherent to the transverse colon by a dense mass of adhesions. The stomach was well distended with liquid and liquid food, and, as was subsequently observed, there were indications of food having passed into the bowel.

The colon, especially the transverse portion, had in it a good deal of fæcal matter. Nodules were detected in the walls of the small intestine. On excision of the portion of the stomach and intestine operated upon, it was found that the pylorus was patulous and sufficiently large to pass the index-finger through. The edges of the wound had firmly united.

The lungs were examined through the diaphragm, and it was found that they readily collapsed, but not as much as normally. No adhesions were present with the exception of slight ones at the right apex. The lungs were full of nodules, firm and resisting to the touch, varying in size from that of a grain of wheat to that of an almond. The lungs were literally studded with these masses, and especially so in the middle lobe of the right lung. These nodules were not only near or upon the surface of this lung, but all through the body of the organ. A patch of the posterior portion of the lower lobe of the right lung failed to collapse, but was not as hard as an area of consolidation. This evidently was an area of hypostatic congestion.

The Specimen.—The massive growth is nodulated and weighs one pound and nine ounces. Its involvement of the wall of the stomach extends for a space of two inches, whence it grows into and involves the entire great omentum. The pathologist reports it a round-celled sarcoma.

Remarks.—Had the condition of this patient's lungs been known prior to operation the growth would not have been disturbed; but no physical signs of the condition present were detected. The fatal result was no doubt due to the pulmonary complication, and the showing of the autopsy amply justified the technique used in the pylorotomy.

It is remarkable that a growth could attain such proportions without being detected, while the patient was being treated for months for gastric catarrh, as was the case here. The supreme importance of physical examination in such cases is shown by the fact that this tumor could doubtless have been discovered many months earlier by even a superficial examination, probably before the pulmonary involvement. This would have made a successful termination possible, and would have shortened the anæsthetic period by more than one-half; for the pylorotomy proper, with the opening and closing of the abdomen, occupied less than one-half the entire time of operation, most of the time being taken up by tying off adhesions of the body of the growth.

In the early recognition of pyloric growths lies the only hope of these patients, and the indications are that when early diagnosis shall have brought them to the operating-table before the involvement of other regions, pylorotomy will have become a truly life-saving operation, as the modern operation for cancer of the breast has proved itself. According to Professor Woelfler, of Prague, the mortality of pylorotomy has recently been reduced to 31.2 per cent., and Kocher, Mikulicz, and Kroenlein have lately performed the operation in nine to ten consecutive cases without a mishap.

SOME PRACTICAL REMARKS UPON THE USE
OF X-RAYS IN SURGERY, WITH SKIA-
GRAPH OF A DISLOCATION OF THE
ASTRAGALUS BACKWARD.

BY J. LYNN THOMAS, F.R.C.S.,

OF CARDIFF, WALES,

ASSISTANT SURGEON TO THE CARDIFF INFIRMARY.

A YEAR'S experience with the X-rays in surgical work has not been an unmixed blessing, because (firstly) one did not fully realize in some of the earlier cases that the Röntgen rays during their transit through the tissues exercise some disturbing influence upon embedded foreign bodies; (secondly) that skiascopy is unreliable; and (thirdly) that one misinterpreted the appearances of *good* results in treatment of fractures because the bond of union at the surface happened to be transparent to the rays, and therefore misled. It is not necessary to multiply cases in which a cutting operation has been avoided in removing needles by the knowledge gained of the exact direction and position of such bodies by our new method of diagnosis, but some good may be served by recording pitfalls for which one was not fully prepared.

Skia-graph I is that of Miss J., a patient of Dr. Downing, who had had a needle in her hand for *four* months. (Plate I.)

It was skia-graphed on June 26, 1896, and on June 27, with a print in front of me, I cut down confidently nearly at right angles to the direction of the needle and explored until the bone was exposed, and with feelings I need not describe found no suspicion of a needle. I closed the wound, and fortunately did no harm; and on August 26 took another

skiagraph, when the needle was found lying over the lower third of the ulna two and one-fourth inches higher up in the forearm (in the dotted region of Skiagraph I). The moral is to operate immediately after localizing the needle, or put the part in a splint until the operation is done.

The Superiority of Skiagraphy over Skiascopy.—Skiagraph II is a good illustration of the importance of not relying upon a fluorescent screen in giving an opinion.

Although I made examination with the screen in a light, tight box, painted black, the Röntgen rays being transmitted through American cloth, I did not observe the detached point of the needle in this case until it was skiagraphed. (Plate II.) This patient referred her pain to where the point of the needle is, and she was surprised to see the needle where the pain was *not*. I explained that referred pain was not unknown in other regions, but my explanation vanished when I saw the skiagraph. I have had a similar case in the foot.

Dislocation of the Body of the Astragalus Backward.—Skiagraph III is the only example that I know of this "very rare" dislocation. (Plate III.) The patient, a lad of seventeen years, working in a colliery, was sent to me by Dr. W. E. Thomas, of Ystrad, who had diagnosed the case at the time of the injury eight months before the skiagraph was taken. The injury which caused the dislocation was the impact of the sole of the boot against the roof of a cutting, underground, the patient lying on a moving trolley with his feet in front. The patient has a useful foot, and we advised non-interference.

There is a fracture through the neck of the astragalus, the body is dislocated backward, the trochlear surface being in contact with the tendo Achillis,—in other words, there is an axial rotation of 90 degrees backward through its transverse axis "anticlockwise."

There is no formation of bone in the gap between the neck and displaced body of the astragalus, for the fibular malleolus is distinctly recognized. The tibial malleolus is seen resting upon the two segments. This skiagraph shows



PLATE I.—Skiagraph showing needle embedded in hand and forearm; *a*, position on June 26, 1896; *b*, position on August 26, 1896.



PLATE II.—Skiagraph showing two fragments of a needle embedded in the hand.



PLATE III.—Skiagraph showing backward dislocation of the astragalus.

very clearly the comparative density of skin, tendon, and muscle to the X-rays, the space posteriorly between the superficial and deep muscles in the leg being very marked.

The tendo Achillis can be traced over the trochlear surface of the astragalus to its insertion in the calcaneum, as well as the arching backward of the posterior tibial tendons opposite the lower tibial epiphysis.

In Stimson's seven cases of this particular injury "persistent flexion of the terminal phalanx of the great toe was present" (Keen and White's Surgery), and a similar condition is well shown in this case.

A comparison of the bones and tendons of this skiagraph, with the illustration of a similar injury in Treves's "System of Surgery," Vol. 1, p. 1025, is very striking.

General Remarks.—The platino-cyanide screens on this side of the Atlantic give more satisfaction than those of tungstate of calcium or of scheelite.

The intermittent character of the X-rays is beautifully demonstrated by moving the hand with outstretched fingers in front of the screen; by moving the two hands in opposite direction in a circle one gets the bewildering effect of the "strobic circles."

By stroking with the finger-tips a patient's skin who has been for some time under the influence of the Röntgen lamp one feels a sensation very much like that produced by rolling a pad of absorbent wool in the two palms; it is distinctly uncanny the first time it is done. This effect is more distinctly felt by standing upon the side where the wires between the tube and coils are. (See *British Medical Journal*, March 27, 1897.) Most writers upon skin lesions due to the exposure to a Röntgen lamp in action have not paid any attention to the part this induced current plays in their etiology. In conclusion, I may add that the electrostatic stresses in the "focus tube" are different from those of an earlier date,—that is, before the invention of the platinum anode reflector. We have found skiagraphy of great use in so-called bruises of the hands in detecting fissures and partial fractures of the

metacarpal and phalangeal bones which otherwise are unrecognizable.

I would suggest that the clear spaces in skiagraphs of *apparent* bad setting of fractures be properly shaded so that a jury may more clearly understand the actual, and not the apparent, displacement in such cases.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 13, 1897.

The President, FRANK HARTLEY, M.D., in the Chair.

SARCOMA OF THE SUBMAXILLARY REGION AND MAMMARY CARCINOMA IN THE SAME INDI- VIDUAL.

DR. WILLIAM B. COLEY reported a case of this description, for which see number for January, 1898.

SOME CONSIDERATIONS ON ABDOMINAL IN- CISIONS.

DR. GEORGE WOOLSEY read a paper with the above title, for which see number for January, 1898.

SPECIMEN OF TYPHOID PERFORATION FOR WHICH LAPAROTOMY WAS PERFORMED.

DR. ROBERT F. WEIR presented a specimen with the following history: The patient was a man, forty years old, who had been ill about two weeks when he was brought to the New York Hospital, where a diagnosis of typhoid fever was made. About a week later it was noticed that he had a good deal of tympanites and abdominal tenderness: on the following day, about 11 P.M., he was seized with a severe pain in the abdomen and suffered from persistent hiccough and vomiting. Intestinal perforation was immediately suspected, and twelve hours later (the delay having been due to the fact that it was necessary to obtain the consent of the patient's friends to the operation), the patient's condition being fairly good under the circumstances,—temperature 102° F.,—the abdomen was opened by Dr. Weir. The right side of the abdomen contained a large amount of purulent material, and in following up the intestine from the cæcum the

finger soon came in contact with two thickened Peyer's glands, and in the upper one was a perforation in the ileum eight inches from the ileo-colic valve, from which gas and fluid escaped. The enlarged patches were readily made out by the thickened feel of the tissue surrounding it and its deep plum color, in marked contrast with the rest of the intestine. The perforation was about the size of a small lead-pencil. An effort was made to suture it, but on account of the thickened condition of the intestine adjacent to the perforation, as well as the close proximity of the second inflamed and thickened patch, this idea had to be abandoned; also when the edges of the ulcer were tentatively brought together marked kinking of the bowel occurred, interfering dangerously with the lumen of the intestine. Another objection to suturing was that whenever traction was made on the silk the intestine was torn. After thoroughly cleansing the abdominal cavity a piece of catheter was therefore introduced into the bowel for drainage, and a ligature was passed through the intestinal wall, securing it *in situ*, and the wound packed around this tube. The abdominal cavity was thoroughly irrigated with a salt solution. Though standing the operation fairly well, the man died twelve hours after the operation, his temperature having risen steadily until it reached 106°, when death occurred.

Surgical interference for intestinal perforation occurring in the course of typhoid fever, Dr. Weir said, is not a very common operation, and is still of sufficient interest to warrant a report of all cases, whether successful or otherwise. The operation was first done about 1887, and up to the present time about forty-nine cases have been collected by Finney, with thirteen recoveries,—27 per cent.,—which is a very encouraging result. In all of these cases the perforation was due to ulcerative lesions occurring in the course of typhoid fever, although in eight or nine of them it was supposed to be due to appendicitis or other troubles until the operation disclosed the true state of affairs. A number of recoveries have occurred even where there was an extensive amount of inflammation, which fact should encourage us to operate even in apparently hopeless cases. The fact should also be borne in mind that this operation is performed on patients who are, as a rule, already very much exhausted by a disease from which they have suffered for several weeks or even longer.

At the autopsy, in his case, only two patches of glands were

found in a condition of ulceration, and these were the ones recognized at the operation; two other patches, small in size and not ulcerated, were, however, found at the autopsy. Dr. Weir called especial attention to this fact not only in reference to its importance in locating the site of a perforation, but also in its connection with the suggestion that had been made for the surgical arrest of the dangerous form of intestinal hæmorrhage that occurs in this fever. This might be associated with the difficulty of determining by palpation or inspection which of the patches was the site of the hæmorrhage. He believed from the benefit obtained in hæmorrhage and pain in gastric ulcer—by a gastroenterostomy—which places the stomach at rest, that in the rarer condition now spoken of that it might not only be more expeditious but equally of avail to make at once an artificial anus and thus check peristalsis, and particularly as the usually involved area is so low down in the alimentary tract that no inanition would thereby be produced. Of course it is only in the very severe forms of hæmorrhage that this operation would be admissible.

Dr. Weir said that in his case perforation had probably taken place some time before the diagnosis was made. The diagnosis is often very obscure, and Finney has suggested that in a doubtful case the blood be examined in order to ascertain whether the number of leucocytes have increased, which, as is known, usually occurs in inflammatory processes.

DR. L. W. HOTCHKISS said he had operated in one case of typhoid perforation, coming on in the third week of the disease, in which a condition prevailed very similar to that described by Dr. Weir. The perforation in the ileum was easily located and sutured. It was surrounded by an infiltrated area, and the abdominal cavity was filled with pus. The patient died about twelve hours later of acute septic peritonitis.

EDITORIAL ARTICLES.

THE GEOGRAPHICAL DISTRIBUTION, PROPHYLAXIS, AND THERAPEUTICS OF TETANUS.

(I) *Geographical Distribution.*—That tetanus should flourish more abundantly in tropical regions is to be expected when it is recalled that the germs grow most luxuriantly at body-heat or heat in slight excess of normal human temperature. The nations that inhabit these regions are reported as “exceedingly susceptible” to the disease; but surely this can be disproved when we remember that these nations are less civilized than the inhabitants without the tropics, and the filthy carelessness of barbaric, semi-barbaric, or quadri-barbaric tribes may well account for the seeming difference in susceptibility. The dearth of reports from the North is very impressive, witnessing, probably, to the inability of the bacillus to flourish in cold climes.

Verneuil has laid stress upon the fact that in localities where horses are kept in considerable numbers the prevalence of tetanus is greater, relatively, and that the specific organism abounds in and upon stable-floors. He explains the occurrence of the disease on shipboard (as has been recorded in several instances) by pointing out that horses were fellow-passengers with the afflicted. Following along this line came the advancement of the “equine” theory of the origin of tetanus, but this was utterly thrown down by the experiments of Dantes, who made cultures in the New Hebrides Islands from the mud with which the natives poison their arrows, and found the bacilli of tetanus and of malignant œdema where no horses exist.

Asiatic records come chiefly from India and its vicinity.

The disease is prevalent in Calcutta and all Bengal. "Tetanus is seldom absent from the Calcutta hospitals." In one hospital alone eighty-three cases were treated in five years. In another fifty-six were treated in a like time. Yet Bombay yields a more horrible tale, having 1955 cases in five years, not including puerperal cases. It is a common malady at Hyderabad and on the Deccan plateau, but no figures can be found to state how common. Remarkably numerous are the cases among the grain-dealers of Bania, who work in dust, and who frequently use manure as poultices for wounds and boils.

In the East Indies the disease is far from common, according to Burg.

In Arabia tetanus is prevalent and also in Ceylon.

Africa.—"Larrey had great experience of this disease during Napoleon's campaign in Egypt," says Erichsen. Poland states that here the disease was of remarkable intensity. Senegambia and Gold Coast have many cases, and, indeed, all the coast of Guinea is an afflicted region. In the islands of the African coast, St. Helena, Madagascar, Réunion, and Mauritius, the soil seems richly laden with the bacterial poison, at least such are the indications of statistics.

Europe.—The meagre accessible details lead us to assume that Germany, Belgium, Switzerland, Spain, and Portugal are the elected lands. Certainly the disease is not unknown in France and Italy, for a good proportion of a collection of cases have been culled from French and Italian journals.

Larrey had scores of cases after the battle of Waterloo, and this was merely a repetition of his experience after Dresden. Yet in Napoleon's Austrian campaign the cases were rare, and never as severe as they had been in Egypt. After the engagement at Moscow there was a striking scarcity of cases, and this in spite of the cold weather and frightful exposure endured, which were factors supposed by the older authorities to favor the development of the disease.

Rose attributes some of the prevalence of tetanus in Switzerland to the frequent practices of dressing fresh wounds with mud or manure, and of obtaining hæmostasis by the application of spider-webs.

McGregor stated that the disease was harassing in the Peninsular War, and that many of the cases followed remarkably minute wounds.

England, Scotland, and Ireland are hardly mentioned in any available statistics. Of Ireland one journal article says, "Tetanus is said to be common here." England furnishes many cases. And although it may be true that the English surgeons have been most faithful in placing their cases on record, our natural conclusion is that many cases occur each year in this small country. Scotland gives very few case-reports to us, nor is it referred to in any statistical work of renown, as a rich field for the development of the tetanic bacilli.

South America.—The ancient idea that tetanus is particularly prevalent in tropical lands was, of course, founded upon actual experiences, and perhaps nowhere have these been more dreadful than in Brazil and Argentine Republic, particularly along the Atlantic coast. Some of the earliest observations which led ultimately to the discovery of the tetanus bacillus were made in Brazil. The inhabitants of Peru and Ecuador are also said to be "susceptible" to this disease, which is good information if we transfer the blame from the inhabitant to the hospitable soil. Further than this no information concerning South America can be presented, yet the very propinquity of other lands and like climatic conditions forbid our presuming that dearth of statistics signifies absence of tetanus.

Concerning tetanus in Cuba several authorities use the expression, "truly endemic." Tetanus neonatorum is a dreadful plague here, the cases in Havana alone rising into the hundreds per year. Biart observed four hundred and seventeen cases in fourteen years of private practice here. An army medical officer saw 858 tetanics in two years on this island (Dupont).

Stories from Jamaica are similar, save for the fact that sectional variations in prevalence are quite remarkable. In St. Domingo tetanus is a "terrible scourge."

Boffier tells us that this malady is frightfully prevalent in Mexico, near the coast, and indicates Vera Cruz as a town where its fatalities are most numerous. Dr. Wilson (of the Brooklyn Health Department Laboratory) has informed me that Yucatan has been recommended to him as an advantageous locality for investigating the clinical value of the antitoxin of tetanus, so many are the cases there always. Bernhard and McDowell are vouchers for the great prevalence of tetanus in Central America.

In order to indicate ever so indefinitely the geographic distribution of tetanus in the *United States*, only two classes of aids are at hand: Scattered, isolated statements about some town or county or State, and the observance of the localities in which reported cases have occurred. To the best of our knowledge, the sections where tetanic infections are most frequent are Northern New York and along the Hudson valley, Brooklyn and surrounding districts of Long Island. Southern Pennsylvania, Virginia in its central, southern, and eastern portions, Georgia, at least about Savannah, Southern Louisiana, Indiana, Illinois, and Southern California. Huck, an army-surgeon, whose experiences covered a number of years in the French and Indian wars, in the last century, stated that out of a total of thirteen cases observed by him nine of them were wounded at the battle of Ticonderoga. North and South Carolinas had reputations for tetanus in 1776. Savannah's record has long been bad. In searching the medical and surgical history of the War of the Rebellion for geographic statistics but little satisfaction was found, but enough cases were detailed to indicate that cases of tetanus were plentiful after the battle of Gettysburg and after the engagement in the Wilderness. Lambert has isolated the germ from the soil in various parts of New Jersey.

Long Island is notorious for its great number of tetanus

cases. Its eastern end has been particularly reviled as a hot-bed for the growth of this specific germ. Quite startling, therefore, is the information from Dr. Hulse (of Bay Shore) that in fourteen years of active work he has seen but one case, and that the disease is very rarely seen in that section of the country. He also says, "Many years ago it was rather common at the eastern portion of the Island, but now, as here, it is very rare." Dr. Wilson questions the accuracy of the general reports concerning the disease in Eastern Long Island. The bacillus has been grown from soil taken from a yard at Glendale. Dr. Fowler has informed me that two operative cases of his own, at Huntington (near the North Shore), developed tetanus. One was a case of mastoid disease, and for the other abdominal section was performed. Lambert has reported cultures of tetanus bacilli from various parts of Long Island, and about Brooklyn tetanus is common, considering the excellent care that we suppose the majority of badly lacerated and punctured wounds and compound fractures receive.

(II) *Prophylaxis*.—In reviewing many articles on tetanus one is impressed with the uniformity with which the various authors dispose of the subject of the prevention of the disease with a few general statements, and one of the most recent works by an eminent surgeon does not mention the subject.

(1) To begin with a suggestion from the pen of Edmund Rose, found in his recent elaborate work on tetanus: It is unwise to devour raw fruit and vegetables fresh from the garden unless they have been thoroughly cleansed, nor should any fruit that has fallen to the ground be eaten unless so treated first. This is because of the possibility of the existence of an unhealed tooth-socket in the jaw, or of abrasions or fissures along the alimentary canal which might act as the gates through which the tetanus bacilli may enter. Here may be the explanation of some of the cases of so-called "idiopathic tetanus." Again, germs thus swallowed might traverse the entire gastro-intestinal

canal unharmed and innocent, and upon exit infect the anal region, or, at the time of labor, find their way into a lacerated perineum or vagina or into the uterine cavity, and give rise to an attack of puerperal tetanus.

(2) Another point upon which this same author insists is the discarding of bandages or dressings which have fallen upon the floor. He thinks that he has lost two cases from post-operative tetanus because the incised parts were enveloped in bandages which had been dropped upon the floor just previous to their use.

(3) So many deaths from this disease have occurred after the reception of slight wounds that every surgeon should treat even the minutest scratches with scrupulous care, nor can this principle be too widely preached among the busy general practitioners of our day.

(4) When wounds have occurred, What shall be their treatment, bearing in mind the possibility of tetanus, at least in a region where the soil is known to be badly infected? The surgical principles of the day seem to indicate thorough scrubbing with soap and water (scrubbing, not bathing), careful washing with alcohol or ether, irrigation and scrubbing with bichloride of mercury solution (1-1000), and a dressing of wet bichloride of mercury gauze, using proper drainage when the style of wound indicates.

(5) Sormant has investigated the value of iodoform as an enemy to the tetanogenic virus, and pronounces it capable of completely neutralizing the virus in a wound comparatively fresh.

(6) Tizzoni and Cattani, as the result of experimental demonstrations, believe that silver nitrate in one-per-cent. solution is the most potent germicide for the tetanus bacillus, for general use in wounds as a preventive injection.

(7) Roux has tested the power of tincture of iodine in this line, with the result that he recommends its use in all dirty

wounds. Tizzoni and Cattani have corroborated his experiments.

Van Cott has shown that the solutions of carbolic acid in ordinary use are not rapidly fatal to the bacterium of tetanus, therefore its use to prevent this variety of infection in dirty wounds is not warranted.

(8) Given a punctured wound, evidently dirty, or caused by the classic nail or splinter, or a pistol-shot wound, its treatment by free incisions so as to expose every nook to the measures detailed above, seems in keeping with the spirit of modern surgery. Germane to this subject is the free incision of all spaces beneath the skin in compound fractures, by which measure alone can the thorough cleansing of these cases and the irrigation with antiseptic solutions be satisfactorily accomplished.

(9) It is said that the tetanus bacillus is an anaërobe. It is truer to say that it cannot live in the presence of oxygen as such. Every molecule of hydrogen dioxide (or peroxide) contains an atom of oxygen which watches and yearns for an opportunity to spring away and oxidize some organic matter. It does so with pus-cells and blood-cells, and why may it not accomplish the destruction of the bacillus of tetanus? Thus we recommend its free use in washing and forcibly irrigating the suspected class of wounds or every dirty wound in a region where the soil is known to be badly infected.

(10) Where bacteriological facilities are at hand the following procedure would be rational, scientific, and possibly life-saving in some cases. Given a "suspicious wound," before cleansing it make a series of cultures from the contaminating materials that it contains, and obtain a solution of them for hypodermic injection into a mouse. If the mouse develops tetanus (as he will right quickly, if infected), or if the microscope reveals the bacterial drumstick in the cultures (as may be in three or four days at the most), practise excision of the injured area, or destruction by the actual cautery.

The objection that this procedure is too complicated and time-devouring to be intensely practical must be admitted, but so were once considered several of the measures which we now adopt gladly because effective.

(III) *Therapeutics*.—In studying 239 cases which I have collected from literature, all occurring within the ten years during which the individuality of the bacillus of tetanus has been known, it is apparent that two general principles have, in the main, guided the minds of the physicians and surgeons in charge in their therapeutics. They have either sought to control the spasms and afford rest by the use of powerful sedative or antispasmodic drugs until the natural resistance of the organism should triumph over the toxæmia, or to directly antagonize the toxine or toxines by the use of a serous solution of toxines, allied to themselves in general properties but attenuated. Therefore it seems the most important duty of the present time to compare the results of the two methods of treatment. Cases have been selected from the literature of seven countries, without any partiality, save that nearly all cases treated by antitoxin are thought to be included. In the other class we include all other cases save those in which some radically different principle of treatment was relied upon as the main hope, or where it appeared to produce marked effect upon the course of the disease.

It is generally accepted that the virulence of infection and the gravity of the prognosis in these cases vary inversely with the length of the stage of incubation. For this reason two tables have been prepared showing the results of these two methods of treatment according to the number of days of incubation.

CASES TREATED BY ANTITOXIN.

Days of Incubation.	Cases.	Cured.	Died.	Per Cent. cured.
Two	1	1	0	100 per cent.
Three	2	2	0	100 " "
Four	2	1	1	50 " "
Five	7	4	3	59 " "
Six	7	5	2	71 " "
Seven	13	5	8	38 " "
Eight	12	8	4	66 " "
Nine	3	1	2	33 " "
Ten	10	5	5	50 " "
Eleven	6	4	2	66 " "
Twelve	12	9	3	75 " "
More than twelve	26	21	5	81 " "
Unknown	12	5	7	42 " "
Total	113	71	42	63 " "

CASES TREATED BY SEDATIVE AND ANTISPASMODIC DRUGS.

Days of Incubation.	Cases.	Cured.	Died.	Per Cent. cured.
Two	2	2	0	100 per cent.
Three	5	2	3	40 " "
Four	9	4	5	44 " "
Five	9	4	5	44 " "
Six	4	1	3	25 " "
Seven	6	3	3	50 " "
Eight	3	2	1	66 " "
Nine	6	2	4	33 " "
Ten	9	5	4	56 " "
Eleven	4	3	1	75 " "
Twelve	2	2	0	100 " "
More than twelve	27	21	6	77 " "
Unknown	27	22	5	81 " "
Total	113	73	40	64 " "

The result is that of the cases treated by antispasmodics 64 per cent. recovered, and of those in which antitoxin was the chief measure 63 per cent. Yet the following differences are discernible:

(1) The rate of recovery is higher under the antitoxin treatment in those cases having short incubations.

(2) The supremacy of antispasmodic treatment seems most marked in cases of unknown incubation, where, in most instances, no wound was discovered.

(3) Most of the cases treated by antitoxin have probably been reported, whereas the great majority of fatal cases treated by other methods are quite as probably withheld from publication.

Thus it would seem that, according to this compilation of cases, antitoxin holds a very important place in the treatment of tetanus, although whether it is established there positively is as yet a question.

As regards different antitoxins: From the studies pursued thus far Tizzoni's product has undoubtedly been the most successful.

Amputation is not an obsolete method of treating tetanus. In English and American journals its adoption is rarely mentioned in the records of cases. Only six of the cases under analysis were treated by amputation, all of which died. Yet this procedure has found a staunch advocate in Rose, who recommends it (where it is rendered possible by the location of the wound) as the *surest* method of treating tetanus. He says that in his own experience he has seen recovery follow this radical measure in forty-two cases.

Cauterization has given excellent results in some cases, as cited by Rose, in which the entire area injured was burned out with the cautery or some chemical substitute, as silver nitrate. But cases are too few and too meagre details are furnished to allow its admission as a regulation method of treatment. Yet

cases have been cured by it and its further trial upon lower animals would open a promising field for investigation.

With the same object in view *excision of the wound* has been practised in many of the cases reported, but without any recorded or noted effect upon any case. More than this, wound excision has been practised in mice at all times after experimental inoculation, and it has been found that, in order to save the mouse from tetanus by wound excision, the work must be done within a few hours of the time of infective puncture. That the same would hold accurately true in the human subject cannot be easily believed, but that the infiltration of the virus into parts adjoining the wounded area takes place very rapidly is undoubted.

Concerning *neurotomy* something must be said, for the striking reversals of conditions brought about by this measure in severe cases of tetanus so justly demand its mention that no element other than prejudice will ostracize it from the therapeutic list. There was once a sailor, who, one night, sustained a wound of the heel by a rusty nail. All night he lay untreated. On the second day he developed frightful pain in the wound, with spasms of the pedal muscles. Soon followed trismus and general muscular rigidity. As soon as the tonic spasms became general the posterior tibial nerve was severed just above the level of the malleolus. Within a few hours the general hypertonicity of the muscles had ceased, and in three days the man was as well as ever. (Rose.) There are several authentic cases, similar to this, on record, most of them having occurred in the middle decades of this century, but notwithstanding our new and valuable knowledge concerning the cause of tetanus, we cannot set these results at naught.

It has not been long since some of the surgical leaders of their time were discussing with warmth the question as to whether the damaging effect of the toxine or toxins of tetanus was invariably upon the central nervous system,—*i.e.*, the cord

and medulla oblongata. The majority took the affirmative side, and with them the question has appeared to be decided. But what shall we say of these cases? More than one authority has claimed to have isolated several toxins produced by the bacillus of tetanus. Therefore, may it not be true that in some cases (those in which the onset of the disease is with pain in the wound and spasms of adjacent muscles) a different toxin is at work than is the offender in the cases where trismus is the introductory symptom, a toxin whose specific action is directed at the nervous system through the peripheral nerves in the immediate neighborhood of the wound? This seems to be the only satisfactory scientific explanation of the results of neurotomy in tetanus, and this being the case, why should we hesitate to adopt this method of treatment in those cases where localized pain and spasm near the infection atrium usher in the general symptoms of tetanus?

Hypodermic injections of a solution of carbolic acid have been used systematically in five cases of the series with 100 per cent. of cures. In one case a 5 per cent. solution was used, and in the others 2 per cent. The incubation stages in these cases were twelve, fourteen, fifteen, and twenty-one days respectively, and in one case the incubation was not known. Thus we do not know that any case with short stage of incubation has been cured by this method. In two cases the onset was rapid, in two cases slow, in one it was moderately rapid. Similar to this method of treatment is the hypodermic injection of solutions of bichloride of mercury. Two cases of this collection have recovered after this treatment. Sedatives in moderate doses were also used in both cases. In both these cases the incubation period was unknown. In one the onset was slow, in the other rapid.

CHARLES H. GOODRICH.

INDEX TO SURGICAL PROGRESS.

CHEST.

I. Experimental Study of Wounds of the Heart. By DR. FREDERICK BODE (Frankfort). It has been demonstrated by the outcome of Professor Rehn's case (Twenty-sixth German Surgical Congress) that suture of the heart can be performed with success. Heretofore the views on the subject had been very conflicting, and the knowledge of the heart's behavior under such circumstances was very scanty. The author has therefore undertaken an experimental investigation of the reaction of the heart after injury, the resulting symptoms, the influence of suture of a division of the heart on the continuation of regular heart action, and, finally, the several factors which, on the one hand, result in healing of a wound and those, on the other hand, which terminate immediately or later in death.

Whatever chamber of the heart was implicated a hæmorrhage during systole was observed. This occurrence held good for all the smaller wounds; in the larger, and in injuries to the auricles and the efferent vessels, a diastolic bleeding was also either unmistakably noted, or else its non-occurrence could not be clearly established. The pressure of the escaping blood was lowest in the auricles and highest in the left ventricle. The amount lost, however, was not in a constant ratio to the pressure, except for extensive wounds of the ventricles. In other injuries a complicated vicarious action of the heart occurred, as during the systole of any given portion diminution in size of the wound by muscular action resulted, being most marked when the muscular wall was thickest. A minute wound of the left ventricle, consequently, occasioned less loss of blood than a

similar one in the other divisions of the heart. Non-penetrating wounds generally excite but little bleeding synchronous with the heart's action.

All the larger wounds of the heart quickly resulted in death from disturbances of circulation and impairment of organic functions, while from the smaller wounds of the ventricles, the hæmorrhage gradually diminished and stopped spontaneously, the time required for wounds of the left ventricle being usually quite short. Wounds of the auricles, right or left, are much more dangerous than those of the ventricles.

In suture of cardiac wounds, the technical difficulties are much lessened after the insertion of the first suture, which can be used to anchor the organ. When the needle pierces the tissues there is a momentary stoppage, succeeded by a period (usually brief) of irregular and increased action. The axis of the line of suture has no special influence on the action.

Full details of the experimental work with cardiograms are appended.—*Beiträge zur klinischen Chirurgie*, Band XIX, Heft 1.

C. L. GIBSON (New York).

ABDOMEN.

I. Splenectomy. By PROFESSOR THOMAS JONNESCO (Bucharest). Since February, 1896, Jonnesco has extirpated the spleen eleven times for malarial enlargement and once for a hydatid cyst. As the result of his experience he recommends the following

Method of Operating.—The surgeon should stand on the patient's *right* side, because from this side he obtains a better view of the pedicle, the ligation of which is the most difficult and important step in the operation.

First Step.—*The abdominal incision* is best made in the middle line. Its length varies with the size of the spleen. It begins at the ensiform cartilage and extends to or below the umbilicus.

Second Step.—Isolation of the spleen. This varies in difficulty according to the extent of adhesions and to laxity of the pedicle. Adhesions may be so extensive and firm that the spleen may be practically continuous with its own bed or the parietes. Extensive and firm adhesions may be a contraindication to continuing the operation. When the adhesions, though intimate, are destructible the operation may be continued, but in separating them one must, when necessary, injure the abdominal wall or even the diaphragm rather than the spleen itself. Often the adhesions contain no vessels, and can then be torn by the hand instead of being ligated and divided, as is usually necessary. When the phreno-splenic ligament is lax and anæmic one may tear through it with safety, but when it is vascular, then it must be separated into several bands, each of which are doubly tied and divided. To reach and examine this ligament the following manœuvre is essential. The operator, covering the spleen with a gauze pad, pulls it to the right, while an assistant draws the left lip of the abdominal wound to the left; this exposes the bed of the spleen and the diaphragmatic vault. Having divided the phreno-splenic ligament, the adhesions of the spleen to its bed are next attacked. Often adhesions to neighboring organs exist, and must be divided. Once the adhesions, both normal and abnormal, have been separated, then it is easy to enucleate the organ beginning with its lower extremity.

Third Step.—Section of the pedicle. When delivered from the belly cavity the spleen is turned over to the left on its convex surface so as better to expose the internal surface and its pedicle. Division of the pedicle ought to be accomplished by separating and dividing between two ligatures each vessel in turn from the lower side upward. The separation of each vessel is one of the most delicate steps in the operation. There are two things one must avoid: (a) Too great traction on the pedicle. This is avoided by an assistant supporting the spleen and preventing its sudden displacement. (b) Rupture of a vessel while sepa-

rating it. Such an accident is easy because of the friability of the vessel walls, and because of their enormous size.

To avoid this accident the author discards instruments and uses his fingers to separate the vessels or groups of vessels (the isolation of single vessels is often impossible).

The isolation and ligation of the splenic artery (often as large as the femoral) and of the vein, which often accompanies it, is rendered specially difficult because of the tail of the pancreas, to which they are often adherent. Where this is the case, it is best to throw two strong ligatures around these structures and ligate *en masse*, then, after division between these ligatures, one ties each of them separately.

The gastro-splenic omentum is a continuation of the pedicle, and should be treated in the same fashion.

Fourth Step.—Revision of the splenic bed and final hæmostasis. Every place where adhesions have been divided must be reviewed and any bleeding stopped. Even when there have been no abnormal adhesions to the diaphragm and that structure has not been injured, there is generally a bleeding point to be found on the pillar of the diaphragm on the vertebral column. This point is exposed by retracting the stomach and intestines to the right. The bleeding surface is due to division of the phrenosplenic ligament, and may be stopped by a few interrupted stitches uniting the peritoneum over it.

Fifth Step.—Closure of abdominal wound and application of dressings. The dressings should be compressive and elastic, so as to fill up the void left by the removal of a huge spleen.

The after-treatment is usually simple. Opium for a few days. If there is much cachexia, and if the operation has been lengthy, it is advisable to use intravenous injections of artificial serum.

Post-operative Complications.—An elevation of temperature immediately after operation has been observed. This was sometimes due to broncho-pneumonia or pulmonary congestion; at

other times it was the evidence of a fresh access of malaria, and was controlled by quinine hydrochlorate. Pulmonary complications after splenectomy have been tolerably frequent, but in none of the author's cases have they been severe.

Indications and Contraindications.—The author has collected thirty-six cases of splenectomy for malarial enlargement, with a death-rate of 50 per cent. From 1887 to 1896 the death-rate was 31.7 per cent. From 1891 to 1896 the death-rate was 15.4 per cent. Undoubtedly this improvement in the prognosis of the operation is due to asepsis and to careful choice of cases.

Among the contraindications usually given by writers are the following: (a) Profound cachexia; (b) extensive adhesions; (c) size of the spleen; (d) leucocythæmia.

(a) Cachexia will undoubtedly continue to be a contraindication, but it is difficult to define the limits of this contraindication. Among the author's cases were two in an advanced condition of cachexia, but in spite of this, operation resulted in marked amelioration of the patient's state. The question, When does cachexia become a contraindication to operation? must be left to the judgment of the surgeon.

(b) The question of adhesions is analogous, and has been discussed earlier in the paper. The author believes that operation should be accepted or rejected (so far as adhesions are concerned) from a consideration of the following points: (1) The general condition of the patient,—could he or could he not stand a long and laborious operation; (2) the quantity of ascites taken as an index to the alterations present in the organs of the belly; (3) the friability of the splenic tissues. This is a continual menace while adhesions are being separated.

(c) Jonnesco does not consider great size and weight of the spleen any contraindication to its removal. He has operated successfully in patients from twelve to sixty-two years, some having enormous hypertrophies.

(d) Leucocythæmia was not certainly present in any of the

author's cases, and is a distinct contraindication as it is always fatal.

The author believes it useless and dangerous to unduly prolong medical treatment, because as long as the spleen is hypertrophied from malaria, cachexia increases, and, *pari passu*, the chances of cure by operation decrease. His own results from splenectomy he considers above all criticism.

Influence of Splenectomy on the Organism.—Examination of the urine before and after the operation shows that removal of the spleen is followed by a very marked *decrease* in the toxicity of the urine. This is true not *only* when the spleen is removed for disease, but also when it is excised in dogs.

The author does not believe that the spleen is an eliminator of toxins, because splenectomized patients do *not* suffer in health from their urinary *hypotoxicity*, but seem to benefit by it. He believes that the spleen makes toxins, and that the lessened toxicity of the urine is due directly to the removal of this toxine manufactory.

Like other observers, Jonnesco remarks on the increase of red corpuscles immediately after the operation. This increase is so great that he believes it to be incontestable that splenectomy removes the cause of malarial cachexia. The leucocytes increase in numbers relatively more than the red corpuscles, so that soon after the operation there are proportionately more leucocytes than red corpuscles. This transitory leucocytosis sooner or later disappears, and the normal relation between the corpuscles is re-established.—*Proceedings of the Twelfth International Congress of Medicine, Moscow, 1897.*

II. The Pathological Anatomy of Rectal Carcinoma.

By DR. QUÉNU (Paris). From some autopsies and the examination of very many specimens, obtained by operation, the author has been enabled to make a minute anatomical study of rectal carcinoma.

Site.—Rectal epithelioma may occupy any part of the

rectum. It is either limited to a segment a few centimetres in length or occupies a third, a half, or even the whole length of the rectum. In practice it is important to establish the upper and lower limits of the disease; most observers are far from showing this precision.

From the purely anatomical stand-point it is rational to distinguish between cancer of the anus and of the rectum. The first develops from the skin or the "dermo-papillary" mucosa. This origin *prima facie* gives an ectodermic or squamous-celled epithelioma. The second develops from the intestinal epithelium and *a priori* can only be of cylindrical cells. These conclusions, while generally true, are not absolute. At many points, here and there, situated between the ano-cutaneous and ano-rectal lines, cells analogous to intestinal epithelium are found; so that, theoretically, it is possible that a cancer located low down may be of the cylindrical type. Further, it is well-known that the rectal mucosa may become covered by squamous instead of by cylindrical epithelium (the result of chronic rectitis, syphilis, etc.), so that in a previously diseased rectum a squamous-cell epithelioma may develop above the anus. Such cases have been observed.

Since pathological anatomy fails to furnish an absolutely precise and general classification, it is well to form our classification in accordance with the indications for and the methods of operating.

(1) *Anal Cancer*.—This originates below the attachment of the *levator ani* to the sphincter.

(2) *Infraperitoneal cancer* originates in the segment of gut between the *levator ani* and the *peritoncum*.

(3) *Highly placed cancer* has its lower limits near the peritoneal cul-de-sac, and stretches upward to or beyond the lower end of the sigmoid flexure.

(4) Cancer affecting all or nearly all of the rectum.

These types are, of course, not absolute; one type may be continued with another type. Clinically to the first type belong

all cancers whose upper margin is not higher than the tip of the coccyx; to the second type, those which, leaving the sphincters intact, stretch up the rectum for a distance of not more than eight or nine centimetres; to the third type, those whose lower limit is eight or nine centimetres from the anus.

Forty-five cases reported by German authors show that thirteen cases belong to the first type; twenty-two cases belong to the second type; ten cases belong to the third type.

Twenty-one cases observed by the author show that five cases belong to the first type; nine cases belong to the second type; two cases belong to the third type; five cases belong to the fourth type.

These tables show the great frequency of cancer situated in the rectal pouch itself. Cancers situated higher or lower than the above seem to be of nearly equal frequency.

Although English authors, in their writings, are very indefinite as to the exact seat of the disease, yet Allingham asserts the great relative frequency of cancer three inches from the anus.

Extent.—The longitudinal extent of the disease varies from two or three centimetres to twelve or fifteen (type of total invasion). The tumor is most commonly annular (seventy per cent.) by the time it is noticed, but this gives no clue to its original form. When an epithelioma of the rectum is seen early its location is often found to be on *one* of the intestinal walls, preferably the anterior or posterior. In twelve cases of non-annular tumor the neoplasm was anterior five times, posterior six times, and lateral once.

According to their form the author divides the disease into two classes,—(1) the circumscribed form; (2) the infiltrating or diffuse form. The latter form differs from the former not only by its extending over several segments of the rectum, but more especially by its invasion of all the tunics of the gut to such an extent that the rectal walls become a rigid cylinder, adherent to the neighboring tissues. This solid kind of rectal cancer, while

it may be a development of the circumscribed, can originate in this form, and advance with great rapidity. It corresponds to the "laminar form" of the English, while the circumscribed variety corresponds to their "tubercular" form.

(1) *The circumscribed form* may be situated on one of the rectal walls or may be annular. It may or may not be ulcerated, according to its age. The tumors may be prominent and obstruct the lumen of the intestine.

(2) *The Infiltrating Form.*—Here the rectum is entirely transformed into a straight, rigid, suppurating tube, which is strewn with ulcers and cancerous granulations or buds. There is absence of prominent tumors protruding into the intestinal canal.

Anatomical Evolution.—Epitheliomata do not long remain limited to the rectal walls,—they invade neighboring tissues. Whatever its exact site may be, an ano-rectal epithelioma exercises a marked influence on the perirectal fatty tissue. This tissue becomes dense, thick, adherent to the gut; in fact, it is subject to an œdema similar to that which surrounds certain malignant neoplasms of the breast. This œdema may complicate operative procedures. Extension may be local or general. Local extension varies with the site of the disease, whether it be anal (primary or secondary) or in the rectal pouch, or higher.

Anal cancers spread towards the ischio-rectal fossa, to the skin of the buttock and perineum, to the vulva and vagina. Cancerous ulceration of the anus may be masked by huge cauliflower excrescences. Malignant ulcers of the anus which involve the sphincters, occasion not only incontinence of fæces, but lead to septic troubles, abscess, fistula, etc., all which favor the extension of the malignant disease. General extension may take place by the lymphatics. According to the location of the disease the glands affected are those of the groin, the postero-superior hæmorrhoidal glands in the concavity of the sacrum, the hæmorrhoidal glands, or all or nearly all of these. Involvement of the inguinal glands is principally observed in cases of

pavement-celled epitheliomata, but one can imagine their involvement in cases of columnar-celled epitheliomata which have involved the anus secondarily. Enlargement of the sacral glands is almost the rule. These glands extend from the level of the rectal pouch to the promontory of the sacrum, where they join the lumbar system. The enlarged glands are not always distinct; they may be hidden by masses of dense connective tissue which has replaced the loose perirectal structures. Enlargement of the lateral glands (median hæmorrhoidal glands) has attracted his attention, but it is far from being rare.

While local lymphatic involvement is the rule, generalization is rare. Perhaps this variety is more apparent than real. Generalization occurs especially through the lymphatics, and may lead to involvement of the kidneys, the pancreas, the ureters, the bone, the lungs, the spleen, the ovaries, and the skin, as well as the liver and peritoneum. Among the glands which have no direct connection with the rectum, and yet have been found affected, the subclavicular are worthy of special mention. One such case has been reported by Rousseau, and another by Hartmann, who found that the structure of the diseased gland was the same as that of the rectal neoplasm.

The anatomical lesions caused by rectal cancer do not merely consist of local or general dissemination of epitheliomatous tissue. Owing to secondary infections, originating in alterations of the mucous membrane, patients are liable to perianorectal abscesses, to proctitis, suppurative or non-suppurative. Besides these, cases have been reported of cystitis; pyelonephritis; peritonitis from perforation; phlebitis of the femoral veins and of the cavernous sinus; and of suppurative coxitis from perforation of the cotyloid cavity.—*Revue de Chirurgie*, July, 1897.

JOHN F. BINNIE (Kansas City).

EXTREMITIES.

I. Tuberculosis of Lymph Vessels of the Extremities.

By PROFESSOR JORDAN (Heidelberg). The newer works on sur-

gery fail to mention this affection, and only slight allusion to it is made in the treatises on pathology, and its existence had not been recognized up to 1880. It is the only form of tuberculosis of the lymph-vessels that possesses any surgical importance. The author has recently seen four cases, and from a consideration of their course and a review of the scanty literature he has made the following observations:

The disease is most frequently situated in the upper extremity. The two sexes are affected equally; most of the patients are young adults. Other tubercular processes are almost always absent. In all cases the peripheral focus was the original and only source of tubercular trouble; it was in all cases situated in the skin of the hand or foot. The lack of evidence of a hereditary disposition and absence of other forms of tubercular disease point strongly to the probability of inoculation, and a majority of the cases gave a more or less definite history of such an origin.—*Beiträge zur klinischen Chirurgie*, Band XIX, Heft I.

II. Traumatic Epithelial Cysts of the Hand or Fingers.
By DR. ALFONS HÖRZ (Tübingen). It has long been known that tumors containing material which presents the appearance of sebaceous matter develop on portions of the body, such as the palmar aspect of the hand and fingers, where neither sweat-glands nor hair are found. Franke was the first in Germany to conceive their proper source, and gave them the name of epidermoids, but he believed that they were congenital. Reverdin was the first correctly to recognize their etiology, as he found that these cysts almost always developed at the seat of a former injury. The experiments of Kaufmann and Schweningen yielded positive evidence that detached fragments of skin could be implanted into the subcutaneous connective tissue as well as in the abdomen of animals, and maintain their physiological function of producing epidermis. The term "implantation cysts" applied to these tumors by Bland Sutton very lucidly indicates their origin.

The following cases were observed in Professor Bruns's clinic:

(1) Following a blow on the second phalanx of the index-finger, a felon developed, which opened spontaneously. The finger always remained thicker after healing, and a year and a half later began rapidly to increase in size. A globular, tense, fluctuating tumor, the size of a large cherry, on the palmar aspect of the finger was removed. It lay in the subcutaneous tissue, and its contents resembled those of a sebaceous cyst, and the tumor showed practically the same structure under the microscope.

(2) Wound of the index-finger by a fork. Eight months later, extirpation at the site of injury of a wound cyst the size of a small cherry.

(3) A year after driving a nail into the palm of the hand a hard, painful swelling developed at the point of injury. Extirpation, two years later, of a cyst embedded in the cicatricial tissue.

A review of fifty-five cases found in the literature is given.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 3.

III. Contribution to Amputation of the Entire Upper Extremity. By DR. A. HEDDÆUS (Heidelberg). In 1887, Berger recommended a plan of operation which has been extensively employed and occasionally modified. The chief innovation consisted in preliminary division or resection of clavicle, and ligation at that point of the subclavian vessels.

In 1893, Naase published an exhaustive study of the subject, contributing fourteen cases from von Bergmann's clinic.

Three such operations have been performed in the Heidelberg clinic (Professor Czerny).

(1) Male, aged forty-one years. In 1883 extirpation of a spindle-celled sarcoma of the axilla. A year and a half later removal of the entire upper extremity for recurrence. Epaulet-shaped upper flap prolonged down on the scapula gave a good

access: the clavicle was divided at its outer third. Death six months later from intercurrent affection without recurrence of the sarcoma.

(2) Male, aged twenty years. Amputation through shoulder-joint for chondro-sarcoma. Five months later removal of the scapula and outer half of clavicle. When seen, nine months later, had recurrence in muscles and secondary deposits in lungs.

(3) Male, aged twenty-three years. May, 1896, excision of a small "tumor" from the deltoid muscle. Recurrence, three months later; removal of the major portion of the deltoid. Recurrence in the axilla; this was also removed. New recurrence necessitating exarticulation of the arm in December, 1896.

Two months later, on account of recurrence the size of an adult head, removal of clavicle and scapula. Preliminary division of the clavicle in its central position and ligation of the subclavian vessels; extirpation of tumor and scapula to which it adhered by a Y-shaped incision; the flaps were readily brought together. Immediate result good, and rapid restoration of general health. Eight weeks after operation, three small recurrences in the muscles were noted. Treatment by inoculation of erysipelas now instituted. Injection of a small quantity (two minims ?) of an eighteen-hour-old bouillon culture derived from a case of erysipelas of the arm. No reaction. Four days later one gramme of mixed toxines, streptococcus, and prodigiosus. Severe reaction for twenty-four hours. Three days later, injection of a forty-eight-hour-old bouillon culture derived from a fourteen-day-old gelatine culture of streptococcus from a puerperal parametritis. Fourteen hours later, development of a typical erysipelas at the site of inoculation and pronounced general symptoms,—temporary remission; but four days after inoculation fever rose to 105° F., and death four days later. The autopsy showed diffuse metastases in the lungs and all the evidences of a severe general infection throughout the body, with a resulting fatty degeneration of all the parenchymatous organs.

This case shows that streptococci cultivated from human erysipelas does not always produce erysipelas in a second individual, and, on the other hand, that streptococci cultivated from another species of infection (parametritis) can, by inoculation into the subcutaneous tissues, produce a typical erysipelas of the utmost virulence. It is also a remarkable evidence of the identity of the streptococcus of erysipelas with the ordinary streptococcus of suppuration.—*Beiträge zur klinischen Chirurgie*, Band XVIII, Heft 3.

BONES,—JOINTS,—ORTHOPÆDIC.

I. Gonorrhœal Inflammation of Joints, Tendon-Sheaths, and Bursæ. By DR. DIETRICH NASSE (Berlin). It has long been known that Neisser's gonococcus was to be found in joints; but little was known concerning the frequency of its presence, or regarding its importance in the causation or the course of the disease. The author has examined thirty acute cases in the past year, finding the gonococci by making cultures nineteen times. The diagnosis, however, is usually easily made, and does not ordinarily require a bacteriological examination.

As a rule, symptoms of metastases in the joints come rather late, but in a small proportion of cases they undoubtedly develop a few days after infection. The process seems not to depend on the extension of the infection to certain regions of the urethra, but rather on the extension to the deeper layers of the mucous membrane. The influence of traumatism in determining the localization of the process in a given joint seems quite evident. In men the joints of the lower extremity, and particularly the knee, are most frequently involved, while in women the wrist-joint is very often attacked. Any joint may become affected, and the localization possesses no characteristic diagnostic feature. Neither is the limitation of the process to one joint sufficiently constant to be of much aid in diagnosis.

The clinical manifestations of gonorrhœal arthritis are

varied and difficult to classify. Certain types may, however, be recognized according to the predominance of particular features. In one type, considerable pain in one or more joints is the most prominent symptom. In many cases the prominent feature is effusion into the joint, the capsule showing little or no swelling. In another and more serious type the periarticular tissues are distinctly involved, the effusion into the joint being usually inconsiderable or unrecognizable. Small quantities of pus or of fibrino-purulent deposits are frequently found, but a true purulent exudate is infrequent. In another fortunately small class of cases we may have all the characteristics of pyæmic joint suppuration which may break through the capsule, setting up a diffuse cellulitis, and resulting in death. The severity of the process in these cases probably does not depend on the gonococci, but on other pyogenic organisms. The disease may also begin as a subacute process, or may run its course from the onset as a chronic condition.

Gonorrhœal inflammation of the tendon-sheaths is by no means rare. It occurs either alone or accompanying gonorrhœal inflammation of neighboring joints. The constitutional symptoms are similar to those observed in the joint conditions, but are usually of a milder type. The tendon-sheaths of the extremities are most frequently affected.

The course and prognosis of gonorrhœal inflammation of the synovial bursæ differ little from those of the joints and tendon-sheaths, except that the condition is distinctly less severe. The mild cases of gonorrhœal inflammation usually only require rest and compression. If improvement does not soon become manifest, immobilization may be employed. The latter treatment is absolutely necessary for the severer forms with involvement of the periarticular tissues. In some cases of extreme distention the joint may be aspirated and washed out prior to the application of splints. Arthrotomy should be reserved for cases rebellious to ordinary treatment, and for the suppurative variety.

It is doubtful if any form of internal medication has an influence on the course of the disease.

The treatment of the urethral condition at any stage should be most conservative, and especially so during the florid period of the synovial inflammation.—*Sammlung klinischen Vorträge*, N. F., No. 181.

C. L. GIBSON (New York).

II. Rapid Reduction of Pott's Curvature of the Spine.

By PROFESSOR THOMAS JONNESCO (Bucharest). While the idea of the possibility of rapid reduction of spinal kyphosis is as old as Hippocrates, the actual carrying out of this idea seems to have been reserved for Dr. Chipault, who did it in 1893. Chipault endeavored (1) to substitute for the gradual reduction of the spinal deformity his method of correction, carried out at one sitting under chloroform. (2) To immobilize the vertebræ in their corrected position, not only by appropriate orthopædic apparatus, but by wiring the spinous processes of the neighboring vertebræ one to the other.

Chipault's procedures and results were published in 1895, and since then he has written several papers supporting the principles advocated by him.

Calot, in 1896, made an important communication to the Paris Academy of Medicine on the means of correcting Pott's curvature. His method consists in—

(1) Reduction, under chloroform, at one sitting, by the application of extension and counter-extension, and by sudden and strong manual pressure on the gibbosity.

(2) Resection of the spinous processes of the vertebræ, corresponding to the disease.

(3) Immobilization of the patient in a plaster jacket, enclosing both trunk and head.

Out of thirty-five cases Calot used this method thirty times. In only five cases did he omit resection of the spinous processes.

In two cases, where bony callus obstructed reduction, he practised cuneiform resection of the spine (bodies of vertebræ), and thus obtained permanent results. Six of his patients (cured) were shown to the academy.

In a later note Calot appears to have abandoned all preliminary resections, and now limits his procedures to manual force extension, completing the correction by the use of pressure to the kyphosis. This last method has been employed by a number of surgeons.

The author uses Calot's method, but subjects it to modifications.

(1) He never has had recourse to a preliminary cutting operation. From the first he believed resection of the spinous processes useless and dangerous, because it decreases the chances of consolidation after reduction.

(2) For manual extension by numerous assistants, which is clumsy, inconvenient, irregular, and inefficient, he uses pulleys. The steady application of force possible by pulleys renders it easy to obtain results with a much less maximum of traction than when the hands are used. Thus, while Calot has used up to 120 and 180 kilogrammes of traction, the author has never exceeded eighty kilogrammes (approximately 160 pounds Troy), and the average force used is about forty-five or fifty kilogrammes.

(3) In place of thick cotton padding the author merely uses the simple undershirt, recommended by Sayre, and thus gets a much more accurately fitting bandage.

Method of Operating.—A special table is desirable, which should be so low that the surgeon can apply direct pressure to the deformity without having to climb on a chair. Jonnesco's table consists of four rigid bars, forming a parallelogram, supported by four strong legs. On this are placed transversely two blocks of wood, padded on the top. One of these blocks is fixed near the end of the table, the other is movable, and can be clamped at any distance from its mate, according to the height of the patient.

The traction apparatus is composed (1) of a Sayre's occipito-mental sling of strong linen, attached to a cross-bar over the head, which in turn is connected to a strong hook in the wall by a strong cord. The hook must, of course, be opposite and on the same level as the patient's head. (2) A binder well padded with cotton is applied around the pelvis above the anterior superior spines of the ilium. To this are fastened two bandages (or towels), one over the sacrum, the other over the pubis. These bandages are tied to a cross-bar, which in turn is connected to a properly placed hook in the wall by a set of blocks and tackle, such as are used in applying a Sayre's jacket. Between the pulleys and the cross-bar there should be a dynamometer. Three assistants are necessary, one to apply traction, one to give the anæsthetic, and one to support the lumbar spine while pressure is being applied to the kyphosis. Besides these three, there must be some one to prepare the plaster bandages for application.

The Steps of the Operation.—(1) *Traction.* Rarely is more than forty-five or fifty kilogrammes necessary, though occasionally, in extensive and old cases, the author has used as much as eighty kilogrammes of force. Under this traction the gibbosity rapidly diminishes without entirely disappearing.

(2) *Direct Pressure on the Deformity.*—Traction being fixed at forty-five or fifty kilogrammes, the traction assistant leaves his apparatus and lifts the lower limbs to keep the pelvic bandages from slipping off. A second assistant supports the lumbar vertebræ, while the surgeon presses with his whole strength on the deformity. (During all this time the patient is lying face downward, with his chest and pelvis supported on the wooden blocks described as part of the operating table.) Under this direct pressure the deformity is rapidly corrected, while a characteristic feeling of crepitation is communicated to the surgeon's hands.

(3) *Application of Fixed Dressing.*—A plaster bandage is applied, taking in not merely the whole trunk but the pelvis and most of the head. As little padding should be used as is

possible. The occipito-mental sling of linen is covered by the permanent dressing and left in place.

By these methods the author has reduced the kyphosis of all the cases presenting in his clinic. The patients have varied in age from two and a half years to twenty-two years, and the duration of the deformity has been from six months to eight years. The extent of the deformities reduced has varied enormously.

The accidents met with have consisted of (a) one death from chloroform (Bruns also has had one recently); (b) one death after forty-eight hours,—cause unknown; (c) one death after eight days, from broncho-pneumonia (Civel reports a similar case); (d) one case of temporary paraplegia.

Anæsthetics should only be used during the reduction, not during the application of the fixed dressing.

Indications.—Undoubtedly recent, non-ankylosed cases promise the best results, but the author found that, in a patient twenty-two years of age, with an enormous well ankylosed deformity of eight years' duration, reduction was fairly easy, and that in spite of imperfect after-treatment the result was good though imperfect. He believes that the limitations of the operation cannot yet be fixed. The existence of paralysis does not contraindicate treatment, since in one case a fairly severe pre-operative paraplegia disappeared after the intervention.

Results.—In three patients from whom the first dressing was removed after three months the deformity was markedly lessened. In one of them the reduction appeared complete, in the other two there was still a marked tendency to a partial recurrence. In view of this result, in such a short time, the author feels sure that another dressing applied and retained for four months longer will give perfect results.

As a result of experience in thirteen cases Jonnesco comes to the following conclusions:

(1) Rapid reduction at one sitting is an excellent treatment for Pott's curvature.

(2) Direct pressure must be applied to the deformity, while extension and counter-extension are being used.

(3) Traction must be applied by means of pulleys.

(4) Traction ought to be applied to the head and pelvis, and not to the superior extremities, as advised by Jeannel.

(5) As a rule, forty-five to fifty kilogrammes of traction are all that should be used. In exceptional cases eighty kilogrammes may be required.

(6) Chloroform is dangerous, and ought only to be used during the operation, not while the dressings are being applied. In cases of recent deformity without ankylosis it may be possible to omit all anæsthetics.

(7) With the exception of the dangers of anæsthetics and broncho-pneumonia, the post-operative accidents are of but little importance.

(8) The method can be used in almost any case of kyphosis, but it gives the best results in recent cases in the young.

(9) All preliminary cutting operations are useless and dangerous.—*Proceedings of the Tenth International Congress of Medicine*, Moscow, August, 1897.

JOHN F. BINNIE (Kansas City).

REVIEWS OF BOOKS.

THE OPERATIONS OF SURGERY. By W. H. A. JACOBSON, M.CH., F.R.C.S.; Assistant Surgeon, Guy's Hospital. Third Edition, 398 illustrations. 8vo, pp. 1337. London: J. & A. Churchill, 1897.

The first edition of this book was reviewed somewhat at length in the ANNALS OF SURGERY for December, 1889. The favorable judgment which was pronounced upon it then has been confirmed by time and the opportunities for frequent reference to it which the years have afforded. The new edition, which is now before us, is thoroughly revised and much enlarged. One-third more pages have been added to the volume, but this does not measure fully the amount of new matter added, for by the omission of some entire sections, and the substitution of smaller type in many parts of the book, a much larger amount of matter has been crowded into the same space, this being due to the author's desire to keep his book down to dimensions that can be held within the covers of a single volume.

Every portion of the book shows evidences of careful revision, and may be accepted as presenting fairly the surgical status of the present moment. Particularly noticeable in the first part of the volume are the new sections on the surgery of tendons, of the brain, and that of intracranial neurectomy. Operations for the removal of adenoid growths of the naso-pharynx are described for the first time, but hardly illustrated with that amount of detail which the frequency and importance of the affection would seem to require. Coming to the surgery of the larynx, it seems to us that intubation of the larynx as a substi-

tute for tracheotomy in membranous laryngitis is too briefly and inadequately described, while it is not given any illustrative cuts. The author says that he is unable to recommend it, but his experience seems to be limited to only three cases, attempted soon after the first paper by Macewen in 1880. In the United States of America, after the perfection of the procedure by O'Dwyer, it rapidly came into favor, and since the addition of antitoxin injections to therapeutic resource in diphtheria, it has almost entirely superseded tracheotomy, while the results of the combined treatment have shown a vast improvement over any ever obtained by any methods previously in vogue.

The chapter on removal of the breast is entirely rewritten. Prominence is given to the views and practice of Halsted, whose method is described in detail. The author himself advocates clearing out the axilla in all cases, but resorts to the removal of the whole thickness of the great pectoral muscle only when enlarged glands can be felt between it and the minor muscle, or high up in the apex of the axilla. In this the author is hardly consistent with the logical inferences to be drawn from his statements (unquestionably correct) in other paragraphs as to the pathology of the diffusion of the disease, upon which depend the indications for the removal *en masse* of every atom of diseased tissue, since long before any gross evidence of the presence of the disease is discernible along the paths of the absorbents, the possibility of its existence is admitted, and in any individual case is probable, so that those surgeons who at once remove the muscle as a probably infected organ are alone consistent, and will undoubtedly secure the largest proportion of permanently successful results. We predict that in future editions Mr. Jacobson will take this ground.

The pericardium is the subject of a new chapter describing the operation of tapping. In the section devoted to ligation of the internal iliac arteries, the experience of Bier and of Meyer in the ligation of the arteries for the purpose of producing atrophy of the prostate gland is not overlooked.

In the pages devoted to hernia notable additions occur. The discussion of operations for the radical cure of hernia is entirely rewritten, and the results of work to date are fully given. In detail are described the methods in dealing with inguinal hernia of Macewen, Ball, Banks, Barker, Bennett, Bishop, Kocher, McBurney, Halsted, and Bassini. Preference is given to the method of Macewen, and the view expressed that the methods of Halsted and of Bassini are needlessly complicated, an opinion in which the reviewer does not share. All description of the formerly practised subcutaneous methods, and of astringent injections, is properly wholly omitted. In the chapters devoted to abdominal surgery naturally the greatest additions occur, and the most discriminating judgment is everywhere shown in the selection out of the mass of propositions and attempts of the past ten years of that which is of permanent value. Operations upon the appendix vermiformis received no mention in the first edition; in the present edition they are discussed at length, and the work and views of American surgeons especially are fully presented. The allied subjects of perforating gastric and duodenal ulcers, and of typhoid ulcers, and of general peritonitis, as regards their operative treatment, are for the first time described.

Similarly in all parts of the book changes and additions are noticeable. In no book which has come under our notice has the work of the surgeons of America been so fully considered and adequately presented, and for this reason this book of Mr. Jacobson is likely to receive most favorable consideration on this side of the Atlantic. The book as a whole is remarkable for its full and concise descriptions and its judicial discussions.

LEWIS S. PILCHER.

APPENDICITIS AND ITS SURGICAL TREATMENT. By HERMAN MYNTER, M.D. Philadelphia: J. B. Lippincott Company, 1897.

This is a most practical and judicious discussion of the subject of appendicitis. The author has searched the literature, and

presents in this volume the views and conclusions of those who have worked and written upon this subject. The book gives one the impression of a seeking for truth for truth's sake. It displays the true scientific spirit of unprejudiced inquiry. In addition to the general literature of the subject, the author gives his own views and experiences, with a report of seventy-five operated cases. He says, "The profession is anxiously awaiting reliable statistics regarding the proportion of recoveries from genuine attacks without operation; the number of such cases who have second attacks; the proportionate fatality of such recurrences as compared with primary outbreaks; the relative advantages of immediate operation and of delay in cases seen some days after the primary seizure, and which show signs of the formation of a localized abscess; the existence and non-existence of 'stercoral typhlitis' and of the 'simple catarrhal' or 'mechanical' forms of appendicitis," and the author has succeeded in adding to our knowledge of these things.

Chapters are given to history, anatomy, histology, function, etiology, pathology, classification, symptomatology, complications, and sequels, diagnosis, prognosis, medical treatment, surgical treatment, statistics, and the report of cases. The author says, "I have never yet regretted having operated too early, and I have operated in every case as soon as the diagnosis was clear; but I have often deplored being called in too late, when the patient already had diffuse peritonitis;" and, further, he observes, "I consider every acute case with the cardinal symptoms, severe pain, vomiting, rigidity, and rising temperature and pulse, particularly if it shows no inclination to recede in twenty-four hours, as ripe for operation." He defers operation if the symptoms begin to abate. We take a very decided exception to the statement that "as much depends upon the after-treatment as upon the operation itself." In appendicitis, of all diseases, this is wrong. At the end of a surgically complete operation, in our judgment, the fate of the patient is pretty generally decided, and

the after-treatment influences the case but little one way or the other.

Half of the volume is devoted to the report of the author's operated cases. This is a most instructive series of histories related with considerable detail. The results secured speak most favorably for operative interference.

The work is evidently the product of a practical, conscientious surgeon; and is a valuable and timely contribution to the literature of a subject which even yet presents many unsettled questions.

JAMES P. WARBASSE.

THE PRACTICE OF SURGERY. A Treatise on Surgery for the use of Practitioners and Students. By HENRY R. WHARTON, M.D., and B. FARQUHAR CURTIS, M.D. Philadelphia: J. B. Lippincott Company, 1897.

As we study the general plan of this work we like it. The first 260 pages are devoted to the Principles of Surgery, and are exceedingly satisfactory. They are terse, clear, accurate, comprehensive, and well illustrated. We know of no other work in which the general outlines of surgical science are presented so thoroughly, with every recent acquisition considered in so small a space.

The chapter on Amputations is a concise treatise, the descriptions of different procedures being well worded. The illustrations are rather antiquated compared with the majority of scientific illustrations of this and other modern works, although the artistic quality is all that is lacking.

Regarding the chapter on Diseases of the Skin the authors are guilty of too great brevity. A generally accepted classification and clear exposition of the tubercular lesions of the skin would here be in place, but the subject is hurriedly disposed of in a single page under the caption "Lupus Vulgaris." Syphilitic skin lesions, particularly the tertiary ones, although mentioned

in a separate chapter, might well have been considered here with tubercular lesions. Purpura receives no attention. It seems to us that the student or practitioner of surgery ought to have more information on skin-diseases, from such a work, than is here given. Similarly incomplete are the pages on the surgery of the Lymphatics. On the other hand, the chapters treating of Surgery of Blood-Vessels deserve the heartiest commendation and praise. The subject is thoroughly and acceptably classified, and although the treatise is complete it includes no wasted word. The nerves and muscles are dealt with superficially.

One hundred and twenty-six pages are devoted to the Injuries and Diseases of Bones, an elegant section of the work. The definitions and descriptions are clear, and the opinions and recommendations are excellently balanced decisions upon the discussions of the day on bone surgery. Nor can less be justly said of the chapters on the Surgery of the Joints.

The most important operations upon bones and joints are acceptably presented, and the "Orthopædic Surgery" is a morsel adapted to the unspecialized digestion of the student or general practitioner.

There are 530 pages treating of Regional Surgery. In general this important section of the work merits enthusiastic praise for its thoroughness and its lucidity. The least common of surgical diseases are not omitted, the authors seeming to believe that rarity imposes the necessity of greater watchfulness, and does not warrant deliberate banishment from consideration. On the other hand, the opposite extreme has been as carefully avoided, and the rarer maladies are handled with commendable brevity. The weakest spot in the work is the brief chapter on the Thyroid Gland. Here the pathology is bad,—that is, it is anything but a true reflection of the tenets of leading authorities, and the classifications are loose and unsatisfactory. Moreover, the assurance with which the writers present exophthalmic goitre as a surgical disease and the unqualified summary of statistics,

which would be perfectly in order in the pages of a special surgical journal, are unsafe here. For the unripe, credulous student-mind will accept these views absolutely, whereas the surgeon must question them for a long time yet.

As a summary to our impressions of this work we should say that for the use of students it is superior. It is more complete, with a less number of useless lines than any work with which we are familiar. It is classified with great care and precision, and this feature is enhanced by heavy-typed titles of paragraphs. The illustrations are instructive and numerous.

Finally, we venture the opinion that these scholarly surgeons, the authors, can never serve the profession and public more acceptably than they have in the production of this volume.

CHARLES H. GOODRICH.

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