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A SERIES

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OF

AMERICAN CLINICAL LECTURES

EDITED BY

E. C. SEGUIN, M.D.

Volume I. No. I.

ON DISEASE OF THE HIP-JOINT.

BY

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NEW YORK:
G. P. PUTNAM'S SONS,
FOURTH AVE. AND 23D ST.

1875.

ON
HIP-JOINT DISEASE.

BY
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GENTLEMEN :—Among the numerous cases present at our clinic to-day, we find three of Hip Disease, and, strange to say, they are typical representations of this disease in each of its three different stages. We shall, therefore, avail ourselves of this opportunity to make some extended remarks upon the subject.

Hip Disease, or *Morbus Coxarius*, as it is ordinarily called, is more frequently observed in childhood than at any other period of life, although I have frequently seen it in the adult. The causes of the disease, judging from my own personal experience, are at most always traumatic. It generally results from an injury, blow, fall, wrench, strain, over-exertion, jump, violent exercise, and sudden checking of the perspiration, or some other violence done to the part, and may occur in any child in the world. In fact, from careful observation of some hundreds of cases, I have found it more frequently in the active, robust, healthy child, than in the dull and sickly one, for the reason that these children are more reckless, wild, and romping, and therefore run more risk of injury than the feeble, sickly child. I know, gentlemen, that this is not the doctrine that you find in any of your text-books, and is, at the present

* Delivered in Bellevue Hospital Medical College, December 23, 1874.
Phonographically reported by W. S. George.

time, not generally believed by the mass of the profession. I was taught, and all your standard works and text-books teach you, that it is a disease essentially of a strumous origin, dependent entirely upon a tuberculous or scrofulous constitution. One of the most distinguished writers on Surgery states distinctly, "No struma, no hip disease."

I do not pretend to assert, as some have stated, that a strumous constitution is a prevention of hip disease, but, on the contrary, a delicate constitution, or a child with a strumous diathesis, would be much more likely to have the disease developed, from the same exciting cause, than would the healthy vigorous child. One of these children will be just as likely (or more, perhaps) to be injured by falling from a window, or an apple-tree, or in a railroad collision, as the healthy child; but these sickly, delicate, strumous children do not climb apple-trees, jump over stone walls, or indulge in any of the dangerous sports of the healthy child, and, consequently, are not so liable to these accidents.

The disease may occur in early infancy, through the carelessness of the nurse allowing the child to fall from her arms or roll from the crib, or in various ways to injure itself. Ordinarily, at this period of life, the disease is not developed, from the fact that the mass of children are tenderly cared for and these accidents avoided; but, from two to ten years of age, when they are large enough to run about and exercise without being under the control of a more prudent person, and before they have arrived at an age of sufficiently mature judgment to guard themselves, is the period of its most frequent occurrence—during the age of recklessness.

The injuries that produce this disease are frequently so slight as, at the time, to pass unheeded by the thoughtless child. As soon as the momentary pain caused by the accident has faded away, the child resumes his games and romps, and neglects to call attention to the slight fall, or wrench, or strain, or bruise which he has received, not being old enough to comprehend its importance.

Later in life, these trivial injuries attract attention and are immediately cared for, which is the reason, I presume, that the disease is not more frequently found in adult life.

The pathological changes that these causes produce are either *Synovitis*, from a rapid and excessive change in temperature; or violent wrenches or strains, tearing from its attachments the ligamentum teres, thereby inducing necrosis of the head of the femur from rupture of the blood-vessel which supplies it; or concussions, falls, jumps, blows, will produce an extravasation of blood in the articular lamella, which sets up an inflammation, the cartilages soon die on account of their low vitality, become eroded and necrotic, interstitial absorption of the bones takes place, due to the constant pressure from muscular contraction, and, finally, exfoliation. But, no matter what the cause, or which of the tissues originally involved, they all, sooner or later, become commingled and included in the general destruction. I don't believe the disease ever commences in the cartilage, as it is entirely without blood-vessels and nerves, and lives simply by imbibition.

For convenience of description, we will divide the disease into three distinct stages, as each represents a different pathological condition of the parts involved, and as the symptoms also vary to a greater or less degree:—

1. The stage of irritation.
2. The stage of effusion.
3. The stage of rupture of the capsule, or perforation of the acetabulum.

In the first stage, or stage of irritation, as it may be called, before effusion has occurred within the joint, the symptoms are not well pronounced, and it often requires a very careful investigation in order to diagnosticate the disease. Generally, the first thing noticed is that the child appears very slightly lame when he first gets out of bed in the morning, or when first he moves about after some hours of rest. This limping or halting gait is so slight as hardly to be

observed, and, after a few minutes of exercise, seems to disappear altogether until the following day, or after a few hours of quiet. He may sometimes complain of pain, but it is usually referred to the knee. But, even in this early stage, if the child be stripped and examined carefully, the disease may be detected.

By stripping the child naked and standing him before you, either on the floor or table, and with his back towards you, the first thing noticed will be that the child bears his entire weight upon one of his limbs, the other being slightly bent at the knee and hip, with its natis lower and more flattened than on the opposite side, and the gluteo-femoral crease is less distinct and nearly obliterated at its outer angle, and is lower than the other. If you now let the child walk around the room, he may not limp sufficiently to attract your attention in this early stage of the disease. But when you bring him back to the position as first described, and let him stand a moment or two, you will find that he invariably resumes the position of sustaining his whole weight upon the sound limb.

You now lay him on his back upon a table, floor, or some solid plane, covered with only a blanket, in such a manner that his entire spine will be brought upon the plane, while a line is drawn from the centre of the sternum over the umbilicus to the centre of the pubis is crossed at right angles by a line drawn from one anterior superior spinous process of the ilium to the other. This can be done by placing your arm under the knees and lifting the thighs until the spinous processes of the vertebræ have touched the solid plane upon which the child is lying. When this is done, and the two lines above mentioned are at right angles, the spinal column is slightly straighter than normal, but it and the pelvis are at right angles to each other, and, if no disease exists within the hip-joint, the limbs can be brought down upon the table so that the popliteal space can be made to touch the plane without disturbing the relation of the lines above described, or lifting the spinous processes from the plane. If you, therefore, hold the

suspected limb in your hand in such manner as to keep the spinous processes on the table while the other lines are at a right angle, you will observe that the well limb can be pressed down to the table so that the popliteal space will touch. The diseased limb can be pressed down nearly to this position ; but before the popliteal space touches the plane, you will notice that the pelvis becomes tilted, making a curve in the lumbar vertebræ, so that the hand can be passed between the child's back and the table.

In flexing the limbs, the well one can be completely flexed, so that the knee will touch the thorax. The diseased one cannot be flexed to this extent ; and before the knee will touch the thorax, the pelvis becomes lifted. Abduction and external rotation may, possibly, at this period, be carried nearly to their normal extent, without much pain. Adduction and internal rotation are much more limited. Compression of the head of the femur into the acetabulum by concussion at the knee, or pressure over the trochanter major, will give pain, providing the pressure is made so that the entire head of the femur shall sweep around all parts of the acetabulum, the pain being made manifest the moment the parts come in contact where the disease exists. Extension—very slight extension—in the proper direction gives instant relief. On measuring the thighs, even in this early stage of the disease, atrophy of a $\frac{1}{16}$, $\frac{1}{8}$, or $\frac{1}{4}$ of an inch will be found to have occurred.

If the disease be detected in this early stage and properly treated, I am satisfied, from extensive experience, that the great majority of cases will entirely recover, with perfect motion and without deformity. This fact alone, gentlemen, which I know to be a fact from personal observation, is, of itself, a sufficient contradiction to the ideas formerly expressed, that the disease was of constitutional origin, and only ended in death, or if in recovery, with more or less deformity and imperfect motion, or ankylosis. If the disease be not detected at this stage and properly treated, it progresses until effusion takes place within the joint, and, in order to accommodate

this increasing effusion, the limb becomes more flexed, abducted, and everted, or rotated outward, to unfold, so to speak, the capsular ligament, thereby enabling it to accommodate itself to the increased amount of fluid within it.

This is the second stage of the disease. The adductor muscles become very rigid and contracted under the influence of reflex irritation ; constant efforts are made to draw the thigh inward, which are unavailing, as it is impossible for the limb to yield to their tractile force, owing to the effusion within the capsule compelling it to assume the position above described.

This stage of the disease is attended by the most acute and agonizing pain, the slightest attempt at motion, concussion, or compression causing the most distressing torture ; even the jarring of the bed, stamping upon the floor, the slamming of a door, or anything that causes the least movement of the bed upon which the little sufferer is lying, may be followed by an increase of pain. At this period of the disease the attendants are frequently awakened at night with a sharp, shrill, agonizing shriek. The mother runs to the child—and probably finds it asleep ; she will have scarcely reached her room before the same thing again occurs, and this will frequently happen during a single night. The inflammation of the joint produces reflex contractions ; the muscles are all on guard to prevent the joint from having the slightest motion. This incessant, constant, unremitting contraction of the muscles preys upon the child, producing exhaustion, until finally, through sheer fatigue, he may drop off into a moment's slumber, when, the muscles being relaxed, the limb falls down, motion is made in the joint, which causes such instantaneous pain that the muscles at once give a spasmodic contraction followed by the piercing scream to which I have just alluded.

Of course, at this period of the disease it can hardly be mistaken ; but upon stripping the child, and examining as I have directed that he should be examined in the first stage, he will be found to

present, both in the erect posture and prostrate position, precisely the same appearances as in the first stage, only in a more marked degree, the chief differences being that the limb will be more flexed, abducted, and *everted*, and the joint more fixed; in fact, any attempt to move the limb in this stage of the disease is futile, the entire pelvis rolling upon the opposite acetabulum as if the diseased hip were ankylosed; and yet this ankylosis is but apparent, being wholly due to muscular rigidity.

If the disease be not arrested at this stage, it goes on to ulceration of the capsule, and effusion of its contents into the cellular tissue about the thigh, or else perforation of the acetabulum, and escape of the fluid into the pelvic cavity, pressing off the internal periosteum before it.

This is the third stage of the disease; and immediately the capsule is ruptured, and the contents escape, the limb assumes an entirely different position. It becomes *adducted, inverted*, straight at the knee, the pelvis on the diseased side becomes raised (whereas before, in the other two stages, it was lower), and the limb is shorter. The gluteo-femoral crease is higher than upon the opposite side.

If the rupture through the capsule is very large, so that the escape of its contents occurs rapidly, this change of form from that of the second to that of the third stage may take place in a single night. If the opening be small and fissure-like, and the contents ooze out slowly, it will require a longer period for the deformity to assume the position which it does in the third stage. In some cases, even when the capsule has ruptured or the acetabulum has been perforated, the limb will remain in the position of the second stage, owing to adhesions which may have occurred, or to the head of the bone being locked in the opening through the acetabulum. The pain, at this rupture of the joint, is very greatly relieved. It has been thought by many authors that at this period the limb was absolutely luxated from the acetabulum. The sudden change in

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the distortion from flexion, abduction, and eversion, with elongation, to shortening, inversion, and adduction, has caused this belief; but of the fifty-two cases I have examined I have never seen luxation upon the dorsum of the ilium in hip disease except in one instance. The absorption of the head and neck of the femur, produced by constant pressure, diminishes its size; the acetabulum, being also pressed upon, has been eroded and absorbed. But while this interstitial absorption has been going on within the acetabulum, periostitis has been going on upon its upper and outer borders, throwing out new osteophytes, and the capsular ligament has been creeping up, increasing immensely the size of the joint, but still retaining within its embrace what is left of the head and neck of the femur. It therefore might be called a displacement of the acetabulum; but so long as the capsule surrounds the head and neck, it ought not to be called a dislocation. (As long as the head is within its capsule it cannot be called luxated.)

The pus or other fluid having now escaped from the capsule, the patient is greatly relieved, but the disease still progresses. Constant muscular contraction promotes interstitial absorption of the head and neck and the acetabulum, and the pus which has escaped into the cellular tissue burrows in different directions, forming abscesses, which open at various points, according to the position in which the child has been placed, and finally makes its way to the outer world, sometimes opening behind the trochanter, sometimes a long distance down the thigh upon the outer side, frequently upon its inner side; and even, as I have seen, if the acetabulum has been perforated, making its way between the internal periosteum, and forming an opening above the pubis; so that the third stage may be accompanied with external fistulous openings, and very great exhaustion from extensive suppuration.

Gentlemen, we now have here three cases typical of the three

different stages of the disease I have endeavored to describe to you. We will first observe them walk. You will notice this little child, six years of age, whose trouble dates from a fall down six steps some eight months ago. The fall was followed by a slight limp some few days afterwards, which has continued at intervals from that time to the present. He has complained of but little pain, and that always has been in his knee. He has been to numerous institutions, and has had various opinions expressed in regard to his case; some terming it rheumatism, others growing pains, and again others disease of the knee-joint, for which he has had iodine painted upon it as you see; and it was not until a few days ago that he was suspected to have disease of the hip.* You see he walks around the room with scarcely a perceptible limp; he stoops to pick things from the floor, bending his hip tolerably well.

The second boy which we here show you, ten years of age, fell from a horseblock four months since, striking upon his trochanter major, and the injury was followed almost immediately by a slight lameness. A few days' rest, and he seemed to be so much better that no further attention was paid to it. After some weeks he began to complain of his knee, became slightly more and more stiff in his hip, but did not complain sufficiently of his hip to attract attention to it, until he was brought to me two days ago in the condition you now see him. You observe that he cannot walk at all, but glides around the room upon one foot, first upon his heel, then upon his toe. You see how carefully he preserves his right limb from the slightest degree of motion. You will notice, when he stands, the limb is bent at the knee and hip much more than in the other case, and is apparently longer, and is extended in front of its fellow, and strongly abducted and everted. When

* A few days before Dr. Sayre saw this case, he was brought to the Clinic for Diseases of the Nervous System, at the College of Physicians and Surgeons, to have a "neuralgia" of the outer part of the thigh investigated, when I made the diagnosis of morbus coxarius. [E. C. SEGUIN.]

he attempts to stoop to pick up anything from the floor, you will observe that he does not bend that leg at all, but sticks it straight out behind him, to prevent motion at the hip-joint.

We now observe this other case, a little girl on crutches. She is about five years old, and fell off the stoop nearly a year and a half ago, but did not complain for some weeks after the fall, when the disease slowly developed, and has gone through its various stages, until it has reached its present condition. She is brought here to-day for the first time, and you see her condition. She is unable to walk except upon crutches, unless she glides along first upon the heel, then upon the toe, as in the second case. Her leg is shortened, and the foot, you observe, hangs over the instep of the opposite side. There has been no mechanical treatment of this case to prevent the deformity which you now observe.

We will now strip these children, and stand them together upon the table before you, that you may see the characteristic deformities of the disease in its different stages. We now turn the table, so their backs will all be towards you. It is a singular coincidence, gentlemen, that in each of these cases the disease is on the right side. This little fellow in the first stage, you will notice, stands firmly upon his left limb; and his right one, as you see, is very slightly flexed at the knee and pelvis, so as to receive no weight. The gluteo-femoral crease is lower than upon the opposite side, and his natis slightly flattened. His limb is very slightly abducted; but you observe that his feet are parallel—foot not everted. Now, look at the second little fellow; you notice how much more his knee is bent, as well as his hip, and his limb stands forward from the other, apparently too long; and you see his limb is much more abducted, and his foot *everted*, a positive evidence of effusion within the joint. His natis is more flattened, and the gluteo-femoral crease entirely obliterated. We will now pass to the third case. You see she requires her crutches to sustain herself. But her limb hangs against, and even over, the opposite

one. When she stands erect, the pelvis on that side is elevated, and the natis rounded out. The gluteo-femoral crease is higher upon that than upon her well limb, and the leg is some two or three inches shorter than the other.

We now lay these children upon their backs, and commence with the first. You will observe as he lies upon the table, placing my hand under his knees, I get the line from the sternum to the pubis at a right angle to a line from one ilium to the other, and while the spinous processes still lie in contact with the table, I drop his left limb and make the popliteal space touch the table without any change in his spinous processes, or in the relation of the lines I have described. When I drop his right leg you will observe I go nearly to the table before altering those relations; but when I press his popliteal space down to the table his pelvis moves, and my hand can pass between his back and the table. I flex his left leg until the knee touches the thorax. The right one flexes to more than a right angle, when, you observe, continuing the flexion, his pelvis becomes lifted. Pressing his limb directly upwards in this instance seems to give him no pain. When I abduct and rotate his limb outward, and then press the limb upward, I produce pain, showing the necessity of careful exploration of the entire acetabulum.

We will now place a mattress upon the table and make the same examinations. You observe I bring his legs parallel with each other, perfectly extended, to all appearances, making the popliteal spaces touch the bed without, apparently, tilting the pelvis, the deformity being so slight that the spring of the mattress obscures it; and an examination upon a soft substance like this would, therefore, deceive you, particularly as in this case pressure upon the leg at the knee directly upward gives him no pain, the disease in this instance being in the inner part of the acetabulum. You can see how easily you could be deceived in this particular case, and that, probably, is the reason why he has passed through the hands of

so many skillful men in the city without the disease being detected.

We now take the second child and lay him on the table, getting our lines as before described; and you observe, to obtain them, we are compelled to abduct, evert, and strongly flex his thigh. The least attempt at motion, in his case, is followed by intense pain and spasm of all the muscles, his joint, apparently, being as completely fixed by contraction as if there were genuine bony ankylosis; any attempt at motion, as you observe, tilts his pelvis so much that even on the mattress it can be noticed and his disease diagnosed.

We now place this third case upon the table, and, to obtain my lines as before described, I am compelled to hold the diseased limb, not so flexed as in the second child's, but strongly adducted beyond the median line; in fact, as you perceive, a plummet dropped from the knee falls outside the lower extremity of the femur upon the opposite side. I can bring that limb parallel with the other, but the instant I do it her pelvis becomes tilted and the deformity takes place in the sacro-lumbar region. Many persons deceive themselves in this stage of the disease, thinking they have performed miraculous cures, correcting the deformity by mechanical appliances, when they simply have made the limbs parallel at the expense of a compensating curve in the lumbar region, no movement whatever having taken place within the joint. I caution you, gentlemen, against deceiving yourselves in this manner. Remembering always the lines I have laid down for your guidance, which must be as I have described them, that the pelvis and trunk may be in their proper relations to each other, then, the position the limb assumes, while retaining these lines in their true relation to each other, gives the exact deformity, and indicates the extent to which the disease has progressed. You will, then, and only then, have the real deformity which exists at the hip-joint. If these lines are not retained in the position which I

have described, any change which takes place in the position of the limb will be followed by numerous curves in different parts of the body as compensating deformities.

We now come to the treatment of this disease, which, of course, varies according to the stage in which we find it, and the reason why I have dwelt so particularly upon the diagnosis of the disease in its earlier stages is because, as I have before stated, by proper treatment at this time, in the great majority of cases, it will be followed by good results.

In the *first stage* of the disease, if the symptoms of inflammation be very acute, pain and tenderness very great, rest, absolute and perfect rest of the joint, is most essentially requisite. In the hearty, robust patient in vigorous health, leeches, cups, or other local depletion may be necessary; ice-bags surrounding the joint often afford the greatest possible relief, while in other instances hot fomentation, the exact opposite, will give the greatest ease. There is no rule with which I am acquainted that will guide you in the application of heat and cold excepting by practically testing, and the one which you find affords the greatest relief, and is the most agreeable to the patient, is the one to employ. In addition to these local applications, extension should be made by means of a weight and pulley secured to the limb by adhesive strips and a roller. The adhesive strips should always extend above the knee to avoid traction upon this articulation. The pulley should be attached in some manner to the bed, the foot of which is elevated ten or twelve inches, to make the body a counter-extending force. If the bowels be constipated, cathartics, as a matter of course, are indicated.

This plan is to be pursued until the more acute symptoms have subsided; but as it is a disease chronic in its nature, long confinement in a bed is injurious to the general health, and we must, therefore, contrive some mechanical appliance which will give extension and counter-extension, at the same time admitting

motion of the joint while it permits the patient to take exercise in the open air.

In some cases, where the disease is very acute and the children very small, this is best effected by placing them in a wire cuirass; a modification of Bonnet's *grand appareil* will be found very useful. When this instrument is employed, it is necessary that the child should be taken from it very frequently, and have all the joints carefully moved, otherwise too long continued rest of the joints may end in ankylosis. In moving the diseased joint, care must also be taken to hold the pelvis, and to make slight extension upon the diseased limb when motion is given to the joint. Perfect rest, long continued, even of the diseased joint, is decidedly injurious, as there is danger of it resulting in ankylosis; hence the objection to plaster-paris or any other fixed apparatus in the treatment of this disease. The disease is essentially within the joint, the capsular ligament not being involved; hence, all that is requisite is extension and counter-extension to prevent the diseased surfaces from being in contact, while at the same time motion is given to keep the parts uninvolved in a healthy condition.

If the child is large enough to run around, with the thigh sufficiently long to give attachment to adhesive plasters, the short splint which I have used for so many years is altogether the best to employ, as it admits of flexion of the knee, and is, therefore, more comfortable to the child in the sitting posture. If they are ten or twelve years of age, and are too heavy to bear the weight of the body upon the instrument without breaking it, or there is too much tension upon the skin by the adhesive plasters, crutches will be necessary when the short instrument is used. If, however, the child's thigh is too short, and he is too small to receive a sufficient amount of extension by the use of the short splint, then the long splint, which I here show you, is much preferable, and, with it applied, the patient is able to take exercise without the use of crutches.

Before applying the short splint, which we shall use in this first case, it may be as well to describe it. It consists, as you see, of a curved cross-bar, surmounting the crest of the ilium, well padded on its inner surface, and to its two extremities is fastened a perineal band for counter-extension ; on its outer surface a ball-and-socket joint, from which runs an iron rod or bar down the outer side of the thigh to within about two inches of the lower end of the femur. This outer bar is divided into two sections, one running within the other, and gauged or controlled by a ratchet and key, which can make it longer or shorter. At the lower extremity of this outer bar is a projecting branch going around to the inner surface of the thigh to receive the attachments of the plaster, hereafter to be described. Both of the lower extremities terminate, as you observe, in a cylindrical roller, over which the tags of the plasters are attached to the two buckles placed at the lower ends of the instrument.

In applying the instrument, it is first necessary to have the adhesive straps to which it is to be fastened properly secured, and this is done as follows. When using the short splint, night-extension is necessary, which is effected by means of weight and pulley : for this purpose a strip of adhesive plaster, to the lower end of which a stout piece of webbing is sewed, is placed on either side of the leg, extending from the malleoli to *above* the knee, in order to avoid traction on the lateral ligaments of the knee-joint ; this is secured by a well-adjusted roller, leaving the pieces of webbing projecting for the attachment of the extending force. Next, for the application of the instrument, a triangular piece of plaster, in which are cut several slits converging toward the apex of the piece, is placed on both the outer and inner side of the thigh, first measuring with the instrument so that the tags which have been sewed to the apices of the plasters will exactly conform to the places of attachment upon its lower extremities. Having secured these with a roller, using care at the upper part of the thigh to reverse

each alternate strip of the plasters in carrying round the roller, and with another turn taking in the other strips—braiding them in, basket-shaped—run the roller down the thigh again and sew.

In applying the instrument, first buckle on the straps at the lower extremity of the femur. Then pass the strap under the femur to the buckle at the outer side of the instrument for the purpose of keeping it in place. We now pass the perineal band around the perineum, and buckle it snugly, but not too tight. We next insert the key into the ratchet and make gradual extension, until the patient is made perfectly easy, and until compression can be made upon the femur against the acetabulum without pain.

If the disease has arrived at the *second stage* before we see it, and the effusion is very great, which will be indicated by the abduction, flexion, and eversion of the limb—sometimes even fluctuation can be detected—the patient must be kept in bed and the extension applied to the limb exactly in the line of the distortion, which will be in the line of flexion and abduction. This line of extension is to be changed day by day, by slight degrees, until the limb is brought as nearly as possible to the straight position. Blisters applied occasionally over the joint may hasten the absorption of this effusion. Firm strapping with adhesive plaster around the joint and compression with a sponge and roller may also be applied for the purpose of aiding absorption; of course, extension being used before this compression is employed. It is barely possible that the effusion may be so great as to paralyze the absorbents, and no treatment will decrease the effusion. Under such circumstances aspiration of the joint is not only advisable, but the proper treatment, and will be immediately followed by a restoration of the joint to its natural position, as you all saw in the case operated upon before you last Wednesday.

When the limb has been brought to nearly its normal position, then the treatment by the short or long splint, according to circumstances, is the same as in the first stage of the disease, the

plasters being re-adjusted as often as necessary. Good adhesive plaster (Maw's, of London, I have found to be the best), properly applied, will frequently remain in position from two to four months, seldom requiring removal oftener than once in six weeks to two months.

If the disease has gone to the *third stage*, capsule ruptured, abscesses formed and not yet opened, it is necessary to puncture these abscesses at various points where they are nearest the surface to prevent the pus from burrowing. The limb then being adducted, the extension, as a matter of course, must be exactly in the opposite direction from what it would be in the second stage of the disease, and the limb gradually abducted until it is brought parallel with the other, when the splint, either long or short, is requisite, to be modified by the *abducting screw*, which I have been in the habit of using for many years with great advantage. In numerous instances, even when the disease has progressed to this stage, by the use of the splint the patient is enabled to improve the general health by out-door exercise, which frequently results in perfect recovery, and in some cases with a moderate degree of motion. The majority of the cases, however, that have arrived at this point before proper treatment has been adopted, are apt to recover with more or less complete ankylosis; in fact, ankylosis should be considered in this stage of the disease a very favorable termination.

In this third case we will apply the long splint, which differs from the short one described above in the following particulars:—

In the first place, it extends the entire length of the limb, receiving the weight of the body at a cross-bar under the foot, and two perineal straps and an iron girdle very nearly encircle the pelvis. In this case, where the adduction is so great and the joint so fixed, it will be necessary also to apply the abducting screw, and in some cases, where the inversion is very great, a screw for the rotation of the foot outward is also necessary, as in the instrument

I now show you. In this particular case we will apply the splint with the abducting screw added. The long bar, reaching from the pelvis to the bottom of the foot, is hollow, and has another bar running inside of it furnished with a ratchet and key, by which we make ext^ension, and which is locked in the same way as the short splint. The cross-bar at the bottom of the instrument (similar to Taylor's) is covered with leather to keep from making a noise on the pavement while walking, and a strong leather strap is passed beneath two iron rods above this latter for the purpose of buckling on the adhesive strap upon the leg to make extension.

In applying it you take two strips of strong moleskin adhesive plaster from two to four inches in width, according to the size of the patient, and the entire length of the limb, the upper extremity of the plaster being divided into strips for two or three inches. Strong webbing, an inch or two in length, with buckles, is sewed fast to the lower extremities of the plasters. These plasters are then placed on either side of the leg in such manner as to leave the buckles a little above the ankle-joint, and secured by a snugly-adjusted roller, so applied as to leave the tags with buckles attached hanging loose, the roller being carried up over the knee, and as far up the thigh as can be done with convenience, when the upper split ends of the plasters are reversed and braided in with the roller as it turns down the thigh, securing it smoothly. The stocking is then pulled up on the foot, holes having been cut on either side for the buckles to pass through, and the shoe applied with holes cut through it in the same way.

The instrument is now placed on the outer side of the leg, and the cross-bar at the bottom brought in front of the heel of the shoe, and securely buckled to the tags above described. The pelvis-belt is next brought around the hips, and secured by the buckle upon the opposite side, and the perineal bands attached as firmly as need be. The knee-pad band is then slipped up or down until it is made to rest opposite the knee, where it is passed round the leg

and buckled fast. Extension is now made by the key upon the ratchet until free compression is borne without pain. The abducting screw is then to be used, and daily increased, for the purpose of abducting the limb.

If the limb be strongly flexed, an additional power is applied at the posterior part of the instrument at the knee, running up the back of the thigh, and secured to the posterior portion of the pelvis-belt, and made tighter as occasion may require for the purpose of extending the limb. This latter strap should be elastic, for the purpose of keeping up a constant tractile force, and at the same time allow of flexion when the patient wishes to sit down. A fixed or leather strap, as used by Taylor, prevents any motion whatever at the hip, and simply anchyloses the joint.

By this means many cases that have gone to the third stage of the disease may in the course of time recover without exsection, as you have seen, with tolerably good form and a moderate degree of motion, without any further operative procedure.

If, however, notwithstanding your treatment, the disease progresses, suppuration increases, the joint becoming more and more impaired, showing a case of progressive caries, we then have no remedy except in *exsection*.

Nature's only way of curing these cases after they have arrived at this point is by the slow exfoliation of the carious bone, and, if this is limited in amount, she is often successful; but if involving the entire head and neck of the femur, with more or less of the acetabulum, as it frequently does, the process is a very tedious one, and the patients often succumb before nature completes the cure; and in the most favorable cases healed by kind nature in this way, they have been left with permanent deformity, and with a very much less useful limb than those which have been cured by exsection. I have now performed this operation over fifty times, and can, therefore, speak with positive assurance upon the subject.

This operation is very simple, indeed, and attended with no danger whatever. The patient being anæsthetized and laid upon the well side, an incision is made from a point midway between the crest of the ilium and the top of the trochanter major, the knife carried firmly down to the ilium, and drawn with a single sweep downward and outward over the posterior edge of the trochanter major, and then curved forward and inward, making a crescent-shaped incision of some four to six inches in length, according to circumstances, and carried fairly down to the bone its entire extent. The wound is then held open with spatulas, and a narrow firm-bladed bistoury is carried around the femur just above the trochanter minor at right angles to the first incision, and divides the periosteum in both directions as far around the bone as can be reached, one-half or three-quarters its circumference. By this circular division of the periosteum you avoid the danger of tearing it off from the femur below the point where section is to be made. If the first incision has not divided the periosteum completely, then carry your knife again through the first incision from the top of the trochanter major down to this cross-incision just described, pressing it firmly through the periosteum down to the bone. The periosteal elevator is then placed in these two triangles, and the periosteum peeled off from the trochanter, carrying with it necessarily the muscular attachments to it. This can be very successfully done until you reach the digital fossa at the neck of the bone and behind the trochanter, where the blade of the knife will be necessary to divide the tendinous insertions of the rotator muscles. The capsule being freely opened, the head of the bone will now be easily thrown from the acetabulum, by strongly adducting the limb and depressing it, thereby tearing off the internal portion of the bone from its lining periosteum, when the finger can be glided around the bone, and with a finger-saw it may readily be removed below the trochanter major. By this means the periosteum will not be peeled off from the bone below

the point of section with the saw, as is too often done by luxating the bone too forcibly.

If upon the first section it is found that the caries has extended still farther down the femur, you can very easily separate it from its periosteal attachments, and whatever amount of bone is necessary can be removed in the same manner with the saw. Under no circumstances should bone forceps be used in the section of so large a bone. The trochanter major should always be removed, even if it is not diseased, as otherwise it would occlude the opening, and prevent the escape of the discharge; and by peeling it from its periosteum, as I have before described, the attachments of the muscles are all left for future use.

When the head and neck have thus been removed, you have a fair opportunity for exploring the acetabulum, and to remove all the carious or necrosed bone by scraping and gouging. If the acetabulum be perforated, which I have frequently found to be the case, with a little care the necrosed bone can be broken off down to the point where the periosteum is attached. I have only in one instance found the internal periosteum perforated.

After washing the wound carefully with warm water, fill it with peruvian balsam; a round small plug of oakum, long enough to reach the very bottom of the acetabulum, is inserted, and left dependent from the wound. The upper and lower ends of the incision are then brought together by stitches and adhesive plaster, and the patient placed in the wire cuirass which has been constructed for this purpose, with a window opposite the place of incision. As it is of the greatest importance that this dressing should be done with care, I will describe to you my mode of doing it.

The cuirass being properly prepared and well padded, the patient is laid in it so that the anus is opposite the opening and free from any possibility of obstruction, when the well leg is the first to be dressed. By making it perfectly straight and screwing up the foot-

rest until it is brought firmly against the heel of the patient, having a pad between the foot and the rest to absorb the perspiration, the instep is then well padded with cotton or a blanket, and a roller is carried firmly round it and the foot-rest, running up over the limb; but before going over the knee a piece of pasteboard, or leather, or several pieces of folded paper, are placed over the leg, knee, and thigh, and the roller carried firmly over this extemporized splint for the purpose of preventing the slightest bending of the knee, when the roller is carried up the entire length of the thigh, around the perineum and over the outer arm of the instrument, and several times back through the perineum, and then across the pelvis, by which means the well limb is made a firm counter-extending force.

Two strips of adhesive plaster from two to four inches in width, according to the size of the patient, are then placed upon either side of the operated limb and secured with a nicely adjusted roller over the foot and up the limb and thigh as far as the abscesses on it or the wounds will permit, being careful to leave a sufficient length of the plasters, at the lower extremity, free for the purpose of applying them to the foot-rest when extension is made, and firmly secured by a well-adjusted roller. The foot-rest is then screwed up to meet the heel of the shortened limb, and these strips of adhesive plaster are brought down around the foot-rest and securely fastened. The foot-rest is then extended by the screw slowly, and gradually, at times waiting a few moments for the muscles to yield, which have been so long contracted, until the limb is brought down to its full extent. It sometimes happens that, from long contraction of the adductors and the tensor vaginæ femoris, subcutaneous section of those tendons and fascia will be requisite before the limb can be brought to its proper position, even after the head of the femur has been removed. After the limb is brought into this position a roller is carried from the foot over its entire surface; a large wad of oakum is placed around the wound to absorb the discharge, and the roller

is carried firmly over the wound, inner surface of the thigh, and around the pelvis. I place great importance upon this latter part of the dressing, as we thereby compress the tissues, and prevent the burrowing of pus, the oakum, which has already been placed in the wound, allowing of free drainage, no matter how tight the roller may have been applied.

Immediately after the patient is dressed in this way, and has recovered from the anæsthetic, he is capable of being stood up against the wall, or riding out in a carriage or boat, and can take his daily exercise in this way. I have, in several instances, had them removed a long distance, some miles, in fact, within an hour of the operation and without the slightest inconvenience or pain. This dressing will probably not require to be changed for from 48 to 60 hours, or until sufficient secretion has been formed to moisten the dressings, when the oakum plug can be removed without hemorrhage. If this dressing does not come away easily, warm water injections will readily float it out. The wound, made clean, is again filled with peruvian balsam and dressed as before. After this it may require dressing once or twice a day, according to the amount of discharge, and the child should be removed from the entire instrument as often as is requisite. The well leg should be removed from the instrument at least once a week, and free movements given to all the joints, ankle, knee, and hip, otherwise we may anchylose them, although they are not diseased. The wire cuirass should be used from a month to two months, according to necessity, after which the patient can be put upon the long splint and allowed to exercise, thereby increasing his prospects of perfect motion of the new joint.

In many of the cases which I have exsected, the motion has been as perfect and complete as in the normal joint, and in one case, Adolph Rosell, the motion is greater in that joint than upon the opposite side, and the limb less than a quarter of an inch shorter than the other, although it was sawed three inches below the

top of the trochanter major; the head and neck having been entirely absorbed, and the acetabulum perforated. Only one of my exsections has recovered by ankylosis, and that was from neglect in the after-treatment, I never having seen the patient after the operation for two years, and the gentleman who had it in charge having no experience in the treatment of this class of cases. All the other cases that recovered have more or less good motion, and infinitely less deformity than those which have recovered by nature's process.

If the surgeon has not the convenience of obtaining the wire cuirass, the operation can be made just as successful by applying extension and counter-extension, while the patient is in bed. Of course, they lose the advantage of out-door exercise and fresh air, which in many instances will be found to be of vital importance.

