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TRUE ANEURISM OF THE BRACHIAL ARTERY AT
ITS UPPER THIRD.

CURED BY COMPRESSION MAINTAINED FOR TEN HOURS BY
MEANS OF A CONICAL PAD,

WITH A RÉSUMÉ OF THE LITERATURE OF THE SUBJECT.

BY

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Late House Surgeon to Bellevue Hospital.

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In consulting the literature of brachial aneurism, arising from other causes than traumatism, one is struck at the outset with the extreme rarity of recorded cases. John Hunter does not mention it at all. Astley Cooper¹ says: "I do not recollect to have seen a case of aneurism from disease of the brachial." Hodgson says:² "those morbid alterations in the coats of arterics which predispose to the formation of aneurism are rarely met with in the brachial or its branches. . . . I have never seen an aneurism of the arm which was not produced by accidental violence." Crisp³ tabulates five hundred and fifty-one cases of aneurism of all varieties, in which there does not appear a single case of spontaneous brachial aneurism. Alluding to it he says it is extremely rare.

Scarpa⁴ reports a case of his own (Case V.) and refers to one by Flajani (Case XIII.). Birkett, who reports Case VII., says he had searched the records and inquired among his professional friends, but was unable to learn of another case. Sir Benjamin Brodie, who saw this with him, had never seen one.

Broca⁵ in his tables mentions twelve aneurisms of the brachial, but they were all of traumatic origin.

Liston⁶ says: "disease of the coats of the arteries of the upper extremity to a great extent is not known, and very few cases of true aneurism below the axilla are mentioned. I have treated but one such case" (Case XI.). Coming down to more recent authorities we find that it is barely alluded to by Holmes, Hamilton, and Bryant.

¹ Surgery, p. 78.

² Diseases of the Bloodvessels, Lond., 1847.

³ Anevrysmes et leur Traitement, Paris, 1856.

⁴ Diseases of Arteries, p. 338.

⁵ Sur l'Anevrysmes, Paris, 1809.

⁶ Surgery, p. 144, ed. of 1838.

Eriehsen¹ says: "spontaneous aneurism rarely occurs below the axilla, but may be met with at any part of the upper extremity." He alludes to four published cases, but does not mention any of his own.

Gross² says: "spontaneous aneurism of the brachial is extremely uncommon. I do not believe it has ever been noticed in this country."

Ashhurst does not mention a case. Agnew relates Case IX. as his only experience upon the subject.

The first case related below came under my own observation last summer. After a very careful search through the literature of the subject, I have been able to get together from all sources thirteen other cases of brachial aneurism which seemed to be of spontaneous origin, *i. e.*, not directly traceable to a wound or injury of the vessel. In some of these cases, slight exciting causes are stated to have been present, but that fact does not seem to me to be sufficient to exclude them from the number. There are very few surgical diseases which the patient does not attribute to some antecedent strain or fall. A shadow of doubt is thrown upon one or two of the cases on account of the brevity of the histories given. It is noteworthy that only three of the thirteen cases, Nos. II., III., and IX., were observed in this country.

CASE I.—Jas. Coreoran, *æt.* 36, labourer, was admitted to Ward 11, Bellevue Hospital, May 31, 1881, for an aneurism of the right brachial artery which he had discovered only four weeks before. He states that his father died by accident at the age of eighty, and that his mother is still living in good health at eighty-two. He has a sister suffering from a malignant growth of the face, probably cancerous. When a child the patient had an articular osteitis of the right knee, which resulted in an ankylosis of the joint at almost a right angle, and which has necessitated the use of a crutch upon that side up to the present time. No distinct history of syphilis; admits the use of tobacco to excess; drinks "moderately."

About four weeks ago, after he had been at work shaking some carpets, he felt severe pains in his right wrist, and noticed it was a little swollen. The pains continued; and, under the impression that they were rheumatic, he applied to a druggist, who, strange to say, advised him to consult a physician, which he did. The doctor discovered a pulsating tumour, which he told the patient was a brachial aneurism, and attempted to treat by compression by means of a tourniquet. The pain from this became in a short time so intolerable that the patient was obliged to have it removed. He has had no other attempt at treatment, and the pains have continued with increasing severity up to the present time. The tumour has also grown steadily in size, but quite rapidly during the past week.

On examination there is found, about two and one-half inches below the border of the pectoralis major on the right side, a tumour the size of a hen's egg, pulsating strongly. Its pulsation is forcible, expansile, but is easily controlled by pressure upon the axillary or the subclavian artery. There is a distinct thrill and a loud *bruit* which can be heard in the brachial below, and also in the radial at the wrist. The radial pulse seems to be slightly delayed upon this side. The whole extremity is swollen so that it measures from half an inch to an inch larger than the left,

¹ Surgery, vol. ii. 140. ed. of 1878.

² System of Surgery, ed. 1872, vol. i. 778.

and it is the seat of some venous congestion. The patient now complains more of numbness and tingling in the hand than of pain, but there is very little if any anaesthesia. A careful examination of the heart was made without detecting any organic disease. Dr. Frank H. Hamilton, who was on duty at the time, very kindly turned the case over to me for treatment, advising that I use compression without an anaesthetic. Digital pressure was first thought of, but was given up and the following contrivance resorted to: A piece of splint board was cut about a foot and a half long, and three inches wide at one end tapering to a half inch at the other. This latter was padded so that it made a hard ball about three-fourths of an inch in diameter. The patient was placed at the edge of the bed, and his arm, stretched out at a right angle with the body, rested upon a table. Seating myself in front of the patient, I rested the broad end of the splint-board against the front of my shoulder, and placed the padded end upon the artery in the axilla. With one hand this was steadied and kept in position. The other hand was kept upon the tumour to make sure that its pulsation was completely controlled. We were thus enabled to make very constant and even pressure with comparative ease.

June 1 at 10.40 A. M. After having used digital pressure at intervals for about half an hour previous, the above was applied with the purpose of controlling entirely the pulsation of the tumour.

11.15 A. M. Patient complains of numbness and anaesthesia in the hand and arm, and of considerable pain.

11.45 A. M. Pain has increased so that Magendie m_{viiij} are administered hypodermically.

12.50 P. M. It is found that by a little care the pad can be so placed as not to include any of the nerve trunks between it and the bone, and that when this is done he complains of no pain. A very slight deviation from this position is immediately announced by darting pains down the arm, which is a signal for a readjustment of the pad. As a little soreness begins to be felt, the pad is removed entirely and digital pressure used for twenty minutes.

1.50 P. M. There has been no pain of any consequence for the past two hours. The patient is in fact so comfortable that he has been dozing for ten minutes. The hand is warm but the arm and forearm are quite cold, and there is some venous congestion.

3.45 P. M. A radial pulse is detected, even when there is no pulsation in the aneurism. On making pressure higher up in the axilla above the usual point, this is completely arrested. For the last half hour there has been considerable pain in spite of all effort not to press upon the nerve trunks, and Magendie m_{vj} is given.

6 P. M. During the day, the assistants, who were the *internes* of the Hospital, relieved each other at intervals of from half an hour to an hour. During the change of hands, occasionally the aneurism would pulsate three or four times before the pad could be adjusted. Sometimes, also, it would slip a little in avoiding nerves, so that there has not been more than fifteen or twenty minutes at a time when there was no pulsation whatever of the tumour. Since 5 P. M., it has been noticed that much less pressure was required to control the pulsation, and also that none took place during a change of hands. The whole limb is now warm and of nearly normal colour.

9 P. M. No pulsation in the sac has occurred since five o'clock. The radial pulse has steadily improved. There has been no numbness since early in the afternoon. The only pain the patient has experienced for

the last few hours has been in his back, from his constrained position. No bruit can be detected. Pulsation of the artery immediately above the tumour is very feeble, and even high in the axilla is much less forcible than normal. The tumour is hard and firm. A hard pad was now placed in the axilla and the arm bandaged to the side. The patient was given a light supper and Magendie η viij, and in a short time he fell asleep.

4th. There has been no further pain, and no return of pulsation; the patient has been kept quiet in bed. The axillary pad is now removed; the tumour is found much smaller and very firm.

20th. There has been no sign of relapse. A careful examination establishes this fact, which before has been doubtful, viz., pulsation in the brachial below the aneurism and throughout its course. This is very feeble. The principal means by which the circulation of the arm is carried is by a vessel which approaches in size the brachial, situated on the outer side of the belly of the biceps. This can be followed down to the elbow, where it is lost. The case has been examined by Drs. Hamilton and McBurney, and several other gentlemen, all of whom agree that the cure is a radical one. The patient is discharged from the Hospital at this date in good general condition, with instructions to use his crutch with the left arm.

Aug. 1. He returned for observation, having had no symptom of relapse since his discharge. The tumour can only be found by careful search.

Jan. 9, 1882. I examined the patient to-day, and was unable to satisfy myself that I could find the tumour at all. The circulation is still carried on chiefly through the large collateral branch above mentioned, the pulsation in the brachial throughout being quite feeble. The radial pulse is about as strong as that upon the opposite side. He complains of the hand often becoming cold. In spite of injunctions, he was found to be using the crutch with the right arm again. He has no pain or other inconvenience than the coldness mentioned.

CASE II. *Aneurism of Left Brachial at its Middle; Ligature of the Brachial at Upper Third; Secondary Hemorrhage; Ligature of the Axillary; Cure.* (Reported by L. D. Waterman, of Indianapolis. *Western Jour. of Medicine*, 1867, p. 584.)—A butcher, aged thirty-two years, seen in May, 1857, with a tumour, size of small hen's egg, at middle of the left brachial artery. It was steadily increasing. The patient had valvular disease and great cardiac hypertrophy. The brachial was tied in its upper third. The aneurism shrunk to a small hard lump without pulsation. The ligature did not come away, and on the sixteenth day, with the thread still hanging, the patient butchered a calf. A few days afterwards he called attention to a rapidly forming tumour just above the ligature. Ligature of the axillary was advised, but refused. Two weeks later the surgeon was called for hemorrhage, the false aneurism having burst. The axillary was then tied in its lower third: the ligature came away properly, and the artery between the ligatures as well as the aneurism was completely obliterated. The patient died six months later of dropsy.

CASE III. *Aneurism of Right Brachial at its Upper Third; Ligature of the Axillary in its Lower Third; Secondary Hemorrhage; Ligatures of the Axillary in its Upper Third; Cure.* (Reported by C. B. Kibler, Corry, Pa. *Buffalo Med. and Surg. Journal*, 1870-71, p. 225.)—Male, aged twenty-nine years. The physician was called August 17, 1870, on account of intense pain in the right arm, forearm, and hand. In the upper third of the brachial artery was a pulsating tumour the size of an orange, which had been noticed six weeks before. It was attributed to swinging on a horizontal bar. August 25, the axillary artery was tied in its lower third. On the eighth day, secondary hemorrhage took place; it was temporarily controlled by pressure upon the subclavian, and finally by ligature of the axillary in its upper third. This ligature came away in five weeks, and the wound was healed. When last seen, a few months

after the operation, he had but limited use of the hand and forearm, and no radial pulsation.

CASE IV. *Aneurism at the junction of the Upper with the Middle Third of the Brachial; Instrumental Compression; Cure.* (Reported by M. Demecé. *Gazette des Hôpitaux*, 1860, p. 170.)—A vinedresser, aged fifty-two years; no history of contusion or injury of any kind; tumour first noticed three and one-half years before, and had grown steadily since that time. He had suffered meanwhile from neuralgic pains, numbness, and stiffness of the fingers. He was first seen July 20; the tumour was then of the size of a large walnut. It had expansile pulsation, thrill, bruit, and, in fact, all the marked signs of aneurism. On July 21, compression of the axillary was begun by means of Broca's instrument for compressing the femoral. In fifteen minutes the pulsation ceased, but the patient was suffering greatly. After an hour and a quarter, he declared he would bear it no longer, and loosened the apparatus. He would not allow it to be reapplied for any consideration. Two hours later examination showed that the pulsation had diminished very much in intensity; the pulse was feeble, and the whole arm red, and a little œdematous. The next morning the pulsation was found to have ceased entirely; it returned again in the evening, but was feeble; patient would not allow anything to be applied. On July 23, and daily thereafter, until August 8, the tourniquet of Petit was applied, or at least the attempt was made to apply it. Once he allowed it to remain fifteen minutes, but usually loosened it immediately, on account of pain. At no time during this period was suspension of the pulsation obtained. He left the hospital at this time. He was seen August 24, and reported that there had been no pulsation for eight days, his pain and numbness were all gone, and he considered himself cured. Pulsation was then absent, as was also the bruit, pulsation of the artery below the tumour felt with difficulty, feeble radial pulse. On October 2, there had been no relapse; the radial pulse was a little stronger, but still weak. Still feeble pulsation in the brachial below the tumour, *i. e.*, the tumour had been obliterated, but the artery not completely. The entire compression was estimated at two and one-half hours.

CASE V. *Aneurisms of the Brachial, Radial, and Vascular Tumour of the Thumb, all in the Left Arm; Unsuccessful Compression.* (Reported by W. D. Spanton. *London Med. Times and Gazette*, 1865, p. 517.)—Female, aged twenty-three years, came under observation in Sheffield General Infirmary, November 5, 1863, for a swelling of the left thumb. She had bronchocele, but reports she had always been in good health. Examination revealed a swelling of the thumb which looked as though it were going to suppurate; also between the heads of the first and second metacarpal bones, an aneurism of the radial the size of a small marble, which had been noticed by a sister three years before. It had never caused pain, and had grown very slowly. On the following day an aneurism of the brachial was discovered three inches above the bend of the elbow, of the existence of which the patient was ignorant. It was the size of a pigeon's egg, pulsated strongly, and had a loud bruit. A systolic murmur was heard at the base of the heart. She was kept quiet, and a tourniquet applied on the upper third of the brachial for a few hours at a time. A little consolidation of the sac seemed at first to take place, but the surgeons having decided against the use of the ligature, she left the infirmary in about the same condition as on admission.

CASE VI. *Aneurism at Upper Third of the Left Brachial; Treatment Palliative; Death from Rupture.* (Reported by Scarpa. *Sur l'Aneurysme*, Paris, 1809.)—T. C., a soldier, perceived, at the beginning of the year 1759, a tumour situated just below the left axilla, for which he knew no cause; no history of traumatism of any sort. Fordyce, who saw the patient, recognized an aneurism, but did not dare to undertake its cure. It steadily increased in size until the patient was brought to St. George's Hospital. The tumour then extended along the course of the brachial artery, and presented marked pulsations. The physicians and surgeons of the hospital were of the opinion that no operation should be undertaken, because the tumour was situated so high up. They contented themselves with palliative measures, *i. e.*, cataplasms and anodynes. At the beginning of December, the aneurism ruptured and the patient died of hemorrhage. On the autopsy, the artery was found corroded and ruptured in the

neighbourhood of the axilla. At first sight it appeared that the sac was formed of the arterial coats; but it was not so. The cavity of the artery was only a little dilated where it opened into the aneurismal sac and half a finger's breadth above it was closed.

CASE VII. *Aneurism of the Brachial at the bend of the Elbow; Failure of Compression; Ligature at Middle Third; Cure.* (Reported by Jules Boeckel. *Gazette Hebdom. de Méd. et de Chirurg.*, 1877, p. 344.)—Mechanic, aged 25 years, entered the hospital at Strasburg November 19, 1876, for a tumour of the right elbow of five weeks' standing. It is reported to have been of "spontaneous" origin but came quite suddenly and with marked pains down the forearm and hand. These obliged him to stop work. A physician treated him two weeks before; a small pulsating tumour in the fold of the elbow was discovered to be the cause. It increased in size until it became as large as a small apple [*pomme d'api*]. Compression by a tourniquet was applied, but the patient became so unmanageable and the pains produced by it so severe it was discontinued. On admission to the hospital, characteristic pulsation, thrill, and bruit were obtained, and the radial pulse was feebler on this side. Compression was not again attempted, but the artery was tied with catgut at the junction of the middle and the lower thirds followed by cessation of the radial pulse. On the third day the radial pulse became again perceptible, and on the following day the stitches having been removed, the patient left the hospital. December 7, tumour was one-half the original size and there had been no return of the pulsation. In January it was observed that both the ulnar and radial recurrent arteries were notably dilated, and could be felt pulsating. The patient was last seen on March 5, he had then been working a month without any relapse. Nothing had been seen of the ligature.

CASE VIII. *Aneurism of the Brachial at the Bend of the Elbow; Partial compression for four months; Cure.* (Reported by Mr. Birkett. *Guy's Hosp. Reports*, 1862, p. 311.)—A young surgeon, aged 29 years, noticed January 23, 1862, an aneurism at the bend of the left elbow the size of a hazel-nut. It had caused no symptoms, and was only discovered by accident. No blow or injury of any kind was known, and he had never been bled. He had had repeated attacks of rheumatism during the past five years. When first observed by Birkett, Jan. 24, it presented all the diagnostic signs of aneurism. Compression by an elastic armlet extending six inches above and below the tumour was advised, and a pad placed under the upper part so as to make moderate pressure upon the artery. During three weeks before this could be made, the aneurism had doubled in size. After two weeks' trial it was discontinued on account of the swelling of the hand and the great pain produced. Flexion was then used for a few nights, but also caused great pain and swelling. After this until May 7, irregular compression was made chiefly by a pad and bandage sometimes combining flexion. The tumour was then about the size of a walnut, and its walls felt much thicker. The propriety of ligating the artery was now discussed but decided against, and under the advice of Sir Benjamin Brodie, the continuance of the compression was determined upon. A steel tourniquet with two pads was now tried and worn by the patient under his coat, the arm being carried in a sling most of the time. This was worn until July 11, when all pulsation ceased, it having been very feeble for some days before. After four or five days all pressure was left off. On examination September 12, it was found to have diminished in size to a hazel nut. There was no pulsation. Considerable wasting in the muscles of the arm took place.

CASE IX. Reported by Dr. D. Hayes Agnew (*Agnew's Surgery*, i. 605, ed. 1878), who says: "In only a single instance have I witnessed a spontaneous aneurism of the brachial artery. The patient was about 60, and the tumour was situated two inches above the bend of the arm. The artery was tied two inches above the tumour with entire success."

CASE X. *Aneurism of the Brachial at Middle Third; Unsuccessful Compression; Ligature of the Axillary; Subsequent Opening of the Sac and finally Excision of the greater part of it; Cure.* (Reported by Kade. *St. Petersburg Med. Zeitschrift*, 1866, p. 202.)—Boatman, aged 46. Came under observation January 4, 1865, with a tumour commencing three fingers' breadth below the right axilla, and extending to within the same distance of the fold of the elbow.

It was of irregular size, and occupied the internal and anterior surfaces of the arm. It measured 19 cm. in length, 17 in width, and the circumference of the arm was 33 cm. against 23 of the opposite side. In one place it was hard, at another elastic and soft, and at another there was fluctuation. It was covered by healthy, but in places, very thin skin. Expansile pulsation, bruit and thrill all marked; pulse in radial and ulnar arteries scarcely perceptible.

He stated that when he was about 20 or 25 years of age, a heavy board fell on his right arm, and that ever since there had been a small nodular swelling at the middle of his arm. It did not pulsate, and remained unchanged until six months ago, when it began to increase in size and grew steadily until it attained its present dimensions.

Intermittent compression was tried for six days, being employed for two or three hours four or five times a day. It seemed to diminish in size, and the bruit was sensibly weaker, but at the end of another week it was larger than ever; the skin was hot and very thin, and ligation of the axillary was decided upon. This was done January 19, and an ice-bag placed upon the arm after the operation. January 25, an exploratory incision was made in the sac for pus, and about a teaspoonful of blood evacuated. February 4, the sac was opened by a free incision, and the clots turned out; there was now some pus. The greater part of the sac was removed a few days later; the wound filled in by granulations; and by the middle of March was entirely healed. The patient was discharged April 8, complaining only of a little weakness in his arm and hand; the arm then measured only 2 cm. more than the opposite one.

Kade's interpretation of the history in this case is ingenious and quite plausible. He concludes that the immediate consequence of the injury was an extravasation of blood either between the arterial coats or into the sheath of the vessel; that this was gradually changed to a firm fibrous tumour adhering closely to the artery; that the continued pressure and irritation of this upon the vessel together with the disturbances from the original injury done to the artery were the starting point of an *endarteritis deformans chronica*; and that as a result of the atheromatous changes which followed this, the aneurism had developed within the last six months.

CASE XI. *Aneurism at Bend of Elbow; Unsuccessful Compression; Cure by Ligation.* (Reported by Sidney Jones. *Brit. Med. Journ.*, 1872, p. 210.)—A woman, aged 30 years, four months before she was admitted to St. Thomas's Hospital, "violently sprained her left elbow." There was much pain at the time, and only two months later was noticed a pulsating swelling. On admission it was the size of a walnut, and situated at the bifurcation of the brachial. Pressure and flexion were tried for two weeks without success. The brachial was then ligated two inches above the tumour. The ligature came away on the twenty-first day; there was now no pulsation at the wrist or elbow. She left the hospital three weeks later, quite well.

CASE XII. (Reported by Liston. *Liston's Surgery*, p. 181.)—"An old ship carpenter, while at work as usual, felt something snap in his arm, and a pulsating tumour was soon after noticed, and before I was asked to see him by Mr Cheyne, of Lieth, it had attained during four months the size of a hen's egg, and was evidently made up in part of solid matter. The brachial was tied and everything went on favourably."

CASE XIII. *Aneurism at the Bend of the Elbow; Digital Compression for ten hours; Cure.* (Reported by Viennois. *Gazette Médicale de Lyon*, 1866, p. 492.)—Male, 17, entered l'Hôtel Dieu, July 26, 1866, for a pulsating tumour of one year's standing. He had been devoting himself to exercising with a hammer for two months when he felt a tumour at the bend of the elbow. When he entered the hospital it was the size of a pigeon's egg, situated apparently at the bifurcation of the brachial. He had had from time to time numbness in the fingers, and the arm was weaker than the other. The tumour was saciform, and situated in front of the artery. It presented forcible pulsation, thrill, and loud bruit. On extending the arm completely all these signs disappeared.

Digital compression was begun over the middle of the brachial at eleven o'clock in the morning. After three hours the tumour became hard, and neither pulsation nor bruit could be detected. In order to insure a cure the pressure was maintained seven hours longer, until nine o'clock in the evening. Patient left the hospital August 8, completely cured. He was heard from September 13: there had been no sign of relapse, the tumour was about one-fourth its original size, and the arm had regained its function.

CASE XIV. *Aneurism at bend of Elbow; Failure of Compression; Ligature applied above and below the Sac; Cure.* (Reported by Flajani, *Collezione d'os Serv, et rifles di Chirurg.*, t. ii. 22.)—A plethoric young man, after making the muscles of his right arm tense in lifting a weight, could not use it at all for several days because of the pain. A lividity of the skin came on the next day: pain and discoloration disappeared in a short time, and he resumed his work. Used his arm freely for six months when he began to feel pain, which, at last, obliged him to stop work on account of its severity. Although he had seen, for some months, a small tumour at the fold of the elbow, he did not think of this as the cause. When he came under observation the tumour was the size of a large walnut, situated about three fingers' breadth above the internal condyle. The usual signs of aneurism were present. After bleeding the patient, as a preparatory measure, compression was begun by means of a bandage extending from the axilla to the condyles of the humerus. It produced considerable engorgement of the arm, though only moderately tight, and not arresting the radial pulse. This was removed on the fourth day, having been applied in all thirty-two hours, and the only change produced in the tumour was a little flattening; the hand and forearm were greatly congested and œdematous. Believing the aneurism would not warrant any further continuance of this treatment, the ligature was applied the next day above and below the sac. On the fifth day afterwards the radial pulse was detected, and suppuration established in the sac. The ligatures came away on the eleventh and twelfth days, and on the forty-first day he left the hospital cured.

Abstracts of the three following cases by Paletta, Pellatan, and Richet, are introduced here, because they have been so often referred to, especially the first two, by other writers upon this subject, as instances of true brachial aneurism. It does not seem to me that they ought to be included under this head.

Paletta's case (*Giornale di Venezia*, Marzo, 1796) was in a nun, a scorbutic subject, who heard one day, in her left arm, "a noise as if she had broken a nerve." Immediately afterward a pulsating tumour appeared a little above the internal condyle. An attempt was made to treat it by compression, but had to be abandoned on account of a fracture of the forearm of the same side, which was received soon after. The aneurism extended to the lower extremity of the arm, and the increased pulsation of this, together with frequent attacks of hemorrhage, are said to have hastened the death of the patient, which appears from the history to have been two or three months from the appearance of the aneurism. No autopsy was made, but the author had no doubt that it was produced by corrosion and rupture of the brachial artery.

Pellatan's case (*Clinique Chirurg.*, t. ii. 4) occurred in a man of fifty-four, who was first seen June 21, 1779. He was in wretched general condition, and had had for about three months a very bad cough, during which he rested mostly with his head upon his right hand. About three weeks before admission to the hospital he had noticed a swelling in the fold of the arm, which had increased in size with all the signs of inflammation, finally rupturing and discharging a large amount of pus. It appeared like an ordinary phlegmon, the skin over it had a gangrenous look; the sinus was still present, but, on careful examination, strong pulsation was detected at the bottom of it. "Everything indicated an effusion of arterial blood," says the author, who then proceeded at once to apply a ligature above and below the tumour. Secondary hemorrhage came on the tenth day, and the patient lost so much blood that he died on the fourteenth. On autopsy the brachial was found ossified at its lower extremity to its bifurcation; along this track a large rent was found, which he thought had been produced by extension of the prolonged flexion.

Riche't's (*Bulletin de la Société Anatomique*, 1873, p. 697) case is a more recent one. The patient was a man of sixty-five, who, when seen, had a large tumour extending from a little above the left elbow to the middle of the forearm, and was of eight days' standing. It came suddenly after a blow received upon some barrel-staves which he was carrying in this arm, and with an acute pain. There was then neither expansion nor bruit. But a week later the tumour had become circumscribed and the size of an orange, and gave all the signs of aneurism. Flexion and compression by sand-bags failing to produce any change in the tumour; digital compression was practised for ten consecutive hours. This arrested permanently the pulsation of the tumour. The bruit could be heard for a week and then disappeared completely. The radial and ulnar pulse continued imperceptible. The patient died comatose one month after the compression. Arteries of the brain were found atheromatous, and extensive cerebral softening, but no hemorrhage or embolus discovered. The aneurismal sac was very thin, and in the anterior part of this a portion much thicker was found, which was interpreted to be another smaller aneurism, by the rupture of which the secondary traumatic aneurism had been produced. This was supposed to have existed a much longer time, but unobserved by the patient. A rupture of the artery was found to correspond to the opening into the sac.

The accompanying Table is a summary of the main points in the preceding cases:—

No.	Authority.	Age.	Sex	Side.	Site.	Supposed cause.	Treatment.	Result.
1	Holt	36	M.	Right	Upper third	Shaking carpets	Instrumental compression for ten hours.	Cure
2	Waterman	32	"	Left	Middle third	None stated	Ligation of brachial; ligation of axillary for secondary hemorrhage.	"
3	ibler	29	"	Right	Upper third	Swinging on horizontal bar	Ligation of axillary, lower part; ligation of upper part for hemorrhage.	"
4	Dennee	52	"	..	Junction of upper mid. third	None known	Intermittent instrumental compression.	"
5	Spanton	23	F.	Left	Lower third	"	Compression by tourniquet.	Left hospital unimproved. Death
6	Scarpa	..	M.	"	Upper third	"	Palliative.	"
7	Boeckel	25	"	Right	Bend of elbow.	Spontaneous	Failure of compression by a tourniquet; ligation of brachial.	Cure
8	Birkett,	29	"	Left	" "	None known	Intermittent compression and flexion.	"
9	Agnew	60	Lower third	"	Ligation of brachial.	"
10	Kade	46	M.	Right	Middle third	Blow 25 yrs before	Failure of compression; ligation of axillary.	"
11	Jones	30	F.	Left	Bend of elbow.	Sprain	Failure of compression and flexion; ligation of brachial.	"
12	Liston	"an old man"	M.	..	" "	Strain	Ligation of brachial.	"
13	Viennois	17	"	..	" "	Exercise with hammer	Digital compression ten hours	"
14	Flajani	"a young man"	"	..	" "	Strain	Failure of compression; ligation above and below the sac.	"

From the foregoing cases the following conclusions may be drawn regarding:—

1. *Age.*—By the best authorities on the subject of aneurism between thirty and forty years is given as the time of life in which the disease is the

most frequent. Seven of the above cases, eight, if we include Case XIV., which is said to have been in a "young man," occurred under thirty-two years.

2. *Sex.*—The predominance of the male sex is borne out by our statistics, as well as by those of all observers on the subject. Only two of the cases (V. and XI.) occurred in females. In one the sex is not mentioned.

3. *Site of the Disease.*—The aneurism affected the left side five times, the right four times, and in five the side is not mentioned. In six of the cases, nearly one half of the whole number, the tumour was at the bend of the elbow, presumptively at the bifurcation of the artery. In two cases (V. and IX.) it was situated at the lower third. Of the remaining six cases, two (II. and X.) were at the middle third; one (IV.) at the junction of the middle and upper thirds, and three at the upper third (I., III., and VI.).

4. *Exciting Cause.*—In five of the cases it is distinctly stated that no assignable cause was known. In one (VII.) it is stated to have been "spontaneous." In Waterman's case (II.) no reference whatever is made to etiology. It may be thought that it is not quite fair to accept this negative evidence as proof that the aneurism was not from an injury. But the additional evidence afforded by the fact mentioned of coexisting valvular disease of the heart, together with the occurrence of secondary hemorrhage following a ligature placed close above the sac, and the death of the patient six months later from dropsy, make it more than probable that the aneurism depended upon disease of the arterial coats.

In Kibler's case (III.) the history states that it was attributed to exercise upon a horizontal bar. Arterial disease seems pretty clearly demonstrated in this case also, by the occurrence of secondary hemorrhage on the eighth day after ligation of the artery just above the sac.

In Case X., that of Kade, the aneurism is believed to have been due to an injury by a falling board received twenty-five years before symptoms developed. His argument, though very interesting, does not appear to me to furnish sufficient grounds for excluding this case from the category of true aneurisms.

In Cases X., XII., XIII., and XIV., the tumour could be pretty distinctly traced to a strong muscular effort or a blow as an exciting cause. In two instances it is stated in the history that the tumour was first noticed some months after the occurrence of the injury. In the other two cases there is no evidence in the histories that a rupture of the artery had been produced. In my own case, the patient, on being questioned, could remember no other possible exciting cause than the carpet-shaking, but it was some little time after this before the tumour was discovered. Whether the use of the crutch under that arm for thirty years had anything to do with the production of the aneurism, is an interesting question, and one upon

which there was quite a diversity of opinion among those who saw the case. I am myself not quite prepared to admit it as the cause of the arterial degeneration. My reasons for this are twofold: In the first place, the pressure of the crutch came two or three inches above the point at which the tumour developed; secondly, notwithstanding the frequency with which crutches are used at all ages, and in all conditions, and that we see almost daily the effects of pressure upon the nerves in the shape of "crutch paralysis," this, I believe, is the only instance on record, if indeed this be one, in which the use of a crutch has been followed by aneurism.

5. *Treatment.*—Palliative treatment only, was used in one case (Scarpa's), it being decided that it was unfit for operation, and the patient was left to die.

In eight cases the ligature was used, with ultimate success in every instance. In four of these the vessel was tied pretty close to the sac, *i. e.*, within two or three inches. Secondary hemorrhage followed in two instances, II. and III. The Hunterian operation was done twice, in Cases VII. and X., in one of which it was followed by suppuration in the sac, and the excision of the greater portion of it. In Liston's case it is not stated at what point the ligature was applied. In Flajani's case (XIV.) the old operation of cutting down upon the sac and placing a ligature on the vessel above and below was performed.

Compression was tried in nine cases; it was successful in four, and failed in five. Of the unsuccessful cases, four (VII., X., XI., and XIV.) were afterwards cured by the ligature, and one (V.) left the hospital unimproved, the ligature being decided against. In Case VII., the compression was made by a tourniquet, but it had to be removed on account of the intense pain produced. In Case X., intermittent compression, which appears to have been digital, was tried for six days, being kept up for two or three consecutive hours four or five times a day. No lasting improvement seemed to follow, and it was then given up. In Case XI., it is simply stated that compression and flexion were unsuccessfully tried for two weeks. In Case XIV., compression was made by means of a bandage extending from the axilla down to the tumour at the bend of the elbow. So much œdema and congestion were produced that it was removed in thirty-two hours, and no change having taken place in the tumour, the bandage was thrown aside. In Case V. the tourniquet was used for a while and then given up, as no special improvement had taken place.

Of the successful cases of compression, digital alone was used in one case (XIII.). It was kept up ten hours, but consolidation of the tumour took place in three hours, as neither bruit nor pulsation could be detected after that time. In three cases some form of instrumental compression was used. In Case VIII. it was made first by an elastic armet and a

pad, but this had to be discontinued on account of intense pain and swelling. A steel tourniquet making partial compression was then worn for two months before pulsation ceased. In Case IV. instrumental compression was kept up for an hour and a quarter, when the pain became intolerable, the instrument had to be removed, and the patient would not allow it to be reapplied. For a week afterward a tourniquet was endured for a few minutes each day, and then the patient left the hospital disgusted. Pulsation ceased spontaneously eight days later.

My own patient (Case I.) had had a tourniquet tried before I saw him, but was unable to stand the pain. By means of the conical pad he was kept free from pain the greater part of the ten hours during which compression was kept up. Only twice was morphia required: once early in the day before we had discovered that it was possible to avoid entirely the nerve trunks. Prompt and complete relief was afforded in both instances. The thickening of the integument in the axilla, consequent upon the long use of the crutch, was undoubtedly of a good deal of advantage in enabling the patient to tolerate the pressure for so long a time. Six hours were required for the consolidation of the tumour; in Case XIII. it was accomplished in three hours. The existence of a good radial pulse at end of five hours, through the collateral circulation, seems to be worthy of more than a passing notice. The condition of the radial pulse is only referred to in three cases. In Case IV. the patient was not seen until eight days after pulsation of the tumour had ceased, and then the radial pulse is said to have been feeble. In Case VI. the radial pulse was not noted until the third day after the application of the ligature; and in Case XIII. not until the fifth day.

May this not be explained in my case, by the supposition that the pressure of the crutch upon the artery had already produced a considerable dilatation of the collateral branches?

The cure of the aneurism without the obliteration of the artery was noted in Denuce's case (IV.), as well as in mine.

From the foregoing it will be noticed that those aneurisms, situated at the bend of the elbow or just above it, have been quite easily managed by pressure when persisted in, or by the ligature. The real difficulties in the treatment of these cases meet us in those in which the aneurism is situated in the middle or upper third of the artery. Broca (*op. cit.*, p. 884) says that aneurisms of the upper third of the brachial still call for the ligature of the axillary, and that pressure is not applicable on account of the proximity of the large nerve trunks. Below the insertion of the coraco-brachialis the indications change; here he advises alternating compression by means of two pads, as even here continuous compression at one point is out of the question.

Ashhurst (*Principles and Practice of Surgery*, p. 558) condemns *in toto* the ligature of the axillary for aneurism of the upper third of the

arm. He says these "may be treated by direct compression or by flexion, and if these fail by the old operation or amputation, either of which is preferable to ligature of the axillary."

Of the six cases above narrated, situated above the middle of the arm, the use of the ligature was followed in two (II. and III.) by secondary hemorrhage; in one (Case X.), by suppuration and excision of the sac. Scarpa's case was left to die, being decided unfit for operation. Denuce's case left the hospital because of the great pain to which he was subjected by compression, and nature completed the cure. With this showing, the simple contrivance of the conical pad, which we will not dignify by the name of an apparatus, but which fulfilled so well the indications in the case in which it was used, seems to deserve a further trial in similar cases.

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