Ligature of the left subclavian artery in its third part for axillary aneurism with antiseptic catgut / by George Y. Heath.

from the Author

LIGATURE

OF THE

LEFT SUBCLAVIAN ARTERY

IN ITS THIRD PART FOR

AXILLARY ANEURISM

WITH

ANTISEPTIC CATGUT.

BY

GEORGE Y. HEATH, M.B., LOND.; M.D., DUN., M.R.C.S.; SENIOR SURGEON TO THE NEWCASTLE INFIRMARY, AND EYE INFIRMARY; LECTURER ON SURGERY IN THE UNIVERSITY OF DURHAM.

PRINTED BY M. AND M. W. LAMBERT, 50, GREY STREET, NEWCASTLE-ON-TYNE.

1877.

LIGATURE

OF THE

LEFT SUBCLAVIAN ARTERY IN ITS THIRD PART FOR AXILLARY ANEURISM

WITH ANTISEPTIC CATGUT.

The records of surgery do not exhibit ligature of the subclavian for axillary aneurism as a very successful proceeding; the cases collected by Scarpa, Travers, Norris, Koch, and Erichsen showing a mortality of about 50 per cent. The snares and pitfalls lying in wait for the hand of the surgeon in this operation are indeed many, and, apparently, there is not one in which it has not at one time or another been caught. It is, in fact, a remarkable thing that every accident that would seem possible has befallen one operator or another in tying this artery. The ligature has been placed round a cervical nerve instead of the artery; the pleura, the vein, and the sac, have each been wounded; part of the vein has been included in the ligature with the artery; the artery has been pierced by the needle; and, lastly, the thoracic duct has been wounded. These casualties, occurring in the hands of the most skilful operators, indicate that ligature of this artery is often, as Fergusson called it, a troublesome affair, and not to be undertaken inconsiderately. Nevertheless, examples are not wanting in which the result has been a brilliant success: thus, in 1834, Lizars put a flaxen thread round the subclavian, and the wound united over the ligature, cut short, in four days. But even where all has gone smoothly during the operation, the dangers which afterwards beset the patient are such as to make us watch his condition with anxiety. If he escape hæmorrhage, pyæmia, cellulitis, or inflammation within the chest, may prove fatal, and even when apparently beyond danger he may succumb from suppuration of the sac.

Impressed with the unfavourable results of this operation and its perilous character, Mr. Holmes, in his exhaustive lectures on the Treatment of Aneurism, states that "the ligature of the subclavian artery is so dangerous an operation that it ought to be restricted to cases where pressure has failed, and to those in which, from the size

and rapid growth of the axillary tumour, the surgeon thinks pressure unadvisable." It would seem, therefore, desirable that every case in which this operation has been practised, whatever the result, should be laid before the profession ; on this account, and because in my case the antiseptic catgut ligature (which may be said to be still upon its trial) was employed, and also as I believe this is at present the only definitively successful case of the kind so treated, I am desirous of submitting it to the profession through the widely-circulated pages of *The Lancet*. For the details of the case I am indebted to the notes of my dresser, Mr. Craig.

James D——, aged forty-eight, cooper, was admitted into the Newcastle-upon-Tyne Infirmary on November 23rd, 1876. He was a big man, tall, broad-shouldered, deep-chested, and muscular. A large pulsating tumour occupied the left armpit, reaching upwards to the collar-bone and downwards to the base of the pit. The pulsation was visible, especially just below the collar-bone and above the upper border of the small pectoral muscle, where less restrained by the muscular wall of the chest. To the hand, the pulsation was distinctly aneurismal, and the contents of the sac chiefly fluid. The finger passed readily down upon the subclavian artery on the first rib, but strong pressure on the vessel was needed to stop the beating of the aneurism; and, although the collar-bone was not tilted up, the great muscular development of the man caused the artery to lie at a considerable depth behind the clavicle. There was no œdema of the left hand, but it was colder than the right, and the left pulse was weaker than the right. The left pupil was dilated. The patient complained of aching pain in the shoulder, back, neck, and arm, and of loss of power and numbness in the fingers. On examination, the heart, lungs, and great vessels within the chest were ascertained to be sound; the sight of the left eye was not materially affected; the urine was free from albumen, and its specific gravity 1012.

History.—Patient knew no cause of his disease. Had not had syphilis, nor recently suffered any accident; was temperate; as a young man had practised pugilism, but after marriage had given that up. In March, 1876, he had felt what he supposed to be rheumatic pains in the shoulder, and experienced unusual trouble in using his two-handed cooper's hammer. In June he first noticed a lump in the armpit ; the swelling gradually increased, and by September had nearly filled the hollow. At that time he could not grasp objects so cleverly as before, and the fingers had become numb. He sought advice, and was told to poultice the swelling, supposed to be an abscess. Being subsequently advised to see Dr. Henry Ward, of Blyth, D——consulted him, and was at once told the nature of his disease.

Operation.—On November 28th, five days after the patient's admission, the subclavian artery was tied at its third part with an

antiseptic catgut ligature. In doing the operation the perpendicular incision was made short, and divided at once the skin and platysma. No director was used, the deep fascia of the neck being pinched up with forceps, and divided near the base of the omo-hyoid triangle. The external jugular vein was drawn aside by an aneurism needle; no other vein or arterial branch was seen before coming upon the cubclavian itself. On raising the fascia the cervical nerves were first discovered; to their inner side lay a yellowish object, not unlike at first sight to the arterial sheath, but which turned out to be the usual* lymphatic gland, and some fat. These were removed, and beneath was the artery coming from behind the anterior scalenus. The great vein was seen in front, separated by a distinct space from the artery. At no time during the operation did the vein rise up swollen, and obscure or overlap the artery. The artery was larger than natural, dilated but not distended with blood; it looked and felt flaccid; it could not be seen to pulsate, and to touch its beating was indistinct; its compression instantly stopped the beating of the aneurism. The arterial sheath having been carefully opened, an unarmed aneurismal needle was gently passed under the artery at its lower and inner side, and now it was that the only difficulty in the operation occurred. I have said that the artery was enlarged, but flaccid, not distended with blood. Thus it happened that as the needle was pushed under and round the artery, its flaccid coats were pushed on before the needle. A careless or impatient thrust would have pierced the walls of the vessel; the needle had therefore to be a little withdrawn, and passed on again. More than once this manœuvre was required, but being fully bent upon passing my needle close round the artery as it lay over the upper edge of the rib, and doing so without either injuring the pleura, unduly lacerating the cellular tissue, disturbing the connexions of the artery, or injuring the last, I persevered patiently, until, by a little humouring, I succeeded in passing my needle as I wished. It was then threaded with a No. 1 carbolised catgut ligature. No force was used in tying the ligature, which was not applied with the object or intention of dividing the internal coats of the vessel. On tightening the catgut pulsation ceased in the aneurism.

But little blood, not more than an ounce, was lost during the operation, which was done according to the antiseptic method. A small drainage-tube was laid from the deeper part of the wound to its outer extremity, which, as the patient was to lie on the left side, would be the most depending point. The usual antiseptic dressings were employed; a smaller (six-ply) gauze cover, large enough to extend some inches beyond the wound in every direction, was placed next the wet padding immediately over the wound, and a larger (eight-ply) gauze cover, such as is used after removal of the breast,

* Crossing: Med.-Chir. Trans., vol. xvi.

was placed over the shoulder, left arm, and side of the chest. A short gauze bandage kept the first cover in place ; a longer (ten yards long, four inches wide) gauze bandage kept the larger cover and the arm secure. The larger cover was left off after a few days, when the wound had become superficial ; the smaller was continued until cicatrisation was about complete.

The temperature, taken by the nurse in the right armpit immediately after the return of the patient to the ward, was 100°. There was a good deal of pain in the arm at 3 P.M., for which an under-skin injection was made. The patient ate a hearty meal at tea-time, and at 6 P.M. the temperature was 98·6° and the pulse 72.

The after-progress of the case is soon told, for in fact there is little to tell. The patient had simply no symptoms. There was no fever nor pus, but a natural pulse and temperature were noted throughout. Several of the sutures were removed on the fourth day ; the remainder, and the drainage-tube, which had already been shortened, on the sixth, when the greaterpart of the wound was closed, and what remained open was superficial. On the fourteenth day cicatrisation was complete, with the exception of a small point at the drainage-tube opening.

The patient, from the evening of the day of operation, expressed himself as feeling perfectly well, and said that, were it not for his freedom from the old pain in his arm, he should not have known that anything had been done to him. On November 30th, the second day after the ligature, pulsation was just perceptible at the wrist.

D—— left the infirmary about six weeks after the operation. At the time of his outgoing the power was returning in the arm and the numbness had left the fingers. The aneurismal tumour had diminished considerably in size, but was not hard ; it gave the impression to the hand of being still chiefly constituted of soft coagulum. I was desirous of retaining him in the house some time longer in order to watch the further changes in the sac, but he felt himself so well that he could not be persuaded to remain, and, in fact, took the opportunity while out on leave of departing entirely.

It was not without consideration that the ligature of the vessel was determined upon in the before-mentioned case. The alternative methods, which most strongly suggested themselves to me, were the old operation of laying open the aneurismal sac, and compression of the subclavian. The former was, however, quickly rejected as inadmissible, for the following negative reasons. There was evidently a sacculated aneurism to deal with, most probably springing from the axillary, between the origins of the acromial and superior thoracic above and those of the subscapular and circumflex below ; the sac did not quite reach the clavicle, and the subclavian artery, though deeply placed, was quite accessible. There were, therefore, no conditions present requiring the opening

of the sac, or the securing of the vessel at the mouth of the aneurism. The collateral circulation was apparently free, and there was nothing to forbid the application to the subclavian of whatever means might be chosen. There were also cogent positive reasons against this plan; a troublesome and bloody operation (in Syme's case, in spite of the preliminary exposure of the subclavian for its more thorough compression, there was a "tremendous gush of blood,") would be required, instead of a comparatively simple and frequently almost bloodless one; important muscles must be cut across, endangering the after-usefulness of the arm, and the axillary vein as well as the cords of the brachial plexus might be injured. Moreover, the actual results of Syme's cases were not altogether encouraging, for in one of the only two cases of sacculated axillary aneurism in which, so far as I know, he laid open the sac, life was imperilled for some time by diffuse cellulities; whilst, in the other (for the details of which I am indebted to Mr. Morgan, of Sunderland, and Dr. Ayre Smith, of the same town, formerly house-surgeon in the Edinburgh Infirmary), it was found at the operation that the sac had so pressed upon the chest as to cause absorption of a considerable part of the first and second ribs; the chest was, therefore, open, and the lung seen to rise and fall during the operation. The patient sank in about a week. The most successful of Syme's cases seems, from his own account of it, to have been really one of ruptured artery, whose severed ends communicated with a diffused collection of blood; the treatment of such a condition, by freely opening the swelling and trying the ends of the artery, is in accordance with the established rules of surgery, and was strenuously insisted on by Guthrie in is instructive and practical lectures at the College of Surgeons, but, I would venture to say, is rarely applicable to sacculated aneurism springing from a large artery. Some years ago, I performed this operation for diffused aneurism of the femoral. The patient originally had an ordinary sacculated aneurism about mid-thigh, and refused the pressure treatment proposed to him. He returned to me at the end of a fortnight with an enormous swelling occupying the whole thigh, extending from a little below Poupart's ligament to near the popliteal space, and presenting only an indistinct impulse coincident with the pulse. Here ligature of the femoral would have probably been followed by gangrene, and the result of pressure was doubtful. The case had, in fact, been changed from one of aneurism to one of ruptured artery. The great cavity was freely laid open, the blood-clot turned out, and the ends of the artery, separated by some distance, tied. Although circumstances rendered it necessary to operate by candle-light, no great difficulty was experienced, and the patient made a good recovery.

In the Newcastle Infirmary the pressure-treatment of aneurisms has been so successful that there is a natural pre-disposition in

favour of this method, which was rejected with regret. But the objections in this case to pressure seemed to me to outweigh its advantages. Although it is not difficult to stop the beating of an axillary aneurism by compression of the subclavian on the first rib, it is for the most part difficult to maintain effective compression for a continuous period. Mechanical means cannot readily be used here, even under chloroform, in the steady, persistent way in which they can be brought to bear upon the common iliac as it lies on the fourth lmbar vertebra; and in the greater number of examples in which the present form of aneurism has been cured by pressure, finger-pressure, or hand-pressure aided by a compressor, intermittently practised, has been the method employed. This form of pressure-treatment may extend over some time—weeks, or even months. Now, in my patient, the tumour was large, filling the armpit with its vigorous pulsations, and its contents mainly fluid. I thought it very unlikely, from what I had seen of similar cases, that coagulation would be complete in one, or even two applications of rapid pressure under chloroform. The intermittent method, already mentioned, would, therefore, be required and it seemed most probable that, before any decided effect could be thus produced, an aneurism, already so extensive, would have the opportunity of increasing and pushing its boundaries into such proximity to the subclavian triangle, that the danger and difficulty attending ligature of the artery, should this ultimately become necessary, would be greatly enhanced. No mode of treating aneurisms can, in my opinion, equal pressure in its almost complete immunity from danger where thoroughly applicable, and it was only from believing this mode to be, in the present instance, unfit, that I abandoned it.

If we could reckon positively on an antiseptic ligature always undergoing the changes described by Lister, and thus strengthening the blood vessel, as the iron rings shrunk upon a canon strengthen it, we might look on the ligature of an artery as almost as safe as its compression. Unfortunately, we cannot quite do this, for the prepared catgut has displayed a certain capriciousness of disposition, which still obliges us to watch with some anxiety the progress of our cases. An examination of the conditions found, where death, from divers causes and at various periods after the application of the prepared catgut to the continuity of the artery, has permitted an inspection of the parts, shows considerable variation in the condition of the catgut: so early as three days after its use it has been found softened and partially absorbed, and so long as fifteen days after it has been fouud *in situ;* and, what is certainly remarkable, in the latter case—McCarthy's,—ligatures having been placed simultaneously on the carotid and subclavian, and the patient having died on the fifteenth day from hæmorrhage, a hole was found in the subclavian, on which the ligature still remained, whilst no ligature, but some thickened connective tissue, was on the carotid,

which was closed by clot, and whose external coat was entire. In a case of my own, in which the common carotid was tightly tied, for aneurism low down on the vessel, with prepared catgut of medium thickness, the patient died of lung disease on the fourth day. At the examination, the aneurism, which communicated with the artery by a small opening, was found consolidated, and the ligature entire and firmly embracing the artery. On carefully cutting open the vessel, the internal coats were found divided, the external coat was entire but thrown into folds, and there was clot on both sides of the ligature.

In no case that I have seen recorded, where death had taken place later than the fifteenth day, was the ligature found unaltered ; whilst, with one exception, in all cases where the parts were examined later than the ninth day after the operation, the catgut was more or less softened and absorbed. The condition of the internal coats has varied greatly, as they have been found sometimes divided, sometimes whole ; but the outer coat, with the exception of four cases in which death occurred by bleeding from a hole in it, has been found entire. These observations are not altogether calculated to give one implicit confidence in the prepared catgut ligature. It seemed to me, however, whilst considering what treatment would be best in this case, that the variations discovered in the condition of the catgut might be attributed partly to differences in its quality and partly to the modes of trying it. Yielding of the arterial coats in the four cases mentioned was apparently produced by special causes which might be avoided. Looking at what happens in the rapid-pressure treatment (consolidation of the sac-contents in from four to twelve hours, in one of my cases, a large ilio-femoral aneurism extending some distance above and below Poupart's ligament was consolidated in ten hours; in another, smaller, but still of considerable size, consolidation was complete in four hours), as well as to the results of direct-pressure treatment as used by Dix of Hull and Prichard of Bristol (cure of the aneurism in about seventy-two hours)—the arterial trunk after either method of treatment often, indeed usually after the rapid-pressure, remaining patent up to the sac, and pulsating without disturbing its solidified contents,—it appeared to me that if the catgut could be reckoned upon to retain its hold merely until after coagulation of the blood in the sac was completed, its subsequent softening and relaxation might be regarded with indifference, and even with satisfaction, as being more likely to leave the arterial coats uninjured. I hoped, too, by the after-treatment, to bring about that early closure of the wound which would afford the opportunity for such changes in the ligature, and such consolidation of the deep parts of the wound, as would constitute the best protection against hæmorrhage, as well as against other dangers.

Such cases as Mr. C. Heath's, of ligature of the carotid, where

the wound was healed in about a week; as Mr. Holmes's, of simultaneous ligature of the subclavian and carotid; and also the state of the ligature and aneurism in my own case related above, fortified me in my belief that a well-selected ligature might be expected to retain its hold upon the artery for a sufficient length of time.

The ligature was chosen with some care; it was procured from Gardner, of Edinburgh; the catgut from which it was cut was the thickest of three sizes sent by him, and was marked No. 1. The ligature was pliable, not very elastic, resisted a powerful tug, was smooth, even, and without any apparent flaw. As stated in the account of the operation, no force was used in the tying, and the idea in my mind was that the internal coats should not be divided. The ends were cut short, for leaving the ends of an aseptic ligature hanging out of the wound seems to me quite inconsistent with the use of such a ligature, and likely to lead to the very evils to prevent which we employ it. With reference to this point, it is worth while to remember that in three cases of ligature of large arteries where, perhaps, the most rapid healing of the wound ever recorded took place—viz., Sir A. Cooper's case of ligature of the femoral with ordinary catgut, Porta's of ligature of the carotid with the same, and Lizars' of ligature of the subclavian with flax, —the ends of the ligature were in each case cut short, and the wounds healed in four days.

In conclusion, I may say that ligature of the artery, antiseptically conducted, was adopted in this case, as offering the smallest number of objections; and that what I asked of the catgut was, that it should hold until consolidation of the aneurismal contents should be complete, that it should then soften and become relaxed without injuring the coats of the vessel, and, by its organisation and incorporation with the arterial walls, strengthen them. By endeavouring to avoid undue injury to the parts involved in operation, and by the after-treatment adopted, I hoped to favour this action of the ligature and the early closure of the deep parts of the wound. My patient was fortunate in the possession of a good constitution, an admirable frame, and a calm north-country temperament, to which qualities may in a great degree be ascribed the successful result.