A CASE
OF
LIGATURE OF THE SECOND PART OF THE
LEFT SUBCLAVIAN ARTERY
FOR THE
CURE OF AN AXILLARY ANEURYSM.

BY
RICKMAN JOHN GODLEE, M.B.

Received November 9th, 1891—Read April 12th, 1892.

ON July 31st, 1891, I saw, with Dr. J. M. Bruce and Dr. Taylor, of Tooting, a gentleman, aged 66, suffering from a large aneurysm involving the upper part of the left axillary artery. It was evidently thin-walled, and pulsated very forcibly. The tumour projected into the axilla, and, although it was not to be felt above the clavicle, the pulsation in this situation was much more forcible than that on the opposite side; and we therefore concluded that the third part of the subclavian artery was, if not actually involved in the aneurysm, at all events larger than normal. The pain in the arm, though at times considerable, was not excessive, and, indeed, more complaint was made of a certain amount of anæsthesia of the hand.

Our patient, who is a hearty man for his age, is short, stoutly built, with a short thick neck, and a fair amount of subcutaneous fat. He spent over thirty years of his life at Bathurst on the West Coast of Africa, where, strange to say, he enjoyed good health ; in fact, he has never suffered from any serious illness in his life, with the exception of one attack of intermittent fever whilst he was in Africa, in 1856. His occupation did not lead him to perform any great muscular exertion, but, when a young man, he went in for rowing and other forms of athletic sports rather energetically. He never suffered from syphilis or rheumatism.

The first symptom of this illness appears to have been a palpitation in the præcordial region, which, he says, was very violent, and which he first noticed about two years ago, and about the time of its first appearance he, on one occasion, fainted. The palpitation, he is positive, was not in the situation occupied by the aneurysm, but lower down, and in course of time it subsided. The next trouble, which began three months before we saw him, consisted of a numbness in the left arm and hand, which gradually became worse, so that at times he let fall his glove or umbrella ; but these symptoms only occurred after he had been walking about for five minutes, and quickly disappeared when he sat down. The pulsation of the aneurysm now became quite apparent, and he assured us that it was much less severe than the palpitation of which he had at first complained.

Dr. Bruce's account of the state of the thorax is as follows :—"Præcordial impulse palpable in the fifth space, just within the left vertical nipple line. No pulsation of any kind in the region of the arch of the aorta. Area of superficial præcordial dulness is of ordinary extent. Over the base of the heart a systolic murmur, and a loud, somewhat thick second sound. The murmur is conducted along the right carotid artery, and it becomes ill-defined towards the mitral area.

"In the left axillary region of the front of the chest are

discovered the physical signs of aneurysm, as already described, including visible and palpable tumour, excentric pulsation in systole and palpable shock in diastole, both completely controlled (along with obliteration of the radial pulse) by pressure on the subclavian artery; a systolic sound (not murmur); and a loud, thick, diastolic sound. Over the left clavicle, in the situation of the subclavian artery, a whiffing systolic murmur, and the same loud, thick, diastolic sound. The diastolic sound is also audible over the back of the left chest.

"No signs or symptoms of pressure on the trachea, bronchi, œsophagus, or recurrent laryngeal nerve. Radial pulse symmetrical at the two wrists, quiet, regular, somewhat small, very soft, sudden, without thickening of the vessel wall. No signs of venous obstruction."

His general condition was good, though he had for some time been losing weight, three stone in all since the beginning of his illness; but, at his age, we were not disposed to recommend surgical interference without giving Tufnell's treatment a trial; although our patient, who was of a restless disposition, very much resented the idea. He was accordingly put to bed, and placed upon a course of iodide of potassium, and a rigid diet for three weeks,¹ at the end of which time the aneurysm had not apparently diminished in size, and it appeared that while the pulsation was no less below the clavicle, it was somewhat more forcible above this bone. It therefore seemed to me that a further delay would most likely render the application of the ligature quite impossible, so I advised him to submit to the operation, after placing before him, as fairly as I could, the chances of success and failure.

On August 29th chloroform was administered, and I made the incision for ligature of the third part of the subclavian, half an inch above the clavicle, but further in

¹ He began with Pot. Iodid. gr. x, but it was afterwards reduced to gr. v, three times a day. The amount of food was not actually measured, and it was not quite so restricted as was recommended by Tufnell.

than usual, its inner end reaching halfway or more across the sterno-mastoid. A large vein was divided in the first incision, and then the clavicular head of the muscle was exposed and completely divided across. The artery was then sought, but as it was very much overlaid by the brachial plexus, and as the neck was short and thick, a vertical cut was made, rather more than an inch long, near the inner end of the first incision, which gave much more room, and rendered the exposure of the vessel comparatively easy, after drawing aside with blunt hooks a very large vein which crossed it vertically, and the cords of the brachial plexus. The artery was large and felt very soft, so I divided transversely, with great care, one half or more of the anterior scalenus, whilst anxiously looking out for the thoracic duct and the phrenic nerve, neither of which, however, came into view. The former would probably have been very difficult to see, but I am sure that it was not divided, as no milky fluid welled up in the bottom of the wound. The second part of the artery, thus exposed, appeared to be comparatively healthy. I therefore passed the needle round it from above downwards, threaded with a piece of fine catgut. This was fortunately accomplished without any difficulty. The catgut was then tied to a piece of fine silk, which was attached to a ligature composed of four strands of the finest chromic catgut, which had previously been prepared and tested. The ligature was drawn through and tied, not sufficiently tightly to rupture the internal and middle coats of the vessel. Two pieces of each end were then tied in a reef knot, so as to ensure, if possible, that the original knot should not become loosened, and then all the ends were cut short. The wound, which was now very dry, was washed with a 1 to 500 sublimate solution, and it was all sewn up except about one inch of the outer part. Cyanide of mercury and zinc dressings were applied, and the arm was bandaged to the side, a knitted stocking and some cotton wool being placed over the hand for the sake of warmth.

Nothing need be said about the healing of the wound, which was complete by the eighth day, except that a certain amount of swelling occurred from extravasation of blood, and that some irritation was produced by the stitches, which were accordingly removed on the fourth day. The discharge of the first twenty-four hours consisted of a considerable amount of bloody serum, but afterwards was practically nil.

The patient kept his bed for a fortnight, and then began gradually to get about again. Whilst in bed he complained of nothing beyond some aching in the upper arm, which still (November 3rd) continues to a slight extent, though it is gradually disappearing. He now looks and feels much better than before the operation, is regaining strength, and can walk moderate distances.

Dr. Bruce and I saw him together on November 6th. He looks rather anxious, and says that he is still weak, and has not regained the flesh which he lost before the operation and during the time he was in bed: he weighs 10 st. 7 lbs., which he thinks is about a stone less than his normal weight. He is, however, cheerful, and has returned to his work at his office in the City. His appetite is excellent and his digestion good. The numbness of his hand has quite disappeared, and his principal trouble is pain in the arm and the front of the chest—no doubt of a neuralgic character, and, it is to be hoped, depending upon the contraction of the aneurysm.

This process of contraction has gone on quite satisfactorily, the induration which remains on the axilla being now quite insignificant. No pulsation is to be felt in any part of the upper extremity, and nothing above the clavicle in the situation of the subclavian, though a feeble pulse, as of the transverse cervical artery, is perceptible a little higher up. Slight thickening still persists above the clavicle; the scar is linear, and the vertical part of it scarcely visible.

So far, then, his condition is quite favorable, but it must be added that there is undoubtedly some faint pulsa-

tion in the first, second, and third intercostal spaces immediately to the left of the sternum. Dr. Bruce noted at the first examination that none was present; and although it is conceivable that the pulsation, which is now quite easily felt and seen, might have been masked by the much more obvious beating of the aneurysm, it cannot but make us think of the possibility of the gradual development of another aneurysm in the arch of the aorta. In this connection we must also remember the pain in the arm, which he describes as being in the shoulder and elbow especially, partly fixed and partly transitory. The percussion note over the pulsating area is rather higher than that of the corresponding part on the opposite side. The cardiac impulse is diffused, the apex-beat is internal to the nipple, the superficial dulness is less than normal. A murmurish first sound and a thudding second sound are heard at the base, but most loudly over the pulsating area. It is thus pretty certain that he has an atheromatous and dilated aorta, and some atheroma of his aortic valves, but there is nothing definite to point to more serious disease of this vessel. The pupils are normal and equal, and I can detect no inequality in the movement of the two vocal cords; but he has a dry, hard cough (which, however, is not characteristically laryngeal, and which he assures us is just what he has every winter). He also says that his friends tell him that his voice has become weaker, though, for his own part, he does not notice any change in it.

In reporting a case of ligature of the second part of the left subclavian, one is naturally led to try to find out how often it has been done before. I have tried, and am convinced that it would not only be a vain attempt, but that, if it were possible to succeed, it would lead to no useful result. A glance at Poland's excellent article on "Subclavian Aneurysm" in the 'Guy's Hospital Reports' for 1871, vol. xvi, p. 129, yields, indeed, the interesting historical fact that up to that time there had been recorded eight cases of ligature between the scalene

muscles, of which five recovered. But 1871 was a long while ago—a very long while ago, considering the strides that modern surgery has been making in the interval; while the enormous increase of medical literature makes it almost impossible to anyone, except an absolute bookworm, to gather statistics of the slightest value. I have, therefore, not made the attempt.

Poland concluded, as the result of the careful study of the tables of Norris, Porta, Holmes, Koch, and Le Fort, that the average mortality after ligature of the second and third parts for aneurysm of the subclavian and axillary arteries varied from 40 to 50 per cent.; but it is enough to show how valueless, for us, this conclusion is, when we see a table which he introduced as a matter of course, stating the exact date of the separation of the ligature, and when we find amongst the “consecutive effects” of the operation the most important place assigned to such conditions as these:

Inflammation and suppuration of the tissues in the neighbourhood of the ligature.

Chronic phlebitis.

Pyæmia.

Pleurisy and pneumonia.

For us the questions are (if the justifiability of the operation have been granted)—First, shall we employ an absorbable or a non-absorbable ligature? and second, shall we tie the knot sufficiently tightly to rupture the internal and middle coats of the vessel? and I think that for some years no good will come of collecting statistics, but that we shall do best to simply record our cases, and the reasons which have led us to adopt this or that method of procedure.

I did not rupture the internal and middle coats because I did not feel sure that the artery was healthy enough to bear the strain, and because I thought that, even if it were strong enough, an already dilated vessel would be more likely to become aneurysmal at the seat of ligature if these coats were injured than if they remained

intact. In doing this I was encouraged by the reports of their experiments on the ligature of arteries by Messrs. Ballance and Edmunds. At the same time I hold the opinion that if an artery be easily accessible, and if its complete exposure do not endanger surrounding important structures, as *e. g.* in the case of the femoral or that of the brachial, the best plan is first to divide the vessel and then to ligature the two ends—a method less likely to give rise to accidents from slipping of the ligature than that of applying first the two ligatures and then cutting between them. But if an artery be not easily accessible I think the safest plan is to apply the ligature tightly enough to rupture the internal and middle coats, if it be healthy; and it is only in the case of diseased vessels that I would recommend the plan adopted here.

I used an absorbable ligature because it seems a more scientific proceeding to leave in the wound a material which will ultimately become completely incorporated with surrounding parts, than one which must remain indefinitely as a possible, if not probable source of mischief; and I used catgut instead of kangaroo tendon, partly because I have no experience of the latter, while I have had plenty to give me confidence in the former and partly because the knot of a piece of kangaroo tendon sufficiently stout for the ligature, seems to me of an inordinate size.

In the performance of the operation easy access to the vessel is obtained by the form of incision I adopted; too much stress cannot be laid on the advantage of having a vertical as well as a horizontal cut. It makes an enormous difference in the accessibility of the deeper parts of the wound. It has been recommended that the phrenic nerve should be sought and held out of the way. If the wound be pretty dry, as in my case, I do not believe that this is advisable, and it really leads one nearer to the edge of the anterior scalenus than it is at all necessary to go. As regards the thoracic duct, it must be remembered that it is in danger as soon as ever the clavicular head of the

sterno-mastoid has been divided. The best way to avoid it is to cut through the anterior scalenus slightly above the level of the subclavian artery—a plan of proceeding which has other very obvious advantages. I should certainly not join with those who advise that this muscle should be divided upon a director; it seems to me that there is much less likelihood of injuring the pleura or wounding the superior intercostal artery if the fibres of the muscle be picked up one by one in forceps and divided by a knife held horizontally.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. iv, p. 102.)