

Anatomico-surgical remarks on the different portions of the axillary artery : with a case in which this vessel was successfully tied / by G.C. Monteath.

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carrying on a part of the blood which the cava would otherwise have been obliged to convey to the heart, but might have finished on the left side, as an azygos, what the lower vein (*p*) as an azygos had begun.

To determine these points, it was resolved to make free with the preparation, and to remove a portion of the aorta that covered what was conjectured to be the termination of the vein *p*, and another portion that obscured the beginning of the vein *o*; when our suspicions were confirmed; for the vein *p* was now seen distinctly to be a large branch rising upwards from the left emulgent, and entering obliquely into the cava inferior, as high up as the cœliac artery; and the vein *o* was as distinctly seen to be a branch nearly as large, sent off, nearly opposite the head of the 7th rib, by the inferior cava, which, like a river, had here split into two streams, leaving a deltoid space between. It had also been observed, that the cava inferior became suddenly enlarged at *q*. The cause was now evident. At that point, the blood of the large vein *p* had been poured in.

The chief peculiarities in this case seem to be—That the vena cava, in passing up behind the liver, avoided all connexion with the hepatic veins—That there was, strictly speaking, no vena azygos either on the right side or the left—That the cava inferior, when it came up to the heart, divided into two unequal branches, the larger turning to the right, and the smaller to the left, but both avoiding the heart—That the branch on the right side, which may be called the cava inferior dextra, followed the course of the vena azygos, and ended as if it had been the azygos, in the cava superior, while the other, which may be called the cava inferior sinistra, ended in the left subclavian vein—That the dextra, while it continued to do its duty as cava, assumed the office of azygos also, by receiving the parietal veins, as soon as it passed the right emulgent vein—That the sinistra, having come off from the dextra, in the thorax, could not only act as an auxiliary cava, in the left side of the thorax, but could also do the duty of an azygos there; but while in this way the duties of azygos would be performed to the whole of the right side and the upper part of the left, the lower part of the left would have been neglected; to guard against which, the left emulgent sends up the large vein *p*, which, while it conveyed to the cava inferior a part of the renal blood, must have also done the duty of an azygos to the parts in its vicinity, as into it the lumbar veins are seen entering—Lastly, That all the blood, with the exception of that from the hepatic and coronary veins, must, in this case, have been poured into

the right auricle from above downwards, in one full and undivided stream.

I do not choose to hazard any opinion, or draw any conclusion, at present, from this very singular distribution of the venous system; but may state, that impressed with the belief that there must have been some accidental, some mechanical cause, which had prevented the blood from getting on to the heart, in the usual way, great care was taken to search diligently and cautiously for any appearance of tumour, compressed vessel, or remaining ligament, but none was found.

College, Dec. 11, 1827.

II. *Anatomico-Chirurgical Remarks on the different Portions of the Axillary Artery, with a Case in which this Vessel was successfully tied.* By G. C. MONTEATH, M.D. One of the Surgeons of the Glasgow Eye Infirmary, lately a Senior Surgeon of the Glasgow Royal Infirmary, &c.

THE cases of ligature of the axillary artery at present recorded, are few and far between, and the successful ones less numerous than those of the carotid, subclavian, or external iliac arteries. I have therefore thought it proper to communicate a case, in which it was deemed necessary to secure this artery, deep in the axilla; in consequence of an injury of the brachial artery, followed by dangerous hæmorrhage, and by extensive mortification of the skin, and of the subcutaneous and intermuscular cellular substance of the arm and forearm, extending to the very border of the axilla. Previously to entering on this case it will be useful to examine the Surgical Anatomy of the Axilla, and to take a brief review of the cases already recorded, in which the axillary artery has been tied.

The axillary artery, surgically considered, may be divided, as has been done by Harrison and Velpeau, into three parts. The first lies at the top of the axilla, close upon the first intercostal space and the second rib, in the space between the lower margin of the clavicle and upper margin of the pectoralis minor, and is a little more in the adult of medium size, than an inch in length. The second, or middle portion, which is the continuation of the artery, and also about an inch in length, commencing with the upper edge of the pectoralis minor, and terminating at its lower edge, lies under, and is as if concealed by this muscle. The third, or lowest portion, extends from the lower edge of the pectoralis minor to the border of the axilla, this border being formed,

as all know, by the insertions of the pectoralis major, and of the latissimus dorsi, with its auxiliary, the teres major, into the os humeri. This third portion is longer than the united lengths of the first and second. The first and third portions have been tied with success; it is very uncertain whether the second has or ought to be attempted.

1st Portion of the Axillary Artery.—It is covered by the common integuments, the clavicular portion of the pectoralis major, the thin aponeurosis coraco-clavicularis, or fascia subclavicularis, which extends from the coracoid process to the clavicle and cartilage of the first rib, and lastly, by loose cellular substance. It is also in some degree hid and overlapped by the axillary vein, which is here as thick as the clavicle, and lies upon the sternal and anterior aspects of the artery. The axillary plexus of nerves lies on the acromial and posterior aspects of the artery. The connexion of the artery with the vein is pretty close, and there are two or three arterial branches given off by this portion, namely, the thoracica humeralis in one or in two divisions, and the thoracica anterior. The anterior thoracic nerve, a branch from the axillary plexus, accompanies these arteries out of the axilla, and the acromial and cephalic veins enter the axilla and axillary vein, in this limited portion of the axilla, and ought to be avoided in any operation. Though the artery itself does not lie deep, and is easily exposed and secured in the dead body, yet its relations with the important parts just mentioned, must render the application of a ligature upon it an operation of some difficulty and nicety, in the living. When the case will admit of it, the ligature should be applied as near to the clavicle as possible, so as to be above the origin of the two thoracic arteries already mentioned; as we know, that when a branch is given off immediately above the ligature, it may prevent the wished for obliteration of the artery, and give rise to fatal secondary hæmorrhage. There is fully an inch of the subclavian artery above this highest point or apex of the axilla, which gives off no arterial branches; where, indeed, the ligature is generally applied, when the artery is cut down upon above the clavicle; and in this point of view, the very top of the axilla (I mean immediately below the clavicle), is the best part of the whole course of the subclavian and axillary arteries, which can be selected for the application of a ligature. The only way in which this first portion of the artery can be exposed and tied, is through the anterior wall of the axilla. I should think it best, in the first place, to divide the common integuments in an oblique direction, commencing immediately below the

clavicle, an inch, or in thin people two inches, from its sternal articulation, and terminating near the point of the coracoid process, where the deltoid and pectoral come in juxtaposition, and where the cephalic vein must be avoided. The fibres of the clavicular portion of the pectoralis major muscle must be next divided to the same extent, either with or without the assistance of a director, as the surgeon may prefer. I may here state that it has been proposed to expose and tie this part of the artery, by merely separating the clavicular portion of the pectoralis major from the clavicular portion of the deltoid, where they are united by cellular substance, and form a natural gutter, called by the French the coraco-deltoid fissure, which conducts the cephalic vein to the axilla, and lies nearly over the course of the artery. But independently of being encumbered with the cephalic vein, it must be next to impossible to operate with any safety or certainty, in such a circumscribed space. It may also be mentioned, that the mere separation from each other, without division, of the muscular fibres of the pectoralis, by an incision in the course of the fibres, as recommended by Professor Marjolin in the *Dictionnaire de Médecine*, article *Anévrysme*, must leave the operator much confined and embarrassed in the ulterior steps of the operation. Muscular fibres should, therefore, to a greater or less extent, be divided so as freely to expose the space between the clavicle and the upper edge of the pectoralis minor. The fascia subclavicularis must next be cautiously divided, also the loose subjacent cellular substance, and the artery will then be found situated in relation to the axillary vein and nerves as above described. When the artery has been cautiously separated in the same manner as any other, the aneurismal needle should be entered between the vein and artery, and brought out at the acromial side.

The cases in which it may be proper to tie this portion of the artery are those of small circumscribed aneurisms in the middle and lower portions of the artery, or a high aneurism of the brachial artery, rising into the axilla. The operation may be also advisable in cases of recent wound of the middle or lower portions, or where there has been a consequent diffused aneurism, provided it be deemed impossible to cut down directly on the wounded part of the vessel, of which hereafter. Experience alone must determine whether, even in the cases I have mentioned, it may not generally be preferable to secure the artery above the clavicle, rather than below it; but that the latter operation may be safely done in cases of aneurism of the axillary artery and a cure effected by it, has been proved by at least two cases.

Mr. Keate, surgeon-general of the English army, tied this portion of the artery in 1800, on account of an aneurism in the lower part of the axilla, which had actually burst. After dividing the skin and part of the clavicular portion of the pectoralis major, but before isolating the artery from the vein and nerves, he passed a curved blunt-pointed needle, armed double, under the artery, as he conceived, and tied two of the ends. After a careful examination, finding that the artery still pulsated below the ligature, he determined on passing another ligature higher up, near to the clavicle, and so deep as evidently to include the artery, and the patient recovered.

Mr. Chamberlaine, of Kingston in Jamaica, was, I believe, the first who secured this portion of the artery, in a surgeon-like manner, and with perfect success. The operation was performed in the manner I have recommended above. The case occurred in 1815, in a healthy-looking negro man, about 25 years of age; who had a circumscribed aneurism of the lower portion of the axillary artery, the size of a large orange, occasioned by a wound with the point of a cutlass. Every thing went on favourably after the operation, and the arm was saved.

Pelletan, in the 2d vol. of his *Clinique Chirurgicale*, relates a most interesting case of circumscribed aneurism, about half way up the axilla, in a man 40 years of age, produced by a violent effort, and which had existed two years, when he applied at the Hôtel Dieu for relief. Though the tumour raised the shoulder by its bulk, yet, to use Pelletan's own words, there was *un espace notable entre elle et la clavicule*, where the artery could be felt, and might have been easily tied. Though this case occurred so far back as 1786, Pelletan, much to his credit, proposed to his colleagues the very operation recommended at the present day, and performed so successfully by Chamberlaine; and I believe Pelletan would have been the first to have tied that part of the vessel successfully, had he not been thwarted and prevented by his colleagues. After he had divided the common integuments in the same way as Chamberlaine, they would not allow him to proceed, as he had planned, with the division of the clavicular portion of the pectoralis, but caused him to thrust a sharp needle repeatedly, *à différentes reprises*, behind the artery, so as if possible to pass a ligature around it. He failed, and renounced the operation, thankful that in these dangerous, unsurgical, and ill-advised attempts, he had not transfixed the artery or vein. The patient died in 20 days after this attempt, of inflammation of the chest, produced by

the aneurismal tumour eroding the ribs, and exciting inflammation of the pleura. Dissection proved that the operation could have been easily performed in the scientific manner Pelletan had proposed. The artery lay even more superficial than usual, and was hardly overlapped by the large axillary vein, in consequence of the tumour having pressed the artery nearer to the surface than natural.

Lastly, Desault, in the last years of his practice, seems to have attempted securing this portion of the artery, on account of an aneurism in the upper part of the axilla; but the patient died of hæmorrhage, among his hands, on the table. This case is alluded to (not described) by Bichat and others, so that little can be inferred from it. We know that Desault attempted to cure this case by the now exploded operation of opening the sac. He performed the same operation on an aneurism of the lower portion, of which hereafter.

2d or Middle Portion of the Axillary Artery.—It is in people of full size, fully an inch in length, and is closely protected and concealed as it were by the pectoralis minor, which crosses it. This portion is covered by both pectoral muscles, whereas the upper and lower portions are covered by the pectoralis major only. The axillary vein here, as in the upper portion, lies on the sternal and anterior aspect of the artery, but does not lie in such close contact with it as above, because the axillary nerves, in place of lying all on the humeral side of the vessel, here form a plexus, embracing and surrounding the artery with a nearly perfect sheath of nerves, which is thus interposed between the artery and vein. This arrangement of the large nerves of the axilla around the artery, is splendidly and lucidly set forth by Scarpa, in his third and fourth admirable plates of the nerves. These connexions of the artery, as well as its depth, either from the base or front of the axilla, render, I conceive, any operation on this part of the vessel almost out of the question, even though Desault's expedient, and Roux's recommendation, of cutting across as much as might be required of the pectoralis major, so as to open up and expose the axilla to view, were resorted to. If this part of the artery were wounded, I would confidently anticipate a favourable result were the upper portion of the artery tied, and also the lower portion, if the nature of the case seemed to demand it, rather than perform the dreadful operation of ripping up the axilla, and attempting to secure the vessel where it is almost inseparably incased in large and important nerves.

3d Portion of the Axillary Artery.—This division commences at the inferior border of the pectoralis minor, and

extends to the base, or lower opening of the axilla. Its length is equal to the united lengths of the two former. The artery now approaches to, and lies pretty close upon the head, neck, and commencement of the os humeri, against which it can be compressed, and the circulation of the arm suppressed during a high amputation, where the tourniquet could not be used. I have repeatedly, in the capacity both of operator and assistant, put this to the proof on the living body, and think it is much more to be depended on than pressure of the artery either against the 1st rib above the clavicle, or the 2d rib below it. The vessel is here protected in front by the lower part of the pectoralis major. Below, the entrance to the cavity of the axilla is covered merely by the common integuments, and a thin fascia, by dividing which in a line parallel to and over the course of the artery, the whole of this 3d portion may be exposed, and a ligature passed around any part of it. The relation of the axillary vein to the artery is here much the same as in the two upper portions. It lies on its internal and sternal aspect. The nerves now no longer form a sheath or plexus around the artery, but having divided into the distinct nerves of the arm and forearm, they course along the different sides of the artery, nearly surrounding it, but so loosely as to render it perfectly practicable to isolate the vessel, and pass a ligature around it. This portion gives off at least four considerable arteries, viz. the thoracica longior, the great and important subscapularis, and the two circumflexæ, all of which are extremely uncertain in regard to the exact site, and mode of their origin, and yet must, if possible, be avoided in any operation on the trunk of the artery.

The artery has been here repeatedly tied with success. This may be necessary when it has been recently wounded, or at the very commencement of a diffused aneurism from wound or rupture, also in cases of aneurism high in the arm. There may be also cases of severe laceration, contusion, or tumour, high in the arm, which may require the ligature of the axillary artery. Mr. Samuel Cooper, in his invaluable Surgical Dictionary, states that this artery was tied about a century ago, by a Mr. Hall of Cheshire, where it had been wounded by a scythe. On referring, however, to the first mention I find of this case, in the 4th vol. of the London Medical Journal for 1784, p. 169, I find that the wound was not of the axillary, but of the humeral artery, just below the axilla. As the wound was free and large, the artery was laid hold of with the finger and thumb, and a ligature tied around it, at the wounded spot, and not in the axilla. The patient recovered.

Mr. White of Manchester, (see the same vol. p. 159), seems

to have been the first who tied this portion of the artery. The case (that of Capt. M. aged 23), occurred in 1783, and was caused by a sword, which wounded the artery just below where it gives off the anterior circumflex artery. A prodigious effusion of blood ensued, soon ending in syncope, and the patient appeared to many persons, both of the faculty and others, to be dead. Mr. White enlarged the wound, both upwards and downwards, and attempted to pass a crooked needle under the artery, but failed. A needle was then passed on each side of the wounded artery, through the integuments, bringing both ends of the ligature through the skin, at some distance above the wound, enclosing a good deal of substance, which, when tied, effectually secured the vessel. I need hardly say, that no surgeon of the present day, would be excused were he to conduct himself thus. The fact is, that three of the large nerves were included with the artery, under the ligature. Mortification commenced on the 4th morning, and he died in the evening of the same day. This was, no doubt, an unfavourable case, because, on dissection, one of the brachial nerves was found to have been divided, and the vein to have been wounded by the sword, but the depriving the limb almost totally of nervous energy, by including the nerves, must have been a complete barrier to success.

In the year 1795, the celebrated Desault tied this portion of the artery, almost as high as its commencement, so far as we can judge from the case, as narrated by Bichat. A sword had entered the axilla, about an inch above the edge of the pectoralis major. A great quantity of blood was lost at the moment, and a large diffused aneurism immediately formed under the pectoralis muscle, the latissimus dorsi, and the walls of the chest and belly. The patient, a man of 30 years of age, came under Desault's care, in the Hôtel Dieu, the 7th day after the accident, and seems to have been operated on, the same or next day. The skin over the tumour had by this time become red and tense, the forearm cold, and there was much attendant pain and fever. An incision, six inches long, was made along the course of the axillary artery, commencing under the clavicle. The two lower thirds of the pectoralis major were fairly divided, the aneurismal swelling exposed, opened, and emptied of blood, the axillary plexus of nerves, the vein, and the artery were then seized *en masse*, and a temporary ligature tied around the whole, so as to command the frightful bleeding. This ligature acted as a temporary tourniquet, till the artery was detached, and examined; when the wound was discovered immediately above the origin of the two circumflex, and the

subscapularis arteries. Here a ligature was applied upon the isolated vessel. The nerves and vein having been next liberated from the gripe of the ligature, first applied, it was also retained as one of reserve. Two more ligatures were applied below the wound of the artery, as is the present custom in most cases of large wounded arteries. During the first days, hopes were entertained of a cure; but on the 6th, the arm began to mortify, and the patient died. The tense and inflammatory state of the parts before the operation, as well as the extent of effused blood, rendered this an unfavourable case; but Scarpa, and the best surgeons of the day, censure highly the temporary ligature of the nerves, as it may have been sufficient to have destroyed their functions permanently, though the stricture upon them was very temporary.

Scarpa relates a case of wound of this portion of the artery, which must have been near its commencement, as it was high in the axilla, and close to the head of the humerus. The wound was inflicted by a sabre. MM. Maunoir, two celebrated surgeons of Geneva, secured the artery successfully, and without the auxiliary step of cutting across the pectoralis major. One of the Maunoirs introduced his finger into the bottom of the sabre wound, which was behind, and ascertained exactly where the vessel was wounded. The other made an incision through the integuments of the axilla, in the course of the axillary artery, divided the tumour, and removed the grumous blood, which did not prevent him from distinguishing the nervous cords of the brachial plexus, and the vein from the artery, which was tied above and below the wound. The artery was then cut across. (See Scarpa, by Wishart, 2d ed. p. 412). The operator was, in this case, easily guided to the exact spot where the artery was wounded, by the finger of the assistant passed into the sabre wound, an example worthy of imitation in all cases of wounded artery, which will admit of such practice. If the wounding instrument has been small, a large bougie or probe will answer the purpose better than the finger. This boy recovered the use of his arm, with the exception of the first phalanges of the last three fingers, which were destroyed by dry gangrene.

Professor Langenbeck of Gottingen, who is surely one of the most able surgeons of the present day, states that he also has successfully tied this portion of the artery. (See his *Bibliothek für die Chirurgie*, &c. vol. iii. p. 274.) In this case, the wound of the artery was so high, that he was obliged to cut across a portion of the pectoralis major. I may here mention, that Roux also recommends this step, and even the division of the pectoralis minor, were it found necessary.

(See his *Nouveaux Elémens de Médecine Operatoire*, tome I. p. 770). But this is a step, if possible, always to be avoided, as the power of the arm must thereby be much weakened for life.

It is certainly one of the approved principles of surgery, that in wounds of large arteries, it is necessary to expose the wounded part of the vessel, and tie it *above* and *below* the opening, so as to prevent hæmorrhage from the *lower* part of the vessel, as well as from the *upper*; and that this is practicable in the lower portion of the axillary artery, the successful cases of Maunoir and Langenbeck have proved; and it seems to me to be the practice demanded in such cases, unless a diffused aneurism of some duration or of considerable magnitude had already formed, filling up and extending perhaps to the very summit of the axilla. This will unfortunately be too often the case in such wounds, for the contents of the axilla are so loose, as to give little resistance to the furious impulse of blood from a large wounded artery. How different are circumstances here and at the bend of the arm, where the brachial artery lies near to a flat surface of bone, and is closely bound down by fascia! In many cases, when the brachial is wounded, the progress of the succeeding aneurism is slow, and may be commanded in a considerable degree, and even in some rare cases cured, by bandaging and rest. Not so in the axilla; where a diffused aneurism, such as I have described in one of Desault's cases, must, in the great majority of instances, rapidly form, unless surgical aid be procured immediately after the accident. In such cases, the general surgical principle of tying the artery immediately above and below the wound, must, I fear, be laid aside, on account of the great difficulties and dangers, both immediate and consecutive, which must be encountered. In the cases of aneurism at the bend of the arm, from wound, the Hunterian operation is almost always successful, and though aneurism from wound of the axillary will generally be more diffused than at the bend of the arm, and therefore not so well suited for cure by the Hunterian operation, I would nevertheless consider that my patient had a much better chance of being saved, by this operation performed immediately above or below the clavicle, than by the operation performed by Desault, even though no injury were done to the nerves. On the other hand, however, where the surgeon is immediately called, and before extensive effusion of blood has taken place, the artery should be secured as I have related above, in the cases of Maunoir and Langenbeck.

In cases of true aneurism of the axillary artery, or even of

false aneurisms from a small puncture, exertion, &c., provided they be circumscribed, I need hardly say that the Hunterian operation alone would be proper. It may be performed immediately below the clavicle, if the tumour be small, and far down in the axilla; and immediately above it, if the tumour be large and reach to the top of that cavity.

The case which I shall now add to those in which the axillary was successfully tied, was one in which there was no wound, aneurism, nor effused blood in the axilla, yet it has appeared to me interesting, not only because it adds one to the number of successful ligatures of the axillary artery, but also furnishes a very striking instance of the restorative powers of nature, under the most unfavourable circumstances.

On the 20th of September, 1823, I was called to see Mr. M. about 20 years of age, residing nine miles from Glasgow. Twenty days before this, his right arm was run over by the wheel of a heavy coach, so as to have bruised it from near the shoulder to the wrist, but without any laceration of the skin. The wheel had crossed the arm about half way up the biceps muscle. Violent pain, swelling, and discolouration soon followed, and increased, notwithstanding the repeated application of leeches and fomentations. Mr. Craig, of Nielston, and Mr. M'Nichol, surgeon in Mearns, attended the patient.

On the 12th day, the swelling along the biceps was alarming, accompanied with high fever, the pulse being 130, and the pain severe. For some days previous to this, Mr. C. could discover no pulse in the radial artery. A free incision was made by Mr. C. over the course of the biceps, which gave vent to a large quantity of bloody pus, and putrid coagula. Suppuration and sloughing of the subcutaneous cellular substance extended down to the very wrist, forming here and there apertures in the skin. A small pulse could now be felt in the radial artery. On the 20th day, the appearance of the arm was truly repulsive. Almost all the integuments and cellular substance on the inner and under sides of the arm and forearm had sloughed, leaving the muscles as if they had been dissected. In some places the periosteum of the humerus was exposed, and the median nerve was visible at the elbow. The veins at the bend of the arm were exposed and dead, and the biceps tendon quite bare. Portions of sloughy matter hung out in all directions, and several of them were this day cut away. The same evening, about bedtime, a sudden hæmorrhage, ending in syncope, took place from the arm, just where the wheel had crossed it. Mr. C. speedily arrived with a tourniquet, but the bleeding had ceased.

Next day, the hæmorrhage recurred, and as it was evident that the humeral artery had given way, and that the patient was in the most critical state, Mr. Tait, surgeon in Paisley, and I were sent for. We found the arm as above described, the patient much exhausted by hæmorrhage, fever, mortification, and pain. The heat of the extremity was natural, and the radial pulse was perceptible, but very small. When Mr. C. saw this case some days after the accident, no pulse (as has been already mentioned) could be felt at the wrist, but it could be discovered some days after, though very feeble, and different from that in the other wrist. It was therefore concluded, that the wheel in passing across the artery had so bruised, or torn it, as to destroy its permeability at this point. It was also inferred from the return of pulse, that a new collateral circulation had been established. It was clear that the humeral artery had sloughed across where it had been bruised, and was the cause of hæmorrhage; yet that the collateral circulation was still carried on, and the pulse perceptible, because the arteries supporting this new circulation were all given off above the point which had sloughed, viz. the descending arteries from the subclavian, the thoracics, the subscapularis, the circumflexæ, and the profunda superior, or collateralis magna.

The gangrene had extended close to the boundaries of the axilla. The consideration of the case therefore resolved itself into two queries; 1st, Amputation at the shoulder joint, or at the border of the axilla, procuring a flap from the outside of the arm; or 2d, Tying the axillary artery, and leaving the arm to be saved if possible. The last would give the patient a chance of saving his limb, for renewal of dangerous hæmorrhage would be prevented, and the power of the collateral circulation, already pretty well established, might not be too much diminished by the loss of the profunda, or the circumflexæ, and of the subscapularis, above all which the ligature must be applied, on account of the gangrenous state of the soft parts, between the slough of the artery and the axilla. In the event of the collateral circulation proving insufficient, and the gangrene proceeding, amputation might still be resorted to. It was therefore agreed to tie the axillary artery, which I proceeded to do at seven in the evening, with the assistance of the three above-named gentlemen.

Operation.—The patient was laid on a table, with his right side near its edge, and the arm supported by an assistant, at a right angle with the body. The subclavian was to be pressed against the first rib, by means of the padded handle of a tourniquet, in case of hæmorrhage. I made an incision 3

inches long, extending along the course of the artery, from as high in the axilla as the integuments would permit, to within half an inch of the sloughing parts of the arm, that is, to the border of the axilla. After cutting the skin and cellular substance about half an inch deep, I performed the dissection chiefly with the handle of the knife and my fore-finger nail, assisted occasionally by tearing a few fibres of membrane with dissecting forceps. Two large nerves first presented, and behind the one nearest the humerus, lay the artery. By cutting the cellular sheath of the nerve with the scalpel, I easily exposed the artery. A very large vein lay on its humeral aspect, not on the sternal where I expected to find it. In this instance, which sometimes happens, the *venæ comites* which in the arm lie on each side of the artery did not unite till high in the axilla. I made a separation, or small opening between the vein and the artery, with the point of the forceps, by tearing the cellular substance. I now entered the armed aneurism needle, easily, between the vein and the artery, pushed it around, and by a few scratches of the nail brought it through on the opposite side. A single ligature was applied at least two inches above the tendon of the *latissimus dorsi*, and the wound brought together by adhesive plaster. About two table spoonfuls of blood were lost from a vein, at the lower angle of the wound. The sloughy parts of the arm and forearm were more freely incised, and a turpentine dressing, which had been in use, continued. Opium and wine had been given for several days, and were also directed to be continued. Whilst performing this operation, I stood behind the arm, and operated over it. I found the position very convenient, and the light of candles perfectly sufficient. It was evident, that by this operation, the collateral supply of blood sent direct from the humeral and axillary, by the *profunda superior*, *circumflexæ*, and *subscapularis*, was at once cut off, which might be expected to effect the circulation in the limb, which was accordingly instantly observed. The arm grew paler and cooler, the hand became cold, and continued for two or three days to be warmed solely by the heat of the body, and the pulse at the wrist could not be felt; but in half an hour, both Mr. Tait and I were sure we could perceive a return of very slight pulsations.

The patient improved daily, though very slowly, the ligature came away on the 18th day, and the wound, made by the scalpel, healed in six weeks. What follows of this case, is chiefly extracted from the gentleman's own history of the after treatment, and progress of cure. The arm from the shoulder to the wrist was still in a piteous state, being one

continued sore, $2\frac{1}{2}$ inches at its narrowest, and not less than $4\frac{1}{2}$ at the broadest places. It was covered with large flabby granulations, which were as soft as curd. The wound improved very little for nearly five months, and when he attempted to sit up a little, or used the smallest exertion, a considerable bleeding, over its whole extent, was the invariable consequence. From this time, a very gradual amendment of the sore went on, under a variety of treatment; but it was not cicatrized till 15 months after the operation. "At this time, I could perform," says Mr. M. "every motion of the fingers, wrist, and shoulder, almost perfectly: the only materially defective motion was that of the elbow. The forearm forms an angle of 135° with the arm, but as it at one time made less than an angle of 90° , I hope, that with a little increased exertion, it will become perfectly straight."

Mr. M. adds the following ingenious remarks regarding sensation; but it will be proper to consider, in reading these, that there must have been injury done to the nerves of the arm, particularly in all probability to the median, by the wheel of the coach. Sensation commenced first in the little finger, 4 or 5 days after the operation, and in the course of 10 days more, existed in some degree in all the rest. During the successive and gradual development of sensation in the different fingers, he observed the following circumstances uniformly take place. The following are his own words:—"Before any nervous action can exist, there must be as much circulation in the part, as is not only sufficient to preserve life, but, when not exposed to a great degree of cold, to keep it in a proper temperature. This is necessary to the lowest degree of sensation, and I have always observed this sensation improved with an increased circulation of blood. The first or lowest kind of sensation, is that of pain, when the part is touched, without, however, any sense of the cause. I have often made the experiment on all my fingers, and I could never distinguish by the part possessed of this lowest kind of sensation, whether the pain was produced by a foreign body or not. The second kind of sensation, is that of heat and cold. It came into all my fingers nearly at the same time with the former, and it differs from all other kinds of sensations, in this that it is most perfect at first. I have always found, that a finger possessed of this sensation, and insensible to the feeling of touch, was a much better thermometer, more readily appreciating small differences in temperature, than one which had the sense of touch in perfection. This no doubt arises from the limited circulation of the blood, allowing the finger readily to assimilate itself to the temperature

of the objects, with which it is placed in contact. The third, and most perfect sensation, is that of touch, by which I mean the faculty of discerning the resistance and inequalities in the surface of bodies. This kind of sensation, I have uniformly found, is longer in being developed than the other two, and is capable of greater varieties of perfection. It was six months ere it existed in my mid finger."

I have repeatedly seen this gentleman since he gave me the above remarks. The arm is now quite straight, and in all respects perfect.

III. *Case of Obstructed Respiration.* By JAMES SYM, M. D.

FEB. 6th, 1826.—A female infant, four months old, was seized six weeks ago with cough, resembling hooping-cough; in recovering from which, her ears suppurated, her nostrils became stuffed, and the upper part of her face was affected with swelling, which caused her nose to appear flattened. This was attended with difficulty of breathing, which within these few days has become alarmingly severe during sleep. While awake she breathes naturally; but when she falls asleep her inspirations become stertorous, and at times so much obstructed as to threaten suffocation. During these exacerbations, her tongue is retracted to the back of her mouth, and her larynx becomes prominent, presenting a large pomum Adami; her countenance becomes pale, her eyelids blue and puffy, her extremities cold, and her pulse slow and irregular; till at length one of the croaking inspirations is suddenly cut short, as if the epiglottis had fallen down upon the rima, and then the agony is extreme, the pulse sinking below the rate of 50 beats per minute, and respiration being in appearance suspended for twenty or thirty seconds. A convulsive struggle at last rouses her from sleep, and she immediately seems to be completely relieved from her distress. The exacerbations recur very frequently in the course of the night, and during their intervals the breathing is performed with a gurgling noise, or snort, which does not resemble the sound of croup, but seems to arise from a moveable impediment, lying in the way of the inspirations, rather than from a narrowing of the passage. While awake she breathes with perfect ease, her voice when she cries is natural, and her cough is now almost removed. She also swallows freely, and the tonsils and uvula are scarcely redder than in health, although somewhat tumid. Pulse when awake 124, during sleep about 80, and sinking to 46 beats per minute.

Feb. 14th.—Has had every night a warm salt bath, her neck has been rubbed with anodyne liniment, and calomel purgatives have been given. On the 7th, a small blister was applied to the right of the trachea, since which she has been disposed to incline her head towards that side. The gum over the lower incisors being tumid, I cut down upon the teeth, and found them near the surface. The cough and vomiting had increased for some days, but now her health appears, except during sleep, to be every way sound; and of late the paroxysms have not in general been so violent as to cause her to awake.

March 5th.—Seems to have caught a cold within these few days, and both her cough and vomiting have returned. Discharged a mouthful of bloody purulent-like matter yesterday. Teeth have not yet appeared.

March 29th.—Upon the suggestion of Professor Burns, a pea was inserted on the 9th, into the back of the neck, but very little matter is discharged. Declines gradually in flesh, and her breathing, even while awake, is now occasionally accompanied by a slight croupy sound.

April 6th.—Some difficulty in swallowing, and difficulty of breathing more permanent. Uvula and fauces considerably swoln, and glands under right angle of jaw enlarged and indurated. The pea being removed, the issue has been made to discharge by dressing with cantharides ointment. Has vinegar applied to her head every morning, and uses quinine.

April 15th.—Since last report had two very severe attacks, in which she started from sleep, gasped for breath, and fell into a swoon. Fauces still swoln and smeared with frothy mucus.

April 20th.—Falling miserably off, and countenance losing its animation. More difficulty of breathing when awake, and coughs up a good deal of mucus. Discharged yesterday a considerable quantity of bloody matter, similar to that discharged on 4th March. Tumor at angle of jaw increasing.

April 23d.—Had an attack yesterday evening similar to those noticed in report of 15th current, but the swoon continued so long that she was supposed to be dead. Recovered with a dreadful convulsive struggle, and had another similar attack at six o'clock this evening, in which she died.

Inspection.—April 25th.—Tumour scarcely perceptible. The trachea and œsophagus being divided below the cricoid cartilage, and dissected upwards, a cyst, containing $2\frac{1}{2}$ oz. of thick greenish matter, was found extending from the left side of the vertebræ to the mastoid process of the right temporal bone, and reaching to the base of the cranium behind the fauces. Its coats were very strong and thick, being white and