

gences, and abuses of the sexual propensity. Finally, every violation of the laws of nature, which tends to break down the vital energies, is capable of giving rise to this affection of the stomach.

Of all the predisposing causes, that which is most frequently operative is the existence in the constitution of the strumous diathesis.

One of the most important duties of a physician is to trace morbid actions to their source, as thus, in many instances, the method of cure is at once indicated ; and in no form of disease is this truth more strikingly illustrated than in that now under consideration.

ART. XVIII.—*Case of Popliteal Aneurism cured by Pressure upon the Femoral Artery, with Observations.* By O'B. BELLINGHAM, M. D.

JAMES HAYDEN, a servant æt. 32, admitted into St. Vincent's Hospital, March 25th, 1843, under the care of Mr. Bellingham, labouring under popliteal aneurism on the right side.

The tumour is seated high in the popliteal space, it occupies the entire ham, and projects also backwards ; it measures three inches in diameter transversely, and a little more from above downwards. On laying the hand upon it a very strong impulse is felt, both posteriorly and laterally. On placing the stethoscope on it a bruit de soufflet, resembling a short but strong whiff, is heard. On making pressure on the femoral artery, all pulsation in the tumour ceases, and on continuing the pressure, it diminishes, and can be completely emptied.

The patient states that his attention was attracted to it about three months ago, in consequence of his feeling a weakness in the limb on coming down stairs ; the following day he perceived a tumour in the ham, but he did not observe any pulsation in it at that time ; a week afterwards when in bed, he felt a pulsation which has continued since. Subsequently he has suffered from some

degree of stiffness and weakness of the knee, which he attributed to rheumatism. Within the last four or five days the ankle has become swollen, the veins of the leg are also slightly varicose. He complains of a feeling of numbness down the back of the leg to the ankle, and he says he suffers some pain when he extends the limb in bed. The disease, however, has not much interfered with the motions of the limb ; indeed he fancied he was better after exercise, and he had walked to the hospital.

He has no recollection of ever straining the limb, or receiving any injury in the part ; he is an inside servant, and has never been employed about horses. His general health is very good, the circulation is tranquil, and the heart's action natural and regular ; he never was in the habit of drinking, never took mercury. He cannot refer the disease to any cause, and had applied at the hospital on the day of his admission merely to get something to rub to the limb, under the impression that he laboured under rheumatism of the part.

In consultation upon the case with Drs. Cusack and Hutton, it was determined to give a trial to pressure upon the artery above the tumour, and Mr. Cusack, having kindly placed at my disposal Sir Philip Crampton's apparatus, which had been successfully employed by him, in a recent case at Stevens' hospital, one similar to it was constructed by Mr. Millikin.

April 3rd. The instrument was applied this day, the pad was placed upon the artery as it passes over the ramus of the pubis, and on the screw being tightened the pulsation in the aneurismal tumour ceased ; in a minute or two it returned, and the screw was again tightened ; this happened several times ; in from five to ten minutes the limb presented a slight dusky colour throughout ; the patient complained of a feeling of cold in both lower extremities, which probably depended upon the exposure. After a short time the collateral circulation became evidently increased, and the vessels enlarged ; the circumflex ilii and the epigastric artery could be felt beating strongly under the finger ; the discoloration of the integuments ceased, but the entire limb appeared to

be somewhat swollen. He began soon to complain of the pressure of the straps by which the apparatus had been secured above the pelvis, and I was obliged to loosen them. Subsequently it was found that the slightest movements of the patient were sufficient to disturb the pad, and thus remove the pressure from the artery. Although intelligent pupils remained beside him during the day and night, he could not bear sufficient pressure to stop the pulsation in the tumour for more than a few minutes at a time. The apparatus was consequently removed altogether the following morning; the skin at the part acted on by the pad had become red and painful; he felt also a sensation of numbness along the front of the thigh, the limb from the hip downwards was evidently larger than its fellow, and no impression appeared to have been made upon the aneurismal tumour.

During the application of the compression the patient was always enabled to tell from his own sensations when the pulsation in the aneurism was checked; and in applying the apparatus, and endeavouring to maintain the pressure, I had the advantage of Mr. Daly's assistance, who had superintended its employment in Mr. Cusack's case at Stevens' hospital, and had improved the construction of the instrument used by him.

April 6th. The limb having recovered its natural appearance, and the redness and swelling having subsided in the situation in which the pad had pressed, the improved apparatus, constructed by Mr. Millikin, Surgical Instrument Maker, of Grafton-street, was applied. The application of the compression commenced about half-past eleven o'clock; the same phenomena were observed as upon the former occasion; the limb very soon presented a dusky tinge throughout, and became somewhat swollen; the pressure caused at first little pain, subsequently it increased; the anterior part of the thigh felt numbed as far as the knee, the superficial veins became enlarged, and the limb colder than its fellow; the patient then was less able to tell by his feelings when the circulation through the aneurismal tumour

was checked. In the motions of the patient the pad shifted its position, and increased pressure only caused him more pain. He remained upon his back, however, until nearly six o'clock, P. M., when, no longer able to bear the pain, he turned for relief on the affected side, and was agreeably surprised to find that the pulsation in the aneurism was checked, without almost any inconvenience to him, the pad merely compressing the artery against the ramus of the pubis, and diminishing, without completely obstructing, the current of blood through it. As he suffered little or no pain, he did not move from this position until about half-past twelve o'clock at night, when he changed it a little; and on loosening the screw to replace the pad, he found that all pulsation in the tumour had ceased; he re-applied it, however, and remained perfectly quiet until about four o'clock, when he had a call to stool; and on removing the pad, he found that the pulsation had not returned.

At nine o'clock, A. M., April 7th, he was visited, up to which time he had continued the application of the same degree of pressure; and on loosening the screw completely, no pulsation could be detected in the tumour, which felt solid, smaller than before, and hard: the limb had recovered its natural temperature, the feeling of numbness had disappeared, and the swelling in a great measure subsided. He was directed to remain perfectly at rest, and to continue the gentle pressure as before, the amount of which he was allowed to regulate by his own feelings.

8th. The patient has remained perfectly at rest, and has continued (without any inconvenience to himself) the application of gentle pressure, just sufficient to diminish the amount of the current of blood through the femoral artery, the pulsation of which can be felt while the pad is applied from the pubis to the origin of the anastomotica magna. The tumour in the ham is smaller, more solid, and does not yield the slightest impulse.

11th. The apparatus was removed altogether to-day. It had been left on for the last two days, rather to compel the patient to remain quiet in the recumbent posture, than with a view to

keep up compression. The tumour in the ham appears to be about the size of a small orange ; it has a solid, hard, and rounded feel. The patient has now none of those uneasy sensations in the limb which he formerly complained of. The vessels which carry on the collateral circulation are enlarged ; the pulsation of the articular arteries about the knee is evident to the eye ; the pulsation in the femoral artery is lost from the lower edge of the opening of the triceps, above which it appears to preserve nearly its natural strength and fulness.

It may be necessary to mention, that the patient was bled, and during the treatment was kept upon low diet. In order further to quiet the circulation, he was prescribed a mixture, containing a small quantity of the tinctures of digitalis and hyoscyamus.

April 22nd. The patient has not been allowed to leave his bed ; the tumour is smaller and harder, about the size and shape of a small egg ; he has no uneasiness of any kind in the limb, and can bend and extend it freely. The pulsation of the femoral artery is felt as low down as the tendon of the triceps ; no pulsation can be detected in the anterior tibial artery on the dorsum of the foot ; but, as in Mr. Hutton's case, a small artery can be felt running over the surface of the tumour towards the calf of the leg. The patient's general health is perfectly good, and he has been allowed full diet for the last week.

The further progress of the case may be detailed in a few words. The patient was not permitted to leave his bed for another month, or until about the middle of May ; during which time a combination of camphorated mercurial ointment and hydriodate of potass ointment (as suggested by Dr. O'Beirne) was rubbed upon the ham. On beginning to move about, he complained of pain in the ball of the great toe, and subsequently the ankle upon the affected side became slightly œdematous towards evening.

June 15th. The patient has been up now for some time, and has been kept in the hospital rather to test the permanence of

the cure, than from any necessity. The tumour in the ham is very small, and he feels no uneasiness of any kind in the limb.

The length of time during which pressure was applied in this case, until all pulsation in the aneurism ceased on unscrewing the pad, was little more than eight hours. The instrument was first placed upon the limb, at about half-past eleven o'clock, A. M., and the pressure continued until six, P. M.; during which time the pulsation was checked for not more than two hours, and this at intervals only of a few minutes at a time. From six o'clock to twelve o'clock steady pressure was kept up, and during the whole of this period the pulsation in the ham was checked; the current of blood, however, through the femoral artery, was not altogether obstructed; its pulsation could still be detected by the finger. After half-past twelve o'clock, the tumour no longer pulsated on the removal of the pressure; but, as the details of the case show, the compression was continued as a matter of prudence for a much longer period.

I have not taken into account the compression exercised by the apparatus first employed, as, on its removal, it was found not to have made the slightest impression upon the tumour; though no doubt it contributed, during the short intervals at which it acted, to bring about the enlargement of the vessels which carry on the collateral circulation.

The instrument employed upon the present occasion consists of a hollow splint, well padded, and of sufficient size to receive the nates and upper part of the thigh of the side upon which we intend to make pressure, and sufficiently long to reach from the crest of the ileum behind to the middle of the thigh. From the upper and outer edge of this splint, a strong steel strap passes upwards, then inwards and downwards, over the anterior superior spinous process of the ileum, until it meets another steel strap from the lower and inner side of the splint, to which the latter is attached by a screw, which permits of its being shortened or lengthened; at the situation where the two steel straps meet, the lower is fitted with a slide and the upper has a hinge;

in addition there is a sliding box, slow tourniquet screw, and pad, with a sliding bar to prevent lateral motion. To the upper and inner edge of the splint a strong spring is attached, which embraces the opposite side of the pelvis, and is continued into a soft strap which passes over the abdomen and secures it above; while below a soft strap passes round the middle third of the thigh.

The principles of the construction of this instrument are the same as in Sir Philip Crampton's; it differs in the larger size of the back splint, which permits the whole of the nates and upper part of the thigh of the affected side to rest in it; also in having a strong spring, which comes round from the opposite side of the pelvis, by both of which the instrument is rendered more secure. In addition, the outer steel strap, in consequence of the greater length of the back splint, comes off at a higher point, which permits of the pressure being more accurately applied to the femoral artery, as it passes over the horizontal ramus of the pubis. The pad, tourniquet screw, sliding box, and sliding bar do not differ from the same parts in Sir Philip Crampton's instrument.

I have suggested a further modification of this instrument to Mr. Millikin, which consists in having the back splint of sufficient size to receive both nates and the upper part of both thighs; the steel strap in which the pad is received, and by which pressure is applied, to come from the opposite side of the pelvis. Such an instrument would answer for applying pressure to the upper part of either femoral artery.

#### OBSERVATIONS.

When we look back, at the present day, to the surgical treatment of aneurism, and particularly of popliteal aneurism, previous to the introduction of the Hunterian operation, we can easily recognize the causes of the general failure of the treatment pursued; and we can have no difficulty in understanding why surgeons, such as Pott, recommended amputation in preference to the only operation then known, which consisted in

laying open the tumour, searching for the vessel which supplied it, and tying both ends of it. We can also readily comprehend the cause of the unwillingness of the surgeons of that period to undertake such an operation, which could not fail of being exceedingly tedious, difficult, and sometimes impracticable, and in spontaneous aneurism must have been generally unsuccessful.

These were the circumstances, in fact, which led surgeons originally to attempt the cure of aneurism by compression. Since the time of Hunter, however, the surgical treatment of aneurism has been so much simplified, that, as his views came to be generally adopted, and his mode of operation to be generally practised, pressure in the treatment of aneurism had but few advocates, and its application seems, with a few exceptions, to have been limited to cases, in which the patient, from timidity, or other cause, refused to submit to the operation of placing a ligature upon the vessel supplying the aneurismal tumour.

In the early application of compression in the treatment of aneurism, the pressure was applied immediately upon the tumour, and the entire limb was at the same time usually compressed by means of a bandage; the patient, in addition, was in general submitted to the medical treatment of aneurism known as Valsalva's; that is, perfect rest in the horizontal posture, very low diet, and frequent bloodletting. Guattani, a surgeon of Rome, in the last century, appears to have been one of the first who put this method into practice to any extent; he treated fifteen cases of popliteal aneurism by pressure, and was successful in four of them. Several of Guattani's cases have been referred to by John Bell in his valuable work on surgery. This treatment was, however, very tedious and painful, lasting many months, and when it failed (which it frequently did) was usually followed by unpleasant consequences, such as the more rapid increase of the aneurism, or its quicker progress to the surface. This method of applying compression has been in a great measure abandoned by surgeons in aneurism of the larger arteries. It is often, how-



ever, successfully applied to aneurism at the bend of the arm, following bloodletting, and other forms of traumatic aneurism, as well as to aneurism of the smaller arteries, such as the temporal, radial, &c.

The application of pressure to the vessel between the aneurism and the heart, with the view of either completely or partially obstructing the passage of blood through it, appears to be a much more recent practice. In the second volume of the *Dict. des Sciences Medicales*, Richerand has related perhaps the earliest case of the kind: it was that of a grocer in Paris, the subject of popliteal aneurism, who, by preserving the recumbent posture for twelve months, restricting himself to a low diet, with a bleeding once a month, and at the same time compressing the artery in the thigh by means of an instrument constructed on the same principle as a truss, was perfectly cured. In the third volume of the *Lecons Orales*, two cases of popliteal aneurism are related, in which compression was successfully employed at the Hotel Dieu by Dupuytren; in one the pulsation ceased in about three weeks; the apparatus employed was a semicircle of steel, with a concave cushion at one extremity, and a pad at the other, capable of being moved by a spring and screw; it is commonly known as Dupuytren's compressor. Dupuytren had recourse to pressure only, because the patient refused to submit to operation. He never appears to have employed this method subsequently; indeed he looked upon these two successful cases as the result of some happy chance which might occur once or twice in the course of a long practice, rather than as the effect of a proceeding worthy of being adopted and recommended; it being well known that in several instances popliteal aneurism has undergone a spontaneous cure after the patient had been admitted into hospital for the purpose of undergoing operation. Two cases of this kind occurred some years since at the Meath hospital, where a bandage had been simply placed round the limb, which could have produced little or no pressure, and was not intended to act in that way. More recently another case

occurred to Dr. Bruncker in the Louth Infirmary, the details of which have been given in the Medical Press.

In the eighth volume of the Medical and Physical Journal, Sir Astley Cooper has described an instrument for compressing the femoral artery, which was employed in one case of popliteal aneurism by Sir William Blizard; although the patient possessed unusual fortitude, he was not able to bear the pressure longer than nine hours. A similar apparatus is mentioned by Sir Philip Crampton in a communication contained in one of the early volumes of the Medico-Chirurgical Transactions, to have been tried in a case of popliteal aneurism, in which he afterwards assisted the late Mr. Dease to operate, but no force that could be borne was sufficient to stop the pulsation in the ham. Mr. Samuel Cooper has given a description of it in his Surgical Dictionary, and adds, that "few patients can endure the pressure of such instruments for a quarter of the time which Sir William Blizard's patient was able to bear it, when put on sufficiently tight to afford any chance of obliterating the artery; and on account of the suffering they occasion they are rarely used by modern surgeons."

A very ingenious instrument for compressing the femoral artery was subsequently invented by Mr. L'Estrange, and employed with success by Sir Philip Crampton and Mr. M. Collis at the Meath Hospital, in some cases where secondary hemorrhage occurred after the operation of tying the femoral artery. The late Mr. Todd, some years ago, successfully applied compression (by an instrument different from any of those alluded to) in one case of popliteal aneurism; it was also used with success, though under most unfavourable circumstances, by Mr. M'Coy, in a case of femoral aneurism, which he brought before the Surgical Society at a late meeting. I am not aware that this instrument was subsequently tried.

No attempts to cure popliteal aneurism by pressure appear to have been made again, until Mr. Hutton was induced to revive the practice; indeed all the modern works on surgery rather

discourage any such attempts. This seems to have resulted partly from the imperfect construction of the instruments employed hitherto, partly from a mistaken theory respecting the mode in which pressure acted, or from ignorance of the exact amount of pressure required. Thus, surgical writers appear to have been under the impression, that in order to cure an aneurism by compressing the artery above the tumour, it was essential to interrupt completely the current of blood through the vessel; in fact, to apply such pressure as would act like a ligature, cause inflammation of the coats of the artery at the part, and obliterate the circulation in the vessel at the point to which compression had been applied. Thus, Mr. Gibson of Philadelphia, in his work on surgery, observes, "compression is now rarely resorted to, experience having proved its general inefficacy. The process has been found, moreover, even when successful, so extremely painful and tedious that few patients can be induced to submit to it, or to persevere sufficiently long to accomplish a cure. That it operates, partly upon the principle of the ligature (when it does succeed), there can be no doubt; by compressing the sides of the vessel, causing the effusion of lymph, and finally, obliteration of the channel, so as to force the blood to abandon the sac, and pass off by the collateral branches." Mr. Guthrie, in his work on aneurism, says, "the application of pressure by means of a spring pad, has been tried, and has sometimes, though very rarely, succeeded. The process is long and pain great, and there is danger of the part sloughing; the pain, indeed, is so great, that few persons can be persuaded to submit to it; and those surgeons who have tried it once, will not again put it in competition with the operation. Mr. White, his colleague in the Westminster Hospital, employed it successfully in a case of popliteal aneurism in a female. The patient bore the pain heroically for five days, but the parts compressed sloughed deeply." Mr. Guthrie adds, "that he watched the progress of the case with great attention, and that

he would not be easily induced to employ Mr. White's instrument, or any other, for such a purpose."

When it was considered absolutely necessary for the success of compression, that such an amount of pressure should be applied as was almost certain to produce sloughing of the part, and very certain to occasion intense pain and suffering to the patient; and when, in addition, this was to be prolonged through five successive nights and days; we can readily understand why patients refused to submit to it; and we can easily account for the disrepute into which the practice fell, and for the unwillingness of surgeons to adopt this treatment, in preference to the simple operation of placing a ligature upon the femoral artery. It would however appear, that it is not at all essential, that the circulation through the vessel leading to the aneurism should be completely checked; it may, perhaps, be advantageous at first, for a short period, by which the collateral circulation will be more certainly established; but the result of this case, if it does no more, establishes the fact, that a partial current through an aneurismal sac will lead to the deposition of fibrine in its interior, and cause it to be filled and obstructed, so as no longer to permit of the passage of blood through it. Pressure, in order completely to obstruct the circulation in an artery, must necessarily be slower in curing an aneurism, as it must in some measure act, by causing obliteration of the vessel at the part to which the pressure has been applied; whereas a partial current through the sac enables the fibrine to be readily entangled in the parietes of the sac, in the first instance, and this goes on increasing, until it becomes filled; the collateral branches having been previously enlarged, the circulation is readily carried on through them.

It appears to me, that in resorting to compression in popliteal aneurism, with the view of causing the sac to be filled up by fibrine, we should never neglect the accessory measures, known as Valsalva's plan of treatment, which alone have been sufficient to effect the cure of aneurisms of large size. In fact, I look upon bleeding and low diet as material aids in bringing

about the cure by pressure. Bleeding will cause the blood to coagulate more rapidly, but it may be said that it will also have the effect of hurrying the circulation ; we have, however, in digitalis, a very efficient means of diminishing the frequency of the action of the heart and arteries, and of quieting the circulation, when the patient is kept in the horizontal posture ; and if we take into account the condition of the vessels when the amount of the circulating fluid is diminished, we shall find that the sac of the aneurism is placed in a very favourable position for entangling the fibrin, which, if it continues to be deposited, will ultimately lead to the obliteration of the sac, and the cure of the aneurism.

The application of well regulated pressure, then, in the treatment of popliteal aneurism, combined with the other measures to which I have alluded, must be regarded as a considerable improvement in surgery ; the operation of tying the femoral artery is perhaps the least successful of that on any of the larger arteries, “in consequence of secondary hemorrhage on the one hand, and phlebitis on the other, so frequently resulting.” And when, within a short period, three cases have occurred in succession in different hospitals, and under the care of different surgeons, it is not too much to expect (from the improvement which has been effected in the construction of an instrument for the purpose), that the necessity for performing this operation will, in future, be much diminished. This result, however, must depend upon the trial of compression in a larger number of cases, though its success in these offers great encouragement to surgeons to attempt it, inasmuch as the difficulties which hitherto surrounded it have been in a great measure overcome ; and the correct theory of the mode of action of pressure, and of the amount of compression required for the success of its application, have been I think pretty nearly established.