NOTE ON THE APPLICATION
OF
INDICES TO ANEURISMAL CLAMPS,
AND OTHER PRESSURE INSTRUMENTS.

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THE marked want of success which has attended the use of clamps and tourniquets in this country, as applied for the cure of aneurism, especially popliteal aneurism, by indirect pressure on the femoral, has become very evident to me in collecting published cases, and comparing the results in English hospitals with those which have been obtained by the Irish surgeons, who feel for this method of treatment all the interest which parentage can give, and are proportionately careful in applying the pressure. It is unnecessary to give figures or details for the purpose which I have in view, and I would only say that the analysis of unsuccessful cases shows that the greater part have failed through the pain caused by the pressure, through the ulceration or sloughing of the skin beneath the pad, or the extreme tediousness of the process causing its abandonment as ineffectual, and recourse to the ligature of the main artery.

Ligature, after compression has failed, gives less satisfactory results than primary ligature. In thirty-seven cases in which it was employed, after compression had failed, by English surgeons, and which I have collected, there were fourteen deaths.

The causes of a large number of the accidents of sloughing, ulceration, extreme pain, which I have mentioned, seem in a number of instances to be the consequences of defective application of the pressure.

To maintain continued and graduated pressure upon the femoral artery (even with the best compresses), without exerting too much pressure on the one hand, and yet sufficiently controlling the flow of blood on the other, is by no means easy, and requires skilled and constant attention, and a great amount of care is needed to prevent excess or defect. The most usual faults on the part of those who are entrusted by the hospital surgeon with watching these cases are employing an excess of pressure, or employing pressure in a wrong direction, so that power is wasted in compressing muscles, and the artery is not fixed against the bone.

The surgeon places the pad carefully in position, but it must presently be relaxed, and then the assistants commonly err, in more or less degree, in reapplying the pressure.

The application of indices to the instrument is likely, I think, to obviate much of the difficulty and to remove some prevalent causes of the failure of instrumental compression. The surgeon putting the pad in position can in each case ascertain for himself with what amount of pressure the femoral circulation can be stopped or slackened, accordingly as he desires to produce the one or other effect. Having determined the minimum force by which this can be effected, he can then inform his assistants, and point out to them the limits within which they must keep the pressure. If, in subsequently replacing the instrument, they find that they fail to control the circulation with that degree of pressure which has been experimentally ascertained to be sufficient, they will be aware that the pad is not well placed, and instead of screwing down the clamp and increasing the pres-

sure until the pulsation is stopped, they will be careful to improve the direction of the pressure. It is very useful for the surgeon himself to know what amount of pressure he is employing to stop the flow of blood; it is still more useful for the assistants to have under their eyes a constant indicator of the degree of correctness and care with which they are carrying out the surgeon's directions.

To give a long table of estimations of the degree of pressure required in different subjects would not, I think, serve any useful purpose, as this will need to be ascertained in each particular case at the commencement of the treatment. I may, however, just select the three following cases from my notes of the results of experiment on this point, as giving average figures for their typical subjects.

A. D—, adult male, 5 feet 7 inches high, somewhat emaciated after illness, measuring (at the level of the perinæum) around the thigh 15 inches, immediately above the knee 12 inches. Pulsation arrested at apex of Scarpa's triangle by pressure of 7 lbs. Pulsation arrested at apex of Hunter's canal by pressure of 8 lbs.

J. R—, adult male, 5 feet 6 inches high, robust and powerful, measuring (at level of perinæum) around thigh 22 inches, immediately above knee $14\frac{1}{2}$ inches. Pulsation arrested at apex of Scarpa's triangle by pressure of 11 lbs. Pulsation arrested at Hunter's canal by pressure of 14 lbs.

A. N—, adult male, 5 feet 4 inches high, slight and feminine build, measuring (at level of perinæum) around thigh 20 inches, immediately above knee $12\frac{1}{2}$ inches. Pulsation of femoral arrested at groin by pressure of 4 lbs. Pulsation of femoral arrested at Scarpa's triangle by pressure of 10 lbs. Pulsation of femoral arrested at Hunter's canal by pressure of 11 lbs.

In the instrument which I have made, and of which I append a woodcut, the pressure is registered by a needle on a scale. It is effected by a strong spring, which affords an

elastic pressure capable of nice graduation from four to twenty pounds. This instrument has already been tested in practice, and works well.

I owe to the kindness of the Director-General of the Army Medical Department the report of a case in which it answered expectation in curing a popliteal aneurism. The analysis of cases shows that elastic pressure is better tolerated than any other.

The principle involved in the application of indices seemed to me not unworthy the brief attention of this Society. It is obviously one which may be applied with advantage to other instruments of pressure and extension in surgery, and Messrs. Savigny and Co. have also constructed an index of similar kind applied to pulleys for reducing dislocations. It may be useful and instructive to apply them to apparatus for overcoming fibrous ankylosis of joints, restoring deformed limbs, and other similar surgical conditions.