

## THE EXTIRPATION OF ANEURISMS.<sup>1</sup>

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THERE are a few morbid conditions affecting the human frame which appear to possess an abiding charm for medical men from generation to generation, and from century to century. Among them may be mentioned stone in the bladder, hernia and aneurism. The greater rarity of aneurisms, and its always impending tragic termination by rupture, have given it an interest peculiarly its own. Hence is it that the pathology, relative liability of different arteries, symptomatology and diagnosis are all but completed chapters. With the proximal deligation of Anel and the apparently more rational procedure of Hunter, the operative therapy of aneurisms of the extremities seemed perfected. Less heroic, though by no means harmless methods, have been devised; some, like the injection of wax or of blood-coagulating chemicals, only to be remembered in the repleteness of history; others to be followed by success often enough to warrant a trial, yet not often enough to make it other than a surprise. Among these may be mentioned galvanopuncture, flexion, direct elastic and digital compression.

Certain is it that in the great majority of peripheral aneurisms the question of operative interference must be solved by selecting one of three methods. They are: (1) Proximal ligation at a point immediately above or some distance removed from the aneurism. (2) Splitting and emptying the sac with peripheral and proximal deligation. (3) The total extirpation of the aneurism.

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The first and second of these methods are sufficiently well known. The third, although described by Purmann 200 years ago, had fallen entirely into oblivion until five years ago. The most recent of our text-books but mentions it. It is for this reason that I beg to direct the attention of my colleagues to this ideal method, and to use for my text the following cases, one from my own, the other from the practice of my friend, Dr. L. Freeman.

CASE I.—Merman S., aged twenty-two. Seven months before admission to the Avondale Hospital fell on the left hand and fractured his thumb. States that shortly after the accident he observed a pulsating tumor over the wrist. Has been treated in dispensary and in hospital by elastic bandage and compression.

*Present Condition.*—On the left forearm, two inches above the wrist-joint, is a pulsating tumor as large as a hickory-nut. It has deep attachments, pulsates uniformly, and is clearly aneurismal; compression of the radial arrests its pulsation. Forced flexion of the forearm also accomplishes it.

April 19, 1893. Forearm flexed on arm, and maintained in this position by bandage for two hours. Pain necessitated removal for one-half hour. Bandage replaced and flexion maintained for three hours. Then, finally, removed. Pulsations returned within a few minutes.

April 21, 1893. Pad placed on radial artery above aneurism and by means of continuous pressure by nurses, all pulsation was checked for three hours. Aneurism had decreased in size about two-thirds, but within an hour was of original size.

April 25, 1893. *Operation.*—Incision three inches long over tumor. Surface of tumor readily exposed, and radial artery traced upwards and ligated with silk twice at each end of the sac. Artery then divided. To remove the sac in its entirety a portion of the tendon of the radial flexor of the wrist was sacrificed. Pulsations did not cease after the ligatures above the sac were brought home. The operation was a dry one. No drainage; catgut suture.

*Result.*—Union by first intention, and under one dressing. Function unimpaired.

*Remarks.*—The aneurismal sac presents a smooth intima. The sac wall has the thickness of a normal artery. Microscopic examina-

tion reveals all the arterial coats in the section. It is to be remarked that whereas compression of the radial at first checked pulsations, the anastomotic circulation was so established thereby that at the time of operation such compression no longer affected the tumor.

CASE II.—I am indebted to Dr. L. Freeman for the report of this case. A. B., aged twelve, was injured just over the ankle by an ice-pick. The wound healed without untoward symptoms. Several months later a pulsating tumor developed. Globular in shape and large as the end of the finger it presented a slight cicatrix on its dome. Under pressure the tumor disappeared, and compression of the femoral checked pulsation. Diagnosis. Traumatic aneurism.

*Operation.*—Incision over tumor, three inches long. A well-developed sac was found, and by tedious dissection severed from its connections. Ligature above and below. Suture without drainage. Recovery uninterrupted.

Though the aneurism in each of the cases was small and involved a part where a parallel vessel assured the nutrition of the parts beyond, the results achieved justify the use of the word ideal to designate the method of treatment by total extirpation. When resorted to for the relief of aneurisms of larger trunks like the axillary, brachial, femoral and politeal, the adjective is none the less appropriate. By briefly comparing the advantages and the disadvantages of the three operative methods of operation, the reasons for my greater faith in one will be best elucidated.

The acknowledged advantage of the Hunterian operation is its simplicity. It is performed in parts undisturbed in their anatomical relations. It is formal and quickly accomplished. The wound is easily kept aseptic, and the recovery is rapid. That the operation is made in a more healthy part of the artery is largely assumption. In traumatic aneurisms, and in those of arterio-venous character, this view is clearly untenable. In the idiopathic variety the danger of meeting the dreaded atheroma, the supposed source of secondary hæmorrhage ought certainly to increase as the heart is approached. Bowlby and C. O. Weber failed to find it oftener just above the aneurism than at a distance above it. Furthermore, the danger of gangrene increases with the stretch of artery cut off from the circulation between the

aneurism and the point of ligation. For these reasons the beneficent influences of modern wound-treatment have failed to decrease the mortality of aneurisms treated by proximal ligation according to Hunter as much as was expected.

While it is true that in 1881 Stimson was enabled to collect in New York twenty-nine cases of ligaturing of the principal arteries with catgut without secondary hæmorrhage and with but one case of gangrene, statistics drawn from wider sources are not nearly so favorable. In 1885 Scriba tabulated ninety-six cases treated antiseptically; twenty-four of these terminated fatally; seven through sepsis; seven through secondary hæmorrhage; in four through hæmorrhage from rupture of the sac; in two through gangrene; in one through embolism of the middle cerebral artery; and in three from unknown causes. In eight additional cases amputation had to be resorted to for gangrene of the extremity. Delbet places the mortality of proximal ligation at 18 per cent.

The presence of the sac after the Hunterian operation is a menace to the limb. By a too rapid establishment of the collateral circulation soft clots may be washed into distal branches, thereby producing localized patches of gangrene. Bardeleben detected this blocked condition of the vessels after the ligation of a healthy femoral artery for popliteal aneurism. Months after ligation trophic changes from implication of nerves in the sac wall may necessitate amputation.

Proximal ligation for aneurism always entails uncertainty concerning the finality of the cure. In not a few cases recurrence ensues after a few months or many years. Davies-Colley, Annandale and Hutchinson have reported cases in which the aneurism returned three, four and seven years after a supposed cure had been effected. In forty cases of total extirpation collected by Kubler the Hunterian operation had been done in five. It is particularly in traumatic aneurisms of arteries with generous anastomoses that there is danger of recurrence or of secondary hæmorrhage after proximal ligation. The glories of the Hunterian operation probably belong to the immediate past.

In recent years attention has, therefore, centred in the old

operation of Antyllus as revived by Syme. It comprises the splitting of the sac, the removing of clots and the ligation of the artery above and below. By the use of the tourniquet the chief danger, that from hæmorrhage during the operation, has been almost removed. The sources of failure are in the sac itself. It is virtually a foreign body, remaining in a large and irregular wound. Deprived of its nutrition, suppuration and sloughing are often unavoidable. In the course thereof secondary hæmorrhages may be expected. A further source of this bleeding is in the many vessels which are within the walls of and open into the sac itself. They are the *vasa vasorum* enlarged by the development of an anastomotic circulation in consequence of operative measures like digital compression or ligation, or from the unaided efforts of nature to overcome the disastrous effects of the diseased vessel on the nutrition of the parts below. Notwithstanding these defects of the method under consideration, its mortality is decidedly less than that of proximal ligation. Delbet places it at 11 per cent. Scriba has collected thirty cases, of which only three terminated fatally. One of the unsuccessful cases should be excluded, since the operation was limited to the splitting of the sac and tamponing with perchloride of iron. In two of the cases only did gangrene occur. The danger from gangrene is placed by Delbet at a little less than 3 per cent., whereas for proximal ligation it is nearly 8 per cent.

Favorable as are the results from the Antyllus operation, they do not equal those obtained from the total extirpation of the sac, an operation to which attention has recently been directed by Scriba, Delbet, Trelat and Kubler, to whose experiences I am largely indebted for the views herein expressed. Practised by Philagrius of Macedon in the fourth century, it was forgotten until the end of the seventeenth, when it was resorted to with success in a brachial aneurism by Purmann. It is generally designated as the operation of Purmann. A method might certainly be called ideal which in forty cases was followed by but one death, and after which gangrene and secondary hæmorrhage were not at all observed. The one death resulted from acute anæmia several hours after an operation made by Socin for aneurism of the scalp. In twenty-four of the cases

large arterial trunks like the axillary, brachial, femoral and popliteal were involved. In the very latest literature I have been enabled to find four more cases of popliteal aneurisms similarly treated, thus making twenty-eight extirpations of major aneurisms of the extremities without a death.

Of the forty-six cases, including those of Kubler, the four just referred to and the cases above reported, thirty-one were traumatic and fifteen spontaneous. Twelve were arterio-venous, the remainder arterial. The presence of a sac in recent traumatic aneurisms has been questioned. Nevertheless Trendelenburg found one in an injured femoral artery as early as the sixth day. While in such cases of recent traumatic aneurism the mere incision and double ligation may answer, it certainly seems better surgery to insure that retraction of the arterial stumps into the sheath above and below which is so essential to safe occlusion of their lumina. This applies particularly to the distal end from which secondary hæmorrhage, if it occurs at all, is more likely to ensue.

The disadvantages of total extirpation are the difficulty of its execution and the danger of wounding important parts to which the sac has formed adhesions. The first of these is not greater than that which attends the removal of tumors of the same size with adhesions. Under the artificial ischæmia obtained by the rubber tourniquet, a careful dissection of the sac wall is made through an ample incision. The smaller vessels are ligated as encountered before they are divided. The afferent and efferent vessels are sought, ligated and divided above and below the sac. To accomplish this it may be necessary to divide the sac in its long axis. It is in the dissection of the deeper portion of the sac that the attending vein may be injured. The danger from this accident has certainly been overrated. From the table of Kubler it appears that the femoral vein was injured in three cases, the popliteal in five, the axillary in one and the brachial in three. In all but one of these the vein was ligated or resected, but gangrene did not ensue. The supposed disadvantage of ligating an unhealthy part of the vessel has already been seen to be largely assumption. Fifteen of the cases were spontaneous aneurisms.

The advantages which make extirpation, in the words of M. Trelat, uttered in the French Surgical Congress of 1889, the operation of the future, are manifold. It is radical. It permits of the ligation of all vessels which could give rise to secondary bleeding. The danger from cicatricial contraction of the sac and the consequent involvement of nerve-trunks is averted. The wound, being a clean one, is, like that after the removal of a neoplasm, likely to unite by first intention.

Based on the foregoing, I beg to submit for your consideration the following propositions regarding the operative treatment of aneurisms of the extremities:

(1) Extirpation is the ideal method. It should be resorted to unless there are weighty reasons against it.

(2) In aneurisms of the fore-arm and of the leg no other method should be adopted.

(3) Aneurisms which have suddenly grown large from subcutaneous rupture of the sac, and those in which rupture is impending, should be subjected to extirpation.

(4) In recent traumatic aneurisms the injured vessel should be divided between two ligatures; when a sac has formed it should be excised.

(5) When other methods have failed, extirpation should be tried before resort is taken to amputation.

(6) In arterio-venous aneurisms extirpation should be practised, if any operation is indicated.

(7) Proximal ligation is to be reserved for cases of idiopathic or spontaneous aneurisms in which the age of the patient or an enfeebled condition from other causes would make a prolonged operation hazardous, and for cases in which the position of the tumor precludes the possibility of extirpation.