

ON THE SURGICAL TREATMENT OF ANEURYSM.<sup>1</sup>BY H. GILBERT BARLING, M.B., B.S. LOND.,  
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I AM inclined to apologise for my temerity in introducing this discussion on aneurysm with the limited experience I have of the disease, but I feel to some extent absolved by the knowledge that, from the comparative rarity of the condition, many other surgeons would labour under similar disadvantage. It has seemed to me appropriate that the Surgical Section of the Royal Society of Medicine should take a formal opportunity of discussing the treatment of external aneurysms due to disease because of the recent methods devised by Matas under the term of "endoaneurysmorrhaphy."

My own operative experience of external aneurysm, excluding traumatic cases of which I do not propose to speak, is based upon five popliteal aneurysms, two aneurysms of the third part of the right subclavian artery with dilatation of the vessels on the proximal side, and one case of aneurysm of the internal carotid. Four of the popliteal aneurysms were treated by ligature of the superficial femoral artery at the apex of Scarpa's triangle. The only points concerning them worth mentioning are that two of them occurred in the same patient, a man aged 22, only a short interval supervening between the cure of the one and the appearance of the other, and that one patient, a male, aged 50, suffered from gangrene of the toes for which a mid-tarsal amputation was performed. The fifth popliteal case was treated by obliteration on Matas's method. Briefly the details are as follows:—

A male, aged 30, a long-distance runner, was admitted to the General Hospital, Birmingham, on June 28th, 1910, with an aneurysm of the right popliteal space rather low down. The circulation was controlled by a rubber tourniquet and the sac laid open. The aneurysm was of the fusiform type, the popliteal artery opened into its upper end, and the anterior and posterior tibial arteries led out of the lower part; two other small arterial orifices were found opening into the sac. All the arterial openings were sutured with fine catgut, the sac was obliterated with the same material, and the wound was closed without drainage. Recovery was without incident of any kind, the foot remained warm throughout, healing was by first intention.

The patients with subclavian aneurysm were both males between 40 and 50 years of age; both complained of pain in the right shoulder, neck, and arm, and had been treated for rheumatism and neuritis. Treatment by rest, iodide of potassium, and modified diet made no impression on the disease, and as the pain was disabling operative treatment was resorted to. The two cases were curiously parallel; in both the intention was to ligature the innominate artery, which was exposed by excision of the inner portion of the clavicle, but in both this vessel, the lower end of the carotid, and the first and second portions of the subclavian were so dilated and atheromatous that the application of a ligature in either of these situations seemed likely to be followed by misfortune. As the limits of the aneurysms prevented ligature above the clavicle the first part of the axillary was tied and simultaneously the common carotid at the middle above the dilated portion. The aneurysms consolidated and there were no untoward symptoms of any kind. The first of the patients died five years after operation with an aneurysm of the arch of the aorta, which ruptured. The other patient lived five and a half years and died from cerebral mischief due to disturbance of the circulation which in turn was the result of aortic disease which had commenced at the time of the operation but developed rapidly a few months before death. Both of these patients were relieved of their symptoms, were restored to their duties, and enjoyed a fair measure of activity.

The aneurysm of the internal carotid occurred in a lady approaching middle age who was quite clear that a small swelling had existed in her neck in the position of the aneurysm for many years, and that it had rapidly enlarged in the few months preceding my examination, when it was the size of a bantam's egg and pulsated very actively both in the pharynx and in the neck. It was quite impossible to determine whether the aneurysm had developed from the upper end of the

common carotid, from one of its main divisions, or from a branch of the external carotid. My incision first exposed the main trunk and then its divisions: when following up the latter a sacculated aneurysm was found springing from the upper end of the internal carotid just before it entered the base of the skull; the sac hung downwards like a pear on its stalk between the external and internal carotids, somewhat compressing the latter, and showing the possibility of an aneurysm bringing about its own cure; the lowest part of the sac just overlapped the bifurcation of the common trunk. The condition seemed favourable for Matas's restorative method, but I was deterred from this by the inaccessibility of the mouth of the sac close to the base of the skull and the difficulty of controlling the regurgitant stream of blood down the internal carotid if the suturing of the orifice proved faulty. Excision of the aneurysm was therefore resorted to. A few days after the operation the patient complained of pain and weakness in the left shoulder which was followed by some wasting of the muscles, but these have now recovered. We have, however, in this incident another reminder of the possible risks of ligaturing one of the main arteries supplying the brain and the desirability of adopting the restorative method when this is applicable.

Aneurysm of the internal carotid appears to affect women more commonly than men. It is apt to extend towards the pharynx and to burst into that cavity, whilst more than once it has been opened there by the surgeon's knife when obscured probably by an inflammatory condition around the sac.

A few words may not be out of place as to the material for ligature in continuity and the method of its application. Personally I prefer an absorbable ligature, and I think none is better than moderately chromicised catgut, which I have used for arteries of all calibre up to the common iliac without drawback of any kind. I do not think either kangaroo or reindeer tendon quite so manageable as catgut and the knot produced is undesirably bulky, a factor which has been accused by more than one surgeon as a source of misfortune by ulcerating into the vessel. Floss silk has much to recommend it; it is easily sterilised, it is strong and very manageable, but it has one serious drawback: although it may be absolutely sterile when applied to the artery, if any wound infection occurs the interstices of the silk become invaded by organisms, and it will probably ulcerate its way through the walls of the vessel. This is shown in two successful cases of ligature of the innominate, one by C. J. Symonds and one by W. B. Burns, of Memphis. The silk ligature used was recognised in the discharge from the wound, and it is easy to imagine the peril to the patients' lives which this implied. If an absorbable ligature should become infected, it would probably not cut its way through the carotid wall, as would silk.

As to the method of ligature, I prefer the stay knot of Ballance and Edmunds to any other. My intention has always been to close the artery with as little damage as possible; division of the internal coat has appeared to me to be a gratuitous injury. But if a great artery is to be closed without this damage a double ligature is necessary, the first to break the force of the blood current, whilst the second is applied under more favourable physical conditions side by side with it. The stay knot, with which everyone is now familiar, provides exactly what is required and disturbs the vascular supply to the arterial walls as little as a single ligature.

It is impossible to leave this part of the subject without referring to the influence of Lister's work on the treatment of aneurysm. In no department of surgery is asepsis of more vital importance; it transcends in value even the gift he bestowed on us of the absorbable ligature. Only when the quite recent history of operative work on aneurysms comes to be written and compared with that of preceding years shall we realise what a profound and vitalising influence our great master exercised on a subject which was at the same time a fascination and a terror to the surgeons who preceded us. To Lister I owe it that my own small experience has been practically without anxiety; there has been no wound infection, and as a consequence no secondary hæmorrhage.

The procedures devised by Matas under the title of endoaneurysmorrhaphy offer a bold challenge to the methods we have hitherto relied on. The essence of his work is that the diseased vessel is attacked from within instead of from without and that the sac is obliterated, no aneurysmal cavity

<sup>1</sup> A paper read before the Surgical Section of the Royal Society of Medicine on May 14th, 1912.

being left in which recurrent pulsation or inflammatory troubles may arise. He relies on the activity of the endothelium lining the sac of the aneurysm, and especially upon that lining the orifices of vessels opening into the sac, when approximated by suture to unite and close the vascular orifices and to obliterate the sac. The advantages claimed for endoaneurysmorrhaphy as against proximal ligature are that the former avoids three of the difficulties of the latter: (1) damage to the vessel wall through the vasa vasorum which exposes the patient to the possibility of secondary hæmorrhage at the point of ligature; (2) failure to cure the aneurysm from too free an anastomotic current through the sac; and (3) pressure on the collateral circulation by the distended sac predisposing to gangrene.

The advantages of endoaneurysmorrhaphy over excision of aneurysm are claimed to be that the main vein is less likely to be injured, that the collateral circulation is less disturbed since the only vessels interfered with are those opening into the

groove indicating the position of the original arterial channel, the wall of the sac is sutured over this groove so as to remodel the arterial wall that it may again carry the blood current. The orifices of smaller arteries in the sac are then sutured and the sac is finally obliterated.

3. *The restorative.*—This is applicable to sacculated aneurysms in which the sac communicates with the artery by an orifice well defined and of moderate extent. The simple orifice is sutured so as to repair the arterial wall and only rarely do secondary orifices require attention. The sac is then obliterated by suture as in the other procedures.

Whichever plan is adopted an essential point is the complete control of the arterial circulation; it is necessary to dominate not only the proximal but also the distal vessel or vessels. This is easy to attain in the limbs when Esmarch's ligature can be applied to the part above the aneurysm, but is far more difficult in the abdomen, in the neck, and where the limbs join the trunk. In such positions the control of

Table giving Details of 16 Cases of Aneurysm Treated by Endoaneurysmorrhaphy in the British Isles.

No.	Position of Aneurysm.	Nature of operation.	Typical or atypical.	Result.	Remarks.	Reference.
1	Subclavian, second and third parts.	Ligature of first part of subclavian and infolding of sac without opening.	Atypical.	Recovery.	—	Moynihan, Leeds, unpublished.
2	Brachial.	Obliteration.	Typical.	„	—	Walter Thompson, Leeds, unpublished.
3	External iliac.	„	„	Death.	Septic peritonitis. Gangrene of leg. Furious bleeding from deep epigastric and circumflex iliac arteries when sac was opened.	Sinclair White, Sheffield, unpublished.
4	Popliteal.	„	„	Recovery.	—	Graham Simpson, Sheffield, unpublished.
5	„	„	„	„	Popliteal vein damaged and ligatured. Gangrene of leg. Amputation.	Thelwall Thomas, Liverpool, unpublished.
6	„	„	„	„	—	Barling, Birmingham, unpublished.
7	„	„	Atypical.	„	Sac too fragile to carry sutures. Operation concluded by tying entering artery.	Anonymous, unpublished.
3	„	„	Typical.	„	—	Rigby, Proceedings of the Royal Society of Medicine, vol. iii., Part I., 1909-10, Clinical Section, p. 131.
9	„	„	„	„	(Same patient as No. 8.)	„
10	„	„	„	„	—	Rigby, Clinical Journal, August 4th, 1909.
11	„	„	„	„	—	Barker, THE LANCET, July 15th, 1911, p. 871.
12	„	„	„	„	—	Maynard Smith, Proceedings of the Royal Society of Medicine, vol. iii., Part I., 1909-10, Clinical Section, p. 130.
13	„	Reconstruction.	„	„	Reconstructed artery seen to pulsate. Gangrene of foot. Amputation of thigh. The sac had ruptured.	Sheen, Clinical Journal, Nov. 9th, 1910.
14	„	„	„	„	The sac had ruptured. Reconstructed artery seen to pulsate. Gangrene of toes.	„
15	Femoral.	Obliteration.	„	„	The sac had ruptured; it could not be entirely obliterated. Drained.	„
16	Subclavian, third part.	„	„	„	Aneurysm exposed by division of clavicle. Traction ligature distal to aneurysm failed to control reflux current of blood, so vessel was clamped on distal as on proximal side of sac.	Pringle, Edinburgh Medical Journal, September, 1911.

sac itself, and as a consequence gangrene of the distal parts is less likely to occur. A further advantage claimed for Matas's method over proximal ligature or excision is the possibility in selected cases of restoring the vessel wall by suture in such a manner as to leave the main blood channel of the distal parts still patent whilst the sac of the aneurysm is obliterated. Although it seems almost unnecessary, yet for the sake of clearness it is advisable briefly to describe and illustrate what Matas purposes. He recommends three different procedures adapted to aneurysm of varying kinds.

1. *The oblitative.*—In this the orifices of the main vessels entering and leaving the sac and of any smaller arteries which may be found in it are closed by suture and the sac itself is obliterated also by sutures. This is the method usually adopted in fusiform aneurysms.

2. *The reconstructive.*—In certain cases of fusiform aneurysm where the proximal and distal orifices of the main vessel are not very far apart and where there is a distinct

the circulation seems to be best attained by clamps applied to the main artery above and below the sac and as close to it as possible. Even then a large collateral opening into the sac, as, for example, the deep epigastric into an iliofemoral aneurysm, may give rise to troublesome and even severe hæmorrhage, and clamping of this vessel would also be required. Aneurysm in the abdominal cavity is treated exactly as in the limb, the sac being obliterated without drainage, and the peritoneum closed over it as the skin would be in the other parts. As to the suture material, catgut, silk, and thread have all been used with success. When the sutures are inserted they should not be used mincingly, but should take a good hold of the walls of the sac without, however, perforating its whole thickness. To obtain obliteration tension mattress sutures are generally necessary; they should take a good hold of the walls of the more superficial parts of the sac, then pass through the overlying skin, when they are tied over rolls of gauze.

Endoaneurysmorrhaphy has attracted more attention on the American continent than in Europe, and to the results attained there we must first direct our attention. Dr. Matas published his last collection of cases in 1910,<sup>2</sup> but I learn from a personal communication that he will shortly place the results up to the present time before the American Medical Association. The record just referred to comprises 149 operations for aneurysm, of which 105 were obliterative, 20 restorative, and 24 reconstructive. Of these, 129 occurred in the external iliac or in its continuation down to the popliteal. In only 5 cases did gangrene follow operation; these were all obliterations, and in 3 of them the principal factor which determined gangrene was injury and ligation of the popliteal vein.

The mortality is not given in the paper alluded to above, and it is, therefore, necessary to refer to an earlier collection of cases by Matas,<sup>3</sup> which comprises 85 operations—59 obliterative, 13 restorative, and 13 reconstructive. The figures are not quite clear, as in one place 8, and in another 7, deaths are referred to, but I am only able to indentify 7. Six of these occurred in the obliterative group, 2 were aneurysms of the abdominal aorta, 1 of the external iliac, 1 was iliofemoral, 1 femoral, and 1 popliteal. The remaining death was after reconstruction in the iliofemoral region; the restorative operations were free from mortality. Secondary hæmorrhage happened in 2 cases only; both were obliterations. Relapse followed operation 4 times, always after reconstruction; 1 of these patients was cured by an obliteration, 2 were submitted to amputation and recovered, the fourth died after rupture of the sac.

In the later paper it is definitely stated that gangrene had not occurred in any of the restorative or reconstructive operations then collected, nor had relapse in any other instances than those referred to above.

The figures which I am able to bring forward regarding endoaneurysmorrhaphy in the British Isles are very meagre, though I have made careful search and inquiry. The total number of cases is 16, 9 collected from current literature and 7 yet unpublished from notes kindly provided by my surgical friends. Of these 16 aneurysms, 1 was of the external iliac, 1 femoral, 11 popliteal, 2 subclavian, and 1 brachial. Fourteen were operated upon by the obliterative method; of these, one patient with external iliac aneurysm died from sepsis. Gangrene of the leg supervened in this case and in one with popliteal aneurysm. The two remaining operations were reconstructive in patients with popliteal aneurysm; in both the sac had already ruptured and both operations were followed by gangrene. Secondary hæmorrhage or failure to cure is not referred to in any of the cases. We have, therefore, one death only, and apart from this case gangrene following operation in 3 other patients, all of whom recovered after amputation. (See table.)

Comparison between these results and those obtained by other methods is not easy, but my table of 11 popliteal aneurysms reveals the misfortune of gangrene occurring in 3 patients, all of whom recovered after amputation, and with these we may contrast the results collected by Rigby from the London Hospital records.<sup>4</sup> The series includes 19 cases operated on for popliteal aneurysm by various methods other than that of Matas. Four of the patients suffered from gangrene of varying extent, 1 from secondary hæmorrhage, and 2 died as the result of the operative proceedings, but in both of them the sac had ruptured.

Argument in favour of particular methods based on statistics is difficult to apply in connexion with aneurysm, partly on account of the rarity of the disease, and partly on account of the varying conditions requiring treatment. I do not propose, therefore, to express any dogmatic opinion on the value of the new treatment as compared with the older methods. Probably that surgeon will obtain the greatest success who restricts himself to no single line of treatment, but selects that most appropriate in the case immediately before him. For example, influenced by my two successful cases of subclavian aneurysm, I should in similar circumstances again tie the axillary and the common carotid, but I am very favourably impressed by the advantages of endoaneurysmorrhaphy and shall gladly adopt it under suitable conditions. Obliteration is likely to hold the field for the

majority of cases; it may be fairly said to have proved its claims. In carefully selected cases restoration of the artery promises brilliant results and should, I think, certainly be adopted where possible. Reconstruction has not so clearly established its claims and should, I think, be used but rarely and when the conditions for reconstruction are unusually favourable.

In conclusion, I would like to express my admiration for the scientific and skilful work of Dr. Matas in injuries and diseases of the vascular system.

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## THE EARLY DIAGNOSIS AND TREATMENT OF EPILEPSY.<sup>1</sup>

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THE subject of epilepsy is so large that when one chooses it for the purpose of a lecture one is obliged to limit one's observations to a comparatively small aspect of the question. I have taken the title of early diagnosis and treatment, because it will enable me to bring forward certain points in connexion with epilepsy which are not only of interest but of practical importance. There is probably no form of serious nervous disease with which the general practitioner is more often brought into contact than epilepsy, and yet there is some lack of confidence displayed by many medical men in dealing with the diagnosis and treatment of this distressing malady.

Epilepsy is an unpleasant subject for two reasons. In the first place, the obscurity which surrounds its pathology remains obstinately dense; in the second place, it is regarded—particularly by the public, and largely, too, by the medical profession—as a disease for which little or nothing can be done. It will be my object not to make a vain attempt to throw light on the pathology of epilepsy, but to endeavour to show that the prevailing gloomy views on the subject of treatment are not altogether justified. Perhaps I ought to say that these gloomy views would, in my opinion, tend to disperse if the diagnosis of epilepsy were more often made at an early stage, and the treatment carried out in a more methodical and intelligent manner.

Statistics are largely responsible for the lack of confidence displayed in the treatment of epileptics, but they should not be taken too seriously. They generally deal with material which has been collected or observed in the out-patient department of a nervous hospital or in one or other epileptic colony. The data derived from either of these sources are eminently fallacious. In the former case the physician who makes his observations has no means of checking the carrying out of the treatment he prescribes, is quite unable to know how far his instructions are obeyed, and is ignorant of many important points in the conditions under which his patients live. In the case of epileptic colonies, the subjects of observations and study, if they are observed and studied, are mostly epileptics of some standing, with regard to whom the question of early diagnosis can no longer be raised.

It must be the experience of many others besides myself that epilepsy in private practice has a happier, or at any rate a less unhappy aspect, and that the results of treatment are often more gratifying than mere hospital experience would lead one to expect. I ascribe the encouragement which is afforded by the treatment of private epileptic patients to three principal causes. The first is based on the fact that early diagnosis is more frequent, although not nearly so frequent as it ought to be. The second relates to the fact that careful observation of the physician's instructions and a considerable degree of regularity of treatment can often be procured. Thirdly, opportunities for studying the individual characteristics of the patients and of their reaction to remedies are sometimes available.

Let me take each of these three points in order and develop them with illustrations.

<sup>1</sup> Being a clinical lecture given at the National Hospital for the Paralysed and Epileptic.

<sup>2</sup> Transactions of the American Surgical Association, 1910

<sup>3</sup> Journal of the American Medical Association, Nov. 14th, 1908.

<sup>4</sup> Proceedings of the Royal Society of Medicine, vol. iii., Part I., 1909-10, Clinical Section, p. 131.