

## THE SURGICAL TREATMENT OF AORTIC ANEURISM.

REPORT ON A CASE SUCCESSFULLY TREATED BY PRODUCTION OF WHITE THROMBUS.

BY JOHN A. C. MACEWEN, M.B., C.M.,  
OF GLASGOW,

Senior Assistant to the Regius Professor of Surgery in the Glasgow University ; Surgeon to the Elder Hospital, Govan ; Assistant Surgeon to the Glasgow Royal Infirmary.

ANEURISM, so far as treatment is concerned, may be said to be divided into two classes, at the present time—those amenable to radical surgical treatment, and therefore curable, and those which, being inoperable in the ordinary sense, come under the care of the physician, who generally frankly recognizes that, beyond diagnosing the condition, and perhaps palliating it by rest in bed, dry diet, and the administration of potassium iodide, he can do little to cure the disease or even to arrest its progress.

To the former class belong the aneurisms of the extremities, which, in many cases, can be successfully treated by ligature and perhaps excision ; to the latter class belong the aneurisms of the aorta and those of its branches close to the main trunk, where a radical excision, at least in the present state of our knowledge, is impossible. The object of this article is to draw the attention of the profession to the surgical aspects of this latter class, in the hope that many cases, at present regarded as hopeless and allowed to die practically untreated, may be given the chance of undergoing treatment which, even where it does not cure the condition as it often does, will, in suitable cases, give remarkable relief for a very considerable period.

The ordinary surgical treatment of all aneurisms is beset with difficulties more or less peculiar to the condition. In the first place, the patient's general condition is often far from satisfactory, the heart in particular being frequently markedly affected. The excitement produced by the anticipation of a

formidable operation, and the further excitement and possible struggling during the early stages of anæsthesia, throw a heavy and most undesirable load upon an already inefficient organ. Added to this, there is the extreme strain upon the heart produced suddenly at the moment of ligaturing a main vessel whose anastomoses are not developed, and death has occurred before now from this cause. In thoracic aneurism, in addition to the heart condition, the trachea and large vessels and nerves may often be affected by pressure, rendering the administration of an anæsthetic still less desirable. In the second place, it is not necessarily only the portion of artery affected by the aneurism which is diseased. It is generally recognized that it is not wise to ligature the main vessel near the aneurism, on account of its diseased condition; and, indeed, a generalized sclerotic condition of the arteries in such cases is not uncommon, a second aneurism sometimes developing, perhaps on the other side of the body.

It will, therefore, be evident that an operation for radical excision of a distal aneurism, even where perfectly possible mechanically, exposes the patient to grave risks, apart from those common to all ordinary operations.

Many operations have been devised for the treatment of aortic aneurism which have as their object the production within the sac of a red blood-clot, as it is believed that spontaneous or natural cure of aneurism occasionally occurs in this manner. Operations having this object in view, however, apart from any mechanical or manipulative difficulties which may be encountered, are always open to grave objection on the score of danger. In the first place, the rapid production of a red thrombus is always liable, even where one is dealing with a distinctly sacculated aneurism, to cause at least a partial obstruction of the lumen of the vessel, and thereby throw a severe strain upon the already weak heart, and this effect must be more pronounced where the aneurism is not markedly sacculated, and where, therefore, the clot forms chiefly or entirely in the lumen of the vessel. In the second place, red blood-clot is not a reliable substance; it is soft; does not adhere firmly to the vessel wall; is friable, and hence is very liable to be

detached as a whole or to have fragments detached from it by the vibrating torrent of blood which rushes through the aorta at each systole of the heart, and so give rise to emboli which may prove very serious, if not fatal. This danger is increased where a foreign body is introduced in the hope that the thrombus will form upon or about it, the adhesion between clot and foreign body being in many cases very slight.

With a view to obviating many of these dangers, whose reality is sufficiently established by clinical records, and at the same time of inducing the production of a strong and enduring thickening of the diseased wall of the aneurism, a method was put forward many years ago by Sir William Macewen of introducing a fine steel needle, highly polished, into the interior of the aneurismal sac or dilatation, and scratching very lightly the inner surface of the opposite wall, so as to produce a series of slight abrasions of that surface. In this operation it is not sought to produce any red thrombus, but rather, by wounding the sac wall, to set up a process of repair which, ultimately, will lead to a thickening and strengthening of the wall, if not to complete obliteration of the sac. He has found that, subsequent to this operation, a red thrombus does not form, but that a white thrombus is deposited. This white thrombus probably consists at first of a deposition of colorless fibrin, produced by the action of the leucocytes coming from the damaged wall of the vessel, acting upon the serum derived from the same source. This white thrombus is at first small in amount, seals up the damage in the vessel wall, but does not cause any marked narrowing of the lumen of the vessel. At a later stage embryonic cells, derived from the various tissues wounded by the needle, appear, and replace the fibrin, so that, in a short time, the white thrombus is replaced by granulation tissue, which, at a still later period, becomes converted into adult tissue, probably largely composed of fibrous tissue.

A remarkable point about this exudate is that, once its formation has been started, it tends, under favorable circumstances, to gradually increase in quantity, fresh fibrin being slowly deposited on the surface, to be replaced later by fibrous tissue. In some cases of aneurism of distal vessels this process

of thickening of the vessel wall has gone on gradually over a period of weeks or months, until ultimately the vessel has become completely occluded. No obliteration has been observed in the aorta, the force of the blood stream in that vessel presumably checking any attempt at undue narrowing of the normal lumen.

The advantages of this process are obvious. In the first place, there is no sudden blockage of the vessel; on the contrary, the process is essentially a very gradual one, abundance of time being given, in those cases where complete obliteration is going to take place, for the thorough development of the anastomoses, and hence strain upon the heart is obviated. In the second place, the thrombus, instead of being large and loosely adherent to the vessel wall, is at first small and is intimately associated with it, rendering detachment practically impossible; and, in the third place, the thrombus becomes progressively converted into granulation and adult tissue as it increases, so that detachment of emboli cannot occur.

Clinically, also, the process has its advantages. It is easy of application; in most cases no incision is required, and hence an anæsthetic is unnecessary, and excitement is minimized, and struggling, with consequent severe cardiac strain, eliminated, while the patient suffers but little discomfort either from the introduction of the needle or from its presence, even when it is retained for several hours. While the writer's aim is to direct attention to this form of treatment particularly for the "inoperable" forms of aneurism, it will be obvious that it possesses great advantages over ordinary operative measures for aneurism of the extremities.

Sir William Macewen has treated many aneurisms, aortic and otherwise, by this method with most gratifying results. An account of a case of aneurism of the arch which has been successfully treated by the writer by this method may be of interest.

The patient, Mrs. J., now aged 40, was placed under his care in the Elder Hospital, Govan, by Dr. Hamilton Robertson, who kindly supplied him with some notes on the case. She first be-

came ill in June, 1908, after having performed some exceptionally heavy housework, when she suffered from attacks of severe pain which radiated from the left breast to the left side of the neck and face, and down the left arm. At first the attacks of pain occurred in the early morning, but soon they became very frequent and severe, lasting, perhaps, for an hour and a half at a time. The pain was described by the patient as maddening, and it caused breathlessness and necessitated her sitting up. A holiday was taken in the hope of improving matters, but as the pain became more constant and, if possible, more severe, she came home and went to the Royal Infirmary, where she remained for a couple of months. Pulsation in the episternal notch was first noticed while she was in the Infirmary, but the pains diminished and disappeared, and she was dismissed, "much improved" by rest, medication, etc. Later, however, the pains reappeared, and when Dr. Robertson first saw her in July, 1909, she appeared to be in great distress, complaining of severe pain, pulsation in the neck, choking sensation, and cough. Respirations were rapid, pulse weak and running, and altogether she seemed so ill on the occasion of this first visit, which patient made to his surgery, that Dr. Robertson was relieved to get her safely home without her collapsing. About this time even the act of sitting up brought on an extreme feeling of collapse, dressing was accomplished with difficulty, while a walk across the kitchen floor caused extreme misery, and patient thought she was dying. The heart was found, on examination, to be enlarged; there was a loud double murmur best heard over the upper end of the sternum, and the left pulse was markedly weaker than the right.

At the end of six weeks of absolute confinement to bed, with restricted dry diet and iodides, patient was again much improved, the pain having disappeared, and the pulsation in the neck having become less marked. As Dr. Robertson considered further improvement unlikely to occur, while a return of the symptoms was practically certain unless patient was kept in bed, he recommended her transference to the Elder Hospital. She was conveyed to the hospital in October, 1909, in an ambulance, and carried to bed in a stretcher. She remained in the hospital for seven weeks, during which period a needle was twice introduced and a large area of the posterior wall was treated. She expressed herself as feeling better after the treatment, but it was thought wise to let her return, as she had come, in an ambulance. She returned

to the hospital in January, 1910, had a needle introduced once, remained in hospital for a month, and was able to go home in a cab. She now felt so much better that she was able to walk a little, and she went to Rothesay for a holiday, and was able to go about and enjoy herself. She returned to the hospital in October, 1910, remaining there for a month, and on this visit had two needles introduced simultaneously on two occasions, at an interval of a fortnight. Thereafter patient began to feel very much better. The choking sensation had quite gone, and she was able to go about freely without any sensation of faintness or collapse, nor did the pains reappear at any time.

Now, in July, 1912, patient expresses herself as having been given a new lease of life, and as feeling better than she has done for many years back. Not only can she go about freely; she can go up and down stairs actively without assistance or inconvenience; she can perform ordinary light household duties; there is no pain nor choking sensation, and she further states that she has entirely recovered from severe headaches which had caused her much suffering prior to the appearance of the aneurism. Pulsation is still noted in the neck, as is to be expected, owing to the deep or posterior wall being the one which was treated, but it is not marked, and only becomes noticeable when patient is excited. Whereas, in the early stages of the disease, the left pulse was markedly weaker than the right, it is now at least as strong. Thus this patient, who, prior to surgical interference, thought she was dying, and was admittedly very ill, has gradually improved under treatment until now, 16 months after the last needling, she feels better than she has done for many years past.

In conclusion, the writer would urge the desirability of early diagnosis and treatment. When an aneurism has become enormous, and, for example, has produced a large perforation in the sternum, the mere excitement produced by the idea of having something done may easily predispose to leakage or even rupture, and thus even the simple procedure of needling may of necessity be abandoned. Thoracic aneurism in particular is admittedly difficult of diagnosis in some early cases, and the great assistance given by an examination by X-rays should then be borne in mind.