A CASE
OF
SACCULATED AORTIC ANEURISM
TREATED BY THE
INTRODUCTION INTO THE SAC OF THIRTY-TWO
FEET OF STEEL WIRE.

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A CASE of aortic aneurism treated by Moore's operation was recently under our care at the Royal Hospital for Diseases of the Chest, and as this mode of treatment is attracting some amount of attention at this time, and has not been followed by the success of which it appears to be capable, it seems desirable to place the case on record.

The patient was a tall, well-developed, powerful-looking man, a smith by trade, forty-eight years of age, who gave the following history.

History.—His parents both died at the age of seventy; there was no hereditary disease in his family. He had always been a smith, and had been in the habit of drink-

ing freely while at his work, but not to excess. At fourteen years of age he had typhoid fever, and he once had a slight attack of gonorrhœa; he had not had syphilis. Five years ago he had pleurisy with effusion on the right side, for which he was tapped. He recovered in two months. Five months ago he noticed a swelling of the front of his right chest which slowly increased. Two months ago a severe cough came on, attended with dark, thick expectoration, and at this time he had pain in the swelling. The cough lasted three weeks, and since then he has noticed that he has been short of breath on exertion, and that the swelling has been larger. He has not had any pain either in the chest or down the arm. He has not suffered from palpitation. He has recently been losing flesh, in spite of his appetite remaining good.

State on admission to hospital (November 20th, 1886).—The man was stout, florid, with congested facial capillaries, iron-grey hair, prominent suffused eyes, free from pain, and said he felt "quite well."

On the front of the right chest was a smooth round swelling, in shape and position like a mammary gland, extending vertically from the second to the fifth rib, and laterally from the right edge of the sternum to the axilla. This swelling was the seat of a forcible expansile and heaving pulsation synchronous with the heart's action. Over it was heard a harsh high-pitched systolic murmur. The second cardiac sound was very loud and accentuated.

The heart's impulse was heaving and very forcible, one inch outside the left nipple line in the sixth interspace; the cardiac dulness reached up to the third cartilage. There was a loud systolic murmur heard at the apex, and conducted into the axilla, and above and outside the apex the second sound, previously clear, was replaced by a coarse diastolic bruit, audible over a very limited area only. The pulse at the left wrist was of good force and volume. On the right side it was smaller in volume, but this was thought to be explained by the presence of a large branch

coming off from the radial artery above the wrist, and coursing round the lower end of the radius to the back of the thumb.

Over the uppermost third of the abdomen, and along the right side of the chest below the swelling, were numerous dilated veins, the blood in which would flow in either direction. The pupils were equal and active. There was no dysphagia.

Above the swelling anteriorly, and down to the angle of the scapula behind, the resonance of the right chest was much impaired, and the respiratory murmur was distant and weak. No râles; vocal vibration diminished. The base of the lung was resonant and breath-sound normal. Nothing abnormal was detected in the left lung or in the state of the abdominal viscera. The urine was acid and free from albumen.

Progress.—The man was kept in bed on a restricted diet, and was ordered iodide of potassium in gr. xv doses three times a day. He was of a very excitable temperament, and it was impossible to get him to keep quiet in bed, but in spite of this it was noted on December 3rd that there was “rather less force in the pulsation of the tumour.” Over the posterior apex of the right lung there was loud bronchial breathing; no râle.

Matters went on in this way without material change until the second week in January, when the patient was a good deal excited by the death of two patients in the same part of the ward as himself.

On January 11th the following note was made:—“For the last few days the swelling has been increasing rapidly in size, and more noticeably so up to yesterday morning. The lower part of the tumour has become much more prominent, not extending into the axilla, but hanging down like a slightly pendulous mamma. Pulsation is very marked and appears more superficial. He has had severe throbbing pain about the nipple, and shooting pain in the shoulder, which is now less. The cardiac signs are unchanged in character, but the intensity of the diastolic

bruit in the left axilla is increased. He is paler, has no cough or difficulty in swallowing; no change in the general physical signs."

In consequence of this change Dr. White asked Mr. Gould to see the man with him with a view to operative interference for his relief. It was evident that the aneurism was undergoing rapid enlargement and that, if left alone, death from external or subcutaneous rupture of the sac was imminent. After explaining the position to the patient it was decided to introduce some fine steel wire into the sac, and this was done on January 11th at five o'clock in the afternoon.

Operation.—The part was rendered insensitive by a subcutaneous injection of five minims of a 20 per cent. solution of hydrochlorate of cocaine, and then a fine Southey's trocar was thrust into the aneurism about the level of the third intercostal space, immediately above the right nipple and at a spot where the pulsation seemed to be most superficial.

Bright blood spurted from the cannula, through which fine steel wire was slowly passed. When about nine or ten feet of the wire had been thus passed in, it broke and it was found impossible to push the broken end through the cannula. Accordingly, a second puncture was made immediately below the first, and twenty-two feet of the same wire was passed into the aneurism; as there was now distinct and increasing resistance to the passage of the wire the cannula was slowly withdrawn and the wire cut close to the skin, and then the same was done to the first cannula. A pad of boracic lint was strapped over the punctures. It was estimated that from ten to twelve ounces of blood escaped through the cannula while the wire was being introduced, but the hæmorrhage was at once controlled by the pad. The operation lasted one hour and a quarter. The patient was nervous and excited throughout, and at times became faint, and for this an ounce and a half of brandy was given. He did not complain of any pain. Immediately after the opera-

tion, when very faint and with feeble cardiac impulse, there was hardly any pulsation to be detected in the mamma-like projection of the aneurism. Two hours later he had recovered his usual appearance and was warm and comfortable save for some shooting, throbbing pains in the back of the shoulder. There was very slight oozing of blood from the punctures. Pulse 96, respirations 32. He was ordered gr. x of chloral and gr. xv of bromide of potassium at once and to be repeated as required. He failed to get sleep in the night, and was very uncomfortable owing to his constrained position in bed and to numbness in the shoulder and arm. The little pad of lint had been stained through by blood but was quite dry. The tumour was much harder than before, and inelastic; the pulsation was more of a heaving character than before. The radial pulse was of fair force and volume. He was rather restless through the day, and in the evening was sick once, being troubled with flatulence.

January 13th.—After the injection of a quarter of a grain of morphia, patient had a quiet night; his pulse was somewhat bounding, 96; respirations 24. There was now a bruise of bluish-yellow colour, extending over the upper part of the swelling. The skin here was glazed but not red. The cardiac phenomena were unchanged, but the second sound was feeble over the aneurism, and the systolic bruit was less marked. The bowels were confined, and a dose of compound senna draught was given, which had the desired effect. The pad of lint was removed in the afternoon because it was soaked through, and there was noticed a considerable and continuous oozing of slightly blood-stained serum from the second puncture. There was slight tenderness over the punctures, the swelling was firm and the pulsation felt in it seemed to be deep. The discharge of blood-stained serum increased and became very troublesome.

14th.—Pulse less full and less bounding in character; patient quiet, free from pain in the chest. Discharge of

thin blood-stained serum through the second puncture was much more profuse. He was troubled with diarrhoea and tenesmus which abated towards evening, and after a bromide and chloral draught he slept well.

15th.—Was quieter this morning ; no pain ; no cough ; pulse of fair force, soft and regular. The serous oozing still very profuse.

17th.—The discharge continued, and was estimated at 3v to 3vj in the day ; it was unchanged in character, being thin, blood stained, and not coagulating spontaneously. The ecchymosis was fading, and there was no redness, tenderness, or other sign of inflammation over the aneurism. There was no change in the heart-sounds, but the pulse was smaller and softer. The bowels had been freely opened with Friedrichshall water. Finding that pressure over the puncture very easily arrested the leakage Mr. Gould applied a pad of boracic lint with four “ tails ” of strapping. This was in the afternoon ; in the evening the patient became very restless and complained of the pressure of the pad, but he slept after the injection of a quarter of a grain of morphia.

Next morning (18th) he was in pain ; the pulse was small and feeble. The draining of serum had completely stopped. There was no change in the limits, appearance, or pulsation of the tumour. During the day the pain in the right chest increased, and he complained of a sense of tightness in the axilla. It was found that a general swelling of the subcutaneous tissue over the aneurism had taken place, and extended into the axilla, and upwards to an inch above the clavicle. The skin had a slight purplish tinge, and two bullæ filled with dark fluid developed over the aneurism.

Next morning (19th) the extremities were cold, the pulse could scarcely be perceived at the wrist, and the patient was evidently moribund. There was very extensive œdema of the subcutaneous tissue of the chest, involving also the shoulder and arm ; the skin over it was mottled in different shades of purple and becoming gangrenous. At 1 p.m.

he died. The temperature throughout the last ten days of life, is shown on the accompanying chart.

Post-mortem examination (twenty-six hours after death) by Dr. WHITE.—Rigor mortis marked; much hypostatic congestion of the dependent parts. The considerable swelling of the right side of the chest and neck and right arm wore a purplish aspect, and large bullæ containing blood-stained serum were present around the right nipple. Arborescent lines of brown discolouration were scattered over the chest and extremities. The tumour of the chest felt hard. The skin, subcutaneous fat, and the pectoral muscle were reflected from the aneurism, and in doing this much sanguineous fluid escaped. The tumour protruded through the chest wall, between the second and third rib cartilages close to the sternum, and further out, between the third and fourth ribs. Over its outer part the muscle was blended in the sac wall. Two small portions of the sac, each about the size of a threepenny piece, and close to the punctures, were obviously sloughy, and during the dissection one of these gave way, and some of the wire protruded from the aperture, and a considerable quantity of dark fluid blood ran out.

The heart, aorta, sternum, and tumour were then removed in one piece and set aside for further examination.

The heart was displaced downwards and outwards, and was covered with a thick layer of subpericardial fat. The left ventricle was considerably dilated and its walls moderately thickened. The aortic orifice was enlarged; the three cusps of the valve were healthy. Immediately above its origin the ascending aorta was enlarged into an irregularly globular dilatation, the size of a large orange, and the interior of this part was very irregular from atheroma. The transverse part of the arch, as far as the origin of the left subclavian artery, was slightly dilated; beyond that point the thoracic aorta was of its normal calibre. Springing from the upper part of the tubular aneurism above mentioned, on its anterior and outer aspect, was an ovoid sacculated aneurism of about the size of a cocoa-nut. Rather more than half of the sac was contained within the chest, and was firmly adherent to the sternum, right ribs, and rib cartilages and the right lung. It projected through the chest wall at the level of the third right rib, the cartilage and a part of the rib having been destroyed in the process. The outer portion of the aneurism formed a tumour adherent to the second and fourth ribs.

The intra-thoracic portion of the aneurism had a thin but well-marked sac. The extra-thoracic portion was destitute of any definable sac, and the tissues limiting the cavity were composed of soft, shreddy, muscular tissue abundantly infiltrated with blood and serum.

The aneurism contained a confused mass of steel wire, in the meshes of, and partly surrounding which, was a considerable quantity of firm, red, fibrinous clot. One loop of the wire projected just through the mouth of the aneurism into the dilated aorta. The entire mass of wire and clot formed an extremely firm mass; it was nowhere adherent to the sac.

The mouth of the sacculated portion of the aneurism was very large, easily admitting four fingers.

Permission to examine the other organs could not be obtained.

Remarks.—In spite of the large size of the aneurism, of its wide mouth, and of its rapid growth, there was one circumstance that rendered it favorable for treatment, and that was the large sacculated portion well marked off from the tubular portion. Although the first part of the arch of the aorta was dilated, yet the external tumour was a distinct sacculated pouch springing from it. Tufnell's treatment was never fully carried out. The man himself when first he came under treatment could not be made to realise the very serious nature of his ailment, and would not submit to a very rigorous limitation of his diet, and the most explicit and often-repeated directions failed to make him observe the perfect rest that forms so essential a part of this treatment. He was of so excitable a disposition that not only would he turn about in bed, but do so quickly. It was no matter of surprise therefore that when he became considerably upset by the death of two near neighbours in the ward the aneurism rapidly increased in size. It was evident then that unless something was done which would speedily excite coagulation in the sac, death would quickly ensue, and it was equally evident that our choice was limited to one or other of the means of directly exciting coagulation within the sac. Electrolysis has not met with the success which was at one time anticipated for it, and the urgency of the case seemed to particularly contra-indicate it. It is true that Moore's treatment of aneurism may still be spoken of as in its experimental stage, but the partial success obtained by Dr. Cayley and Mr. Hulke in a case not unlike our own encouraged us to hope that it might prove of benefit to our patient, and at any rate prevent the threatened rupture of the external portion of the aneurism. The result achieved showed that while our expectation was not groundless we had not made sufficient allowance for the danger always attendant upon the sudden coagulation of a large aneurism lying in a bed of loose connective tissue,

nor for the special mechanical disadvantage of having a large mass of steel wire within a thin sac. The particular points in the case to which we would especially direct attention are as follows :

The fatal termination of the case was due to the sloughing of the tissues and the aneurism, and this, we fear, was largely due to the treatment pursued. At the time of operating the external portion of the aneurism was enlarging rapidly and the sac had no doubt given way. The operation itself led to an extravasation of blood beneath the skin, and a free discharge of bloody serum occurred from one of the punctures. But it was only when a compress was applied with sufficient firmness to arrest this oozing that really serious symptoms arose ; and it would seem that the moderate pressure of the pad of lint over the firm unyielding mass of wire in the aneurism sufficed to produce gangrene of the intervening tissues. It is well known that the sudden coagulation of the blood in a large aneurism is liable to cause sloughing of the sac and inflammation of the superjacent tissues, and this has been especially noticed in the case of axillary aneurisms where the tumours are surrounded by loose connective tissue. The reason assigned for this occurrence is the altered nature of the pressure exerted upon these tissues when the fluid within the sac becomes solid. Still more is this the case when the contents of the aneurism are not a mass of fibrin and blood-clot only, but a tangled coil of steel wire.

Looking back upon our case, therefore, we think that the partial rupture of the sac which had no doubt taken place at the time of the operation rendered it an exceedingly unfavorable case for any treatment, perhaps especially so for the one we pursued. Further, the length of wire introduced was too great, and the unyielding mass it formed in the aneurism was distinctly a source of danger. Had we stopped when the wire broke, and been content with some ten feet or so coiled up in the cavity, it may be that we should have excited coagulation without

exposing our patient to the danger which proved fatal to him. We were under the impression that the aneurism was even larger than it proved, and, guided by previous operators, we continued to pass in the wire until distinct resistance was met with, and did not regard, as we should have done, the serious risk this entailed.

The hæmorrhage during the operation was annoying to the operator but probably beneficial to the patient.

The following is a list of all the cases which we have been able to find in which Moore's treatment has been carried out.

1. Moore. 1864. Aortic aneurism; iron wire, 26 yards; death. ('Med.-Chir. Trans.,' xlvii.)
2. Levis. 1873. Subclavian; horsehair; death.
3. Bryant. 1873. Popliteal; horsehair, 20 feet; "almost complete consolidation;" death in five days from ulcerative endocarditis.
4. Rubio. 1874. Innominate; iron wire, 2—3 mètres; death.
5. Paul. 1874. Innominate; horsehair, 15 feet; death. ('Med.-Chir. Proc.,' New Ser., 12.)
6. Levis. 1876. Innominate and subclavian; horsehair, several yards; death.
7. Levis. External iliac; horsehair, several yards; inflammation, suppuration of sac; death from hæmorrhage.
8. Baccelli. 1884. Aortic; watch spring; death.
9. Baccelli. 1884. Aortic; watch spring; death.
10. Van der Meulen. 1879. Brachial; catgut; recovery.
11. Loreta. 1885. Abdominal. Silvered copper wire; recovery.
12. Ransohoff. 1886. Aortic; silver wire; death.
13. Maury. Subclavian; horsehair; death.
14. Cayley and Hulke. Aortic; steel wire; improvement; death.
15. Pringle and Morris. Aortic; steel wire; death.
16. White and Gould. Aortic; steel wire; death.

Among these sixteen cases there are but two of complete recovery: those of Loreta and Van der Meulen; but in two more, those of Bryant and Hulke, the result was at any rate a partial success. Ashhurst mentions that Domville, Montenoveri, and Stimson have also had unsuccessful cases, but we have not been able to find details of these.

Conclusions.

1. Moore's treatment is worthy of further careful trial in properly chosen cases.

2. The operation should be performed before there is reason to suspect rupture of the sac.

3. Only a small quantity of wire should be introduced at any one time.

4. No firm pressure should be made over the aneurism afterwards.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 241).