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J. B. Peacock's kind copy*

(4)

CASES

OF

DISSECTING ANEURISM,

OR

THAT FORM OF ANEURISMAL AFFECTION
IN WHICH THE SAC IS SITUATED BETWEEN THE
COATS OF THE VESSEL.

By THOMAS BEVILL PEACOCK, M. D.,

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Royal Medical Society.

(From the *Edin. Med. and Surg. Journal*, No. 157.)

CASES OF DISSECTING ANEURISM, &c.*

THE term Dissecting Aneurism was first employed by Laennec,† and it would appear that he regarded the case which he has quoted as the first which had been recorded. Mr Allan Burns has, however, related a well marked example of the affection in his work on Diseases of the Heart, published in 1809; and two others are described by Mr Shekelton,‡ in the Dublin Hospital Reports for 1822. Cases of the affection in an early stage are also related by Morgagni,§ and by Dr Nicholl in his account of the examination of the body of George II.||

More recently, two cases of the disease have been given by Mr Guthrie in his Lectures on the Diseases and Injuries of Arteries, one by Dr Elliotson in his Lumleyan Lectures, two by Drs Pennock and Goddard in the American Journal of Medical Sciences,¶ two by Mr Smith in the Dublin Journal;** and one figured in the fourth fasciculus of plates published by the army medical department, is also described by Dr M'Lauchlan in the Glasgow Medical Journal.†† In addition to those, two cases of the disease recently fell under my notice in the Royal Infirmary; and I have had the opportunity of examining a third which occurred in the practice of Dr Paterson of Leith. Two preparations of the disease I have found in the Museum of the College of Surgeons, and one in the Hunterian Collection of the Royal College of Surgeons of London; and still more recently, an interesting example has been quoted from an Italian Journal in the Gazette Medicale de Paris.‡‡ In the following paper, after describing the particulars of five of the cases not hitherto reported, I shall offer as full an analysis of the whole of the nineteen cases as the data will allow.

The Dissecting Aneurism differs very greatly from the more com-

* This paper forms the substance of an essay read before the Royal Medical Society in November 1842.

† Traite de l'Auscultation, 1826, Tome ii. pp. 696. This case was related by M. Ambroise Laennec to the Society of the Faculty of Medicine at Paris.

‡ Dublin Hospital Reports, Vol. iii. p. 231.

§ De Sedibus et Causis Morborum, Ep. xxvi. § 15, 17, 21, Ep. xxvii. § 28; and Alexander's Translation, Vol. i. pp. 803-6, 861.

|| Philosophical Transactions, 1761.

¶ Quoted in the London Medical Gazette, Vol. xxiii. p. 668.

** Dublin Journal of Medical Sciences, Vol. ix. p. 426. Contributions to Pathological Anatomy, by R. W. Smith. Reference is made to a third case, the preparation of which is contained in the Museum of the Richmond Hospital.

†† Vol. i. p. 1, 1833.

‡‡ Tome x. p. 524, August 1842. Case of M. Tessier, extracted from the Giornale delle Scienze Mediche.

mon forms of aneurismal affection. In the latter, whether resulting from dilatation of the arterial tunics, or from rupture or ulceration of the internal and middle coats, the sac forms a distinct and more or less round tumour projecting from the side of the vessel, with the canal of which it communicates by a comparatively small aperture, and the disease, though fatal, is slow in its progress, and gives rise from the pressure of the tumour on the adjacent vital organs, to very characteristic symptoms. In the dissecting aneurism, on the contrary, the sac occupies the walls of the vessel, and following its course, resembles only a dilated artery; the aperture by which the two canals communicate is usually a long and narrow fissure; the disease is suddenly developed, and usually rapid in its progress to a fatal termination; nor are the symptoms which attend its formation and progress such as can be regarded as characteristic of the affection. The disease usually originates in laceration of the internal and a part or the whole of the middle tunic of the artery, more rarely in the perforation of the coats from other causes, and as they have not acquired that intimate adhesion together which obtains in cases of circumscribed aneurism, or are rendered more readily separable by active disease, the blood insinuates itself into the cellular space between the external and middle coats, or more probably between the layers of the latter, and effects their separation. An aneurismal sac is thus produced, following the course of the artery to a greater or less extent both above and below the internal fissure, bounded externally by the external coat, with probably in most, if not all cases, a portion of the middle, and separated from the original canal by a septum composed of the internal membrane of the artery, and a part or the whole of its middle tunic.

When a case of the disease is examined at a remote period, the ragged aperture by which the sac communicates with the vessel, and the roughness and irregularity throughout its course, at once point out its nature. In a later stage however, the edges of the fissure become clean and equal, the sac acquires a lining membrane of a yellowish colour and possessing the smoothness of the serous lining of a healthy artery; the branches passing to the adjacent parts are observed, some to take their origin from the new canal, others from the original vessel; and the whole resembles rather an uncommon conformation of the artery than the effects of disease,—a resemblance which becomes the more striking, when, as occasionally happens, the sac after proceeding a greater or less distance, reopens into the canal from which it originated. Mr Shekelton, in speaking of the cases which fell under his notice, says on examination “of the first case, I was at a loss to explain it, so little did the tumour resemble an aneurismal sac, and so similar was its situation to that of the artery, that I was rather inclined to regard it as an uncommon *lusus*. In the second, however, the doubt was

cleared up, for the aneurismal sac had not undergone that revolution in its structure which might have given rise to such a mistake; and lastly, a similar aneurism having commenced in another part of the artery, afforded some explanation of the progress of the disease.”*

The accumulation of instances of the disease in its several stages from the earliest, in which it only appears as a rupture of the internal coats with an ecchymosis beneath the external, to the state in which it forms an entirely new canal, has now removed all difficulty in recognizing the affection. I shall proceed to describe the cases which I have found hitherto unpublished, offering such additional illustration from those already recorded as the description of the disease may seem to require.

The first case is one for which I am indebted to Dr Paterson of Leith, and the preparation of which is in my possession.

CASE 1.—*Dissecting aneurism originating in a transverse laceration of the internal and middle coats of the aorta, one inch above the semilunar valves. Death from rupture of the sac into the pericardium.*

The patient, a female 56 years of age, was of somewhat intemperate habits, and had suffered for some time from asthma. She retired to bed in her usual health, and was found dead the following morning.

On examination, the pericardium was greatly distended with blood, and a laceration by which it had escaped was found on the anterior surface of the aorta. On opening that vessel from behind, the internal and middle coats displayed a transverse fissure, crossing the upper part of the external longitudinal opening; and between the two, the coats were separated to a considerable extent, both above and below. The following notes are taken from examination of the preparation: The external fissure is eight lines in length, and is situated somewhat to the right side of the vessel, and follows a longitudinal direction, its lower extremity being half-an-inch above the origin of the aorta. Its edges are clean and regular, presenting the appearance of an incision. The internal rupture is, on the contrary, transverse, and is situated one inch above the aortic semilunar valves, and is two inches in length—scarcely one-third of the circumference of the vessel being still entire. Its edges are ragged and uneven, the internal coats not having throughout given way at the same point. The separation between the coats extends upwards for about one inch, forming however, only a narrow channel in the front of the vessel; downwards it reaches an inch and a-half, and extends over a much wider portion, passing behind the semilunar valves and in the space at the base of the heart where the *septum ventriculorum* is formed by the fibrous tissue and lining membranes of the ventricles, so that the

* Dublin Hospital Reports, Vol. iii.

sac is here separated only by these membranes from their respective cavities. When recent, the lower portion of the sac contained several tolerably firm coagula. The ascending aorta is dilated to fully twice its natural size, and its walls are of very unequal thickness, and display several smaller and somewhat sacculated expansions—in some of these the coats being so thin as to be semitransparent and to consist of little else than the external and internal tunics. Atheromatous deposit is copiously infiltrated beneath the lining membrane throughout the course of the thoracic aorta, and near its origin has in several places undergone the ossific degeneration, while in others the lining membrane is abraded or so soft as to be readily removed. The vessels arising from the arch are larger than usual, more especially the *arteria innominata*. Where the thinning of the coats does not exist, they are on the contrary, thicker than usual, and covered externally by false membrane, producing adhesions between the reflected and attached pericardium. The aortic valves are sound; the mitral opaque and a little thickened. The cavity of the left ventricle is large, and its walls somewhat thinned; at the apex there exists a very distinct dilatation, so as to form a small cavity, which is separated from the fat there deposited by an extremely thin layer of muscular fibre. The right cavities of the heart are both very greatly dilated. On minute examination of the parts forming the aneurismal sac, it was found to be situated, not between the external and middle coats, but between the laminae of the latter, the largest portion of the fibrous tunic being, however, still attached to the lining membrane, and so forming the posterior wall of the sac, while a thin lamella was separated along with the cellular tunic and assisted in forming its external covering.* The preparation in this case most closely resembles that figured in the army plates.

The next case is very similar to that which has just been related. The preparation is contained in the Hunterian collection of the Royal College of Surgeons of London. Of this I regret the only information I was able to procure was contained in the reference to the preparation in the catalogue as a case of "Rupture of the Aorta."†

CASE 2.—*Dissecting aneurism of the ascending aorta, originating in a transverse fissure of the internal coats, and terminating by hæmorrhage into the pericardium.*

The canal of the aorta in this preparation is considerably dilated,—the dilatation commencing somewhat abruptly about an inch above the aortic valves, and terminating at the point at which the

* Several writers have fallen into the error of describing the origin of the aorta as not passing the cellular coat. This tunic, though thin, is firm and resistant on the portion of the aorta covered by the pericardium, but becomes much more distinct towards the arch.

† This case is described by Mr Guthrie in his Lectures, &c.

left subclavian artery is given off; the dilatation is greatest in the ascending portion of the arch, and involves also the origins of the large arteries passing to the upper extremities and head—the brachio-cephalic trunk and the left carotid being especially affected. The coats of the artery over this space are thickened, and the internal is slightly marked with atheromatous patches throughout the course of the vessel. The rupture in the internal and middle coats is situated about two inches above the aortic valves at the concavity of the arch, and is about one inch in length; its direction is at first from above obliquely downwards and then transversely. The separation between the coats occupies a space of about two inches in diameter on the right side of the vessel, and bounded laterally by the attachment of the pulmonary artery. The fissure in the external coat of the artery by which the blood must have escaped into the pericardium, is in length one inch, its lower extremity being about half-an inch from the origin of the aorta; its direction is longitudinal, the transverse division of the internal coats crossing its upper extremity. The edges of the internal fissure are smooth and regular, those of the external ragged and torn. The heart is not retained with the preparation, but the aortic valves, with the exception of displaying small vegetations at their free margins, are healthy. The dilatation of the aorta where at its greatest, is about twice the ordinary diameter of the vessel. It is not throughout equal, several small and slightly sacculated portions existing in the transverse arch.

These cases afford the earliest examples of the disease which I have had the opportunity of examining, and they are of a similar description to several of those which have been recorded, and which are referred to (3, 4, 5, and 6,) in the appendix. It is to be regretted that no history could be obtained of the last case, though the small size of the aneurismal sac and the appearances of the ruptures render it probable that, as in the first case, death must have followed almost instantaneously upon the internal rupture, from the escape of the blood into the pericardium.

An earlier stage of the disease has in several instances been found on dissection. Morgagni* has related the case of a nobleman, 59 years of age, who died suddenly, and in whom the aorta “was first ruptured at the distance of about a finger’s-breadth from the heart. Yet this rupture was not large; but near to it and round all the basis of the aorta, a kind of blackness, as if from an old bruise appeared, which was owing to black blood stagnating under the external coat; and this blackness extended itself throughout the lungs in general, but particularly about the branches of the pulmonary artery.” The pericardium was distended with blood.

* *De Sedibus et Causis Morborum*, xxvii. § 29.

Dr Nicholl in his account of the examination of the body of George II., published in the Philosophical Transactions for 1762, after describing the rupture of the right ventricle, which had occasioned death, says, "In the trunk of the aorta we found a transverse fissure in its inner side, about one inch and a-half long, through which some blood had recently passed under its external coat and formed an elevated ecchymosis." A similar appearance is described by Mr Hodgson,* as occurring in the case of a lady who died suddenly from rupture of the apex of the left ventricle. "The aorta of a lady illustrated this stage of the formation of an aneurism. The internal coat was throughout converted into cartilage, and covered with calcareous deposition. At the arch of the aorta there was a transverse slit about an inch in length, which had penetrated also the middle coat; the blood had insinuated itself between the external and middle coats, the former of which was raised into a tumour about two inches in circumference, and presented the appearance of a circumscribed ecchymosis." Mr Hodgson quotes this appearance as probably the earliest stage in the formation of a circumscribed aneurism as described by Scarpa, while however, it is possible that the process of dissection here begun might have been arrested by the effusion of lymph around the edges of the fissure, it is fully as probable that, had the patient survived, it would have gone on to the formation of a dissecting aneurism.

In the following case the dissecting process was somewhat more extensive than in the two formerly given. The disease was however, probably of equally recent formation.

CASE 8.—*Dissecting aneurism, the sac of which extended from the origin of the aorta to the commencement of its abdominal portion. Two ruptures of the internal coats situated in the transverse arch. Death from escape of blood into the pericardium.*

Janet Jopp, aged 84, left her house, situated in the High School Wynd, on the morning of the 12th of January 1842, with the intention of going into Nicolson Street. When opposite to the Infirmary she was observed to sit down on the steps, and almost immediately fell forwards; and on being carried into the Infirmary, she was found to have expired. It appeared on inquiry of her friends, that, with the exception of having a year and a half before laboured for a short time under a dropsical affection, she had suffered from no serious illness, and was in her usual health up to the time of her leaving the house.

The body was examined in the presence of Dr Craigie the following day. The brain was found healthy; between 11 and 12 drachms of serous fluid were removed from the lateral ventricles, and a considerable amount was contained in the base of the skull.

* Diseases of the Arteries and Veins, p. 63.

The veins of the neck and chest were greatly engorged with dark fluid blood. The cavity of the pericardium was distended with bloody serum, and contained a considerable quantity of coagula, and on these being removed the membrane covering the aorta and pulmonary artery was found elevated by extravasated blood, and, on the surface of the former, there existed a superficial fissure, having a longitudinal direction through which the blood could be made to exude on pressure. On the heart and lungs being removed from the body, a separation of the coats of the aorta was found to have occurred, extending from its origin to the commencement of the abdominal portion of the vessel. On slitting up the outer coat a rupture was detected, situated three-quarters of an inch behind the origin of the left subclavian artery, and extending transversely through the two internal coats of the vessel for nearly its whole circumference; the edges of this fissure were ragged and irregular, and the laminæ of the middle coat were somewhat separated. Two inches anterior to this rupture, and one-third of an inch below the origin of the *arteria innominata*, there existed a second on the anterior aspect of the vessel; this was nearly an inch in length, its course following that of the artery, so that it crossed the fibres of the middle coat; its edges were widely separated and more regular than those of the transverse fissure. From these points the blood had effected a separation between the coats upwards to the heart, and downwards to the commencement of the abdominal aorta. Beneath the pericardium the separation was not entire, the blood having been infiltrated into the cellular tissue without breaking down its attachments, so that a probe could not be made to protrude through the fissure in the pericardium, though the blood transuded on pressure. Some blood had also escaped at the posterior part of the arch and into the right lung, but without any distinct rupture being traceable. Some loose coagula were contained in the sac at the ascending portion of the arch. At the commencement of the aorta the separation between the coats forming the sac involved nearly three-fourths of the circumference of the vessel; at the transverse portion it was more confined, being bounded by the large arteries proceeding to the head and upper extremities, but below the left subclavian and near the posterior rupture, the coats were detached around nearly the whole circle of the vessel; beneath this point the canal became narrower, and ceased where the vessel passed between the crura of the diaphragm. The external coat of the *arteria innominata* was separated over its whole circumference, as was also that of the right carotid, and, for a short distance, the left subclavian. The intercostal arteries on each side opened into the aneurismal sac, and the internal coats presented

small apertures corresponding to their origins, forming communications between the original and newly-formed canal. The ascending portion of the aorta was somewhat dilated. Its coats thinner than usual, and the lining membrane elevated by atheromatous deposit in the form of small yellowish-coloured masses; no roughness or ulceration was anywhere detected. The coats of the vessel were evidently recently torn asunder, and the separation had taken place, as in the former case, not in the cellular tissue, between the external and middle coats, but between the laminæ of the latter, a very thin layer of the middle tunic remaining attached to the external coat. The heart was of its usual size, much loaded with fat and flaccid; the walls of the left ventricle were thicker, and its cavity smaller than usual, probably from the mode in which death had taken place; the valves were healthy. The lungs were healthy, but attached by slight cellular adhesions to the parietes of the chest, and were unusually mottled with black pulmonary matter. The right contained some extravasated blood. The abdominal organs were natural, but the kidneys and spleen small in size. The uterus contained several hard masses about the size of peas imbedded in its substance.

The cases in the appendix marked 7, 9, 10, and 11 were very similar to that last related. In the second, however, death occurred from a rupture of all the coats of the *arteria innominata*. In the 3d, a distinct opening formed from the sac into the cavity of the pericardium, and the last proved fatal by rupture of the right auricle.

A case of rupture of the aorta, related by Mr Rose,* in the Medical and Physical Journal, I conceive to have been very similar to several of these. The internal fissure occurred at the commencement of the transverse portion of the arch of the aorta. The blood first passed beneath the fibrous coat and pericardium, and burst by a small rupture through that membrane; the internal rupture still, however, continuing to give passage to the blood, the corresponding external coat at length gave way, and the blood escaped into the mediastinum, and then into the pleural sacs. Had the patient survived the escape of the blood into the pericardium in case eighth, hemorrhage would probably have taken place into the lungs more extensively.

The cases which have now been related were all of recent origin,—others are, however, recorded, in which the disease had been of long standing, and in which the aneurismal sac formed a canal external to that of the artery, lined by a distinct membrane, and communicating with the original canal by smooth and regular openings. Such is the case detailed by Laennec (15) in which the sac was situated in the abdominal aorta; or still more remarkably

* London Medical and Physical Journal, Vol. lviii. 1827, p. 15

the case related by Dr Pennock in the American Journal of Medical Sciences. In this case, marked No. 18, the fissure occurred half-an inch above the semilunar valves, and the sac, which was situated in the laminæ of the middle coat, extended thence to the bifurcation of the aorta. More recently a case has occurred in the practice of the Royal Infirmary, of which an abstract is marked 19 in the appendix; in this the sac commenced by a longitudinal fissure behind the origin of the left subclavian artery, and extended to the bifurcation of the aorta, forming a second communication, probably of some standing, with the left common iliac artery. In this instance, also, I satisfied myself that the internal rupture did not penetrate the whole thickness of the middle coat, and that the sac was found within its laminæ. As, however, this case will be reported by Professor Henderson, in whose practice it occurred, I forbear further allusion to it.* This case, it will be observed, bears very close resemblance to those of Mr Shekelton, 16 and 17. In the first of these the tumour originated about three inches above the bifurcation of the aorta, and reopened by two apertures into the two common iliac arteries. In the second the aneurism arose from the aorta along with the left common iliac artery, and opened by two apertures into the corresponding external iliac.

The above cases constitute all those which I conceive to have originated in lacerations of the internal coats; and it is doubtful whether, in one at least of Mr Shekelton's cases, the disease may not rather have originated in an extension of the internal coat of the vessel, between the middle and external tunics. The remaining cases there is reason to regard as having had a different origin. These cases are those, the preparations of which are contained in the Museum of the College of Surgeons of Edinburgh, and I am indebted to the curators of the college for permission to publish a description of them. Unfortunately there exists no other history of the cases, than the very meagre notice contained in the museum catalogue.

CASE 12.—*Dissecting aneurism of the ascending aorta, the result of ulcerative perforation of the internal coats of the artery, immediately above the semilunar valves. Death from rupture into the pericardium.*

This preparation is marked 1144 in the museum catalogue of pathological preparations. The ascending portion of the aorta is dilated to fully twice its natural size,—the dilatation occupying chiefly the convexity of the arch, and terminating at the origin of the *arteria innominata*. The external coat of the vessel is covered with layers of lymph, and the internal is thickened, and much corrugated, containing also much deposit in the subjacent cellular tis-

* Since this was written Dr Henderson has published an account of this case, with remarks on the formation of dissecting aneurisms in the London and Edin. Med. Journal for July 1843.

sue. About half-an inch above the semilunar valves, the lining membrane is entirely denuded over a space larger in size than that of a sixpence, and from this a probe can be passed obliquely into the sac of the aneurism, which is situated at the anterior portion of the arch, and between the middle and external coats. The length of the sac is about two inches, and the breadth one inch and a-half; its external wall is thick and rough from layers of lymph; at the inferior part of the sac an opening, large enough to admit a writing quill, communicates with the cavity of the pericardium.

CASE 13.—*Dissecting aneurism originating in an ulcerated aperture near the origin of the left subclavian artery. Death is stated to have resulted from the obstructed state of the circulation. This preparation is marked 1145.*

The ascending portion of the aorta is considerably dilated, and its inner coat extremely irregular from the yellowish masses deposited in the subserous cellular tissue. These, though firm, have not undergone ossification. Behind the left subclavian artery there is a regular oval-shaped aperture about the size of the little-finger nail, which leads into the aneurismal sac. This is situated beneath the external coat of the vessel, and extends along its anterior portion from the left subclavian artery to the heart, surrounding about two-thirds of the circumference of the vessel. The whole of the coats of the artery are unusually thick and the external, where it covers the sac, especially so. The sac contains layers of coagula, some of which appear to have been decolorized, and these have partially obstructed the aperture by which it communicates with the original trunk. The separation of the coats has apparently also advanced along the *arteria innominata*.

It would have been a matter of much interest to have ascertained the history of these cases, since they bear so slight a resemblance to the others, as to point strongly to another mode of formation. In the catalogue both are stated to have originated in rupture of the internal coats. I am, however much inclined to doubt the correctness of this, and to regard them as having resulted from ulceration. The apertures are such as would scarcely be formed by fissures, and the diseased state of the lining membrane, and the great thickening of the coats, with the lymph effused on the external walls of the sacs, show that active inflammatory action must have been present, either prior or subsequent to the occurrence of the perforations. In this form of the affection the series of the cases is not so complete as in that resulting from rupture,—an appearance found by Morgagni* in the body of a man who died suddenly at the age of 60. I am, however, inclined to regard as indicating an early stage of the affection. “From the same surface, not a great distance from the

* De Sedibus et Causis Morborum, Ep. xxvi. § 15.

heart, a foramen, big enough to admit a finger, took its origin, and going through the coats in an oblique course of almost four finger's breadth, from below upwards, it at length opened on the external surface of the artery within the pericardium." And again, in a female who died of an aneurism of the aorta, he found "a kind of ulceration about two inches above the semilunar valves, and in that ulceration were three or four very deep foramina very near to each other, each of them about the bigness of a lentil, but of an angular form rather than round. From these foramina winding sinuses were carried obliquely outwards, and reached to the external lamina of the aorta, which was in that place, therefore, of a brownish colour mixed with red, as if in consequence of inflammation, and became much thickened by a great flow of moisture. And in the middle of that redness, the lamina being at length lacerated, the blood had made a way for itself into the pericardium by a foramen similar to the internal foramina, and almost of the same magnitude."*

Mode of Formation.—Few pathologists will probably be found at the present time to adopt the exclusive views of Scarpa, that aneurismal tumours always arise from rupture of the internal and middle coats, or, as he terms them, the "proper coats" of the artery, and it is probable that, had he frequently examined specimens of the disease in an early stage, instead of tumours of large size, his opinions would have been much modified, since it is granted that, however the disease originates, the continuity of the internal and middle coats of the artery throughout the walls of the sac can only be traced in small aneurismal tumours; and sufficient evidence has been adduced by different observers to show that, while the disease is occasionally traceable, both to rupture and dilatation of the coats, the latter is at least in the upper portion of the aorta the most frequent mode of origin. The examination of several recent specimens of aneurismal disease in different stages of progress, and of numerous diseased arteries, has led me to suspect that the two forms of aneurism are traceable to diseased changes in the coats, which, though often found more or less co-existent, are of very different descriptions, and which produced results varying greatly according to the preponderating change. In the one, that form to which the terms atheroma or steatoma has been applied, and the nature of which has recently been illustrated by Mr Gulliver, a yellowish granular matter is deposited in the lining membrane of the artery, or in the cellular tissue beneath it, and occasionally invades the middle coat. This undergoes a gradual process of softening; the lining membrane gives way; the middle coat is also perforated or atrophied, and the tunics around the diseased portion become firmly adherent, and thus, while the

* Ep. xxvi. § 21.

current of the blood is sustained by the outer coat, which, however, must be conceived to have been strengthened by the exudation of lymph, the separation of the coats, and the diffusion of the blood between them is prevented, and a circumscribed aneurism is produced, according to the views of Scarpa. The other change, or that which I conceive leads to the formation of the aneurisms by dilatation, has not attracted so much attention. In this instance the disease, though not confined to that tunic, involves chiefly the middle coat. This membrane loses its yellow colour, becomes semitransparent, and of a harder consistence than usual, acquiring the appearance of the hyaline or cartilaginous tissue. Its fibrous texture also is less distinct, and in this respect the contrast between the healthy and diseased coats is rendered more apparent on microscopic examination. The middle tunic also becomes, as described by Dr Davy,* much thinner than usual, and in places where the dilatation is great, can often not be traced. While these changes are in progress, the several coats become more intimately adherent together, and on dissecting an artery in this state, the tunics, which in the healthy portions are readily separable from each other, can rarely be traced in the diseased parts, the middle coat usually splitting and remaining attached partly to the external, partly to the internal coat. With this affection of the fibrous coat, there is usually combined some degree of atheromatous disease and thickening of the inner membrane. In each form of disease, however, the changes are either preceded or attended by the morbid adhesion described, and I have uniformly found it present in such recent specimens as I have examined, and this too in some in which the dilatation of the coats was very slight; and it seems to form an important step in the development of the sacculated aneurismal tumours. It appears, however, to have been overlooked by Scarpa, who, though he regarded the rupture of the internal tunics as resulting from "a slow change," and described them as becoming intimately adherent, yet appears to have considered that this change did not extend to the external coat. Burns, however, in his strictures on views of Scarpa, has remarked, that "the rupture of the internal coats of an artery is not the first part of the process which takes place in the production of an aneurism. Before this happens we find that the external coat has all around the diseased part of the proper coats of the vessel been fixed to the healthy coats more firmly than usual. When, therefore, by the *vis-a-tergo*, they burst at the weakest point, the blood insinuates itself between the external and the middle coats, it detaches the former from the latter as far as the disease of the internal coats extends. Beyond this it cannot separate them, the adhesion having there become preternaturally firm."† In the above passage, Mr Burns has, I con-

* *Researches, Physiological and Anatomical*, Vol. i. p. 372.

† *Diseases of the Heart*, p. 215.

ceive, correctly described the mode of origin of the sacculated aneurisms from rupture of the internal coats; and in his report of a case of dissecting aneurism, he has described the firm band of adhesion by which the extension of the sac between the coats was limited.* Without it, he has justly observed, that the blood would freely insinuate itself between the coats separating them extensively from each other, instead of producing, as supposed by Scarpa, a circumscribed tumour. It is, indeed, to the sudden occurrence of a rupture of the internal, and a part or the whole of the middle coats of an artery, the tunics of which have not previously become adherent, that the origin of the dissecting aneurism has usually been ascribed, and it is a view which readily explains all the features of the disease; while the infrequency of the dissecting as compared with the circumscribed forms of aneurism, may be referred to the rare occurrence of disease of the coats, sufficient to produce their rupture or ulceration unattended by adhesion of the tunics together. To this view of the mode of origin of the dissecting aneurisms, it has, however, been objected by the editor of the *Gazette Medicale*† in his account of the case of M. Tessier, that the adhesion of the coats of the artery which is supposed to precede the formation of sacculated aneurisms by rupture, so far from being a constant is a rare occurrence; and more recently by Dr Henderson,‡ that the supposition of such adhesion is not necessary to explain the formation of sacculated aneurisms from rupture of the coats, since no such result as the diffusion of fluids in the course of the vessel attends their injection after death into arteries of which the internal coats have been ruptured. To obviate the former objection, I may refer to the remarks of Mr Burns and to my own dissections. The latter, though opposed to the observations of the last author, is supported by the experiments of Nicholl and Scarpa. In a discussion, therefore, as to facts, I prefer to appeal to the following experiment. The aorta of a female, 59 years of age, dying of acute head affection, was cut across at its point of passage from the chest, and into the thoracic extremity a large pipe was inserted; the arteries passing from the arch having been secured, the vessel was then distended with water thrown in by a powerful injection syringe. The substance of the heart soon became greatly distended through the coronary arteries. A ligature was then placed on the origin of the aorta, and fluid injected so as to greatly distend the vessel, but several of the small mediastinal vessels becoming ruptured, the water, after repeated trials, was found to escape with considerable rapidity, and no rupture of the coats resulted. The finger was then introduced into the lower opening of the vessel, and a laceration of the internal coats being made with the nail, fluid was again injected, when the

* Diseases of the Heart, page 233.

† Tome x. p. 524.

‡ *Edinburgh and London Monthly Journal*, July 1843.

external coat became at once distended, not, however, in the form of a distinct tumour, but throughout the whole course of the vessel from the pipe to the ligature at its origin. The parts being removed from the body and dissected, the fissure was found to occupy one-third of the circumference of the vessel, and to be situated at its front, and about the middle of the descending portion. It penetrated through a part of the middle coat, and from this point a separation of the layers of that tunic was produced, extending above to the ligature on the origin of the artery, and downwards to that on the pipe. It was situated in the middle coat, and involved at the lower part, two-thirds of the circumference of the vessel being there bounded by the origins of the intercostal arteries. At the ascending and transverse portions of the aorta, the coats were separated only at the front of the vessel. In the innominate and the left carotid arteries, the separation ceased at their origin, but advanced about three-quarters of an inch along the left subclavian, surrounded its whole circle, and then, as in the other two vessels, reopened into its canal. The layer of the middle coat separated in connection with the external coat at the posterior extremity of the artery was extremely thin, but increased in thickness towards the origin of the vessel, till in the ascending portion it was fully half a line in width. Both the internal coats were, throughout the course of the vessel, free from any appearance of disease.

From this experiment, which has been frequently repeated and variously modified with a similar result, we are, I conceive, warranted in concluding with Dr Davy* that the coats of the aorta are, in a healthy state, capable of extreme distension before giving way, and, consequently, that the rupture of the internal coats of the vessel, which constitutes the first step in the formation of a dissecting aneurism, must be ascribed to their being rendered lacerable by disease; and *secondly*, that, after the occurrence of a fissure penetrating the substance of the middle coat, that membrane will readily admit the blood to effect a separation of its laminæ. In this respect the experiment corresponds with that related by Dr Pennock. From experiments† of a similar kind instituted on the aorta after entire rupture of its internal coats, it appears that, though the cellular membrane between the external and middle tunics still more readily allows of separation along the course of the vessel, yet that, even where most distinct, the external coat does not alone possess sufficient density to resist the pressure of the extravasated fluid, and hence it is most probable that the sac of the dissecting aneurism will be found to occupy the laminæ of the middle coat, a layer of that membrane being in all cases united to the separated external coat,—an inference which is supported by the facts, that, in each of the three recent cases which

* Researches, Physiological and Anatomical, Vol. i. p. 446.

† For a fuller account of these experiments see the Ed. and Lond. Monthly Journal for October 1843.

I have myself examined, and in those of Drs Pennock and Goddard, such was found to be the case. The results of experiments, in which the ruptures in the internal coats were of small extent, render it likely that the kind of aneurism developed will also be affected by the form and extent of the laceration. If this involve a considerable portion of the circumference of the vessel, and offer much resistance to the flow of the blood along its channel, that fluid will be much more likely to penetrate between the coats and effect their separation.

Predisposing Causes.—The increased lacerability of the coats in dissecting aneurisms is supported by observations on several of the cases. In that first related in the paper, Dr Paterson noticed when recent, the peculiar friability of the internal membrane, by which it admitted of being rubbed off with the finger, and a similar remark has been made in reference to other cases. In several, the same condition of the coats was evinced by the existence of two or more ruptures as in case 8. Though, indeed, the above experiments would convey the impression that the internal coats, being in part divided, the blood would readily penetrate between the laminæ of the middle tunic, and give rise to a dissecting aneurism, such does not appear to be invariably the result. I observed, during the course of last summer, in the museum of Guy's Hospital, a very curious preparation illustrative of this point. It is the aorta of a man, 30 years of age, who died in consequence of a fracture of the spine, from a fall which occurred seven weeks before. The internal coats of the ascending aorta are ruptured transversely over a considerable portion of the circumference of the vessel, yet the tunics having become adherent around the edges of the fissure, the external coat has been partially dilated into a circumscribed aneurismal tumour. We may, therefore, infer, that, as suggested by Dr Henderson, to give rise to a dissecting aneurism, the coats of the ruptured vessels must possess a less intimate adhesion than in their healthy condition, and such seems to have been most remarkably the case in the instance which he has recorded,—the coats “having admitted of being detached with a facility not much less than that with which two moistened pieces of paper may be separated.”*

In most cases of the disease, partial or general dilatation of the walls of the artery precedes the rupture of the internal tunics. In eleven of the cases recorded, this is stated to have been observed, and while in several the dilatation had attained the extent of being twice or three times the ordinary calibre of the vessel, in one instance only is the artery reported to have been healthy. Of the nine cases, the preparations of which I have inspected, in all but three there was combined with general dilatation of the diseased vessel, a thinning of its coats, and in one or two, portions of

* London and Edinburgh Medical Journal, July 1843.

the walls were rendered perfectly translucent. The lining membrane, however, though ordinarily exhibiting some appearance of the diseased states, to which it is so subject, was, in some cases, either healthy or but little affected, and in only one or two did it display much disease. The morbid change on which the lacerability of the coats is dependent would, therefore, appear to be rather the result of acute than chronic action. The facts recorded do not enable us to judge of the connection of rheumatic inflammation, which so powerfully predisposes to diseases of the heart and vascular system in general, with the present form of disease. Several of the patients are, however, stated to have suffered from rheumatism, and in the case marked 19 there existed old adhesions between the loose and attached pericardium.

Advanced age seems to predispose to the occurrence of the disease. Of the five cases described in the paper, the ages of only two of the patients was ascertained, and both of these were, it will be remembered, in advanced life. Of ten persons, whose ages are reported, 1 was 24 years of age; 1, 47; 2, 56; 2, 60; 1, 67; 1, 70; 1, 75; and 1, 84; two others are stated to have been of middle age, and one elderly. The lady referred to by Mr Hodgson, who presented an early stage of the disease, was 70 years of age, and George II. whose case was very similar, was in his 77th year at the period of his death. Two of the patients whose cases are related by Morgagni were also in advanced life. That a large proportion of those affected with the dissecting form of aneurism should have been elderly persons, accords with the view entertained of its mode of formation, and may be ascribed to the loss of flexibility and increased brittleness of the arterial tunics in advanced life; and it is probable also, in some degree, to their less intimate attachment to each other. Circumscribed aneurisms are usually found in middle-aged and powerful subjects, and are often traceable to direct injuries sustained. The dissecting aneurism, on the contrary, results from loss of resistance in the arterial tunics, by which they give way often under the ordinary impetus of the blood.

Similar reasoning may explain the remarkable difference which, so far as the observations hitherto collected enable us to judge, obtains in the relative prevalence of the disease in the two sexes. Of 63 cases of circumscribed aneurisms, observed by Mr Hodgson in different arteries, 56 occurred in males, and only 7 in females; and if from this number those be deducted which were situated on the arteries of the extremities, to which, for obvious reasons, men are much the most subject, the proportion of males is still very great, having amounted to 23 out of the 29 cases, or to nearly 4-5ths. Of 27 cases of aneurism of the aorta, treated in the Royal Infirmary during the years 1840-41-42, the proportion of males was somewhat less, being only 18 or 2-3ds. The dis-

secting aneurism, on the other hand, appears the most frequent in females. Of the 15 cases in which the sex is stated, 10 having occurred in females, and only 5 in males, the proportion being the reverse of that in circumscribed aneurisms of the aorta, as calculated from the records of the Royal Infirmary.

Exciting Causes.—The occurrence of the rupture of the internal coats of the artery which constitutes the immediate cause of the disease, seems to have been often traceable to some sudden exertion, though, from the small number of cases which were accurately observed during life, it is impossible to speak with confidence on this point. One patient was seized while engaged in his usual occupation of a blacksmith; a second dated the occurrence of her symptoms to using great exertion in pumping water; a third was attacked after retiring home fatigued by attending a funeral; in a fourth instance the patient, a soldier, was walking from chapel to his barracks. In the third case related in this paper, the rupture was probably induced by the exertion to an elderly person of ascending the High School Wynd; and in case 19, the patient's friends stated her to have been attacked suddenly on rising from scouring the floor. In another instance, the patient was seized when engaged in earnest conversation, and in several, as probably in case 1st, the subject of which was found dead in bed, the patients appear to have been using no exertion at the time of attack.

Situations and extent of the internal rupture and sac.—The influence of the impetus of the blood on the occurrence of the primary ruptures is apparent from the comparative frequency of their situation in the different portions of the aorta. In ten cases the fissure was situated within a short distance of the semilunar valves, and probably, also, in an eleventh. In one near the origin of the *arteria innominata*. In three of the left subclavian, there being, however, in one of these, a second rupture in front of the origin of the *arteria innominata*. In three in the abdominal aorta, and in one at the origin of the left common iliac artery. In three cases the internal coats were ruptured in two or more different places.

It is probable that in small vessels dissecting aneurisms cannot take place, as the laceration of the internal coats would most probably lead to the entire obstruction of the canal, and consequent gangrene of the extremity, as occurred in the cases recorded by Mr Turner.* Like the ordinary forms of the disease, the dissecting aneurism is confined to the vascular system of red blood; no instance, so far as I am aware, having occurred of the disease being developed in the pulmonary artery,—a fact which may be explained by the thinness of its coats, and by the less impetus of

* Transactions of the Medico-Chirurgical Society of Edinburgh.

the blood impelled by the right ventricle. Cases of spontaneous rupture of that vessel are, however, recorded.

The usual extent of the fissures seems to have been from one-fourth to one-half the circumference of the vessel, but in two cases nearly its whole circle was divided. The portion of the circumference over which the separation between the coats occurred was usually a-half, or two-thirds; but this bore reference to the attachments of the artery to the adjacent parts, and to the branches given off from it. In several instances the sac, when advancing along the branches, surrounded for a greater or less extent, the whole of their circumferences, producing the appearance of one vessel entirely enclosed within a second.

In six of the cases the sac of the aneurism occupied a larger or smaller portion of the aorta at its origin from the heart; in two it commenced at the origin of the aorta, and terminated at the point of departure of the *arteria innominata*; in two, commencing at the same point, it extended to the origin of the left subclavian artery; in two to the commencement of the abdominal aorta; in one to the origin of the common iliac arteries; and in one the separation of the coats seems to have been continued as far as the popliteal arteries; in one case when the sac originated immediately behind the left subclavian artery, it terminated in the left common iliac; in three it extended along a larger or smaller space of the abdominal aorta; and in one it was confined to the left common and external iliac arteries.

Result.—The size of the sac, or the extent to which the blood had effected a separation between the coats, bore, therefore, it will be observed, reference to the situation occupied by the ruptures of the internal coats of the vessel. When these were near the origin of the aorta, the sac was usually of small extent. The thinness of the external coat of the artery in this situation, and the very imperfect support which it derives from the reflection of the pericardium, affording little resistance to the pressure of the extravasated blood, which, therefore, readily makes its way into the sac of the pericardium. Cases 1, 2, 3, 4, 5, and 6 afford examples of this description. In cases 7 and 10 the separation was carried to a great extent, but death ensued from rupture into the pericardium, as also in case 8, in which the internal fissures were situated at the transverse arch. Cases 7 and 11 differed from all these in their result, death suddenly supervening in the former from rupture of the whole of the coats of the *arteria innominata*, and in latter from perforation of the right auricle. In reference to the last termination, I have been favoured with the following remarks by my friend Mr Thurnam: “In the course of an investigation into cases of spontaneous varicose aneurisms, I had my attention directed to the cases forming the subject of your paper, with three instances of which I was particularly impressed, from the remarkable lesion of the

central organ of the circulation with which they were associated. The aneurismal disease in these cases was in its early stage, and had its seat in the ascending aorta, or arch of that vessel. The aneurism itself in none of these cases was ruptured, but was apparently still in an indirect way, the cause of death, from its being associated with rupture of one of the cavities of the heart. The first case was that of George II., the details of which, by Nicholl in the *Philosophical Transactions*, are accompanied by some ingenious observations as to the cause of the rupture of the heart. We cannot, I think, refuse to believe with this author, that the dissecting aneurism of the aorta, suddenly induced, would act as a powerful impediment to the circulation of the blood, that it thus gives rise to the distension of the cavities of the heart, and the consequent rupture of one of them. I cannot but regard the observations of Nicholl as strongly confirmed by the two more recent cases which are related by Burns (case 11) and Hodgson. In the case of the monarch there do not appear to have been any premonitory symptoms which could indicate the period of formation of the aneurismal rupture; but in both the other cases such symptoms were observed in the one four days, in the other twenty-four hours before death. The three cases taken together would seem to warrant the conclusion that, in certain conditions of the heart, the formation of a dissecting aneurism of the aorta, like any other obstruction to the circulation suddenly set up, may be sufficient to determine a rupture of that organ. It is remarkable that in no two of these three cases did the rupture occur in the same cavity of the heart, but that the right auricle, and the right and left ventricle were respectively ruptured." In a former portion of the paper I have ascribed the occurrence of the longitudinal rupture in case 8th to the obstruction offered to the flow of blood by the more distant transverse fissure, and I think it probable that in the first case, "the distinct thinning of the walls of the apex of the left ventricle, so as to form a small cavity, which was separated from the fat there deposited by an extremely thin layer of muscular fibre," formed the commencement of a process, which, had not the external wall of the sac and its serous covering given way, and allowed the blood to flow into the cavity of the pericardium, would have terminated in rupture of the left ventricle.

When the laceration of the internal coats of the aorta is situated near its origin, the external tunic and pericardium may, however, resist the current of the blood, and the patient die from other causes. Such was the result in cases 13 and 18, in both of which the patients sunk under the secondary disease of the heart, superinduced by the aneurism, and combined in the latter with uterine disorder. When the fissures are situated below the arch of the aorta, as in cases 14, 15, 16, 17, and 19, the blood, following the

law of gravitation, tends to separate the coats in the lower portion of the vessel, and rarely makes its way to its origin; and thus the disease is productive only of indirect obstruction to the circulation, and may be in no degree accessory to the patient's death.

Duration.—From what has been stated as to the course of the disease when occupying different situations its duration may be anticipated. When the internal fissure is situated near the origin of the aorta, the rupture of the external coat and pericardium usually follows rapidly the extravasation of the blood beneath it, and death is almost instantaneous, as in cases 1, 3, 4, and 8, and probably also in 2. In 6 and 12 the sac had probably existed some short time before the fatal seizure on the occurrence of the external rupture. Should the external coat and the reflected portion of the pericardium possess sufficient power to resist the pressure of the blood in the aneurismal sac, life may be prolonged and the patient may ultimately succumb, from the rupture of that membrane, or more rarely, of one of the cavities of the heart, or, as still more rarely happens, the disease may be indefinitely prolonged, and the patient may sink under the secondary diseases induced. In case 10 the patient survived the first seizure seven hours. In 5, two days; and in 7, three days. In 11, where death took place from rupture of the right auricle, the occurrence of the internal laceration was indicated by the symptoms four days previously. In case 13, in which the date of the formation of the aneurism is not known, the appearance of the sacs and the parts adjacent, render it probable that it had existed some time, and the patient sunk under the obstruction to the circulation through the original canal occasioned by the pressure of the external aneurismal tumour. In 18, the symptoms first appeared eight years before death. In case 19, where the external fissure was situated behind the origin of the left subclavian artery, the disease, according to the statement of the patient's friends, had existed for nine months, and the appearance of the newly formed sac—the distinct membrane with which it was throughout lined—the reopening of the canal at its distal extremity into a branch of the trunk from which it originated, and the smooth edges of the two apertures by which it communicated with the original artery, left no doubt of its duration having been as great as was reported.

Lastly, in cases 15, 16, and 17, the disease appears to have been unconnected with the death of the patient, and in the two latter, as also in case 19, the communication of the distal extremity of the sac with the original canal may be regarded as constituting an imperfect natural cure of the disease.

Diagnosis.—From what has been before stated as to the result of these cases, the symptoms which they induce during life may be inferred.

1. In the class of cases in which the external rupture follows rapidly that of the internal coats, the patient is seized with sudden pain and sense of constriction in the region of the heart, difficulty of breathing, vomiting, failure of the action of the heart, coldness of the extremities, and death.

2. When the external coat possesses sufficient strength to resist the impetus of the blood, symptoms similar to those referred to, viz. intense pain in the region of the heart and along the course of the large vessels, followed by rapid prostration of strength and syncope, mark the period at which the internal rupture takes place, and, after continuing for a longer or shorter period, may wholly or partially subside when their sudden recurrence indicates the giving way of the external coat, and the patient is rapidly carried off.

The case marked 5 in the appendix forms a good example of the symptoms in this class of cases. "R. D., 79th regiment, a tailor, aged 47, of dissipated habits, suddenly became faint when on his way from the chapel to the barracks, and with much difficulty reached his own room. When seen he was suffering severely from pain along the upper part of the chest, particularly under the left clavicle. He compared the pain to what he supposed would be produced if a red hot iron was thrust into his heart. His countenance was pale and anxious; his respiration greatly oppressed, interrupted and difficult; no pulsation could be perceived in the cardiac region. An anodyne and antispasmodic draught afforded him immediate relief; after a second draught, he passed a quiet night, and the following day he felt so well as to be able to resume his employment. Two days after, he again became ill, and when seen was found labouring under most distressing symptoms, resembling, on first appearance, a fit of apoplexy. He was in a state of insensibility; his breathing was laborious and hurried, and his face of a deep blue colour; and his eyes fixed and pupils dilated to their utmost. The tongue was bluish and projecting between the teeth; the pulse was quite imperceptible, and the impulse of the heart could not be felt. On dissection, the pericardium was found distended with blood, but no distinct rupture could be detected. The aorta was nearly of its natural circumference, and its coats of usual thickness; a rupture of the middle and internal coats ran transversely across nearly half its circumference, a short distance above the semilunar valves, and the external coat was separated from the middle for some distance by a stratum of coagulated blood."*

In the case several times referred to as contained in the *Medical and Physical Journal*, three different stages were well-marked. A gentleman, 52 years of age, who had suffered much from anxiety

* 4th. Fasciculus of Plates published by the Army Medical Department, 1842, and Dr Maclauchlan in Vol. i. of *N. S. Glasgow Medical Journal*.

of mind, and had laboured under rheumatism, while talking earnestly with a friend, was seized suddenly on the 16th of February with pain commencing at the chin, passing rapidly down his neck in the course of the great vessels to the chest and back, and was obliged almost immediately to go to bed. The pain continued the following day, with some tendency to syncope, and on the 18th, he became alarmingly faint while on the close-stool, but again rallied till about four the following morning, when the faintness recurred and proved rapidly fatal. These different attacks of faintness seem to have marked the several periods at which the ruptures of the arterial coats, and of the boundaries of the extravasated blood took place. The internal coats of the aorta were lacerated at the transverse arch, and the external coat separated as far as the pericardium, that cavity being distended by blood which had escaped through a small laceration. The external coat had also given way over the situation of the internal rupture, and had allowed the blood to flow into the mediastinum, and thence into the pleural sacs.

3. The symptoms of the third class of cases resolve themselves into those of the deranged circulation, and the cardiac disease superinduced, and thus resemble those attendant on the more frequent forms of aneurism, with, however, the exception, that, as the dissecting aneurism does not produce a distinct tumour, and scarcely occupies a larger space than a moderately dilated artery, no symptoms will be produced from pressure in the adjacent organs, the signs being thus absent which are most characteristic of the circumscribed forms of the affection. It may, however, happen, that the two varieties of the disease are more or less combined, a sacculated expansion being presented in some portions of the newly formed sac. Such was partially the case in 19, and the dilated portion pressing on the left ureter had caused great dilatation of the pelvis, and calyces of the corresponding kidney.

It would be useless to dwell upon the symptoms in these cases, as they are simply those of the ordinary forms of cardiac asthma.

From what has been before stated, it will be apparent that, in the present state of our knowledge, the detection of the dissecting aneurism during life must be extremely uncertain. When the disease is of sufficiently long standing, physical signs might probably be detected consisting of a combination of those of dilatation of the aorta, with a murmur caused by the flow of the blood through the opening in the internal coats; and these with the absence of the signs, produced, by the pressure of circumscribed aneurismal tumours, on the adjacent organs, might form some clue to the nature of the disease. In case 19, though the patient was carefully observed, no morbid murmur was detected over the seat of the opening into the sac, and the nature of the affection was unsuspected during life. In the case of Dr Pennock, No. 18, the internal opening

was situated near the aortic valves, and there was perceived during life, "a strongly marked rasping murmur opposite the cartilage of the third rib, and along the upper third of the sternum; and the second sound was dull and somewhat prolonged," but as "the semilunar valves were partially ossified, and the mitral valves thick and with cartilaginous depositions in its free margins," it is doubtful how far these signs were produced by the aneurism.

These constitute all the remarks I have to offer. In the present state of our knowledge, any analysis of this subject must necessarily be imperfect. The anatomical details of most of the cases recorded are very defective, and but few of them have been under observation during life, or, if observed, have been examined with sufficient care.

It is indeed probable, that, as two cases have fallen under my own observation in less than twelve months, the affection may be of more frequent occurrence than the small number of published cases would lead us to suppose, and that no long time will elapse before the materials are sufficiently extensive to afford a full history of this interesting form of a very important class of diseases.

Explanation of the Plate.

Vide page 281, case 8.

Fig 1.—A, the origin of the aorta.

B, The vessels given off from the upper portion.

C, The transverse rupture through the internal and middle coats, situated one inch behind the origin of the left subclavian artery.

D, The second fissure in the internal coats, situated below the origin of the *arteria innominata*, and following a longitudinal direction.

E, The external coat slit up and turned back, showing the separation between the layers of the middle coat in the ascending portion of the aorta, constituting the sac of the aneurism.

F, The external coat slit up and turned back from the descending aorta, showing the lower portion of the sac.

G, a piece of whalebone placed in the separation beneath the external coat of the *arteria innominata*, to show the continuation of the aneurismal sac along the course of this vessel.

H, The situation of the fissure in the serous covering the aorta, by which the blood escaped from the sac into the cavity of the pericardium.

Fig. 2. Diagram of the aneurismal sac and artery in the descending portion of the aorta.

a, The canal of aorta.

b, The aneurismal sac, situated between the layer of the middle coat.

c, The portion of the coats remaining attached.

1, The external coat.

2, The middle coat of the aorta.

3, The internal coat.

APPENDIX.—CASES REFERRED TO.

CASE 3.—Edward M'Goran, aged 24. The aorta dilated from its origin to the *arteria innominata*, its walls thinned, and the internal membrane ulcerated; the fissure through the internal coats commencing above the aortic valves and running longitudinally for

two inches and then transversely; a small sac between the external and middle coats, with an oval aperture into the cavity of the pericardium; hypertrophy with dilatation of the left ventricle of the heart.

The patient was suddenly seized with syncope while engaged in his usual occupation of a blacksmith. He had previously complained of dyspnoea, and had never been a strong man. R. W. Smith in *Dublin Journal of Medical Science*, Vol. ix. 1826, p. 426.

CASE 4.—Mary Guise, aged 70. A transverse rupture of the internal coats of the aorta, half-an-inch in length, situated half-an-inch above the semilunar valves; the sac extending between the external and middle coats from the origin of the aorta to the *arteria innominata*; terminating by an external rupture into the cavity of the pericardium; the patient was suddenly seized with pain in the region of the heart, dyspnoea and fainting rapidly terminating in death. R. W. Smith in *Dublin Journal of Medical Science*, Vol. ix. 1826, p. 426.

CASE 5.—R. D., 79th Regiment, aged 47, a tailor.

¶ The aorta of natural calibre and thickness; a rupture of the internal coats, situated two inches above the semilunar valves and extending transversely around two-thirds of its circumference; separation of the external and middle coats over a small space, and escape of blood into the pericardium without a distinct fissure being detectable.

The patient was suddenly seized when walking with violent pain in the region of the heart and prostration of strength, followed, after a partial recovery during two days, by rapidly fatal syncope.

The preparation of this case is contained in the museum of the Army Medical Department at Chatham, and is figured in the 4th fasciculus of the plates. The case is more fully described by Dr M'Lauchlan in the first volume of the *New Series of the Glasgow Medical Journal*.

CASE 6.—A transverse slit through the two internal coats of the aorta near its origin, with a small sac between the external and middle coats, opening by a longitudinal rupture into the pericardium.

The patient was admitted for a rheumatic affection and pain in the side, and suddenly complained of pain in the region of the heart, fell back and expired. Elliotson, *Lumleyan Lectures on Diseases of the Heart*, p. 34.

CASE 7.—A transverse rupture of the internal coats of the aorta near the origin of the *arteria innominata*; the external coat separated from the middle over three-fourths of the circumference of the vessel from the commencement to the arch of the aorta, and then on the left side to the popliteal arteries. The separation also extending on the *arteria innominata*, and to the bifurcation of the primitive carotid arteries, and the intercostal and abdominal branches, where

it surrounded the whole vessel. Escape of blood into the pericardium without a distinct rupture. The patient, a man of 60 years of age, was seized three days before his death with symptoms regarded as apoplectic. *Giornale delle Scienze Mediche*, quoted in *Gazette Medicale de Paris*, Vol. x. 1842, p. 524.

CASE 9.—The ascending aorta greatly dilated and the heart hypertrophied and dilated; a rupture of the two internal coats of the aorta situated beneath the origin of the *arteria innominata*, and extending over half the circumference of the vessel; the sac extending from the origin of the aorta to one inch beyond the left subclavian artery and occupying two-thirds of the circumference; atheromatous patches and bony scales in the descending, but not in the ascending aorta.

The patient had been for a considerable time asthmatic, and suddenly, when making slight exertion, expired from the rupture of the entire coats of the *arteria innominata*. J. G. Guthrie, *Lectures on Diseases and Injuries of the Arteries*, 1830, p. 43.

CASE 10.—A rupture extending through half the thickness of the middle coat, nearly one inch in length, situated three-quarters of an inch above the aortic valves; the sac occupying one-half the circumference of the vessel, and extending from the origin of the aorta to the eighth intercostal artery and along the *arteria innominata*, left primitive carotid, subclavian, and intercostal arteries; rupture into the pericardium; heart large and fat. The patient, a cook, was suddenly seized with faintness and oppression in the cardiac region and died in seven hours. P. B. Goddard, *American Journal of Medical Sciences*, quoted in *London Medical Gazette*, Vol. xxiii. p. 668.

CASE 11.—An irregular slit in the proper coats of the aorta, leading into a sac extending between the middle and external coat from the origin of the aorta to the *arteria innominata*, and bounded by firm adhesions of the coats together. Heart flabby, fat, and soft; great dilatation of the right side, and rupture of the right auricle.

The patient, a literary gentleman, 56 years of age, after labouring for a short time under incipient symptoms of cardiac disease, was suddenly seized with sense of constriction in the chest, collapse of the features, coldness of the extremities, and feebleness and irregularity of pulse; from these symptoms he partially recovered and died suddenly four days after.

CASE 14.—An horizontal fissure half-an inch in length through the internal coats of the descending aorta, leading into a sac between the middle and external coats five inches long. No history. J. G. Guthrie on *Diseases of Arteries*, p. 60.

CASE 15.—Jean Millet, aged 67, arch of the aorta dilated and studded with osseous plates and concentric hypertrophy of the left ventricle of the heart; rupture of the internal coats of the ab-

dominal aorta two inches from its origin, and occupying two-thirds of its circumference; sac extending below to the bifurcation of the aorta, and above to the arch and along the cœliac artery, where it surrounded the whole of the vessel.

Death from acute cerebral disease combined with chronic disease of the urinary organs. No symptoms of aneurism observed during life. Laennec, *Traité de l'Auscultation Mediate*, Tome ii. p. 692.

CASE 16.—An aperture in the abdominal aorta three inches above its bifurcation; the sac forming an oblong tumour in the course of the aorta, and opening into the right common iliac artery three inches from its origin, and into the left $1\frac{1}{2}$ from the bifurcation. The sac lined by a distinct membrane “presenting the same appearance in the aorta, the sac, and iliac arteries.” The original trunk compressed but pervious. No history.

There is some doubt whether this, and perhaps the following case, were examples of the ordinary form of dissecting aneurism, or whether they did not originate in a gradual extension of the lining membrane between the coats. Shekelton, *Dublin Hospital Reports*, Vol. iii. p. 201.

CASE 17.—An aperture at the bifurcation of the aorta leading into a sac following the course of the left common iliac artery and opening into the external iliac by two apertures; the original canal contracted and pushed aside, but pervious.

The patient was an elderly female, who died of tuberculous disease of the lungs; the aneurism probably produced no symptoms. Shekelton, *Dublin Hospital Reports*, Vol. iii. p. 201.

CASE 18.—The heart double its natural size; great hypertrophy with dilatation of the left ventricle and dilatation of the right; some valvular disease; a fissure half an inch in length, penetrating a part of the middle coat, and situated half-an inch above the semilunar valves; the sac extending in the laminæ of the middle coat from the origin of the aorta to its bifurcation and along the *arteria innominata*, and left carotid arteries; and reopening into the *arteria innominata*; numerous foramina between the sac, and original canal in the descending portion of the aorta.

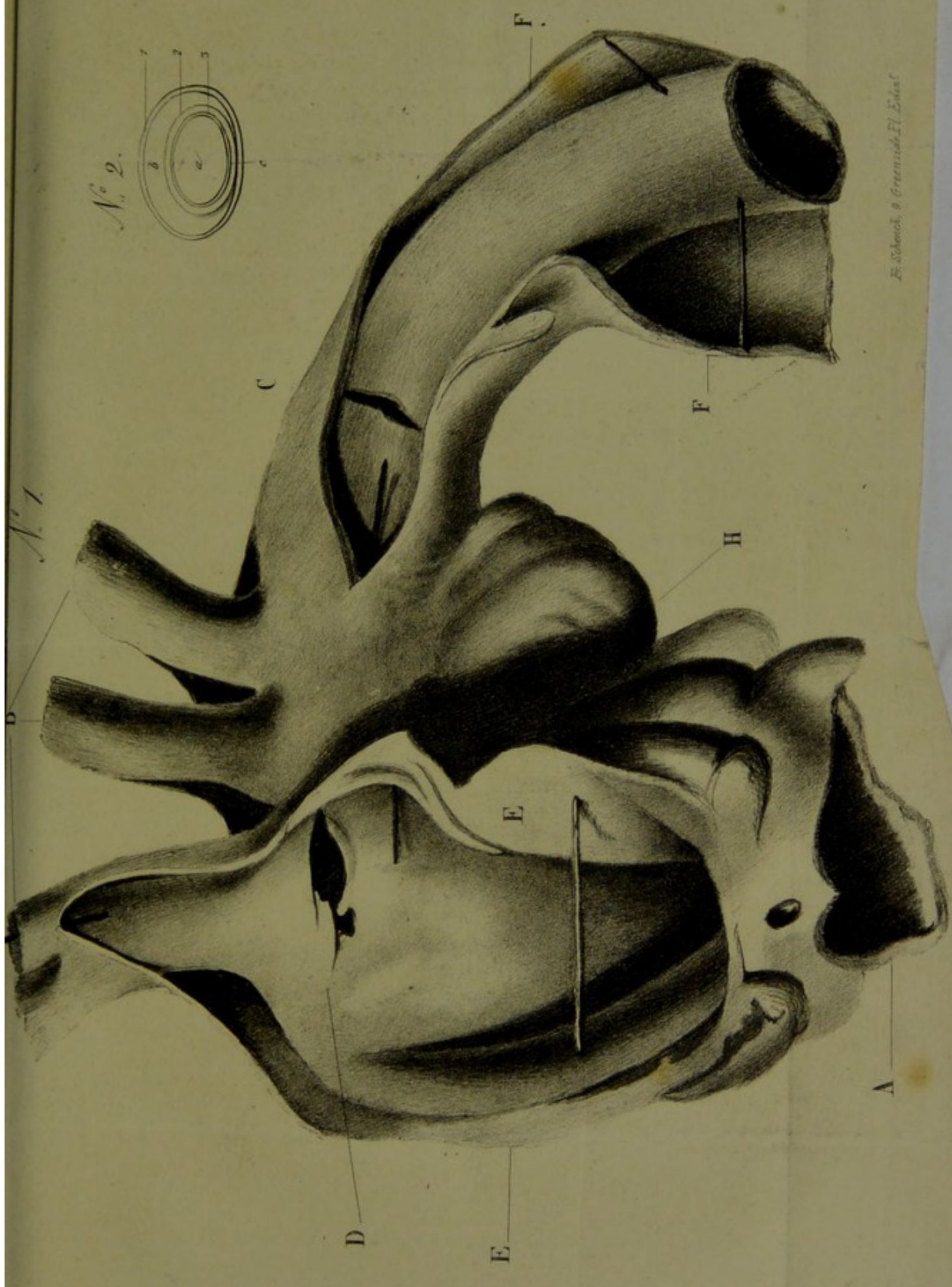
The patient, a female, 75 years of age, was seized, while engaged in pumping water, with pain in the sternum, violent action of the heart, and sense of suffocation. To these succeeded the usual symptoms of cardiac disease, which, combined with uterine disorder, proved fatal eight years after the first seizure. W. C. Pen-nock, M. D., *American Journal of Medical Sciences*, quoted in *London Medical Gazette*, Vol. xxiii. p. 668.

CASE 19.—Margaret Robertson, aged 60, was suddenly seized, nine months before her death, with faintness, pain, and sensation as if something had given way about the heart, which came on as

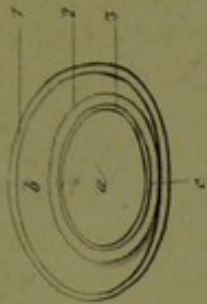
she was rising from scouring the floor. Prior to this, however, she had not enjoyed good health, but her symptoms afterwards became much increased. She began to suffer from pain in the chest and difficulty of breathing, sometimes amounting to orthopnoea. Three months before her death her face and extremities began to swell, and these symptoms gradually increased upon her. The impulse of the heart was natural, and the pulse small and regular. No morbid murmur was detected. On examination of the body, adhesions were found between the reflected and attached pericardium; the cavities and walls of the heart were much hypertrophied and dilated, and the mitral and aortic valves slightly thickened; the ascending aorta was somewhat dilated, and its walls thinned, but the lining membrane, though displaying punctiform redness, was smooth and free from deposit. Immediately behind the origin of the *arteria innominata* there existed a fissure one inch and one-tenth in length, running longitudinally, by which the canal of the artery led into an aneurismal sac. The edges of this fissure were smooth, and the sac, which was lined by a smooth yellow membrane, extended thence, at first in front, afterwards inclining more to the left side, as far as the bifurcation of the aorta, where it opened by a small oval aperture with smooth edges, into the left common iliac artery. On close examination the fissure was found to extend only through a portion of the middle coat, and the sac to be continued between its laminæ. On the right side the intercostal arteries opened into the aorta, as did also the celiac and superior-mesenteric arteries. The left intercostal and the inferior mesenteric, however, communicated with the newly formed sac. At the upper portion of the abdominal aorta the sac was much dilated, and this portion pressing on the left ureter, had caused much expansion of the pelvis and calyces of the corresponding kidney. Several openings existed between the sac and aorta throughout its course, and the sac was in the upper part crossed by numerous small bands aptly compared to *cordæ tendinææ*, but which proved to be the small arterial branches enveloped in a layer of lymph similar to that lining the sac.

In this case it will be perceived there existed two channels for the circulation in the left lower extremity, one through the aorta, which was much compressed and flattened, though probably of its usual calibre, the other through the newly formed sac; the latter contained no coagula except in the dilated portion, where there existed several masses, not, however, decolorized.

This case occurred in the practice of Dr Henderson in the Royal Infirmary, and is more fully reported in the Edinburgh and London Monthly Journal for July 1843.



N^o 2.



Et Schœd. 8. Greniade. Pl. LXXXI

ARTICLE II - An account of some Experiments illustrating
 the mode of formation of the Dissolving Membrane
 THOMAS B. FRASER, M.D., late Pathologist to the Royal
 Surge Hospital, (With a Plate)

EXTRACTED FROM THE LONDON AND EDINBURGH MEDICAL JOURNAL
 MEDICAL SERIES FOR OCTOBER, 1823.

It has been usually conceived that the dissolving Membrane
 derive their origin from the occurrence of a rupture of the inter-
 nal coats of an artery, by which the blood is enabled to insinuate
 itself between the external and middle coats and effect their
 separation, so as to produce a sac following the course of the
 vessel and the development of this form of disease, rather than
 the unaccounted unexplained manner has been explained by
 supposing it to be the latter case, the slow change in which the
 internal rupture gradually has previously rendered the inter-
 internal surface so as to produce the separation of the
 current of blood.

To this view it has however been objected - that the
 existence of adhesions between the coats in cases of rupture
 which necessarily takes place, so far from being constant, is
 the occurrence, as only that the separation of such adhe-
 sion is unnecessary, and is discomfited by the interstices
 and union which generally exists between the coats of a vessel
 and by the effect of forcibly injecting fluids into the
 between the coats or into an artery with its internal coats
 ruptured, when in either case a tumour results from the dis-
 tion and distension of the outer coat, and not an external rup-
 tion of the coats as in a dissecting aneurism. The latter opi-
 nion, which has recently been urged by Professor Leake,
 is, however, founded on the experiments of Drs. Nicholls and
 Scarpa. The former is said to have demonstrated before the
 Royal Society in the year 1752, that when air is injected into
 the primary artery until the internal coat be ruptured, there
 external will form itself into a tumour, which is



