Remarks

ON

A COMMUNICATION BETWEEN THE TWO VENTRICLES OF THE HEART OCCUPYING AN UNUSUAL SITUATION.

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THE usual situation where one meets with a communication between the two ventricles of the heart is that occupied in the normal condition by the pars membranacea septi. The specimen I desire to put on record is one of that small class in which the communication is between the conus arteriosus or infundibular part of the right ventricle on the one hand and the aortic vestibule on the other.

The patient, a man aged 30 years, was under the care of Sir Clifford Allbutt in the General Infirmary at Leeds, and died there in April, 1879. The clinical notes of the case cannot be traced, but the post-mortem examination was made by the late Dr. Jacob, who was then the house physician, and his notes state that the heart was enlarged and weighed 19½ oz. He also mentioned the unusual position of the aperture. When, some 12 years ago, I was making a systematic examination of the section in our museum dealing with diseases of the heart, I discovered that this specimen had not been put on record in any of the journals. I therefore got permission from Dr. Allbutt, as he then was, to show the specimen at the Anatomical Society of Great Britain and Ireland and to publish a description of it. At the meeting of the society which was held in Edinburgh in 1907 I gave an account of the specimen and discussed its meaning, giving the explanation which I now put on record.

DESCRIPTION OF SPECIMEN.

In the preparation of the specimen for display in the museum the outer part of each ventricle and auricle has been removed. One can see, however, that there must have been considerable hypertrophy of the walls of all the chambers. The remains of the mitral and tricuspid valves are normal; there is a valvular patency of the foramen ovale.

The long dimension of the abnormal aperture in the ventricular septum would, in the natural position of the heart, be almost vertical. As seen from the left side (Fig. 1) it is situated immediately below and in front of the anterior segment of the aortic valve,¹ with the middle three-fifths of which its longer dimension is co-extensive. It measures three-quarters of an inch in length by one-fifth of an inch in width. Its anterior and lower boundary is rounded and concave and is formed by the free margin of the thick fleshy infundibular part of the septum of the ventricles. The endocardium lining this margin, and for some distance below the aperture on each aspect of the septum, is thickened and opaque. On the left side especially, the membrane is particularly thick and fibrous and this thickening ends below by a singularly sharp and

abrupt edge. On the free margin of the septum there are also some vegetations indicative of recent endocarditis. The aperture is bounded above and behind by the anterior aortic segment.

As seen from the right ventricle (Fig. 2) the aperture opens into the conus or infundibular part of that cavity. Here it is bounded below and in front by the concave margin of the septum already mentioned; above and behind it is bounded by the anterior segment of the aortic valve, which, in consequence of the deficiency in the septum, is visible from the right ventricle. Not only is this segment of the aortic valve visible from the right ventricle, but it projects into that chamber forming an aneurysmal dilatation of about the size of a small hazel nut, which separates the aperture from the antero-right pulmonary segment. The portion of the valve entering into this dilatation is thinned out and is much less substantial than the rest of the segment. At the summit of the dilatation there are two apertures about a fifth and a sixth of an inch respectively in diameter. These have projecting margins fringed with recent vegetations.

There is some general thickening of the aortic valve segments; the convex aspect of the anterior segment is roughened by the presence of vegetations. The portions of the convex aspects of the postero-right and postero-left segments which overhang the aperture are also slightly coated with vegetations. The posterior segment of the pulmonary valve which bounds the aperture above and in front is much thickened and coated with vegetations on both its convex and concave aspects. It is clear that during the diastole of the ventricles there must have been a stream of blood impinging on this part of the valve through the two apertures in the aneurysmal dilatation of the aortic segment. The portion of the antero-right pulmonary flap which is left is normal.

The deficiency in the septum is separated from the pars membranacea by a distance of three-quarters of an inch on the right side and by a distance of half an inch on the left side, the septum between being altogether fleshy. The pars membranacea septi is of small extent; it does not reach so far forward as is usual, and, as is indicated in the sketch (Fig. 1), it falls short of the junction of the anterior and postero-right segments of the aortic valve.

NATURE OF THE ANOMALY.

At the time I was first seeking an explanation of this particular form of deficiency of the septum of the ventricles I entertained the commonly accepted view that the main stems of the aorta and pulmonary artery were formed from the bulbus arteriosus or bulbus cordis by the division of that tube into two, and that the septum formed in the process of this division extended down into the common ventricle, where it was met by the upward-growing septum which effects the division of that chamber. I therefore saw in the anomaly a failure of fusion between the inter-ventricular and interbulbar septa. I was soon led to modify this view by the study of a paper by Professor Arthur Keith on Malformations of the Bulbus Cordis which appeared in the Quatercentenary Publications of the University of Aberdeen. Partly as the result of his own investigations in comparative anatomy and partly from a study of the embryological work of Greil, Keith was able to point out that the fate of the bulbus cordis is different from that mentioned above. By far the greater part of the bulbus is developed into the conus

¹ The references in the text to the different semilunar segments will be clearer if read in connexion with Fig. 3.
No. 4767.

arteriosus or infundibular part of the right ventricle, a very small portion of limited vertical extent being probably represented by the extreme upper part of the left ventricle just at its opening into the aorta. The aorta and pulmonary artery are not therefore formed from the bulbus cordis at all, but result from division of the common aortic stem. In bringing the specimen before the Anatomical Society in 1907 I interpreted the anomaly in the light of these newer views. The aperture became in my opinion "interbulbar" and was due to an imperfect formation of the septum which divides that part of the heart.

In some of his previous writings Keith had described two bands which are visible on the

FIG. 1.

View from left side. Aperture in septum shown by bent pointer passed through it. Another pointer passes through the pars membranacea septi at the stippled area.

posterior wall of the conus of the right ventricle when that cavity is opened from the front. These he calls respectively the reptilian and the mammalian band. The former descends towards the apex along the ventricular septum and is called the left infundibular or apical band; the latter, which he terms the right infundibular or lateral band, passes outwards on the lateral wall of the right ventricle towards the margo acutus. These two bands, as he points out, meet on a raphé which is sometimes quite distinct, and which extends from the commissure of the two septal pulmonary segments above to the pars membranacea septi below. This raphé indicates the position of the two ingrowing processes which form the septum of the bulbus cordis. It is in the line of this raphé that deficiencies in the bulbar septum are met with, and in the specimen I describe it will be seen that the long axis of the aperture coincides with its upper half (Fig. 2).

REFERENCES TO SIMILAR CASES.

In the article on Congenital Malformations of the Heart by Laurence Humphry in Allbutt's "System of Medicine" I found references to five cases which appeared to be of the same nature as the specimen I have described. Two of these cases were mentioned in Peacock's work published in 1866 (second edition); Rokitsanski was credited with two cases; and a reference was made to the case recorded by Dr. Sidney Coupland

in 1879, an undoubted example of the unusual defect I have described. The two cases mentioned by Peacock were said to be in the Museum of St. Thomas's Hospital, but there was some ambiguity in the references he gave. Coupland also in commenting on his own specimen mentioned these two cases recorded by Peacock, but I gathered from the context that he had not inspected them himself.

As I knew that Professor Keith had about that time (1905) been making a very full examination of all the malformed hearts in the London museums I wrote to him on the matter, calling attention to the ambiguity of Peacock's references, and asking if he knew the specimens. In his reply Professor Keith was very careful to lay down the criteria which should guide us in determining the admission of specimens to the class of that described by Coupland which he regarded as essentially the same as that on which I was working. It was not enough that the aperture as seen from the left side of the heart should be in the same situation, but when inspected from the right side it must open into the infundibular part of the right ventricle, and must not be separated from the pulmonary segments by an area of cardiac tissue which would indicate the completion of the septum of the bulb. In regard to the reputed cases at the Museum of St. Thomas's Hospital he wrote: "There is no record of this type of specimen in my notes of the abnormal hearts at St. Thomas's Hospital; either Peacock was mistaken, or they have disappeared, as they are not now placed with the specimens on the shelves." In Peacock's work it is stated that the specimens formed a part of Sir Astley Cooper's museum, and that they were described by Dr. J. R. Farre. In addition to other abnormalities they are described by Peacock as presenting "a deficiency in the septum, interposed between the left and the infundibular portion

FIG. 2.

View from right side. The other ends of the two pointers shown in Fig. 1 are seen. The aneurysmal bulging of the anterior aortic segment is seen with the two apertures on its summit. The posterior pulmonary segment is seen to be thickened. A small part of the antero-right segment is preserved. The whole of the antero-left has been taken away.

of the right ventricle, immediately below the origin of the pulmonary artery." I have referred to the original description by Farre. The specimens are described under the heading of "Ostium Arteriæ Pulmonalis Communicating with Both Ventricles." They are probably both examples of the deficiency described by Coupland and myself; further than

this I cannot go, for though the description is supplemented by plates, these do not supply all the data on which to base a certain opinion.

Of the cases recorded by Rokitanski Keith accepted one (Case No. 20—that of a boy three years of age), but he rejected the other (Case No. 19), as there was clear evidence that the interbulbar septum was complete. From his notes on the specimens in the various London museums he was able to give me the following references to cases

FIG. 3.

A, Anterior aortic segment. B, Postero-left aortic segment. C, Postero-right or non-coronary segment. P, Posterior pulmonary segment. A-l, Antero-left pulmonary segment. A-r, Antero-right pulmonary segment. A, B, P, and A-l, constitute the four *septal* segments of Keith. The interrupted line shows the extent to which the aortic root is embraced by the muscle of the ventricles.

which appeared to him to conform to the type of that at which I was working. One of these, in the Museum of St. George's Hospital, was "evidently described by Rolleston in the Transactions of the Pathological Society." The patient was a boy aged 11 years. The opening into the right ventricle was three-eighths of an inch below the pulmonary valve and "just above the origin of the posterior or fixed, and of the anterior cusps of the tricuspid valve." The second was in Guy's Hospital Museum (No. 2309, the patient a female aged 19). The third was in the Museum of the Royal College of Surgeons of England (No. 580).

THE CONDITION OF THE ANTERIOR AORTIC SEGMENT.

The aneurysmal dilatation of the anterior segment of the aortic valve and its projection into the right ventricle, which I have mentioned, was a striking feature of the specimen. This condition of the valve is mentioned by Coupland as having been present in his case also, but the projection

FIG. 4.

Showing the usual relationship of the muscle of the ventricle to the aortic valve (A) and the unusual relationship mentioned in the text (B). Aortic wall, valve segment, and ventricular muscle indicated respectively by the letters *a*, *v*, and *m*.

was much less and the valve segment was entire. To understand the condition one must study the relationship of the root of the aorta to the musculature of the heart, and especially to that of the ventricles. From a series of dissections I made to satisfy myself as to this, I found that the root of the aorta is embraced by ventricular muscle on

its anterior and lateral aspects, and that this muscular investment extends backwards on the right side as far as the junction of the anterior one-third with the posterior two-thirds of the right or non-coronary cusp, and on the left side as far as the middle of the postero-left cusp. (Fig. 3.) The whole of the aorta opposite the anterior cusp is closely embraced by ventricular muscle.

The exact relationship of the ventricular muscle to the aorta and to its valve segments varies in another respect. The usual relationship opposite the anterior segment is that shown in the diagram. (Fig. 4, A.) Some ten years ago I put in the anatomical museum a specimen in which the condition was as shown in Fig. 4, B. The valve segment and the coat of the aorta were apparently completely separated from one another; both could be seen to end rather abruptly except for a thin layer of endarterium which preserved their continuity and through which the muscle of the ventricle could be readily seen.

Now in the specimen on which I am commenting there was a complete absence of any support to the aorta and valve corresponding to the greater part of the anterior segment. If we conceive the condition resulting from the failure in the complete formation of the bulb septum to be represented by Fig. 5, A we can readily understand that the condition shown in Fig. 5, B might be brought about by the diastolic aortic pressure. There is a slight bulging outwards of the part of the aorta entering

FIG. 5.

The lettering *a*, *v*, and *m*, as in the former figure. Shows that the infundibular part of the right ventricle is not cut off from the aortic vestibule of the left ventricle. A shows the congenital defect. B shows the bulging of the portion of the segment which faces towards the right ventricle. The beginning of the bulging is shown by the two arrows.

into the formation of the sinus of Valsalva, but the main part of the projection is formed by the thinned-out tissues of the valve segment itself, and this is precisely limited to where the ventricular muscle is wanting—namely, opposite its middle three-fifths. From an examination of the specimen I should think that during the early phase of diastole of the ventricle the aperture of communication would be closed by the apposition to its concave margin of the anterior aortic segment at the junction of the greatly thinned-out portion with the rest of the flap, which in this way would be assisted in supporting the diastolic aortic pressure. It will be seen that it is only that part of the segment which is directed to the cavity of the right ventricle which has become stretched, and this raises some further considerations.

CONCLUSION.

The amount of support which the ventricular muscle gives to the semilunar valves has been discussed by the late Dr. G. A. Gibson and by others. Dr. Harry Campbell has speculated on the conditions whereby it appears to be the case that the delicate tissue of the aortic valves is able to

support the diastolic pressure of the blood during the whole of a long and active life without giving way, and he concludes that the valves must get support from the part of the ventricular muscle which surrounds their bases remaining in contraction until the pressure in the ventricle has been raised by the entry of blood from the auricle on the relaxation of the general mass of the ventricular musculature. The work of Stewart would appear to support this view, and in the Schorstein lecture, which I had the honour to deliver at the London Hospital in 1912, I mentioned a clinical observation which seemed to point in the same direction. Those portions of the segment, therefore, which were directed respectively to the right and to the left ventricle would be assisted by the conditions, whatever they may be, which enable the delicate tissues of the pulmonary and aortic semilunar valves to perform a task which, without such help, would be clearly impossible. The resources of the left ventricle in this respect are presumably much greater than those of the right, and so it is natural that the portion of the valve which presented to the right ventricle should have been the part to suffer.

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SOME CONDITIONS THAT SIMULATE CHRONIC APPENDICITIS.¹

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I HAVE chosen as my subject some of the conditions that may simulate chronic appendicitis, because in the latter part of last year a distinguished London physician brought a charge of uncritical and unscientific diagnosis against surgeons in connexion with appendicitis, and crystallised it into the taunt, "the craze for appendicectomy." I realise the very grave measure of justice in that charge. Since appendicitis became not only common but fashionable very many appendices have been unnecessarily removed in the absence of any real evidence that they were the cause of symptoms and without any relief to the patients' sufferings, and this is a state of affairs that challenges us to approach the diagnosis of appendicitis in a critical attitude of mind.

It is in the diagnosis of *chronic* appendicitis that mistakes are most often made, and I propose to limit my remarks to some of the conditions simulating that variety of chronic appendicitis in which

there have never been any severe acute attacks—a form of the disease that is characterised by chronic pain and some tenderness in the right iliac fossa, accompanied as a rule by constipation. I do not propose to consider those more distant imitators and associates of chronic appendicitis, gastric or duodenal ulcer and gall-stones; nor must I stay to discuss lesions of the right kidney and ureter, with which at times chronic appendicitis may be confused. I propose only to deal with certain structures in the more immediate neighbourhood of the appendix, and first I have to mention Lane's ileal band and Jackson's pericolic membrane.

Lane and his followers hold that the symptoms we are considering, as well as an enormous number of other symptoms, are often due to an intestinal stasis or chronic obstruction, which is caused by an abnormal band of adhesions that we sometimes find attached to the ileum some three inches above the ileocaecal valve. Normally the lower ileum rides freely on its mesentery right down to its junction with the caecum. Lane's ileal band, when present, is a fold of peritoneum on the left or inferior side of the ileum (see illustration), which tethers the gut down to

Diagram showing Jackson's pericolic membrane (P) and Lane's ileal band (I).

the parietal peritoneum over the psoas muscle near the pelvic brim. It is said by Lane to be acquired as the result of a tendency to enteroptosis, and to cause a kink of the ileum and chronic obstruction to its contents. Others have considered that it is an inflammatory band. Both these views of its causation, however, have been severely criticised, notably by Gray and Anderson in this country,² and Flint in America,³ who drew attention to the frequent occurrence of the ileal band in the full-time foetus, and demonstrated its congenital origin. I am able from my own embryological and clinical observations to confirm the congenital origin of the band. It is the same structure as the genito-mesenteric fold of Douglas Reid, and is a peritoneal fold drawn down from the left side of the lower part of the mesentery by the testis or ovary in its descent. Some trace of it can be made out in almost any foetus beyond the fifth month, though it is only fully developed in a small percentage of cases. I

¹ An address delivered before the Lancashire and Cheshire Branch of the British Medical Association.

² THE LANCET, May 10th, 1913, p. 1300.

³ Johns Hopkins Hospital Bulletin, October, 1912.