

## MODERATOR BAND IN LEFT VENTRICLE AND TRICUSPID LEFT AURICULO-VENTRICULAR VALVE.

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### LEFT MODERATOR BAND.

ON two previous occasions I have communicated to this *Journal* notes on the occurrence of a moderator band in the left ventricle of the human heart.<sup>1</sup> I have now before me a third specimen from an adult male subject, which I employed during the present winter to illustrate my lectures on the vascular system.

The *left ventricle* was opened into by cutting through the wall parallel to and immediately to the left of the anterior interventricular groove, and not by the customary method of transfixing, which is so apt to injure some of the intraventricular structures. A strong rounded band, 27 mm. long by 5 mm. in width, was seen to pass across the ventricular cavity. It was attached by one end to the septal wall, 18 mm. from its anterior border, and by the other to the opposite wall, with the muscular fibres of which it was continuous. It lay almost transversely to the long axis of the ventricle: its lower border was 28 mm. above the apex of the cavity, and its upper border was 12 mm. below the basal attachment to the ventricular wall of the more anterior of the two papillary muscles. It consisted of muscular tissue, surrounded by endocardium.

A fibrous thread, about equal in thickness to a chorda tendinea, was attached to the ventricular wall, about midway between the base of the more anterior papillary muscle and the level of the upper border of the moderator band. It passed backwards to become connected with the posterior wall of the ventricle, close to the base of the more posterior papillary muscle, and was quite free between its two ends.

<sup>1</sup> Vol. xxvii., *Proceedings of Anatomical Society*, Feb. 1893, p. xix, and vol. xxx. p. 568, 1896.

The septal wall of the ventricle, as in the heart which I described in 1896, possessed, from the place of attachment of the moderator band up to the aortic vestibule, a smooth surface, almost unbroken by projecting *carneæ columnæ*.

The *right ventricle* was opened into by an incision along the right border of the heart, and another immediately below and parallel to the right auriculo-ventricular groove. A strong papillary muscle arose from the anterior wall. Its base extended for 20 mm. as far as the anterior edge of the interventricular septum. Immediately above, but separated by a pouch-like recess, was the moderator band of the right ventricle, which arose by three muscular bundles, two of which were continuous with the septum near its anterior border, whilst the third was connected with the anterior wall of the ventricle, not far from the septum. The right moderator band blended with the anterior papillary muscle a short distance above its basal attachment. Its maximum length was 14 mm.

When the right and left moderator bands in this heart were compared with each other, it was seen that the left was longer and thicker than the right, and was more freely differentiated from the ventricular wall. In both cavities they were muscular, so that, in considering their function, they ought not to be regarded as bands which passively moderate or restrict the distension of the chambers in which they lie, but rather as actively participating in the work of the ventricle, and by their contraction drawing the opposite walls together and assisting in the expulsion of the blood.

In its thickness and the degree of its muscularity, the left moderator band in this heart contrasted in a marked manner with those seen in the two hearts previously described. In them the bands, though longer, were much more slender, and, though muscular at the attached ends, contained in their length apparently only a single fasciculus of muscular fibre.

#### TRICUSPID LEFT AURICULO-VENTRICULAR VALVE.

During the present winter session the dissectors of a thorax called my attention to the *left ventricle* of a heart in which three strong *musculi papillares* projected from the wall into the

cavity. They were almost equal in length and thickness, and for descriptive purposes may be named A. B. and C. A. sprang from the posterior wall, close to the left border of the ventricle; B. from the same wall, close to the right and posterior border of the septum; C. from the septum in front of and to the left of B. Each muscle gave origin in the usual way to chordæ tendineæ. As three muscles of almost equal magnitude were present, I was naturally led to examine the auriculo-ventricular opening, to see if there were not three cusps to the valve, which was found to be the case.

The largest cusp was placed obliquely in front of the opening, and was opposite the interval between papillary muscles A. and C., from each of which it received chordæ tendineæ. This cusp was also in relation to the aortic vestibule and opening; it was smooth on both surfaces, and obviously represented the normal anterior cusp of the mitral valve. The second cusp was situated opposite the interval between A. and B., from both of which it received chordæ tendineæ; it was distinctly smaller than the anterior cusp, and was situated behind and somewhat to the left of the opening. The third cusp was between B. and C., and received chordæ tendineæ from both; it was about the same size as the second cusp, and was on the right posterior part of the opening. From their smaller size, the two posterior cusps together represented the posterior cusp of the normal valve.

The cusps were all thickened, contracted, and somewhat calcified from disease, and they consequently did not present such broad surfaces as in a healthy valve.

The increase in the number of cusps in the mitral valve is an interesting variation in relation to comparative anatomy. Though in most mammals the normal number of cusps at the left auriculo-ventricular orifice is two, as in the human mitral, a larger number is sometimes seen. In the horse, for example, an accessory cusp is occasionally seen on the right of the opening. In the Cetacea, the ziphioid *Mesoplodon bidens* (Sowerby's whale),<sup>1</sup> though possessing two large cusps in the valve, had two distinct smaller cusps intermediate to the larger, so that the valve was definitely quadricuspidate. In a specimen of the Whale-

<sup>1</sup> *Jour. of Anat. and Phys.*, vol. xx. p. 164, 1886.

bone whale, *Balænoptera rostrata*,<sup>1</sup> the quadricuspidate division was more strongly marked, and, in addition, I found three thick stunted papillary muscles opposite the intervals between three of the cusps, whilst the fourth interval, instead of a single thick muscle, had several smaller elongated papillæ, from which the chordæ tendineæ arose. I may also state that in this heart four strong muscular moderator bands passed across the left ventricle from the septal to the ventral wall.

<sup>1</sup> *Proc. Roy. Soc. Edin.*, Feb. 15, 1892, p. 62.