

ANATOMICAL STUDY OF THE MODERATOR BAND

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Abstract :

Moderator band is a muscular trabecula which extends from interventricular septal wall to the base of anterior papillary muscle in right ventricle of heart. This study was conducted on 20 hearts from adult human cadavers. Out of 20 specimens of heart we could observe the presence of moderator band in 17 and in rest 3 it was not visible for record. Origin length, thickness and distance from tricuspid valve were noted. The average length of the moderator band was 13.82cm with the SD of 3.94 and the average thickness being 4.46cm with the SD of 1.36. The average distance from tricuspid valve was 3.6cm with the SD of 1.01. As the moderator bands, or other large trabeculations, can be major obstacle for the repair of apical ventricular septal defects, the morphometric study of moderator band may help the surgeons during surgical procedures conducted for correction of such defects.

Keywords : Moderator band, ventricular septal defects, septomarginal trabecula, morphometry.

Introduction :

A muscular band, well-marked in sheep and some other animals, frequently extends from the base of the anterior papillary muscle to the ventricular septum. From its attachments it may assist in preventing over distension of the ventricle, and so has been named the moderator band.¹

The moderator band, another marker for the morphologically right ventricle, takes off from the body of the ventricular septum to cross to the parietal wall carrying within it a fascicle of the right bundle branch of the atrioventricular conduction system.²

A large branch from the left anterior descending artery passes along the length of the moderator band in the right ventricle. This artery, which measured up to 1000 .u in diameter in hearts with prominent moderator bands, may

constitute an important part of the supply of the anterior papillary muscle of the right ventricle.³ Any damage to moderator band might cause ischemia of distal structure.

The moderator band, or other large trabeculations, is the major obstacle for the repair of apical ventricular septal defects⁴. The morphometric study of moderator band may help the surgeons during surgical procedures conducted for correction of such defects.

Materials and Methods :

This study was conducted on 20 hearts from adult human cadavers in the department of anatomy, K. S. Hegde medical college, Mangalore. The hearts were fixed and kept in a 10% formalin solution. The sternocostal surface was dissected with one incision parallel to anterior inter-ventricular sulcus and another parallel to right half of inferior margin about half an inch above. Anterior wall was pulled carefully to right to visualize inside of right ventricle. The septomarginal trabecula was exposed.

The septomarginal trabecula was identified as a fleshy band extending from inter-ventricular septum to the base of anterior papillary muscle. The length was measured from the papillary end to the septal end with the help of digital Vernier caliper. Thickness was measured at its approximate middle portion. An approximate distance of the septal end of septomarginal trabecula to the tricuspid valvular margin was measured.

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Observations and Discussion :

Table.1 : Morphometry of moderator band

Specimen no	Length (mm)	thickness (mm)	Distance from tricuspid valve (cm)
1.	20.5	4.4	3.6
2.	17.6	4.9	6.6
3.	9.7	4.5	2.5
4.	15.8	3.24	4.5
5.	13.4	5.11	2.5
6.	22.3	7.15	3.3
7.	13.9	6.0	3.5
8.	15.5	6.5	4.0
9.	10.12	3.2	3.6
10.	16.5	5.6	3.2
11.	15.6	4.27	2.6
12.	11.3	4.33	4.5
13.	11.6	2.76	4.0
14.	10.54	2.04	3.2
15.	8.82	3.11	3.2
16.	9.18	3.98	4.0
17.	12.6	4.8	2.4
Mean	13.82118	4.464118	3.6
SD	3.943485	1.363218	1.016735

The septomarginal trabecula was a common structure, originating from the muscle of the interventricular septum. This muscular band deriving from the lower segment of crista supraventricularis was, in most cases, visibly separated from the surface of the interventricular septum.⁵

Out of 20 specimens of heart we could observe the presence of moderator band in 17 and in rest 3 it was not visible for record.

In the present study out of 17 specimens the moderator band was separate from the muscular wall in 14, in another three it was found to be tethered to the muscular wall as in specimen no.15. A thin sheet of plastic could not be inserted between the wall and the band.

In as many as 14 specimens moderator band was arising from the lower segment of crista supraventricularis. 'The septomarginal trabecula was a common structure, originating from the muscle of the interventricular septum. This muscular band deriving from the lower segment of crista supraventricularis was, in most cases, visibly separated from the surface of the interventricular septum'.⁵

Single connection with anterior papillary muscle was found in only three specimens as seen in specimen no.9. In rest of the specimen it showed multiple connections (specimen no.13)

Prominent septal portions were seen in 11 specimens as in specimen no.4. In all other specimens the papillary portion was muscular thick and prominent as in specimen no.9. In two specimens we could see a thin slender moderator band with prominent papillar portion as seen in specimen 8 and 15. These observations are in accordance with the observations made by Depreux et al. who investigated 100 hearts from several mammals and, based on observations and measurements, classified three types of trabecula: I — muscular and thick, II — fibrous and thin, and III fibromuscular.⁶

Septoparietal trabeculations were found extending from the anterior margin of the septomarginal trabeculation to the parietal wall in 5 specimens as seen in specimen no.13. In many other specimens there were multiple minor trabeculations extending from moderator band.

Carlos Alva et al also observed that along with these major septoparietal trabeculations, multiple minor trabeculations extended to the apex, creating complex but variable patterns of trabeculations within the apical component of the right ventricle⁷.

The above observations correlate with the observations made by S.T.F. Bandeira et al' who classified the septomarginal trabecula into eight groups⁸.

The average length of the moderator band was 13.82cm with the SD of 3.94 and the average thickness being 4.46cm with the SD of 1.36. The average distance from tricuspid valve was 3.6cm with the SD of 1.016735. According to Carlos Alva et al who studied the 10 normal hearts, the moderator band took origin at a mean ratio of 0.48 (SD 0.16) of the ventricular length. Also, observed the mean distance from the pulmonary valve to the origin of the moderator band, or to the most prominent septoparietal trabeculation in the 2 hearts without a moderator band⁸.

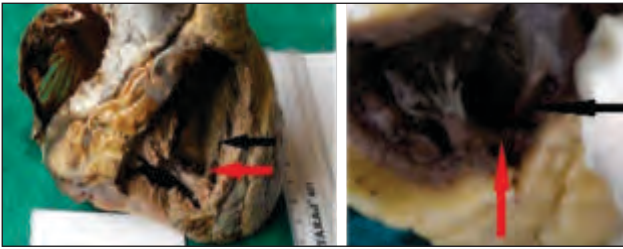


Fig.1 Moderator band with prominent septal portions

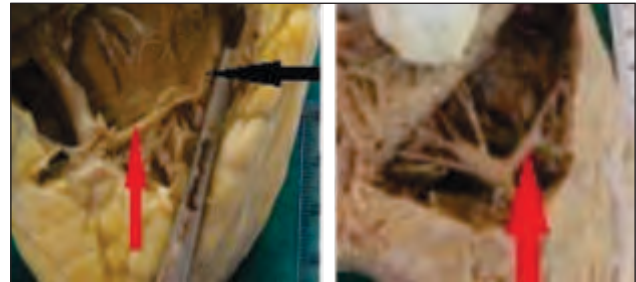


Fig.5 Thin slender moderator band with prominent papillary portion



Fig.2 Moderator band with septoparietal trabeculations

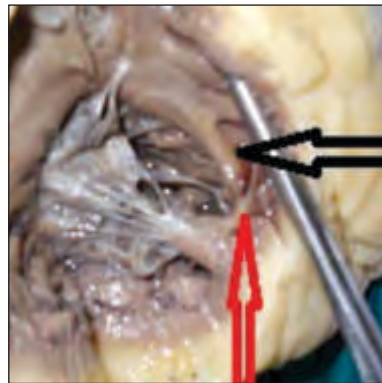


Fig.6 Moderator band arising from the lower segment of crista supraventricularis



Fig.3 Slender moderator band with prominent papillar portion



Fig.7 Moderator band with multiple connections with anterior papillary muscle arising from the lower segment of crista supraventricularis



Fig.4 Septoparietal trabeculations extending from the anterior margin of the septomarginal trabeculation

According to P. Parto et al the macroscopic and microscopic studies revealed that, the moderator bands are found in different position in the right and left ventricles in the ostrich heart. In the right ventricle, there is one musculo-tendinous moderator band about the base of the ventricle, which extends from the interventricular septum to the muscular stalk of the muscular valve. It was single and sometimes branched.⁹

Similarly Camila Ribeiro Leao et al observed septomarginal

trabecula in goats consisting of a third order fleshy trabecula that was present in 69% of the specimens¹⁰. The apical and septoparietal trabeculations were much coarser in the right ventricle of the pig compared with man.¹¹

According to F. Bojsen-moller and J. Trandum-jensen "The right bundle branch of the conducting system in 19 pig hearts was traced through part of the interventricular septum and through the moderator band as far as the base of the anterior papillary muscle".¹²

The interventricular septum is formed by the fusion of

three structures. The primary fold at the apex of the heart progresses proximally, becoming the trabecular portion of the interventricular septum. The inlet septum arises posteroinferiorly and fuses with the trabecular portion, forming the septomarginal trabecula (moderator band). The infundibular septum arises from the downward extension of the conal ridge. The conal ridge fuses with the endocardial cushions to form the membranous portion of the interventricular septum. So the developmental morphology of moderator band might help in understanding and surgical corrections of the defects pertaining to interventricular septum.

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