



MICROANATOMICAL STUDIES ON THE MODERATOR BAND (TRABECULA SEPTO MARGINALIS) OF HORSES (*EQUUS CABALLUS*)

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Abstract

The moderator bands from six adult horses over two years of age were utilised for histological studies. The moderator band (trabecula septomarginalis) was composed of an outer thick endocardial covering, Purkinje fibres, ordinary myocardial fibres, blood vessels and nerves. The endocardium was thick and consisted of an endothelial covering and an underlying connective tissue of collagen, elastic and a few reticular fibres. The Purkinje fibres were large, irregular cells with centrally placed nuclei. It was present either in the myocardium or in the subendocardium. The myocardial fibers were striated and had a centrally placed nuclei. The intercalated disks were noticed in both myocardial fibers and Purkinje fibres. Blood vessels of various sizes and nerve fibres were also noticed.

Key words : Moderator band, Purkinje fibres, Myocardial fibres

The moderator band (trabecula septomarginalis) is considered to prevent over distention of the ventricles (Sisson and Grossman, 1961). The artery of the moderator band can play a key role in collateral circulation following the obstruction of the epicardial coronary arteries (Reig *et al.*, 2000) in human heart. The right bundle branch of the conducting system of the heart passes down in the interventricular septum and continues by way of the moderator band to the base of the anterior papillary muscle. From here branches

are issued to the subendocardial plexus of Purkinje fibres and pass to the conus arteriosus to the free wall of the ventricle and to the septum (Yoshida *et al.*, 1991). In horses, the moderator band is an important structure to prevent over distension and also for its vascular and conduction elements as well. The literature available on the histological structure of moderator band in horses is scanty and hence the present study was undertaken.

Materials and Methods

The moderator bands from six adult horses over two years of age were collected from the postmortem room of the Department of Veterinary Pathology, Madras Veterinary College, Chennai. The tissues were fixed in buffered formalin and Bouin's fluid and further processed for histological sectioning and staining.

Results and Discussion

The moderator bands of horse consisted of a thick outer endocardial covering, Purkinje fibres, ordinary myocardial fibres, blood vessels and nerve fibres (Fig. 1) as noticed by Prasad and Sinha (1979) in buffaloes and Fawcett (1994) in bovines.

The endocardium was thick and consisted of an outer endothelial layer situated over a fibro-elastic membrane, as observed by Bone (1982) and Dellmann and Eurell (1998) in animals and Bardosi *et al.* (1990) in human hearts. Below the endothelium a thick layer of subendothelium composed of collagen, elastic

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and a few reticular fibres were noticed. It is contrary to the findings observed by Prasad and Sinha (1979) in buffaloes, where the subendothelial connective tissue was greatly reduced.

The inner layer of connective tissue or the subendothelial layer was dense and thick. The outer layer or the subendocardial layer was thin at some places and thick at other places. The subendocardial connective tissue layer was loose and consisted of blood vessels and Purkinje fibers at some places. This is in agreement with the findings of Ham (1979) in human beings and Dellmann and Eurell (1998) in animals. As observed by Dellmann and Eurell (1998) in animals, the connective tissue fibres of the endocardium was continuous with that of the myocardium.

The Purkinje fibres were large irregular cells present either in the middle of the moderator band as in buffaloes (Prasad and Sinha, 1979) or within the myocardium (Fig. 2) or in the subendocardium (Fig. 1) as observed by Ansari *et al.* 1999. The sarcolemma of the

Purkinje fibres was thicker than the ordinary myocardial fibres as spotted by Prasad and Sinha (1979) in buffaloes.

The Purkinje fibres were seen mostly in groups. They were all surrounded by a thick connective tissue network or capsule which consisted of blood vessels. But the connective tissue was not noticed in between the individual Purkinje fibres within a group (Fig. 2) as observed by Ansari *et al.* (1999) in sheep heart, and Muir (1965) in human heart. The myofibrils of the Purkinje fibres were dispersed around the periphery with a vacuolated appearance in the centre of the cell (Fig. 3) as observed by Ham (1979) in human beings. The nuclei of the Purkinje fibres were round to oval and centrally placed, surrounded by a vacuolated surface. This is in agreement with the findings of Ham (1979) who recorded that the vacuolated space was occupied by the glycogen.

The ordinary myocardial cells were smaller than the Purkinje fibres (Fig. 2). They showed striations and had a centrally placed

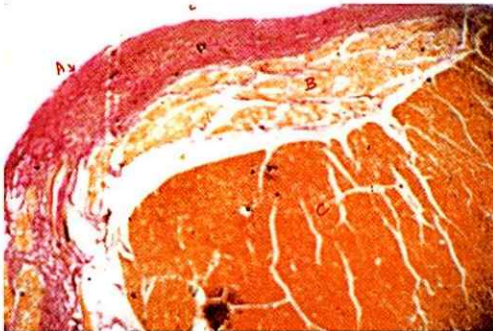


Fig. 1. Moderator band of a two year-old horse showing collagen fibres of the endocardium. Van Geisons x 125
A. Endocardium B. Sub endocardial Purkinje fibres
C. Myocardium.

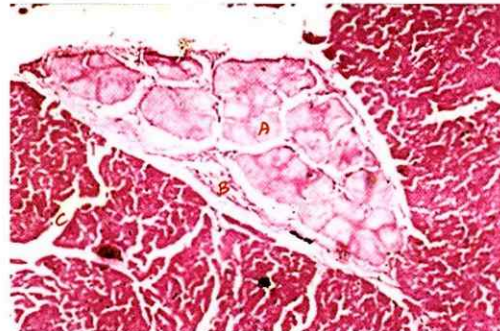


Fig. 2. Moderator band of a three year-old horse showing Purkinje fibres and myocardium. H & E X 250
A. Purkinje fibres B. Capsule around the Purkinje fibres
C. Myocardium.

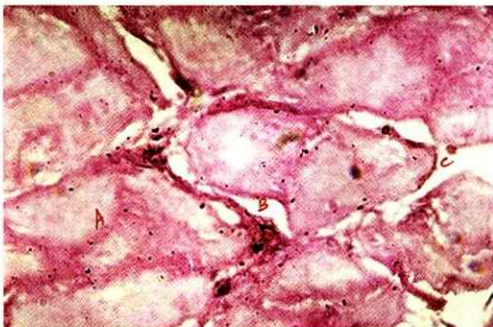


Fig. 3. Moderator band of a three year-old horse showing three sarcolemmal portions of Purkinje fibres. H & E X 500
A. Intercalated disk sarcolemma B. Internal sarcolemma
C. External sarcolemma



Fig. 4. Moderator band of a four year-old horse showing myocardium. H & E x 250
A. Myocardium B. Blood vessels

round or oval nuclei. The intercalated disks were also noticed comparable to the observations of Fawcett (1994) in human beings. Individual cardiac muscle fibres were surrounded by highly vascular connective tissue network similar to the endomysium as observed by Craigmyle (1986) in human beings. Copenhaver (1964) recorded that in human heart, between the bundles of muscle fibres, there were coarser collagenous fibres and elastic fibres.

In the present study cardiac muscle fibres were divided into bundles in the centre of the moderator band. But below the endocardium the muscles fibres were tightly packed without any fascicular arrangement.

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- Nunez - Duran (1981) noticed that the arrangement of Purkinje fibres made it possible to distinguish three sarcolemmal portions in each cell. The intercalated disk, the internal sarcolemma and the external or surface sarcolemma is in direct contact with the connective tissue. Same observations were made in the present study also. (Fig.3).
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