A Histological Study on the Coronary Artery of the Indigenous Black Bengal Goat in Bangladesh

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Abstract: The coronary artery of the black Bengal goat was studied by light microscopy. The wall of the coronary artery consisted of the tunica intima, tunica media and tunica externa. The tunica intima consisted of a single layer of flattened endothelium. The tunica media was well-developed and composed of mainly of smooth muscle cells together with some fine elastic fibers. The tunica externa consisted of predominant collagen fibers, and some elastic fibers and smooth muscle cells. Elastic fibers in the tunica externa formed a circular arrangement around the tunica media. Sex differences were not observed. The media with well-developed smooth muscle cells may be responsible for changes in functional physiological conditions of the heart.

Key words: black Bengal goat, coronary artery, histology

It has long been known that the pathogenesis of atherosclerosis is the primary cause of coronary heart disease in humans. Atherosclerosis is widely prevalent arterial lesions characterized by patchy thickening of the tunica intima, resulting from the deposition of cholesterol and lipid materials within the tunica intima and also in the media of large and medium sized arteries [10, 13]. A histological study on the coronary arteries in human has been reported [12]. Although histological studies on the arterial walls of some domestic and laboratory animals were described in our previous reports [3–5], no such work has been carried out on the coronary arteries of indigenous domestic and laboratory animals. Therefore, the present study was undertaken to clarify the histological characteristics of coronary arteries in black Bengal goats in detail, and to compare them with the histology of other muscular arteries in mammals.

A total of 12 adult apparently healthy black Bengal goats, local to the Mymensingh district were used in the study (Fig. 1). The average body weight of the animals was within the range of 12–15 kg. They were maintained at the Laboratory of Anatomy and Histology, Bangladesh Agricultural University and provided with food and water ad libitum. All the animals were anesthetized with sodium pentobarbital (Nembutal® 25 mg/kg body weight) and sacrificed by exsanguination from the carotid artery. The vascular system was

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flushed with physiological saline followed by 10% buffered neutral formalin. The thoracic cavity was opened and the heart was surgically excised. Small pieces of coronary arteries (about 1 cm³) from both right and left sides of the heart were dissected out (Fig. 2) and immediately fixed in the same fixative. The tissues were dehydrated in a series of ethanol baths and routinely embedded in paraffin wax. They were sectioned at 5 µm. Four staining methods were used: Meyer’s hematoxylin and eosin for general histological study, Weigert’s elastica Van Gieson for elastic tissues, Weigert resorcin fuchsin for smooth muscle cells, and Azan for collagen fibers [11]. After staining, the tissues were observed with a light microscope (Olympus, Japan). The diagram and photographs were made for illustrating the results.

As has been reported by many investigators, the arterial wall in the present study was of a muscular type and consisted of the tunica intima, tunica media and tunica externa [1–3, 6, 7, 9, 14].

The tunica intima of the coronary artery in black Bengal goats was the innermost layer of the three tunics and consisted of a single layer of flattened endothelium resting on the internal elastic membrane. The subendothelial layer was absent (Figs. 3–5). Similarly, the subendothelial layer is absent in the muscular arteries of swines [4, 14], Wistar rats [3], and dogs [5]. Buch [8] reported that the subendothelial layer disappears at the peripheral muscular arteries. Our present study agrees well with that of Buch [8].

The tunica media was the middle layer of the arterial wall and was composed of predominant smooth muscle cells and a few fine elastic fibers. The elastic band or lamina was completely absent. The tunica media of muscular arteries in human and other mammals is composed of circularly arranged smooth muscle cells and some
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The internal elastic lamina or membrane of the tunica media was prominent in the black Bengal goat, while the external elastic lamina was indistinct or absent (Figs. 3–5). Similar morphological characteristics have been observed in the muscular arteries of Wistar rats [3], Japanese swines [4] and dogs [9].

The tunica externa was the outermost layer of the arterial wall and was composed of predominant collagen fibers, a few elastic fibers, smooth muscle cells, blood vessels and nerves. Coarse elastic tissues were comparatively abundant on the inner side of the tunica externa, and they surrounded the tunica media in the form of circular arrangements (Figs. 3–5). A similar histological character was observed in the muscular arteries of dogs [9], but not observed in muscular arteries of Wistar rats [3], where no such arrangement of elastic tissues was reported. The tunica media of the coronary artery of the black Bengal goat was thickest among the three tunics, whereas the tunica media of muscular arteries in miniature swines [14] and Wistar rats [3] was thinner than the tunica externa.

In conclusion, it is suggested here that every artery has different histological structures at different levels.

The tunica media of the coronary artery was composed of smooth muscle cells. Due to its special characteristics, the smooth muscle can adjust or adopt with the physiological condition of the body. Therefore, the presence of smooth muscle cells in the media of coronary arteries might be responsible for changes in physiological conditions of the heart.

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