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Some Observable Changes of Coronary Arteries Seen in Human Cadavers- Student Point of View

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Abstract : *Human cadavers are peerless source of understanding the human anatomy, where we get precise hands-on experience. Often these cadavers are also a rich source of learning anatomical variations, birth defects or anomalies including surgical aspects of anatomy, which enhance the students learning in the direction of clinical applications. Cardiac pathology especially coronary artery disease is one of the frequent causes of natural death among donated cadavers. By considering this, the present study of histo-morphology of coronary artery may help the pre-clinical students to realize about atherosclerosis, plaques, arterial blockade and stenosis etc. in the coronary arteries.This article is mainly intended to motivate the basic student learners to record all such observations including congenital defects to pursue their interest in the respective subjects through problem based learning methods.*

Introduction:

Cardiovascular system is the earliest system to develop in the fetus. Its function starts by the age of 23 day of intrauterine life.Cardiovascular diseases especially of coronary artery are one of the major causes of death in the developed countries.Its incidence is increasing in the developing countries also, because of the changing lifestyle. Rapid urbanization, sedentary life style, hypertension, diabetes mellitus etc. are the major precipitating factors for the coronary diseases. Atherosclerosis is one of the important changes which commonly observed in the medium sized coronary arteries. Type A personalities are more prone in the development of coronary artery disease.

Methodology:

Ten male cadavers from the department of the Anatomy USM-KLE were taken to study the histology of right and left coronary arteries in the heart. The gross anatomy of both the coronary arterial pattern was observed as usual. All the cadavers were aged around 60 years. Small segment of right and left coronary artery were cut 1 cm distal to its origin from the ascending aorta. The artery was fixed in 10% formalin and it was cleaned from debris attached to it. Later was subjected to histological processing and microtome sectioning. Sections were taken at the 4 microns thickness, followed by H & E staining.

Observations:

The histology of arterial sections shows separation of layers in tunica media in three samples (Fig: 3, 4 &5) in each of right and left arteries. Three of the vessels one right and two left were showing thickened intimal layer with reduced lumen size with accumulated thrombus(Fig: 2&4). In most of the coronary arterial wall was showing atherosclerotic plaques, and calcification (Fig: 1). They were showing occlusion almost filling the lumen space. But two right arteries and three left were free from any such appreciable changes in any layer. In all the specimens adventitia showed no significant changes. Some of the obviously observed differences are tabulated below

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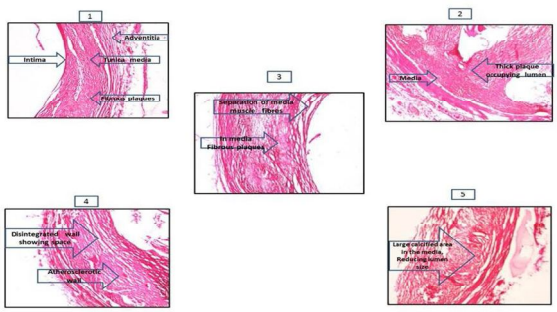
Wall thickness comparison				
Coronary artery	Tunica Intima	Tunica Media	Tunica Adventitia	No change in any layers
Right	+++ (3 Right)	+++ (3 Right)	----	2 Right
Left	+++ (3 Left)	+++ (3 Right)	----	3 Left

Histology: Coronary Arteries



Discussion:

Many studies have been done on the coronary arteries to render effective diagnostic and therapeutic interventional procedures. Rapid progress has been made in this direction in the last few decades. A detailed normal study of coronary arteries would be of use to cardiologists and interventional radiologists to predefine the abnormalities by invasive and non-invasive techniques.[1] Congenital, inflammatory, metabolic and degenerative diseases may affect the coronary circulation which enhances the cardiac surgical repairs and understanding of the basic anatomy and histology to improve the operative outcomes.Atherosclerosis is the progressive disease involving mainly coronary arteries. The sclerotic plaques are deposited in the intimal layer of the arteries. This leads to narrowing of the lumen producing ischemia of the heart. Many studies have been done on histo-morphology of coronary arteries. Gross et al(1934) described the histology and gross anatomy of coronary arteries and their branches in human hearts. In 1975, Moore and Ruska observed the fine structure of capillaries and small arteries.[2]

In our studies the tunica media showed atherosclerotic changes in 12 specimens. Out of all the three layers, most of the atherosclerotic changes like calcifications, fibrosis etc. seen in the tunica media layer only. We have observed atheromatic plaques protruding from the intimal layer, into the cavity of lumen causing reduced space for the vascular blood flow. But the adventitial layers have shown no significant changes. Changes in these two layers of the arterial wall may be contributing for the cardiovascular risk in susceptible individuals.

Parker (1958) studied the coronary arteries by electron microscopy.[3]Boucek et al (1963) reported the relation between microanatomy and functional properties of coronary arteries in dog. Spiro and Weiner (1963) narrated the fine structure of coronary arteries.[4] Histological study of coronary arteries in different mammals were carried out by Kumar Keshawa (1978).[5]He found that thickness of the collagen fibers in the branches of the coronary arteries in different animals like dog, buffalo, rabbit, goat, pig and including human being was relatively dense against the main coronary artery. It was

found that the relatively dense arrangements of collagen fibers were noted against the main coronary artery[6]. This would be the prominent change adding to increased risk of CAD.

Gregory A. Fishbein, BS; Michael C. Fishbein, MD there are many types of arteriopathy mentioned in the literature are including atherosclerosis, Monckeberg medical calcific sclerosis and arteriolosclerosis[7].The structure of the vessel wall changes as the person's age advances. The changes that develop with aging lead to atherosclerosis.[8]Progression of the atherosclerosis are silent until the full blown coronary artery disease manifests clinically.The incidence of coronary artery disease is more in males than in females until 4th decade.[9]Upto fourth decade female hormone estrogen may be the protecting factor which affects lipid metabolism by slowing down the process of atherosclerosis in coronary arteries.[10] In a study conducted by Dhallu Choudary in 2003 revealed that the mean lumen diameter of the vessels in males was wider as compared to females.[11]

Often the anomalous origin and branching pattern of these arteries were seen to be associated with cardiovascular risk. According to Allard C Vanderwal atherosclerosis of the coronary artery can lead to different degrees of severity of angina pain to sudden cardiac arrest especially in adults. These vessels are showing substantial changes with ongoing ageing process[12] Deopujari R and Dixit A revealed that the thickness of tunica intima was found to be increased significantly in cadavers aged between 40-50 years. Thickness of tunica media was found to be increased in cadavers aged 40 years and above. But no significant gross changes were noted in the thickness of tunica adventitia [13]. These observations from various authors in the histo-morphology study of the coronary vessel may be showing variable changes, depending on the constitution of the individuals. Clinical studies have mentioned relative risk in right coronary artery is more when compared with left one, where the males are more prone for CAD (coronary artery disease) than females. Such observations and correlation certainly helps students/learners to understand its clinical significance and problem based applications.

Conclusion; Coronary artery disease is a most prevalently seen condition in the society. Coronary arteries are more prone to show structural changes especially with the advancing age. Most of the cadavers procured for dissection are frequently showing such structural changes which is worth to note for the preclinical learners. Certainly such observations and keeping their records will inculcate an idea among the students for their active learning.

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