Anatomical Multiple Variations Of Coronary Arteries In Human Hearts- A Cadaveric Study From Rajasthan.

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ABSTRACT:

Coronary artery disease is one of the major causes of death in developed as well as developing countries. The increasing use of diagnostic and therapeutic interventional procedures necessitates that a sound, basic knowledge of the coronary artery pattern is essential.
The present study was undertaken in the Department of Anatomy, SMS Medical College included 100 cadaveric human hearts. After simple dissecting procedure coronary arteries were traced and their variations were noted.
Right coronary artery was originating from right anterior aortic sinus in 94% of the total human hearts and in 3% cases from left anterior aortic sinus. It terminates at the point between right border-crux in 80% cases. The left coronary artery bifurcated in 64% cases also, quadrifurcation was observed in 10% of hearts. It gets terminated at anterior apex in 68%, and in 6% cases it reaches upto > 5 Cms up in the posterior interventricular sulcus.
Thus, the precise knowledge of coronary arteries is required for the angiographers and cardiothoracic surgeons for an efficient management of coronary disease and other cardiac ailments.

Index terms: quadrifurcation, coronary arteries, pentafurcation

1.1 Introduction- Coronary artery disease has become one of the major causes of death in developed as well as developing countries. In present times, a sound basic knowledge of the coronary artery pattern is essential because of the increasing use of diagnostic and therapeutic interventional procedures.

Much progress has been made in the last few decades than in all foregoing medical history in the management of cardio-vascular diseases. Due to introduction of newer surgical techniques, in-correctable lesions have been controlled. Knowledge of the normal and variant anatomy and anomalies of coronary circulation is necessary in the management of congenital and acquired heart diseases. Hettler stated there are three types of coronary circulations viz. left coronary artery dominance, right coronary artery dominance and co-dominance. Abnormal origin and distribution of the coronary arteries are one of the causes of sudden death in young and adult patients, along with physical exertion.
Coronary artery variations are important from clinical and surgical point of view. Adequate knowledge of these variations with regard to source, and incidence is important for the interpretation of coronary angiography, stenting procedures and surgical myocardial revascularization. The present study intends to establish variations in the branching patterns for the coronary arteries in Rajasthan. Though the variations in branching pattern have been reported for other parts of India and world, the incidence has not been reported for Rajasthan. This knowledge has significance as these variations have anatomical, pathophysiological diagnostic and therapeutic implications. Although numerous data on the variations of the coronary arteries have been reported, further exploration in this field would still enrich the knowledge on them and it is also essential in view of their great clinical significance.

1.2 Material and method- The study was conducted in the department of Anatomy, SMS Medical College, Jaipur. This was done on cadaveric human hearts which were dissected to trace the variations in coronary arteries. Ethical clearance for the study was obtained from the Institutional ethical committee. Total 100 human hearts of different age groups and of either sex were studied. The hearts were dissected out from the cadavers after giving two longitudinal incisions in the right and left parasternal region extending up to sternoclavicular joints and joining them with two transverse incisions above and below the suprasternal notch and xiphisternum respectively. The pericardium and the vessels attached to the heart were carefully preserved in 10% formalin for dissection at a convenient time. Both the coronary arteries and their branches were exposed and highlighted using red fabric color and the data was recorded.

1.3 Observation And Results- The branching pattern and distribution of coronary arteries was dissected and observed as under- right coronary artery was originating from right anterior aortic sinus in 94% of the total human hearts and in 3% cases from left anterior aortic sinus. It terminates at the point between right border-crux in 80% cases. The left coronary artery bifurcated in 64% cases also, quadrifurcation was observed in 10% of hearts. It gets terminated at anterior apex in 68%, and in 6% cases it reaches upto > 5 Cms up in the posterior interventricular sulcus.

TABLE- 1.3.1- SHOWING VARIATIONS OF RIGHT CORONARY ARTERY
(A) ORIGIN OF RIGHT CORONARY ARTERY

SITE	OBSERVATION (%)
Right anterior aortic sinus	94
Left anterior aortic sinus	03
Posterior aortic sinus	01
Directly from aorta	02

TABLE- (B)-TERMINATION OF RIGHT CORONARY ARTERY

SITE	OBSERVATION (%)
Right Border	6
Right Border – Crux	80
Crux	9
Crux - Left Border	3
Left Border	2

Fig-1- Showing termination of right coronary artery between crux and left border of heart.

TABLE- 1.3.2- ORIGIN OF LEFT CORONARY ARTERY

SITE	OBSERVATION (%)
Right anterior aortic sinus	00
Left anterior aortic sinus	95
Posterior aortic sinus	03
Directly from aorta	01
Pulmonary trunk	01

Fig-2. Showing origin of Left coronary artery directly from Aorta without its divisions

TABLE -1.3.3- DIVISIONS OF MAIN TRUNK OF LEFT CORONARY ARTERY

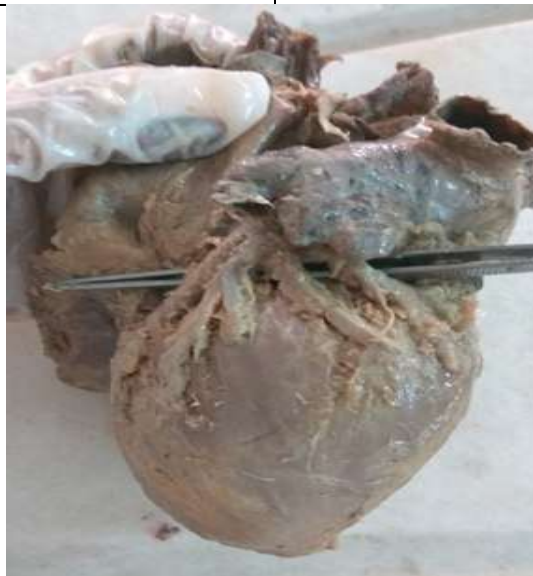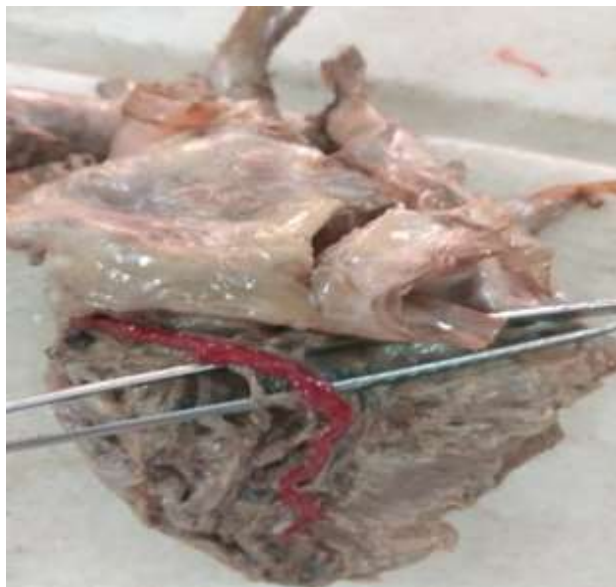| BRANCHES	OBSERVATION (%)
One Branch	2
Bifurcation	64
Trifurcation	20
Quadrifurcation	10
Pentafurcation	4

fig-3- showing Quadrifurcaton of Left coronary artery

TABLE -1.3.4 -TERMINATION OF LEFT ANTERIOR DESCENDING ARTERY

TERMINATION SITE	OBSERVATION (%)
Anterior Apex	68
Posterior Apex	19
2-5 Cms up PIVS	7
> 5 Cms up PIVS	6

TABLE-1.3.5 – SHOWING DOMINANT CIRCULATION

DOMINANCE	OBSERVATION (%)
Right	79
Left	17
Co-dominance	04

Figure -4- showing Left Dominance

1.4. DISCUSSION- Varied number of variations have been reported in the branching pattern of coronary arteries in various researches. Of all, left coronary artery shows many variations in its origin, branching pattern and termination. In case of trifurcation of left coronary artery, we can call the third artery as median artery. This branch presents various patterns of collateral blood flow, which creates an importance in coronary insufficiency.

1.5 CONCLUSION- The Knowledge about the variations of coronary arteries is helpful for cardiologists and radiologists in performing various procedures like coronary angiogram, coronary angioplasty, and bypass grafting surgeries etc. Thus, this study contributes to anatomical variations of coronary arteries which will help our surgeons.

CONFLICT OF INTEREST- NO

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