

A Cadaveric Study on Coronary Arteries in Human Heart and Its Variations

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Abstract

Background: Coronary" is derived from the Latin word co-ro-ne. Corona translates to "Crown." Situated in the center mediastinum, the heart is a conical, muscular, hollow organ. It is protected by the pericardium. Its four chambers are the left and right ventricles, as well as the right and left atria. The coronary sinus, as well as the superior and inferior venae cava, supply deoxygenated blood to the right atrium. **Material and Methods:** The Department of Anatomy provided 60 formalin fixed hearts, chosen at random from cadaveric hearts used for dissection instruction and stored heart specimens. **Results:** The current study examines the number, origin, external diameter, branching pattern, degree of termination, and dominance of coronary arteries in 60 cadaveric heart specimens. The coronary arteries' origin, course, and branching pattern were found to vary. **Conclusion:** Coronary artery disease is one of the main causes of mortality. Risk factors include hectic lifestyles and inactive lifestyles. The prevalence of inferior wall myocardial infarctions makes coronary dominance important. **Keywords:** RCA, LCA, PIVA, PIVS.

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INTRODUCTION

Located in the center mediastinum, the heart is a hollow, muscular organ with a cone shape. The pericardium surrounds it. The heart, which circulates blood throughout the body, is fed by the coronary arteries. the coronary arteries, both left and right. (1). Starting in the anterior aortic sinus, the right coronary artery (RCA) joins the left coronary artery's (LCA) circumflex branch at the terminus. The right coronary artery has the following branches: ventricular (right conus artery and right anterior ventricular branches), atrial anterior (sinus-atrial node artery), right posterior ventricular, posterior interventricular, and right posterior atrial.^[1]

The left posterior aortic sinus is where the left coronary artery originates. It divides into the diagonal, circumflex, and anterior interventricular arteries.^[2] The blood supply to the ventricles' diaphragmatic surface is significantly impacted by changes in the coronary arteries' branching pattern. The relative dominance is explained in terms of the posterior interventricular artery's (PIVA) origin. It is appropriate dominance if PIVA comes from RCA. PIVA is left-handed if it is developed from LCA. If both LCA and RCA result in PIVA, then it is called balanced pattern. Understanding normal and variant anatomy and abnormalities of coronary artery circulation is vital to improve results in the treatment of heart disorders.^[3] When evaluating the prognosis of coronary artery disease, dominance is crucial.^[4] In contrast to left dominance, right and mixed forms of dominance are not fatal.^[5] The goal of the current study is to monitor the beginning and end of PIVA. Coronary dominance is described by the origin of PIVA.

MATERIALS AND METHODS

Source of data: The Department of Anatomy provided sixty (60) formalin-fixed hearts—preserved heart specimens and cadaveric hearts used for dissection training—that were chosen at random. Over the course of two years, the fixed heart specimens were analysed and dissected.

Study design: Cross-sectional study

Sample size: According to a study on "Variations in coronary arterial system in cadaveric human heart" [6], 23% of the hearts were left dominant and 66% were right dominant. The required sample size was determined to be 60 specimens with 80% power and 95% confidence level.

Steps of dissection: By removing the ribs and sternum, the hearts were extracted from the cadavers. The major vessels were doubly ligated and then transected. The heart and major vessels were extracted from the pericardial cavity after the parietal pericardium was cut. To remove blood clots, all hearts were cleansed with running tap water. A 10% formalin solution was used to repair hearts. Every heart has been tallied. The coronary arteries and their branches were examined in every heart. The coronary sulcus's fat was removed. The origin of the right coronary artery is traced to its turn on the back of the heart

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After that, it was dissected along its branches in the back of the heart. The branches of the left coronary artery were identified. The origin of the PIVA, which runs along the posterior interventricular groove, was located. PIVA was followed through on until termination. There was no discernible difference in origin or insertion. The origin of PIVA, RCA, LCA, or both was used to define coronary dominance. The information was totalled. A statistical study was carried out.

Inclusion criteria: Heart specimens with intact coronary arteries that were fixed with formalin regardless of age, gender, or race.

Exclusion criteria: Hearts with damaged or lacerated coronary arteries, hearts undergoing coronary artery surgery, and maldeveloped hearts were not included.

RESULTS

Present study is carried out on 60 specimens of cadaveric hearts and observed for number, origin, outer diameter, branching pattern, level of termination and dominance of coronary arteries. Variations were observed in the origin, course and branching pattern of coronary arteries.

Number of Coronary Arteries

Table 1: showing number and percentage of coronary arteries

No. of coronary arteries	Specimen	Percentage
2	53	88.3
3	7	11.7
4	0	0
Total	60	100

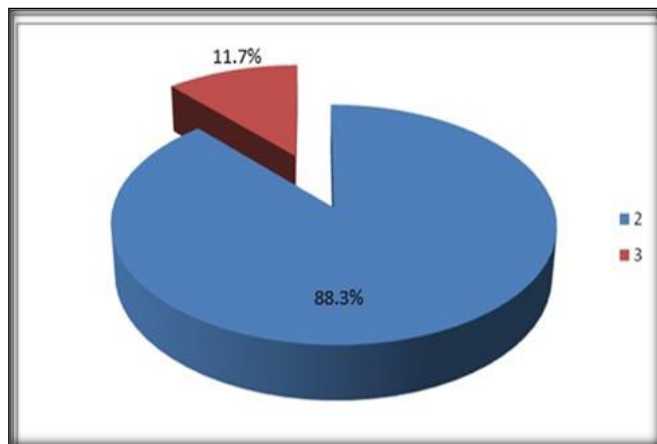
Out of 60 specimens analysed there were 2 coronary arteries in 53(88.3%) instances, 3 coronary arteries in 7 (11.7%)cases

and in none of the sepecimens there was 4 coronary arteries.

Origin of Coronary Arteries

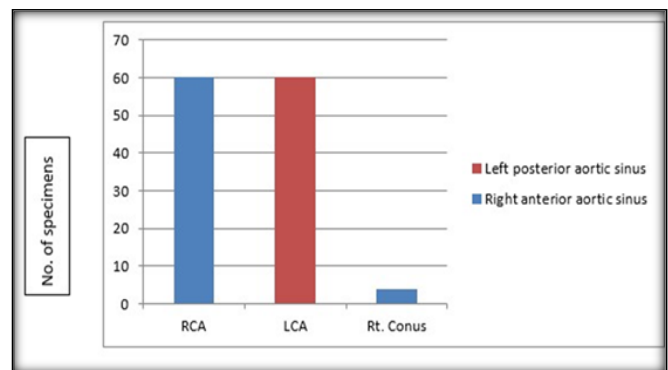
Table 2: showing origin of coronary arteries

Origin of	Right anterior aortic sinus	Left posterior aortic sinus	Percentage
RCA	60	0	100
LCA	0	60	100
Rt. Conus	4	0	6.7



In all the 60 instances RCA was arising from right anterior

aortic sinus while LCA was arising from left posterior aortic sinus. In 4 instances the right conus artery originated from the right anterior aortic sinus. There was no anomalous origin of RCA and LCA.



Level of coronary ostium:

Table 3: Prevalence of Microalbuminuria in the Study Population

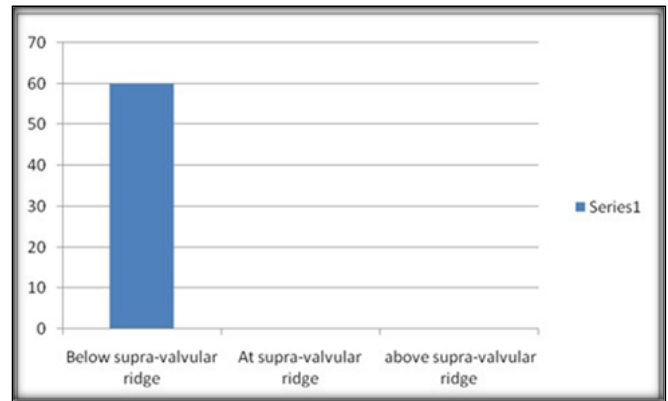
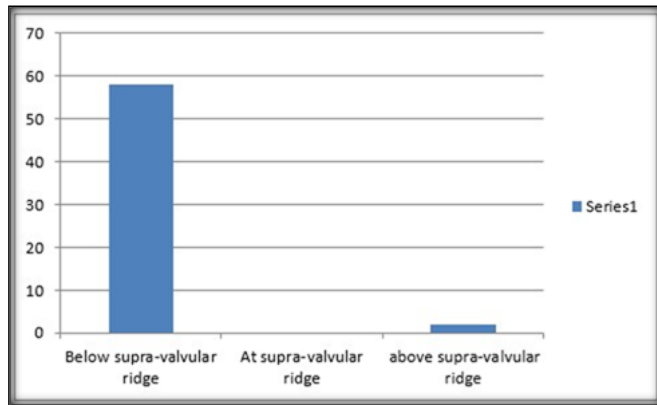
Level of coronary ostium	Left	percentage
Below supra-valvular ridge	58	96.7
At supra-valvular ridge	0	0
above supra-valvular ridge	2	3.3

Level of ostium of LCA was below supra-valvular ridge in 58 (96.7%) specimens, above supra-valvular ridge in 2 (3.3%)

specimens and at supra-valvular ridge in none of the specimens.

Table 4: showing level of coronary ostium of RCA

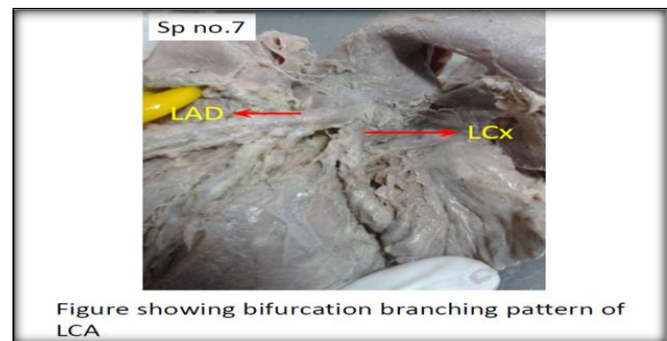
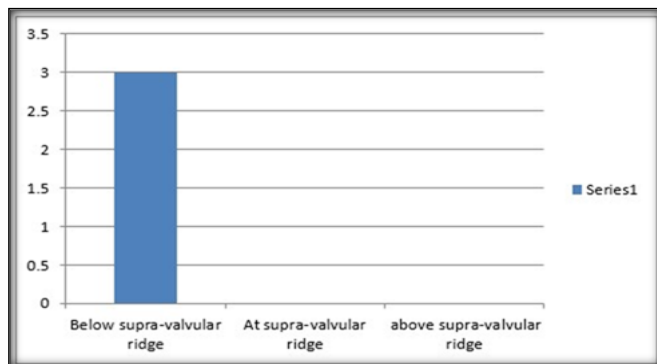
Level of coronary ostium	Right	Percentage
Below supra-valvular ridge	60	100
At supra-valvular ridge	0	0
above supra-valvular ridge	0	0



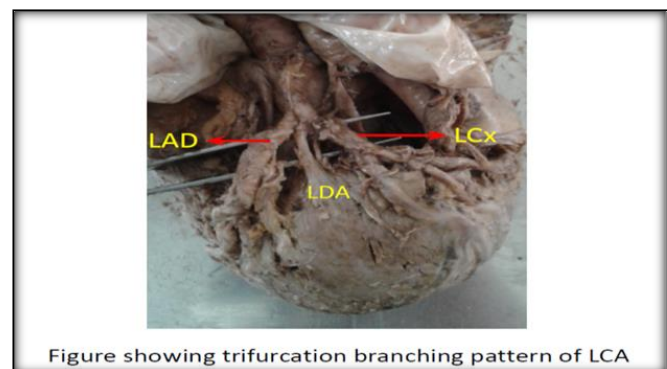
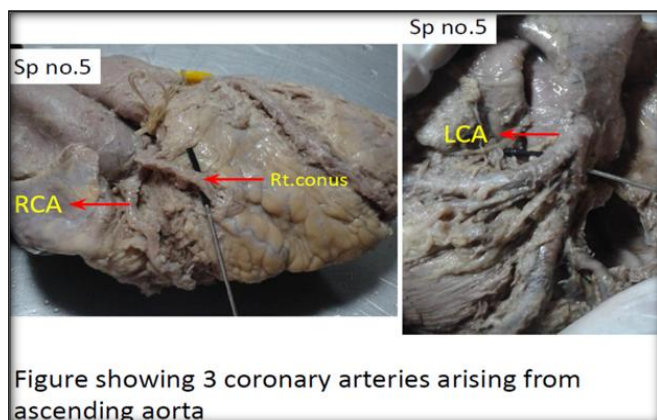
In all 60(100%) specimens the level of ostium of RCA was below supravalvular ridge and in none of the specimens it was at or below supravalvular ridge.

Table 5: showing level of coronary ostium of Right conus

Level of coronary ostium	Rt. Conus	Percentage
Below supra-valvular ridge	3	5
At supra-valvular ridge	0	0
Above supra-valvular ridge	0	0



Level of ostium of Right conus was below supravalvular ridge in 3 (5%) specimens and absent in remaining 57 specimens.



DISCUSSION

The heart beats about one lakh times every day. Around the third week of embryogenesis, the coronary arteries that nourish the heart begin to form in utero. Vasculogenesis, angiogenesis, arteriogenesis, and remodelling are the stages of development. Variations and anomalies are common because of the complexity

involved in the formation of coronary arteries.⁷ These arteries' abnormal origin has significant clinical symptoms. Heart dominance patterns are important in a number of clinical conditions. There are more deaths when left dominance is compared to right and mixed types of dominance. Dominance is associated with cardiac inferior wall infarcts. ⁵ The degree of left ventricular myocardial damage can affect how these infarcts turn out. The left ventricle's blood supply provides the basis for this. The left coronary artery supplies the majority of the left ventricle in right-dominant hearts. However, the left coronary artery supplies even more area in left-dominant hearts. Sudden

death can also result from certain coronary artery abnormalities, particularly in young athletes.⁸ Therefore, in order to treat congenital, acquired, metabolic, or degenerative heart illnesses, doctors must have a thorough understanding of the typical and variant morphology of coronary arteries.³ The current investigation included 60 specimens, and 55 cases (91.7%) showed right coronary dominance, which is consistent with previous research. ^{3,9,10,11,12}, The current study's incidence of left coronary dominance was 6.7%, which was likewise consistent with previous research.^{10,11,13,14} 1.7% of the participants in this study had co-dominance. The current study's findings are compared to those of several other writers as follows.

Table 6: Comparison of the origin of PIVA.

Authors	Origin of PIVA		
	RCA (%)	LCA (%)	BOTH (%)
Padmashree et al 2014 [12]	89%	11%	0%
Hirak Das et al 2010 [5]	70%	18.57%	11.43%
Kalpana 2003 [3]	89%	11%	0%
James 1958 [13]	90%	10%	0%
Nordon D G 2012 [11]	88%	8%	4%
Ballesteros 2011 [14]	76%	6.80%	17.20%
Jyoti P kulkarni 2013 [9]	90%	10%	0%
Nagaraj 2014 [10]	90%	6.67%	3.33%
Present study	91.70%	6.70%	1.70%

Variations in sample size and a diverse racial and geographical population could be the cause of the percentage discrepancy. PIVA in this study began with RCA and ended at ¼ way down PIVS in 28.57%, ½ way down PIVS in 37.5%, ¾ way down PIVS in 23.21%, and at apex in 10.71%. Twenty-five percent of the PIVA that came from LCA ended halfway down PIVS. The remaining 75% ended halfway down the PIVS. The cessation of PIVA did not show a definite pattern as compared with the findings of the other writers.^[3,10,12]

CONCLUSION

One of the main causes of death is coronary artery disease. Stressful and inactive lifestyles are also risk factors. Because inferior wall myocardial infarctions are frequent, coronary dominance is significant. The degree of left ventricular myocardial damage determines the outcome of cardiac infarcts. Revascularisation of these arteries in block instances necessitates a thorough understanding of the coronary arteries' typical and variable structure. PIVA is particularly significant because it establishes coronary dominance. Additionally, understanding these differences is crucial for procedures like imaging using traditional catheters.

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Conflicts of interest

There are no conflicts of interest.

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