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Original Research Article

A STUDY OF CORONARY DOMINANCE PATTERN IN CENTRAL RAJASTHAN POPULATION

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Abstract

Background: Coronary arteries show wide variations among different populations. Origin of posterior interventricular artery was taken as the basis of dominance. The present study was undertaken on 200 male and female patients. Out of the two hundred patients, 178 presented with right dominant circulation, 21 had left dominance and one show codominance or balanced dominance. The results of the study were compared with authors and variations were noted. Aim of the study to know the coronary dominance pattern in central Rajasthan population. **Materials and Methods:** Male and female patients of age group of 30-70 years who present to the Cath lab of Cardiology Department of J.L.N. Hospital, Ajmer for coronary angiography for different indications are included in the study. **Results:** Out of 200 patients, 178 presented with right dominant circulation, 21 had left dominant circulation and 1 presented with balanced/ co-dominant coronary circulation. **Conclusion:** Since dominance pattern can affect treatment outcome and prognosis, so prior knowledge of coronary arterial dominance pattern can help cardiologists formulate better management protocols.

INTRODUCTION

The Human heart is an important organ that pumps blood throughout the body through the circulatory system. The process of circulation is necessary for continued life of the cells, tissues, and ultimately the whole organism. The cardiovascular system is the first major system to function in the embryo. The primordial heart and vascular system appear in the middle of the third week of embryonic life, but the heart actually starts functioning at the beginning of the fourth week. Since then it undergoes rhythmic and regular contractions and relaxations completing the cardiac cycle which never stops until the cardiac death. The heart is supplied by right and left coronary arteries. Each coronary artery is a vasa vasorum of the ascending aorta, because heart is developed from the fusion of two primitive endothelial tubes which represent the ventral aorta.

The term 'coronary' comes from the Latin term "Corona" meaning "Crown". The heart is normally supplied by two coronary arteries: The right coronary artery (RCA) and left coronary artery (LCA). Variability in the origin of the posterior interventricular artery (PIVA) is expressed by the term "Dominance". The term right and left "Coronary Preponderance" or "Dominance" was used to show which coronary artery irrigates the heart' diaphragmatic surface, based on the origin of the posterior interventricular artery (PIVA). Origin of PIVA from the RCA was termed 'Right Dominance'; from the circumflex artery was called 'Left Dominance'. Origin from both the RCA and the circumflex artery was known as balanced pattern.[1]

Left dominance seems to be associated with higher mortality due to acute infarction and a higher incidence of Arteriosclerosis. Because of the importance of the anatomy in the planning of coronary disease surgeries, the dominance of the circulation is a common theme for discussion in the literature.[2] The present study is undertaken to determine the pattern of coronary artery dominance in central Indian population and document its association with cardiovascular diseases.

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MATERIALS AND METHODS

This study is based on coronary angiography reports of 200 patients whose angiography was done in cardiology department of J.L.N. Medical College & Hospital, Ajmer. Reports from the Cardiology department were collected and analysed for information pertaining to the study, to find out the dominance pattern in different patients and then categorized them into right coronary artery dominant, left coronary artery dominant or balanced circulation type.

RESULTS

Out of 200 patients, 178 presented with right dominant circulation, 21 had left dominant circulation and 1 presented with balanced/ co-dominant coronary circulation.
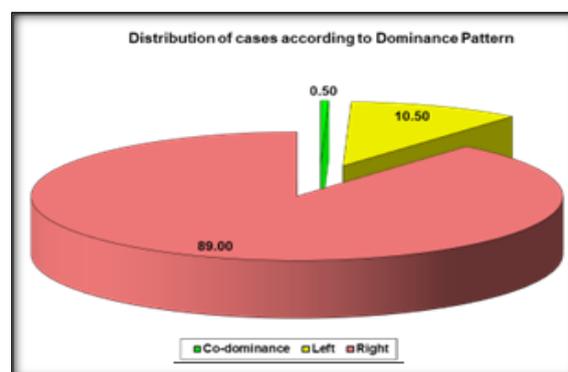

Figure 1: Distribution of cases on the basis of Dominance Pattern

Table 1: Dominance pattern and their percentages

Dominance Pattern	No.	%
Co-dominance	1	0.50
Left	21	10.50
Right	178	89.00
Total	200	100.00

Table 2: Dominance pattern range in different textbooks

Textbooks	RCA Dominance	LCA Dominance	Co-dominant
Braunwald's Heart disease	85	7.5	7.5
Harrison's Principles of Internal Medicine	85	5	10
Moore's Clinically Oriented Anatomy	67	15	18
Snell's Clinical Anatomy by regions	90	10	-
Hurst's The Heart	70	10	20

DISCUSSION

Myocardium requires a continuous supply of blood to meet its oxygen requirement, imbalance in oxygen demand and supply can lead to transient ischemic changes in myocardium or full blown ischemic heart disease. The blood supply to myocardium comes from right and left coronary arteries which arise from anterior and left posterior aortic sinuses respectively. the main trunks and first and second order branches run subepicardially along the atrioventricular (AV) groove, interventricular (IV) groove or on surface of heart deep to epicardium. Variations in coronary arterial system mainly affect diaphragmatic aspect of ventricles and reflect relative dominance of coronary arterial supply. The term dominance of coronary artery is misleading because left coronary artery almost always supplies a greater volume of tissue than right coronary artery.[3]

A study done by Vishram Singh et al,[4] the right coronary artery dominance was found in 80.58%, 11.63% had LCx dominance and 2.79% had co-dominant coronary circulation. Studies have shown that extent of coronary atherosclerosis does not depend on the type of coronary artery dominance.[5] In ACS patients left dominance will be a significant and independent predictor of high long term mortality.[6]

Coronary artery dominance has an influence on the relative contribution of different coronary arteries to total left ventricular blood flow.[7] Most of the individuals with left dominance the right coronary artery is small and fails to reach the acute margin of the heart, so a proximal stenosis of left coronary artery may result in extensive ischemia and worse consequences in a left dominant system than in right dominant system and the potential to rapidly form collaterals may be reduced in patients with left dominant system as right coronary artery is not sufficient to profuse the myocardium.[8]

In a study done by Catherine Gebhard et al,[9] the right dominance was present in 91% and left dominance in 9% and they also observed a higher incidence of coronary artery disease in left dominance patients, whereas the prevalence of normal coronary arteries was more frequent in right dominance. The pattern of coronary artery dominance varies in different regions.

According to Altaii et al,[10] right coronary artery dominance was found in 83%,left dominance was found in 14.5% and co-dominance in 2.5%.

Another study conducted by Bin Yan et al,[11] shows right dominant pattern in 90.6%, left dominance in 6.7% and co dominance in 2.7% Another study in Italy,[12] have reported the right dominant pattern in 86.6%, left dominant in 9.2% and balanced in 4.2%.

In the study conducted in Netherlands, the pattern was 9.8% left dominant and 90.2% non left

dominant.[13] In the study conducted in Rawalpindi, Pakistan the subjects were found to have 80.49% right dominance, 11.3% left dominance and 3.8% co-dominance.[14]

From the above mentioned studies, the right dominance is more prevalent and it is in accordance with our findings.

The coronary artery circulation can be categorized into three subsets- right dominant, left dominant and balanced/co-dominant.

In right coronary artery (RCA) dominance, right coronary artery after giving off posterior interventricular artery continues beyond the crux as right posterior atrioventricular branch terminating in one or several posterolateral ventricular branches that supply diaphragmatic surface of left ventricle.

In left coronary (LCA) dominance, posterior interventricular artery and posterolateral ventricular branches to diaphragmatic surface of left ventricle come from circumflex branch of left coronary artery. RCA is very small, does not reach the crux and does not supply left ventricular myocardium in this type of coronary circulation.

In balanced/co-dominant coronary circulation, the RCA gives off PIV artery while left circumflex artery provides all posterolateral branches.

In this study RCA dominance in 89% is closer to RCA dominance percentage of Braunwald's (85%) and Harrison's textbooks (85%). In this study LCA dominance in 10.50% is closer to Snell's and Hurst's data which is 10%. This study reflects that co-dominance is only present in 0.5% individuals.

CONCLUSION

Among three types of coronary circulation, right coronary dominance is most common and the second most common dominance is left dominance while balanced or co-dominance is least common. Knowledge of coronary artery variations and pathologies is important in planning the treatment and in interpretation of findings of cardiovascular diseases. The thorough knowledge of coronary dominance is essential for interventional cardiologists and cardiothoracic surgeons to plan proper intervention/ surgery for patients with coronary artery diseases.

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