

Coronary Artery Dominance: What pattern exists in Pakistani Population?

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Objective: To document the pattern of dominant coronary artery in our population.

Study Design: Case series study.

Place and duration: This study was carried out in the Cath Lab of Cardiology Department, Pakistan Institute of Medical Sciences (PIMS), Islamabad over a period of two years.

Subjects and Methods: All patients of either gender over 14 years of age who presented to the Cath lab for coronary angiography for different indications were included by convenience sampling technique. Patients with congenital heart diseases were excluded. The sociodemographic profile of the patients, pattern of coronary artery dominance (based on posterior descending artery and posterolateral ventricular artery origin from LCx, RCA or both), association of Coronary artery disease (CAD) with coronary artery dominance and association of Ramus with coronary artery dominance were all recorded on a proforma. The data were subjected to statistical analysis.

Results : Out of a total of 200 patients, 74.5 % (n=149) were males while 25.5 % (n=51) were females. The mean age was 55.17 ± 11.35 years. The age range was 20-84 years. Majority of the patients (65.56 %) were in their 5th and 6th decades of life. There was no in-hospital mortality. Right coronary artery was dominant in 60.5 % of the patient population. Ramus intermedius was found in 24% (n=48) of the patients.

Conclusion: The right coronary dominant and co-dominant pattern coronary arteries are more prevalent in our population. Age and sex have no significant association with coronary dominance.

Key Words: Dominant coronary artery. Coronary artery disease. Coronary angiography.

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Introduction

The two main coronary arteries are the left and right coronary arteries. Left coronary artery (LCA), divides into the left anterior descending artery (LAD) and the circumflex (LCx) branch. LAD supplies blood to the front of the left side of the heart. The Circumflex artery supplies blood to the lateral side and back of the heart. The right coronary artery (RCA) divides into the posterior descending artery (PDA) and acute marginal arteries. It supplies blood to the right ventricle, right atrium, Sino Atrial node and Atrio Ventricular node and variable portion of the left ventricle.¹

There are many types of classification of coronary circulation. The first type was introduced by Banchi in 1904. Hettler defined the following types: left coronary artery dominance, right coronary artery

dominance, and co-dominant.² The vessel which supplies the posterior descending artery and at least one posterolateral branch is called the dominant vessel. The RCA is dominant in 85% of patients. The RCA is non dominant in 15% of patients in which one half have PDA and posterolateral branch arising from the distal circumflex artery called left dominance and in the remaining half the RCA gives rise to PDA and the LCx provides all the posterolateral branches called co dominant circulation.¹

The pattern of dominant vessel varies in different populations. The dominant pattern has clinical significance as the ECG changes and the region of involvement in ST segment elevation myocardial infarction is different. Knowledge of coronary artery variations and pathologies is important in planning the

treatment and in interpretation of findings of cardiovascular diseases.

The present study was undertaken to determine the pattern of coronary artery dominance in our population and document its association with coronary artery disease.

Material and Methods

This Case series study was carried out in the Cath Lab of Cardiology Department, Pakistan Institute of Medical Sciences (PIMS), Islamabad over a period of two years. All patients of either gender over 14 years of age who presented to the Cath lab for coronary angiography for different indications were included by convenience sampling technique. Patients with congenital heart diseases were excluded. The sociodemographic profile of the patients, pattern of coronary artery dominance (based on posterior descending artery and posterolateral ventricular artery origin from LCx, RCA or both), association of Coronary artery disease (CAD) with coronary artery dominance and association of Ramus with coronary artery dominance were all recorded on a proforma.

The data were analysed through SPSS version 10 and various descriptive statistics were used to calculate frequencies, percentages, means and standard deviation. The numerical data such as age were expressed as Mean $\pm$ Standard deviation while the categorical data were expressed as frequency and percentages.

Results

Out of a total of 200 patients, 74.5 % (n=149) were males while 25.5 % (n=51) were females. The mean age was 55.17 ± 11.35 years. The age range was 20-84 years. Majority of the patients (65.56 %) were in their 5th and 6th decades of life. There was no in-hospital mortality. The pattern of the coronary artery dominance with age and sex has been depicted in Table I.

The distribution of coronary artery disease is

Table II: Pattern of CAD with Coronary Dominance (n=200)

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Dominant Vessel	TVCAD	LAD	Normal	Ramus	RCA & LCx	LCx	LAD & RCA	LAD & LCx	RCA	LMS	Total
RCA	58 (47.93%)	27 (22.31%)	11 (9.09%)	7 (5.78%)	7 (5.78%)	1 (0.83%)	4 (3.31%)	3 (2.48%)	2 (1.65%)	1 (0.83%)	121
LCx	16 (40.02%)	12 (30.67%)	5 (12.82%)	1 (2.56%)	0 (0.0%)	4 (10.25%)	0 (0.0%)	0 (0.0%)	1 (2.56%)	0 (0.0%)	39
Co Do	14 (35.0%)	11 (27.50%)	12 (30.0%)	1 (2.50%)	0 (0.0%)	1 (2.50%)	1 (2.50%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	40
Total	88 (44.0%)	50 (25.0%)	28 (14%)	9 (4.5%)	7 (3.5%)	6 (3.0%)	5 (2.5%)	3 (1.5%)	3 (1.5%)	1 (0.5%)	200 (100%)

Table I: Distribution of Coronary Dominance with Age and Sex (n=200)

		Dominant Vessel		
		RCA,	LCx,	Co Do
Upto40 yrs	Male	4.5 %	0	3.5 %
	Female	0	0	0
41-50 yrs	Male	14.5 %	4.5 %	5 %
	Female	5 %	1 %	1 %
51-60 yrs	Male	15 %	6 %	3.5 %
	Female	4.5 %	3.5 %	1.5 %
61+ yrs	Male	11 %	3 %	4 %
	Female	6 %	1.5 %	1.5 %
Total		60.5 %	19.5 %	20 %

depicted in Table II. Ramus intermedius was found in 24% (n=48) of the patients and the association of ramus with coronary dominance is depicted in Table III.

Table III: Association of Ramus with coronary dominance (n=200)

Ramus	Dominance Vessel			Total
	RCA	LCx	Co Dom	
Present	20.66%	38.46%	20.0%	24%
Absent	79.33%	61.5%	80.0%	76%
Total	60.5%	19.5%	20.0%	

Discussion

In our study, 60.50% RCA dominance, 19.50% had LCx dominance and 20% had co-dominant coronary circulation. There is no significant difference in dominance pattern with age or sex. The pattern of coronary artery dominance is different in different communities. In a study by Abuchaim DC et al³ in 25 human hearts the most common form of coronary circulation was found to be the right dominant. In a study in swine by Vieira TH et al⁴, arterial pattern was found to be right dominance based on crux cordis and the subsinuosal interventricular branch. In a study on pigs by Sahni D et al,⁵ the RCA was found to be

dominance in all hearts. In a genetic study with respect to the dominance pattern of coronary blood supply, two of three monozygotic twin pairs differed, while all dizygotic twin pairs were found to be concordant.⁶

Though right dominant circulation was more prevalent in our patients, CAD was more frequent among those with left dominance circulation. This finding is in conformity with what is reported in the published literature.⁷ In another study it was found that the extent of coronary atherosclerosis does not depend on the type of dominant coronary artery⁸ but in patients with ACS, left dominance is a significant and independent predictor of increased long-term mortality.⁹ Similarly the origin of the SA node artery is not related to coronary arterial dominance, but the origin of AV node artery is dependent on coronary arterial dominance.¹⁰ The presence of myocardial bridging is more related to coronary dominance, especially in the left coronary circulation.¹¹

In Kenya the RCA was found to be dominant in 82% of the hearts.¹² The RCA dominance was most prevalent, followed by the balanced type and the left coronary artery dominance in Brazilian population as well.⁸ In a study done with multi detector computed tomography (MDCT) in 322 patients in Italy left dominance was found in 8% of cases and intermediate ramus was found in 22.6%.¹³ In another study at Italy the coronary dominance pattern results were: right, 86.6%; left, 9.2%; balanced, 4.2%.¹⁴ However in a study at Karachi in Pakistani population sixty percent subjects had right dominance pattern and 15% had left coronary dominance. Whereas, 24% patients had co-dominant (balanced) circulation.¹⁵

In our study, Ramus intermedius was found in 24% cases which is similar to that reported in other populations.¹³ Further studies are required to evaluate it further.

Our study has some limitations. As all the patients studied were suffering from coronary artery disease, so it was not a true representative of general population. Most of the cases studied were males. We could not assess the exact association of CAD with coronary dominance.

Conclusion

The right coronary dominant and co-dominant pattern coronary arteries are more prevalent in our

population. Age and sex have no significant association with coronary dominance.

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