

Study of Pattern of Coronary Artery Dominance by Angiographic Method in Chennai

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Abstract: ***Background and Aims:** Coronary artery disease is one of the major causes of death in developed countries. The aim of this study was to determine the pattern of coronary artery dominance by coronary angiography method and its correlation with the extent of coronary artery disease. **Methods:** A five-month hospital based prospective observational study of 880 patients (from Dec 2017 to Apr 2018) of either gender of 18 years of age or more, eligible for coronary angiography for diagnostic purpose, were performed in this study. The patients with valvular heart disease, congenital heart disease were excluded. The sociodemographic profile of the patients, pattern of coronary artery dominance and its association with coronary artery diseases were all recorded on a proforma. The data were subjected to statistical analysis. **Results:** A total of 880 patients, 66.82% (n=588) were male and 33.18% (n=292) were female. The mean age was 59.11±11.61 years. The age range was 34-81 years. There was no in-hospital mortality. Right coronary artery was dominant in 85.5%, left dominant in 10 % and co-dominant in 4.5% of the patient population. Abnormal ECG (due to ST-T changes) was 68.18% in left dominant and 42.02% in right dominant. The chance of having coronary artery disease with abnormal ECG (due to ST-T changes) compared to normal ECG is 24 times more in left dominant and 3.875 times more in right dominant. **Conclusions:** The right coronary dominant pattern is more prevalent in our population. There is no significant association of age and sex with coronary dominance. The Left coronary dominant pattern is more associated with the presence of coronary artery diseases.*

Keywords: Coronary angiography, Coronary artery disease, Dominant coronary artery

1. Introduction

Coronary artery disease (CAD) is one of the major causes of death in developed countries. The following types of coronary circulations are seen: left coronary artery dominance (LD), right coronary artery dominance (RD), and co-dominant (CD). The vessel which supplies posterior descending artery (PDA) and at least one posterolateral branch is called the dominant vessel. The right coronary artery (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 left circumflex artery (LCx) provides all the posterolateral branches called co-dominant circulation.

Dominance pattern of the heart has got important clinical significance. LD anatomy is believed to be associated with worse prognoses for patients with acute coronary syndrome (ACS) and stable coronary artery disease. LD was found to have significantly higher mortality than RD and mixed types. Knowledge of coronary artery variations and pathologies is important in planning the treatment and in interpretation of findings of cardiovascular diseases.

2. Methods

Study Design

This was the hospital based prospective observational study.

Place and Duration of Study

Institute of Cardiology, Madras Medical College, Rajiv Gandhi Government General Hospital, Chennai during December 2017 to April 2018.

Inclusion and Exclusion Criteria

All patients of either gender of 18 years of age or more, eligible for coronary angiography for diagnostic purpose, were taken in this study. The patients with valvular heart disease, congenital heart disease, hypertrophic cardiomyopathy, below 18 years of age, showing anomalous Coronary arteries, showing entire proximal occlusion and patients who were going for pre-operative coronary angiographic for cardiothoracic surgery were excluded in this study.

Sample size and Sampling

A total of 880 patients were enrolled in the study. The sociodemographic profile of the patients, pattern of coronary artery dominance (based on PDA and posterolateral ventricular artery origin from LCx, RCA or both), association of CAD with coronary artery dominance were all recorded on a proforma. All standard views were taken during coronary angiography with special focus on left anterior oblique cranial view to document left dominant system.

Statistical Analysis

The data were analyzed descriptive statistics were used to calculate frequencies, percentages, means and standard deviation. The numerical data such as age were expressed as Mean ± Standard deviation while the categorical data were expressed as frequency and percentages.

3. Results

Right coronary artery was dominant in 752 (85.5%), left dominant in 88 (10%) and co-dominant in 40 (4.5%) of the patient population.

A total of 880 patients underwent diagnostic CAG during the specified period 588 (66.82%) were male and 292 (33.18%) were female.

Among total of 880 patients, 228 (25.91%) were smokers, 520 (59.09%) patients had Hypertension, 336 (38.18%) had Diabetes, and 200 (22.73%) had Dyslipidemia.

Cardiovascular Risk Factor

Risk Factor	Value
Smoking	228 (25.91%)
Hypertension	520 (59.09%)
Diabetes	336 (38.18%)
Dyslipidemia	200 (22.73%)

Among the RD group 496 (65.96%) were male and 256 (34.04%) were female. In the LD group 76 (86.36%) were male and 12(13.64%) were female. In CD group 16 (40%) were male and 24 (60%) were female.

The mean age was 59.11±11.61 years and the range was 34-81 years. Among the RD group 476 (63.30%) were equal to

or below 65 years and 276(36.70%) were above 65 years. In the LD group 60(68.18%) were equal to or below 65 years and 28(31.82%) were above 65 years. In CD group 28(70%) were equal to or below 65 years and 12(30%) were above 65 years.

Age-wise distribution of Coronary Dominance

Risk Factor	Age Distribution (years)			
	<= 65		65+	
	Count	Row N %	Count	Row N %
Dominant Artery	476	63.30%	276	36.70%
LD	60	68.18%	28	31.82%
CD	28	70.0%	12	30.0%

In LD, abnormal ECG (due to ST-T changes) was 68.18% whereas in RD, abnormal ECG (due to ST-T changes) was 42.02%. In LD, the chance of the person to have CAD present among the abnormal ECG is 24 times more likely than that with normal ECG. However, in RD, the chance of the person to have CAD present among the abnormal ECG is 3.875 times more likely than that with normal ECG. Odd ratio analysis was done by the test of association.

Relation between ECG, Coronary Angiography and Coronary Dominance

Dominant Artery			CAD			Total			
			Absent	Present		OR	LL	UL	P-Value
RD	ECG	Normal	168	268	436 (57.98%)	3.875	1.84	8.16	<0.001
		Abnormal	44	272	316 (42.02%)				
		Total	212	540	752				
LD	ECG	Normal	24	4	28 (31.82%)	24	2.038	282.672	0.014
		Abnormal	12	48	60 (68.18%)				
		Total	36	52	88				
Total	ECG	Normal	212	280	492 (55.91%)				
		Abnormal	56	332	388 (44.09%)	4.489	2.298	8.766	<0.001
		Total	268	612	880				

In our study, 85.5% had RCA dominance, 10% had LCx dominance and 4.5% had codominant coronary circulation; Male population was found to be more in each of the dominance pattern (i.e. 65.96% in RD and 86.36% in LD); and age-wise, more patients were below 65 years of age in all dominance pattern (i.e. 63.30% in RD, 68.18% in LD, 70% in CD). Hence, there is no significant difference in dominance pattern with age or sex. Though, RD circulation was more prevalent in our patients, CAD was more frequent among those with LD circulation.

In another study it was found that the extent of coronary atherosclerosis does not depend on the type of dominant coronary artery but in patients with ACS, left dominance is a significant and independent predictor of increased long-term mortality. 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. The presence of myocardial bridging is more related to coronary dominance, especially in the left coronary circulation.

The pattern of coronary artery dominance is different in different communities. RD was most prevalent, followed by CD and LD in Brazilian population as well.

In another study at Italy the coronary dominance pattern results were: right, 86.6%; left, 9.2%; balanced, 4.2%. In

another study done in Jalgaon region of North Maharashtra, India, the pattern of coronary dominance was 82.4% RD, 13.3% LD and 4.3% CD. Similarly in another study done in Assam (India), the pattern was found to be 70% RD, 19% LD, and 11% CD. In study in Hyderabad (India), 83% RD, 14.5% LD and 2.5% CD was found.

In the study conducted in Netherlands, the pattern was 9.8% LD and 90.2% non-LD. In a study conducted in Kathmandu (Nepal), RD was found in 83%, LD in 10%, and CD in 7%. From the above studies, RD is more prevalent which is in accordance to our findings.

Various Studies	Right Dominant	Left Dominant	Co Dominant
Italian	86.6	9.2	4.2
Maharastra	82.4	13.3	4.3
Assam	70	19	11
Hyderabad	83	14.5	2.5
Netherland	90.2	9.8	-
Nepal	83	10	7

4. Conclusion

The right coronary dominant pattern in coronary artery is more prevalent in our our population. Age and sex have no significant association with coronary dominance. The Left

coronary dominant pattern is more associated with the presence of Coronary Artery Diseases.

References

- [1] Libby P, Bonow RO, Mann DL, Zipes DP. Braunwald Heart Diseases a text book of Cardiovascular Medicine 8th ed. Saunders 2008:478
- [2] Veltman CE, de Graaf FR, Schuijf JD, van Werkhoven JM, Jukema JW, et al(2012) Prognostic value of coronary vessel dominance in relation to significant coronary artery disease determined with non-invasive computed tomography coronary angiography. Eur Heart J 33:1367–77. <https://doi.org/10.1093/eurheartj/ehs034>
- [3] Smithuis, R & Willems, T. 2013. Coronary anatomy and anomalies. [Online]. Available: <http://www.radiologyassistant.nl/en/p48275120e2ed5/coronary-anatomy-and-anomalies.html>. [2013, September 23]
- [4] Fuster, Walsh, Harrington hunt, King III, Nash prystowsky, Roberts, Rose; Hurst's THE HEART, 13th edition The McGraw-Hill Companies 2011
- [5] Balci B, Yilmaz O. Atherosclerotic involvement in patients with left or right dominant coronary circulation. 2004 Jun;60(6):564-6