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Original Research Article

Angiographic evaluation of dominance pattern of coronary arteries

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Abstract

Background: The right and left coronary arteries supply blood to heart. The artery which gives off posterior interventricular branch is called as the dominant artery. Angiography is an important invasive procedure through which anatomy of coronary arteries can be studied.
Materials and Methods: Inclusion criteria: A consecutive series of 350 adult patients having mean age range between 40-60 years referred to the Cardiovascular and Thoracic Surgery Centre, Chhatrapati Sambhajinagar (Aurangabad). Exclusion criteria: Known or diagnosed cases of anomalous coronary arteries. Angiographic views: Left anterior oblique (LAO) for the right coronary artery whereas right anterior oblique (RAO) and left anterior oblique (LAO) for the left coronary artery.
Results: Right coronary artery dominant in 74% of cases, left coronary artery in 16.86% of cases and a co-dominant pattern in 9.14% of cases.
Conclusions: Findings of this study in accordance with that of many other studies and standard textbooks available on the subject.

Keywords: Coronary, Dominant, Angiography, Right anterior oblique, Left anterior oblique.

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1. Introduction

Coronary angiography is a technique in which a catheter is inserted into the femoral artery in the thigh and or radial artery in the forearm, progressed sequentially into the ascending aorta till the site of origin of coronary arteries, where the contrast agent is pushed and imaging done. Accurate identification of coronary arterial branches is important in the interpretation and description of coronary arteriograms, especially if therapeutic procedures are to be performed. The first selective coronary arteriography was done by Dr F Mason Sones in 1959.[1] Schlesinger, as cited by Zahid Ali Kaimkhani, was the investigator who clearly described the criteria for arterial dominance. According to his criteria, an artery is designated as dominant if it gives off posterior descending artery (PDA) or is supplying the posterior part of interventricular septum and the crux of heart. Moreover, arteries are labelled as co-dominant if the posterior part of interventricular septum and the crux of heart is supplied by both the left and the right coronary arteries.[2] According to Last's anatomy,[3] 10% hearts are left dominant and remaining 90% are right dominant. As per Gray's anatomy[4] 60% hearts are right dominant. Snell's anatomy[5] states that majority of the individuals, about 90%, are right dominant since the posterior interventricular artery is a branch of the right coronary artery and 10% of the individuals in whom the circumflex artery gives off the posterior interventricular artery as its branch are left dominant. Knowing the pattern of dominance of the arteries supplying blood to heart is crucial not only because a relationship is defined between the coronary dominance pattern and the diameters of circumflex and right coronary arteries but also due to an association which exists between the left coronary artery dominance and congenital bicuspid aortic valves.[6]

2. Materials and Methods

The study was conducted in Anatomy department of Government Medical College, Aurangabad (Now Ch. Sambhajinagar). A consecutive series of 350 adult patients having mean age range between 40-60 years referred to the

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Cardiovascular and Thoracic Surgery Centre, Ch. Sambhajinagar (Aurangabad) were included. Excluded from the study were patients known to be having anomalous coronary arteries. Approval from the ethical committee of the above mentioned institute was obtained. The parameters selected for the study included.

1. Coronary artery dominance pattern
2. Sex differences, if any, in the coronary artery dominance pattern

The data obtained from the angiographic procedure of the patients was analysed for the above parameters, charted, compared and contrasted with that given in literature and other studies.

2.1. Dominance pattern of the coronary arteries

The coronary arteries can show a right dominant, a left dominant or a co dominant pattern. The criteria defined by Schlesinger was used for labelling the dominant artery. According to that criteria, as stated above, an artery is designated as dominant if it gives off posterior descending artery (PDA) or is supplying the posterior part of interventricular septum and the crux of heart and as co-dominant if the posterior part of interventricular septum and the crux of heart is supplied by both the left and the right coronary arteries. For the RCA the LAO view was analysed and for the LCA the RAO and LAO views were analysed.(**Figure 1**)

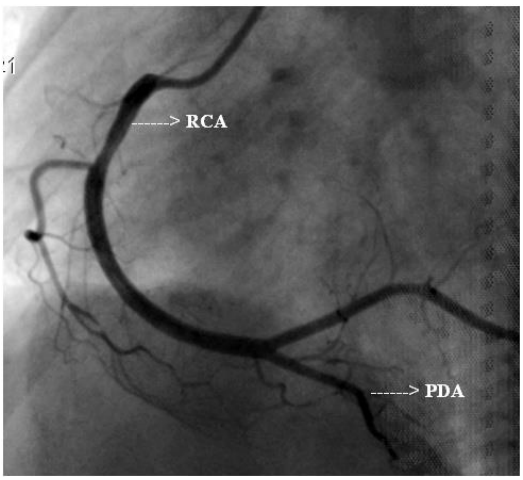

Figure 1: LAO view showing PDA arising from the RCA (The right dominant pattern)

3. Result

Of the 350 patients, 259(74%) patients showed right coronary dominance with 80.30% of them male and 19.69% female. By contrast 59(16.86%) patients had left coronary dominance of which 81.36% were male and 18.64% female. Moreover, 32 (9.14%) patients had co-dominance (balanced circulation), with 81.25% male and 18.75% female. (**Table 1**)

Table 1: Pattern of coronary arterial dominance

	Dominant Pattern (n=350)	**Male n=(282)**	**Female n = (68)**
	No (%)	No (%)	No (%)
Right dominant	259(74)	208(80.30)	51(19.69)
Left dominant	59(16.86)	48(81.36)	11(18.64)
Co-dominant	32(9.14)	26(81.25)	6 (18.75)

Table 2 shows the correlation between sex and dominance pattern. 73.75% of males out of a total of 282 number of cases had right coronary dominance, 17.02% left coronary dominance and 9.21% co-dominance pattern. Whereas, 75% of females out of a total of 68 number of cases had right coronary dominance, 16.18% left coronary dominance and 8.82% co-dominance pattern.

Table 2: Pattern of dominance in relation to gender

Dominant Pattern (n=350)	**Male n = (282)**	**Female n = (68)**
Right dominant	73.75%	75%
Left dominant	17.02%	16.18%
Co-dominant	9.21%	8.82%

4. Discussion

Various research enthusiasts have extensively studied the branching pattern and distribution of coronary arteries till date. This study too is a tiny star in the galaxy of research activities on this subject to help the clinical fraternity in appropriately interpreting their findings and thereby taking better therapeutic decisions.[13-15]

4.1. Dominance pattern of the coronary arteries

In this study 74% of cases were right dominant, 16.86% left dominant and 9.14% co-dominant. Thus a constant pattern of arterial dominance comparable with that given in literature was observed. Similarly, no sex difference was noted in coronary dominance pattern which is in agreement with other published reports.

The criteria introduced by the outstanding work of Schlesinger et al for the determination of coronary arterial dominance have been used in a variety of studies (and also in this study).

According to Last's anatomy[3], 10% hearts are left dominant and remaining 90% are right dominant while as per Snell's anatomy[5] right coronary artery dominance is present in most individuals (90%). Gray's anatomy[4], however, noted that 60% hearts are right dominant. Table 3 shows the comparison of dominance pattern of coronary arteries found in the present study with that of other studies.

Moore 1930, cited by Chaudhry, was first to observe in dog hearts followed by Gross and Kugel in human hearts in 1933 that (as against the anatomical dominance) the LCA is

the dominant artery functionally (based on perfusion studies) since a greater part of left ventricle is supplied blood by it.[2]

Table 3: Comparison of coronary arterial dominance pattern

	Right dominant	Left dominant	Co-dominant
Present study	74%	16.86%	9.14%
Hutchins et al[6]	70%	10%	20%
Kim Seong Hwan[7]	73.5%	16.3%	10.2%
Murphy et al[8]	79%	9%	12%
Kalpana R[9]	89%	11%	---
Marwa Tharwat & Co[10]	63.02%	25.57%	11.39%
Cihan Altin & Co[11]	81.06%	12.20%	6.20%
Kronzon et al[12]	87%	10%	3%

5. Conclusion

This work entitled "Angiographic Evaluation of Dominance Pattern of Coronary Arteries" was carried out in the Department of Anatomy, Government Medical College, Ch. Sambhajinagar (Aurangabad). A consecutive series of 350 adult patients having mean age range between 40-60 years and referred to the Cardiovascular and Thoracic Surgery Center of the said institute for coronary angiography were included in the study. The data obtained was evaluated to find out the coronary arterial dominance pattern.

In this study, the right coronary artery was found to be dominant in 74% of cases, the left coronary artery in 16.86% of cases and both the right and left coronary arteries (a co-dominant pattern) in 9.14% cases. Findings were very much in accordance with other published reports, studies and standard textbooks. Knowing the coronary artery dominance pattern is of paramount importance to the clinicians since the dominance pattern is related with the diameters of right coronary and left circumflex arteries thereby helping them during coronary artery bypass graft and percutaneous coronary angioplasty procedures.

6. List of Abbreviations

LAO – Left anterior oblique; RAO – Right anterior oblique; CASS – Coronary artery surgery study.

7. Source of Funding

None.

8. Conflict of Interest

None.

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