International Journal of Anatomy and Research,
Int J Anat Res 2015, Vol 3(3):1289-92. ISSN 2321- 4287
DOI: http://dx.doi.org/10.16965/ijar.2015.213

Original Article

A CADAVERIC STUDY ON CORONARY PREPONDERANCE

Vinitha G [*1], Sarala H S [2], Priya Ranganath [3].

[*1] Assistant professor, Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India.

[2] Tutor, M D Anatomy, Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore, Bangalore, Karnataka, India.

[3] Professor and Head, Department of Anatomy, Bangalore Medical College and Research Institute, Bangalore, Bangalore, Karnataka, India.

ABSTRACT

Background: Knowledge of coronary preponderance is important to understand coronary artery diseases, interpret the findings and plan the treatment of cardiovascular diseases. It influences the amount and anatomic location of myocardium that is perfused by the left or right coronary circulation. The aim of the present study is to observe the origin of posterior interventricular artery which determines the coronary preponderance or dominance.

Materials and Methods: The study was done on 50 formalin fixed adult heart specimens in the Department of Anatomy, Bangalore Medical College and Research Institute irrespective of age, sex, socio-economic status, religion and education status. The coronary arteries were examined by gross dissection and analyzed statistically.

Results: Right preponderance was seen in 31(62%) hearts, left preponderance in 11 (22%) hearts and balanced or codominance was seen in 8(16%) hearts.

Discussion: The coronary artery dominance has an important clinical significance.Most of the studies have reported a higher percentage of right preponderance including the present study. Results of the present study was compared statistically with the study done by Hirak Das et al (n=70). On comparison right dominance was statistically insignificant (z = 0.91, p = 0.36), left dominance was statistically insignificant (z = 0.46 , p = 0.64), and balanced pattern was also statistically insignificant (z = 0.82 , p = 0.41)

Conclusion: The present study on coronary dominance would be of use to the cardiologist and interventional radiologist to predefine the abnormalities by invasive and non invasive studies.

KEY WORDS: codominance, coronary artery, coronary diseases, coronary dominance, left coronary preponderance, right coronary preponderance.

Address for Correspondence: Dr. Vinitha G, Department of Anatomy, Bangalore medical college and research institute, Bangalore – 560002. Karnataka, India. Mobile No: +919482018309
E-Mail: drvinithagang@gmail.com

Access this Article online

Quick Response code

DOI: 10.16965/ijar.2015.213

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 13 Jul 2015 Accepted: 01 Aug 2015
Peer Review: 13 Jul 2015 Published (O): 31 Aug 2015
Revised: None Published (P): 30 Sep 2015

INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of mortality and morbidity in India. Recent trends indicate that the disease has escalated to younger age groups also. It is seen significantly both in males and females irrespective of socio economic status [1].

A complete knowledge of the coronary circulation is an increasingly vital component in the management of congenital and acquired

heart diseases.

Normally the heart is supplied by two coronary arteries: Right coronary artery (RCA) and left coronary (LCA). There is a wide variation with regard to origin, course, termination and branching pattern of coronary arteries.The term 'dominance' also called as 'coronary preponderance' is used to refer to the coronary artery giving off the posterior interventricular (PIV) branch, which supplies the posterior part of the ventricular septum and often part of the posterolateral wall of the left ventricle.In 'right dominance', the PIV (descending) artery is derived from the right coronary; in 'left dominance' it is derived from the left. In the so-called 'balanced' pattern, branches of both arteries run in or near the groove [2]. Various terminologies were used such as 'right, 'mixed', 'left inferior'. The terms 'right', 'symmetrical', and 'left' were also proposed [3].

The most common is right dominant pattern, which is present in approximately 67% of people. In approximately 15% of hearts the LCA is dominant, in which the PIV artery is a branch of circumflex artery. There is codominance in approximately 18% of people, in which branches of both the right and left coronary arteries reach the crux and give rise to branches that course in or near the PIV groove [4].

Knowledge of coronary artery variations and pathologies is important in interpretation of findings and planning the treatment of cardiovascular diseases, hence the present study was conducted.

MATERIALS AND METHODS

A total of 50 formalin fixed adult heart specimens were collected from the Department of Anatomy, Bangalore Medical College and Research Institute irrespective of age, sex, socio-economic status, religion and education status. Visceral pericardium was stripped and subepicardial fat was removed to study the coronary artery and its branching pattern. The branches were dissected manually and carefully till their termination.The coronary artery which gives the PIV artery and determines the coronary preponderance was examined in detail. Photographs were taken; required data were noted and analyzed statistically.

RESULTS

It was observed that in hearts where the RCA and circumflex artery terminated at the crux, the PIV artery took a L-shaped turn and continued along the posterior interventricular sulcus. If the main artery crossed the crux then the PIV artery was found to arise as a side branch.

PIV artery took its origin from RCA in 31(62%) hearts and called right preponderance (fig 1).

Fig. 1: Showing right preponderance.

In 11 (22%) hearts PIV artery originated from circumflex artery, a branch of LCA and called left preponderance (fig 2).

Fig. 2: Showing left preponderance.

PIV artery arose from both RCA and circumflex artery in 8 (16%) hearts. These were called balanced or co –dominance (fig 3) where two PIV arteries could be seen.

Fig. 3: Showing codominance.

Termination of RCA was seen at right border in 3 hearts, between right border and crux in 11, at crux in 6, between crux and left border in 30 and at left border in none of the hearts.

Similarly termination of circumflex artery was seen at right border in none, between right border and crux in 4, at crux in 11, between crux and left border in 28 and left border in 7 hearts.

Table 1: Showing Dominance pattern.

Dominance	No of Hearts	Percentage (%)
Right dominance	31	62
Left dominance	11	22
Balanced	8	16

Table 2 : Showing comparisons of dominance pattern.

Authors	Right preponderance	Left preponderance	Balanced
Schelesinger(1940) [15]	48%	18%	34%
James (1961)	90%	10%	-
Cavalcanti (1995)	69.09%	11.82%	19.09%
Bezbaruah (2003)	76%	20%	4%
Kalpana (2003) [16]	89%	11%	-
Das (2010)[14]	70%	18.57%	11.43%
Present (2015)	62%	22%	16%

DISCUSSION

The coronary artery dominance has an important clinical significance. It has an impact on coronary blood flow volume in the left circumflex and right coronary arteries but not in the left anterior descending coronary artery. These findings suggest that the extent of myocardial perfusion area is associated with coronary blood flow volume [5].

Left anterior descending artery (LAD) in left coronary dominance is usually long wrapping around the apex of the heart supplying major portion of myocardium, and angiographic interventions in such cases have important clinical significance. Ilia et al has concluded in his study that lesions in LAD would have more profound clinical importance in left dominant heart than right dominant heart [6].

A study conducted by Eren et al indicated that, although right dominance circulation is more common in general population, both the coronary diseases and coronary artery variations are more common in individuals with left dominance circulation [7].

The study done by Vasheghani-Farahani et al demonstrates a relationship between angiographic CAD severity, and the involved arterial territory and dominancy patterns.The right-dominant patients tend to have three-vessel disease, stenosis of more than 50% in right coronary artery and left circumflex territories, more than the left-dominant patients [8].

According to Makarovic et al several studies have confirmed the relevance of left coronary artery dominance in the outcome and prognosis of obstructive CAD. Therefore, it is conceivable that the type of coronary artery dominance also has an effect on the occurrence and outcome of non obstructive CAD [9].

In patients with acute coronary syndrome, left dominance is a significant and independent predictor of increased long-term mortality according to Goldberg et al [10].

Murphy et al has noted in their study that patients with left dominance have a shorter left main coronary artery than patients with right dominance. The increased prevalence of a dominant left coronary arterial system in aortic stenosis suggests that this may be part of a developmental complex. They also have an increased risk of perioperative myocardial infarction if there is associated obstructive coronary artery disease [11].

The presence of bridges appeared to be related to coronary dominance, especially in the left coronary circulation according to Loukas et al [12].

In patients with ST-segment elevation myocardial infarction (STEMI), a left-dominant coronary artery system is linked with higher risk of 30-day mortality and early reinfarction compared with right dominance, according to a study published by Veltman et al [13].

In 2010, Das et al said that in right dominant RCA usually supplies AV node. Hence any inferior wall infarct caused by occlusion of the RCA will have higher risk of AV block [14].

Previously many studies have been conducted by both Indian and foreign authors, where dominance was a part of their study. Most of the studies have reported a higher percentage of right preponderance including the present study. But the study by Schelesinger [15] in 1940

shows 48% right dominance which is less when compared with others. Present study shows higher percentage of left preponderance (22%), when compared with rest. Balanced pattern showed wide variations from 0% to as high as 34%. Present study was compared with similar studies done previously (Table 2).

Results of the present study was compared statistically with the study done by Das et al (n=70). On comparison right dominance was statistically insignificant (z = 0.91, p = 0.36), left dominance was statistically insignificant (z = 0.46, p = 0.64) and balanced pattern was also statistically insignificant (z = 0.82, p = 0.41).

CONCLUSION

Knowledge of coronary artery variations and pathologies is important in planning the treatment and in interpretation of findings of cardiovascular diseases.

From the study it can be concluded that most common is right preponderance followed by left preponderance and then balanced pattern.

Preoperative information about the coronary arterial anatomy and extent of coronary artery disease may be helpful in planning the use of coronary perfusion and other myocardial preservation techniques during surgery in order to reduce the incidence of myocardial infarction.

Conflicts of Interests: None

REFERENCES

[1]. Chauhan S, B T Aeri. Prevalence of cardiovascular disease in India and its economic impact – a review: International Journal of Scientific and Research Publication. Oct 2013: 3(10).1-5.

[2]. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 39th ed. 1017-18.

[3]. Hadziseli movic H. Blood vessels of the human heart. VEB Georg Thieme, Leipzig: 1982: 14-42.

[4]. Moore KL. Clinically Oriented Anatomy. 5th ed.2006. 156-58.

[5]. Sakamoto, Takahashi S, Coskun AU, Papafaklis MI, Takahashi A, Saito S et al. Relation of distribution of coronary blood flow volume to coronary artery dominance: American Journal of cardiology. May 2013:111(10):1420-4.

[6]. Ilia R, Rosenshtein G, Marc W J, Cafri C, Abu – Ful A, Gueron M. Left anterior descending artery length in left and right coronary artery dominance. Coronary Artery Diseases 2001;12(1):77-78.

[7]. Eren, Bayram E, Fil F, Koplay M, Sirvanci M, Duran C et al. An investigation of association between coronary artery dominance and coronary artery variations with coronary arterial disease by multidetection CT coronary angiography. Journal of computer assisted tomography Dec 2008: 32(6): 929-33.

[8]. Vasheghani-Farahani, Kassaian SE, Yaminisharif A, Davoodi G, Salarifar M, Amirzadegan A et al. The association between coronary arterial dominance and extent of coronary artery disease in angiography and paraclinical studies: Clin Anat. 2008 Sep;21(6):519-23.

[9]. Makarovic Z, Sandra Makarovic, Ines Bilic-Curcic. Sex-dependent association between coronary vessel dominance and cardiac syndrome X: a case-control study: BMC Cardiovasc Disord. Oct 2014:m14:142.

[10]. Goldberg A, Southern D, Galbraith P.D, Traboulsi M, Knudtson M.L, Ghali W A. Coronary dominance and prognosis of patients with acute coronary syndrome. American Heart Journal Dec 2007; 154(6): 1116- 1122.

[11]. Murphy ES, Rösch J, Rahimtoola SH. Frequency and significance of coronary arterial dominance in isolated aortic stenosis. J Cardiol. April 1977;39(4):505-9.

[12]. Loukas M, Brian Curry, Maggi Bowers, Robert, Louis Jr, Artur Bartczak et al. The relationship of myocardial bridges to coronary artery dominance in the adult human heart. Journal of Anatomy Ju;y 2006;209(1)1:43–50.

[13]. Veltman CE, Van der Hoeven BL, Hoogslag GE. Influence of coronary vessel dominance on short- and long-term outcome in patients after ST-segment elevation myocardial infarction. Eur Heart J. 2014; doi:10.1093/eurheartj/ehu236.

[14]. Das H, Das G, Chandradas D, Talukdar K : A Study of Coronary Dominance in the population of Assam : Journal of Anatomical Society of India 2010; 59(2) 187-191.

[15]. Schlesinger MJ. Relation of anatomic pattern to pathologic conditions of the coronary arteries. Arch Path. 1940;30: 403-415.

[16]. Kalpana R. A Study On Principal Branches of Coronary Arteries In Humans : Journal of Anatomical Society of India 2003;52(2): 137-140.

How to cite this article:

Vinitha G, Sarala H S, Priya Ranganath. A CADAVERIC STUDY ON CORONARY PREPONDERANCE. Int J Anat Res 2015;3(3):1289-1292. **DOI:** 10.16965/ijar.2015.213