## Original Article

# A study on coronary dominance patterns in the human heart and its clinical significance

Damor Bhavana*, Tank Kamlesh**, Solanki Seema***, Kumar Sneha V****

*Tutor, Department of Anatomy, Baroda medical college,  Vadodara,
**Assistant professor, Tutor***, Associate professor****, Department of Anatomy, B .J. Medical College, Ahmedabad

## ABSTRACT

**Background:**  Among heart diseases, coronary artery disease is one of the major causes of death in developing countries. Anatomical variations of the coronary arteries are not uncommon. Their recognition, particularly in the patient presenting with angina, is important, as decisions with regard to revascularization procedures depend on knowledge of the anatomy of each individual artery. Coronary predominance in man is determined by the artery that emits the posterior interventricular branch. Thus, dominance can be right, left or balanced circulation. Left dominance seems to be associated with higher mortality due to acute infarction and higher incidence of arteriosclerosis.

**Objective:** To know the dominance of coronary circulation.

**Material and Method:** The present study was carried out on 60 specimens of human heart which were obtained from Anatomy department, B. J. Medical College, Ahmedabad. These 60 hearts were dissected to study branching pattern and dominance of coronary arteries.

**Result:** In present study right dominance was observed in 90% of the specimens and left dominance was observed in 10% of the specimens.

**Conclusion:** Knowledge of the present study can be helpful to the radiologists and cardiovascular surgeons for anatomical assessment of coronary arteries for various diagnostic and therapeutic purposes to predefine the abnormalities by invasive or non-invasive studies.

**Key words:** Coronary pattern, heart diseases, anatomy, prevention

## INTRODUCTION

The heart is supplied by two coronary arteries, right and left. The coronary arteries are the branches of ascending aorta. The two arteries form an oblique inverted crown, consisting of an anastomotic circle in the atrio-ventricular sulcus connected by marginal and interventricular loops intersecting at the cardiac apex. [1] In 'right dominance', (70%) the posterior interventricular artery is derived from the right coronary artery.

In 'left dominance' (10%) the posterior interventricular artery is derived from the left coronary artery. These peoples are likely to be affected by coronary diseases, because the entire left ventricle and left ventricular septum are under the nutritional control of the left coronary artery, and obstruction of the left coronary artery may produce output failure of systemic circulation. In the 'balanced' pattern, (20%) posterior interventricular branches are derived from both coronary arteries. Individuals with 'balanced' type of coronary distribution are least affected by coronary diseases [2].

According to World Health Organization (WHO), coronary heart diseases constitute the main cause of death worldwide. Variation in the morphological pattern of coronary arteries and their major branches is an important factor in the assessment and treatment of coronary heart disease.

The number of branches, their location and the myocardial mass irrigated are factors that determine the choice of therapy in all coronary artery bypass grafting (CABG) surgeries; thus surgery is preceded by a detailed analysis using angiographies.[3]

**Aims/Objectives of the study:**

1) To know the dominance of coronary circulation.
2) To know the normal patterns of coronary arteries and variations in its origin, course and branching pattern.

## MATERIALS AND METHOD:

### Materials used:
1. One set of dissection instruments – forceps, scalpel, scissors
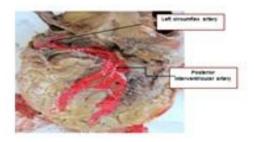2. Water, bowel.

### METHOD:
The present study was carried out in anatomy department, B.J. Medical College, Ahmedabad on 60 hearts from embalmed bodies during period of October 2011 to November 2013. The specimens were collected. The heart was dissected out and visceral pericardium was removed to expose the coronary arteries. These 60 hearts were dissected to study origin, course, branching pattern and termination of coronary arteries. Each specimen was thoroughly washed to clean the blood clots. The courses of right and left coronary artery were traced from the ostia by cleaning the epicardium and fat by dissection. Branches of coronary arteries were examined grossly.

### RESULTS

In present study right dominance was observed in 90% of the specimens in which posterior interventricular artery arose from the right coronary artery and left dominance was observed in 10% of the specimens in which posterior interventricular artery arose from circumflex branch of left coronary artery (Figure:1). No specimen with balanced dominance was found in the present study.

**Figure: 1 (Posterior view): Specimens showing left dominance**



### DISCUSSION

The coronary arteries are the branches of ascending aorta. The right coronary artery arises from the anterior aortic ('Right coronary') sinus.The left coronary artery arises from the left posterior aortic ('Left coronary') sinus.

The name and nature of a coronary artery or a branch is defined by that vessel's distal vascularization pattern or territory, rather than by its origin. [4]

Although the left coronary artery always supplies a greater mass of myocardium than does the right, it is not usually 'dominant'. The dominant coronary artery is that which gives the posterior interventricular branch, traversing the posterior interventricular sulcus and supplying the posterior part of the ventricular septum and often part of the poster lateral wall of the left ventricle as well. Dominance can be a significant determinant of prognosis in acquired coronary artery disease. In most individuals with left dominance the right coronary artery is usually small and often fails to reach the acute (right) margin of the heart (Raphael, Hawtin&Allwork, 1980) so that an acute, proximal occlusion could have disastrous consequences, as the potential for rapid development or re-opening of collateral vessels is likely to be diminished. [5]

**Table-1 Comparison of coronary dominance**

| Authors | | Dominance | | |
|---|---|---|---|---|
|  | N | Right % | Left % | Balanced % |
| Kalpana R(2003) | 100 | 89 | 11 | - |
| Abuchaim DC(2009) | 25 | 72 | 20 | 8 |
| Bhimalli S(2011) [7] | 60 | 60 | 23.33 | 16.66 |
| Reddy JV(2013) [8] | 80 | 86.25 | 11.25 | 2.55 |
| Present study | 60 | 90 | 10 | - |

### Dominant Circulation
Left dominance seems to be associated with higher mortality due to acute infarction and higher incidence of arteriosclerosis. (10)

According to **Cavalcanti**left dominance was observed in 11.82% of specimens and right dominance in 88.18%. [6] In present study right dominance was observed in 90% of the specimens in which posterior interventricular artery arose from the right coronary artery and left dominance was observed in 10% of the specimens in which posterior interventricular artery arose from circumflex branch of left coronary artery.

### CONCLUSION

Knowledge of coronary circulation is important for anatomists, radiologists and cardiovascular surgeons performing angiographies and shunt surgeries for anatomical assessment of coronary arteries for various diagnostic and therapeutic purposes to predefine the abnormalities by invasive or non-invasive studies. The advances made in

coronary artery bypass surgeries and modern methods of myocardial revascularization needs a complete knowledge of the normal anatomy of coronary arteries with its variations.

Present study provides valuable information to the anatomists and clinicians to understand the coronary dominance. These variations are important, as decisions with regard to revascularization procedures depend on knowledge of the anatomy of each individual artery.

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*Corresponding Author:*

Dr. Damor Bhavana
Department of anatomy,
Baroda Medical College, Anandpura,
Vadodara, Gujarat, India.
Email:kamlesh_tank08@yahoo.co.in