



## A Cadaveric Study of Coronary Arteries in the Population of Vidarbha Region of Maharashtra

### KEYWORDS

Left Coronary Artery(LCA), Right Coronary Artery (RCA), right & left dominance, posterior inter-ventricular artery (PIVA), Middle cardiac Vein(MCV)

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**ABSTRACT** *The incidence of coronary artery disease is increasing now a day's all over the world. Coronary arteries show wide variations & Dominance pattern which has got important clinical significance in different pathologies. So the present work is undertaken to study the variations, branching pattern & dominance of coronary arteries in population of vidarbha region of Maharashtra, India. These region based variations have not been dealt with enough in the standard books. The knowledge of these variations are of paramount importance when considering various surgical interventions.*

*Aim of the present study was to determine the variations, branching pattern & dominance of coronary arteries in vidarbha region and to compare it with other studies.*

*Thirty eight cadaveric hearts were studied. The population under study included the population of vidarbha region. The coronary arteries were examined by gross dissection and analysed statistically. The modes of termination of the right coronary artery and the circumflex artery were described with the help of five points: 1) at the right border 2) between the right border and the crux 3) at the crux 4) between the crux and the left border and 5) at the left border. Origin of the posterior inter-ventricular artery was taken as the basis of dominance. Right dominance was found in 89.47% & left dominance was found in 10.52%. The results of the study when compared with other authors the right dominance is significantly higher while no balanced dominance was seen. So it can be concluded that every region carries its own proportions of dominance and detailed studies should be conducted for betterment of human being in each region.*

### 1. INTRODUCTION

Coronary artery disease is one of the major causes of death in developed countries. The incidence of coronary artery disease is increasing today in developing countries as well, because of changing life style, urbanization, sedentary nature of work, hypertension, diabetes mellitus and increased type a personality<sup>1</sup>. Importantly coronary artery anomalies are a cause of sudden death in young athletes in the absence of additional heart abnormalities. The prevalence in India had increased rapidly from 1% in 1960 to 9.7% in 1995 in urban population<sup>3</sup>.

The term 'Coronary' comes from the Latin term "Corona" meaning "Crown". The heart is normally supplied by two coronary arteries: Right coronary artery (RCA) and left coronary artery (LCA). Coronary arteries are known for their wide variations with regard to origin, course, termination and branching pattern. There are also wide regional variations which have not been dealt with enough in the standard books. Thus a region specific study of the coronary arteries would help both cardiac surgeons and radiologists in dealing better with the coronary heart disease<sup>4</sup>.

Variability in the origin of the posterior inter-ventricular artery (PIVA) is expressed by the term "Dominance". The term right or left "Coronary Preponderance" or "Dominance" was used to show which coronary artery irrigates the heart's diaphragmatic surface, based on the origin of the posterior inter-ventricular artery (PIVA). Origin of the PIVA from the RCA was termed 'right dominance'; from the circumflex artery was called 'left dominance'. Origin from both the RCA and the circumflex artery was known as balanced pattern. The same parameters had been used in this study to determine dominance<sup>4</sup>. Vari-

ous terminologies were used such as 'right', 'mixed' and 'left inferior'<sup>5</sup>. The terms 'right', 'symmetrical' and 'left' were also proposed<sup>6</sup>. Standing S<sup>7</sup> preferred the use of the term 'Dominance'. The results of the study were compared with other authors and analysed statistically with some of them.

### 2. MATERIALS AND METHODS

A total of 38 hearts without any obvious pathology were obtained from the department of anatomy GMC Akola. The hearts were preserved in 10% Formalin [Formalin= 40% solution of Formaldehyde in water. 10% Formalin= 10 parts formalin+ 90 parts water] and dissected at a convenient time later. Visceral pericardium and sub-pericardial fats were removed. The coronary arteries and their branches were carefully dissected out and followed till their termination. The arteries were painted with red fabric colour to enhance contrast. Photographs were taken. Relevant data were recorded and analysed statistically (manually).

### 3 OBSERVATIONS & RESULTS

#### 38 hearts were examined.

#### A) The Right Coronary Artery (RCA)

The Right Coronary ostium was present in all the specimens in the right anterior aortic sinus, the ostium was below the sino-tubular junction in all specimens. There were no variations among the branching pattern of RCA. The RCA was found to terminate at the right border in 2 hearts (5.26 %), between the right border and the crux in 2 hearts (5.26%), at the crux in 7 hearts (18.42 %), between the crux and the left border in 22 hearts (57.89 %) and at the left border in 5 hearts (13.15%) [Table I].

**TABLE I. TERMINATION OF RCA**

Site	No.Of Hearts	Total(%)
Right Border	2	5.26
Right Border – Crux	2	5.26
Crux	7	18.42
Crux - Left Border	22	57.89
Left Border	5	13.15
Total	38	38

**B) The Left coronary artery (LCA) / (The circumflex artery)**

The ostium for LCA was present in the Left posterior aortic sinus, the ostium was below the sino tubular junction in all specimens. There were no variations among the branching pattern of LCA.

The circumflex artery was found to terminate at the Right border in 1 hearts (2.63 %), between the crux &the Right border in 3 hearts (7.89%), at the crux in 8 hearts (21.05 %), between the Left border & crux in 20 hearts(52.63%)& at the left border in 6 hearts(15.78%) [Table II].

**TABLE II. TERMINATION OF CIRCUMFLEX ARTERY**

Site	No.Of Hearts	Total(%)
Right Border	1	2.63
Crux -Right Border	3	7.89
Crux	8	21.05
Left Border- Crux	20	52.63
Left Border	6	15.78
Total	38	38

In hearts where the RCA or the circumflex artery terminates at the crux, it was observed that the artery made an L- shaped turn and continued along the posterior inter-ventricular sulcus as the posterior inter-ventricular artery (PIVA). In specimen where the main artery crosses the crux, the posterior inter-ventricular artery was seen to arise as a side branch.

**TABLE III. ORIGIN OF POSTERIOR INTER-VENTRICULAR ARTERY (DOMINANCE)**

Dominance pattern	No.Of Hearts	Total(%)
Right dominance	34	89.47
Left dominance	4	10.52
Balanced dominance	-	-
Total	38	38

The posterior inter-ventricular artery continued forward for variable distance along the posterior inter-ventricular sulcus towards the apex. It usually terminated by anastomosing with the terminal part of the anterior inter-ventricular artery. The posterior inter-ventricular artery was found to arise from the right coronary artery in 34 specimens (89.47%). These were called 'right dominant' (Fig. 1). It arose from the circumflex artery in 4 specimens (10.52%), called 'left dominant' (Fig.

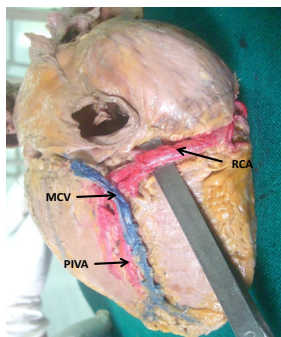


Photo No. 1 Showing Right Dominance

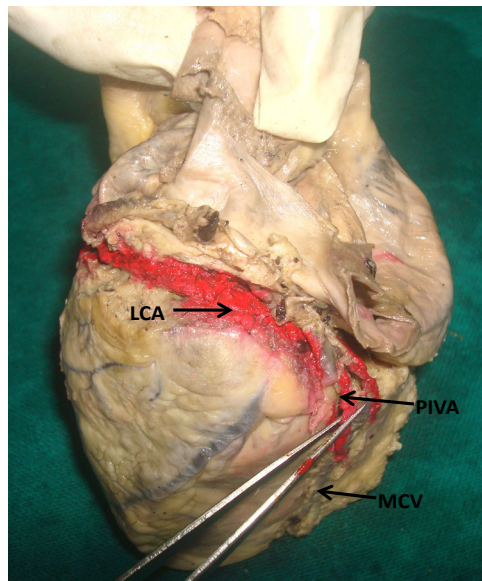


Photo No. 2 Showing Left Dominance

**4. DISCUSSION**

According to Hirak Das <sup>4</sup>, Dominance pattern of heart has important clinical significance. Left dominance was found to have significantly higher mortality than right dominance and mixed types<sup>9</sup>. Dominance also showed a role in left anterior descending (LAD) stenosis. It was observed that in left dominance, the LAD usually wraps around the apex of the heart, supplying major portion of the myocardium. In contrast, in right dominance, it was the posterior inter-ventricular branch of the right coronary artery that supplied most of the myocardium. As such, lesions in LAD would have more profound clinical importance in a left dominant heart than in a right dominant one<sup>9</sup>.

Dominance also plays an important role in inferior infarcts of the heart. Inferior wall infarcts although less extensive than anterior infarcts are more important as they can cause various degrees of atrio-ventricular block in approximately 30 % of cases. The dominant RCA usually supplies the atrio-ventricular (AV) node. Therefore an inferior wall infarct caused by occlusion of the RCA will have higher risk of AV block<sup>10</sup>.

Five points of termination of the right coronary artery and the circumflex artery were used in this study. As the right coronary artery approaches the crux, it branches out into one to three posterior inter-ventricular rami but only one of these, running in the inter-ventricular sulcus, is called the 'posterior inter-ventricular artery' <sup>7</sup>. The RCA supplies an average of 1.8 arteries to the posterior aspect of the left ventricle<sup>11</sup>. During its course in the coronary sulcus, the circumflex artery gives off branches to the inferior (or diaphragmatic) surface of the left ventricle<sup>12</sup>. The branches supplying the inferior surface of the left ventricle are also referred to as "left postero-lateral (marginal) arteries"<sup>13</sup>.

Almost all authors have reported higher percentages of right dominance [Table IV]. Even in the present study, right dominance was more common(89.47%) as compared with Left dominance (10.52%).The findings of present study were near about equal to the findings of James ( 1961), Cavalcanti (1995)&Kalpana R (2003). However Schelesinger (1940), Bezbaruah NK (2003) & Hirak Das (2010)found a

lower percentage for right dominance & higher percentage of left dominance.

**TABLE IV: - DOMINANCE PATTERN COMPARED WITH OTHER AUTHORS**

Authors	Right dominance	Left dominance	Balanced
Schelesinger (1940) <sup>14</sup>	48 %	18%	34%
James (1961) <sup>15</sup>	90%	10%	-
Cavalcanti (1995) <sup>16</sup>	88.18%	11.82%	-
Bezbaruah NK (2003) <sup>17</sup>	76%	20%	4%
Kalpana R (2003) <sup>18</sup>	89%	11%	-
Hirak Das (2010) <sup>4</sup>	70%	18.57%	11.43%
Present study	89.47%	10.52%	-

## 5. CONCLUSION

The right dominance is significantly higher when compared with other studies while no balanced dominance was seen. So it can be concluded that every region carries its own proportions of dominance and detail studies should be conducted for betterment of human being in each region.

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