



## Original Article

## A cadaveric study of variation in branching pattern of left coronary artery

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## ABSTRACT

**Background & Objectives:** Coronary artery disease increasing today due to because of change life style and diseases like diabetes and hypertension etc. Knowledge of normal and variation in coronary artery is important in management of coronary artery disease and congenital heart diseases. In this study we observed the branching pattern of left coronary artery in North Indian population.

**Material and method:** Study carried out on 50 formalin fixed heart obtained from anatomy Department during period of 3 years.

**Result:** The most frequent termination pattern was bifurcation (74%), followed by trifurcation (18%), quadrifurcation (6%) and pentafurcation (2%).

**Conclusions:** High degree of variability in left coronary artery branching pattern required extra caution during interventional coronary angiography and surgery.

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## 1. Introduction

The left coronary artery is arise from left posterior (left 'coronary') aortic sinus it supplies a greater volume of myocardium, including almost all the left ventricle and atrium, most of the interventricular septum. Left coronary artery usually have 2 Major initial branches, the left circumflex and anterior interventricular (descending) arteries. Its initial portion, between its ostium and its first branches, varies in length from a few millimetres to a few centimetres. This part is loosely embedded in subepicardial fat and usually has no branches, but may give off a small atrial ramus and, rarely, the sinu-atrial nodal artery<sup>1</sup>.

Occasionally, the left main trifurcates into the LAD, left circumflex and a third (intermediate) artery. This third branch originates between the angle formed by the LAD and the left circumflex arteries and has various names, including "ramus intermediate," "median artery," "left diagonal artery," and "straight left ventricular artery."<sup>2</sup>

Left coronary artery trunk quadrifurcation and pentafurcation also found in previous studies.<sup>3–18</sup>

Numbers of variations is present in origin, length and branching pattern of left coronary artery. Knowledge of these variations mandatory for interventional cardiologist and radiologist to avoid misdiagnosis.

Proper knowledge is essential for interpretation of coronary angiography and for placement of stent during percutaneous coronary intervention and diagnosis and management of congenital acquired heart diseases.

## 2. Material and method

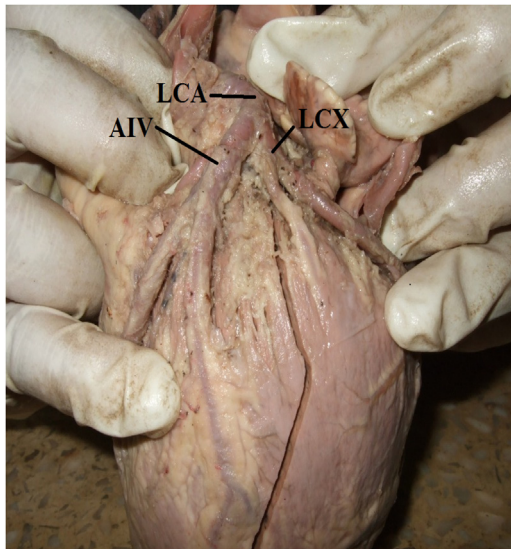
The study performed on 50 formalin fixed human cadaveric heart of both sexes during routine dissection in department of anatomy of Smt N.H.L. municipal medical college Ahmedabad in last 4 year. Skin incision on thorax made at midline. Muscles of pectoral region cut and thoracic cage opened. Heart with pericardium along with great vessels removed. Pericardium and fats were removed. The left coronary artery dissected carefully. Origin from aortic sinus noted and their branches were dissected from origin to termination. Photographed taken and analysed.

## 3. Result

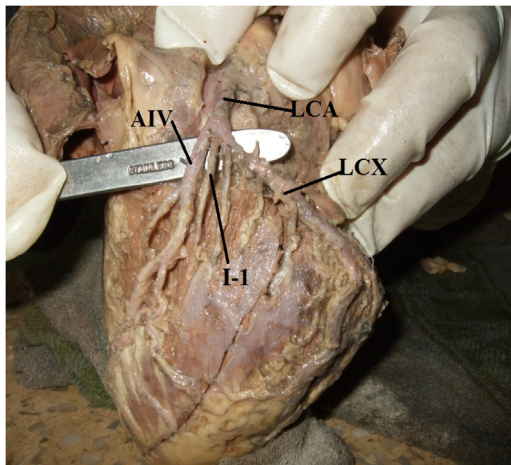
The main trunk of coronary artery bifurcating in anterior interventricular (AIC) and circumflex coronary arteries (CA) in 37 specimens (74%) (Fig. 1).

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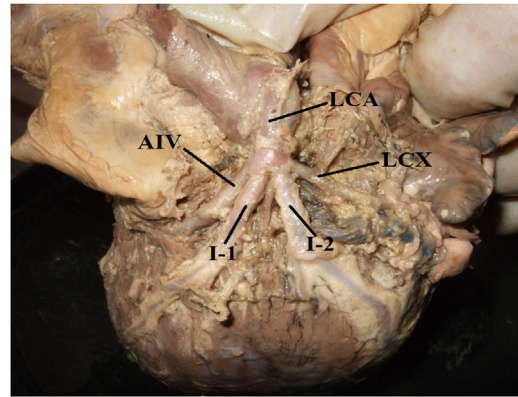
E-mail addresses: [drjalpa73@yahoo.com](mailto:drjalpa73@yahoo.com), [djd0086@gmail.com](mailto:djd0086@gmail.com) (J.N. Desai).



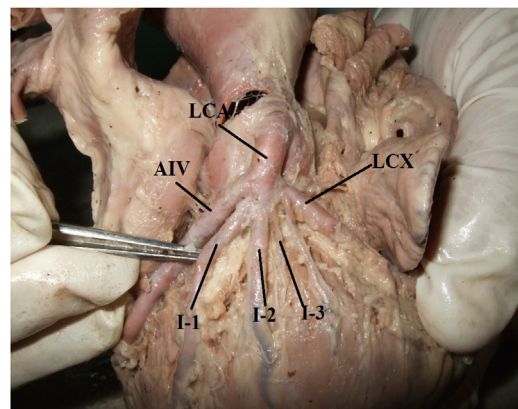
**Fig. 1.** Bifurcation of LCA.  
(LCA-left coronary artery, AIV-anterior interventricular artery, LCX-Left circumflex artery)



**Fig. 2.** Trifurcation of LCA.  
(LCA-left coronary artery, AIV-anterior interventricular artery, LCX-Left circumflex artery I-Ramus Intermediate)



**Fig. 3.** Quadrifurcation of LCA.  
(LCA-left coronary artery, AIV-anterior interventricular artery, LCX-Left circumflex artery I-Ramus Intermediate)



**Fig. 4.** Penta-furcation of LCA.  
(LCA-left coronary artery, AIV-anterior interventricular artery, LCX-Left circumflex artery I-Ramus Intermediate)

In trifurcation (Fig. 2) the LCA gave the anterior interventricular (AIC), circumflex coronary arteries (CA) and an additional branch, the diagonal artery (DA) found in 9 specimens (18%). 3 Samples(6%) showing quadrifurcation (Fig. 3) the LCA gave the anterior interventricular (AIC), circumflex coronary arteries (CA) and two

**Table 1**  
Comparison of branching pattern of left coronary artery with other studies.

Author Specimens(n)	Single	Bifurcation [%]	Trifurcation [%]	Quadrifurcation [%]	Penta-furcation[%]
Bapista et al. <sup>3</sup> n = 150	–	54.7	38.7	6.7	–
Kalpana <sup>4</sup> n = 100	1	47	40	11	1
Surucu et al. <sup>5</sup> n = 40	–	47.5	47.5	2.5	2.5
Reig and Petit et al. <sup>6</sup> n = 100	–	62	38	–	–
Lujinovic et al. <sup>7</sup> n = 20	–	65	35	–	–
Ortale et al. <sup>8</sup> n = 20	–	50	46	4	–
Ballesteros et al. <sup>9</sup> n = 154	–	52	42.2	5.8	–
Fazliogullari et al. <sup>10</sup> n = 50	–	46	44	10	–
Bhimalli et al. <sup>11</sup>	–	56.7	33.3	8.3	–
Udhayakumar et al. <sup>12</sup> n = 40	–	75	22.5	2.5	–
Dombe et al. <sup>13</sup>	–	54.7	35.9	7.8	–
Agnihotri G.et al. <sup>14</sup> n = 100	–	66	30	4	–
P.Dharmendra et al. <sup>15</sup> n = 93	–	58.06	35.48	6.45	–
P.Chougule et al. <sup>16</sup> n = 50	–	70	30	–	–
Julius A et al. <sup>17</sup> n = 208	–	54.8	32.2	9.6	3.4
Mirza R .U Beg et al. <sup>18</sup> n = 40	–	45	42.5	10	–
Present Study (2015) n = 50	–	74	18	6	2

diagonal artery. 1 specimen (2%) show presence of Pentafurcation (Fig. 4).

#### 4. Discussion

In present study on 50 formalin fixed hearts we found mode of termination of left coronary artery is bifurcation in 74% which is similar to Udhaykumar et al.<sup>12</sup> and much higher than previous studies in which range of bifurcation between 45 and 70%. Trifurcation found in previous studies in between 22 and 44% cases but in present study only 18% cases found which is much lower than past studies (Table 1).

In present study 6% cases show Quadrifurcation which is similar to studied done by Bapista et al.<sup>3</sup>, Ballesteros et al.<sup>9</sup> and P. Dharmendra et al.<sup>15</sup>

In present study 2% cases (1 specimen) show Pentafurcation. In previous studied Kalpana R<sup>4</sup>, Surucu HS et al.<sup>5</sup> and Bhimalli et al.<sup>11</sup> are reported single case similar to present study but Julius et al.<sup>17</sup> reported higher frequency of Pentafurcation in Kenyan population.

Difference in findings of different studies depends on difference in sample size as well as on different populations.

#### 5. Conclusion

The present study on incidence of variations in branching patterns of left coronary among North Indians give knowledge of variation which have great importance in making a proper diagnosis and planning of further procedure regarding treatment.

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