



Morphometric Study of Left Coronary Artery in Human Adult Heart

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ABSTRACT

Aim: To study the number, level of left coronary Ostia, branching pattern of the left coronary artery, and the length of the stem of the left coronary artery. **Materials and Methods:** This study is conducted on 5 cadaver hearts in the department of Anatomy of college. **Results:** In the present study about 92% of specimens have single Ostia and 8% of specimens have double Ostia. About 64% of heart coronary Ostia are below the sino-tubular junction and about 36% are above the sino-tubular junction. Left coronary artery bifurcates in 84% of specimens and 16% of specimens trifurcate. The length of the stem of the left coronary artery is between 12.45 mm to 25.2 mm and the external diameter of the left coronary artery is between 2.39 mm to 6.58 mm. **Conclusion:** Studying the variations of the coronary artery is helpful for Interventional Cardiologists and Radiologists to interrupt the various diagnostic and therapeutic procedures.

Keywords: Ostia, Sino-tubular junction, Left coronary artery

INTRODUCTION

In the normal heart, oxygenated blood is supplied by two coronary arteries that arise from the ascending aorta. The Left coronary artery originates from the left posterior aortic sinus and runs towards the left, under the left auricle. After a short course, it divides into two vessels, the left anterior descending artery, and the circumflex artery. The left coronary artery trunk presents a wide variability in its morphological expression with regards to its length, level of origin, and several terminal branches. There is a correlation between the length of the main left coronary artery and atherosclerosis present in its branches or the presence of a complete left bundle branch block. Approximately a third of worldwide deaths are caused by ischemic or coronary heart disease, suggesting that greater attention is needed to study the coronary diameter and myocardial vasculature. Thus, the knowledge of such variations is important for the evaluation of percutaneous coronary artery interventions, coronary artery surgeries, or prosthetic valve replacements, and last but not the least, for its academic value among upcoming clinicians.

Objectives of the Study

To study about

- Number of left coronary ostium
- Level of left coronary ostium
- Branching pattern of left coronary artery
- Length of left coronary artery

MATERIALS AND METHODS

The present study was conducted on 25 adult heart specimens that were used during routine dissection for MBBS students in the Department of Anatomy at Tirunelveli Medical College. Twenty-five specimens of the heart were collected by cutting ribs and sternum and opening of thoracic cavities of the cadavers. The great vessels, ascending aorta, and pulmonary trunks were ligated by using threads at two places and they were then cut in between the two ligatures. The parietal pericardium was incised and the heart, along with the proximal part of the great vessels, was taken out of the pericardial cavity. Then, the aorta and the pulmonary trunk were excised about 2 cm above the supra-valvular ridge. All the collected samples were kept in 10% formalin. After a gradual separation and retraction of the myocardial fasciculus, the left coronary artery was exposed. The length of the main trunk was measured by using a vernier caliper and the branching patterns were noted. The ascending aorta was cut longitudinally (near the right posterior non-coronary sinus) to check the position, number, and level of the left coronary ostium.

RESULTS

The following observations were seen in our study.

The Number of Ostia

Among the 25 specimens collected, we observed that only two specimens had two coronary Ostia noted at the left posterior aortic cusp. The rest of the specimens had only one coronary ostium in the left posterior aortic cups.

Level of Ostia

Among the 25 specimens, we observed that in 16 specimens' ostium is located below the sino-tubular junction, and the remaining 9 specimens it is located above the sino-tubular junction (Figure 1 and Figure 2).

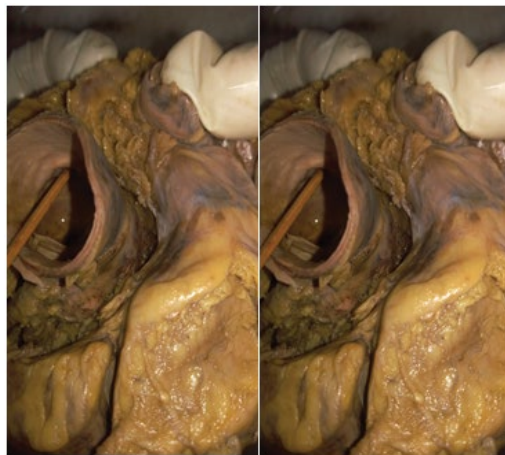


Figure 1 Left coronary ostium below the level of the sino-tubular junction

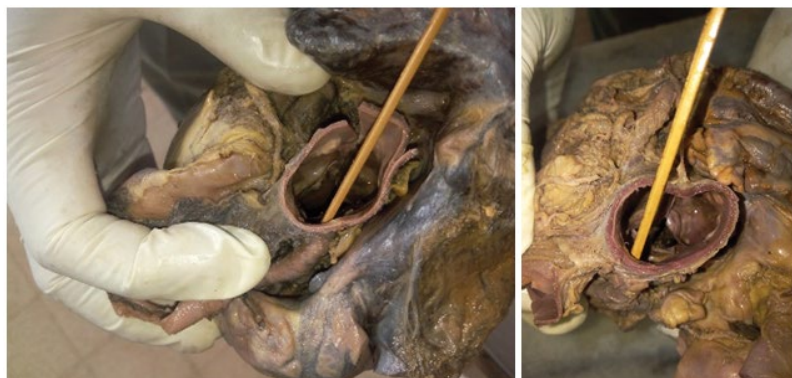


Figure 2 Left coronary ostium above the sino-tubular junction

Branching Pattern

In this study we observed about 21 specimens there was the bifurcation of the left coronary artery and the remaining 4 specimens observed that there was trifurcation of the left coronary artery (Figure 3 and Figure 4).



Figure 3 Left coronary artery-Bifurcation



Figure 4 Left coronary artery-Trifurcation

Length of Left Coronary Artery

From the findings given in Table 1, the length of the stem of the left coronary artery is between 12.45 mm and 25.2 mm.

Table 1 Length of left coronary artery

No of specimen	Length of the stem of left coronary artery (mm)	External diameter of left coronary artery (mm)
1	15.79	4.29
2	18.41	4.71
3	14.98	2.82
4	13.45	3.74
5	13.54	3.5
6	13.23	2.39
7	14.26	5.72
8	15.23	3.6
9	14.51	4.34
10	25.2	6.45
11	12.1	6.58

12	15.2	4.5
13	14.75	5.5
14	17.58	3.4
15	18.5	3.45
16	19.67	4.25
17	20.01	4.15
18	18.78	3.87
19	13.45	3.94
20	12.45	3.87
21	17.15	3.5
22	16.18	4.01
23	15.75	4.25
24	14.01	4.45
25	15.07	4.5

DISCUSSION

Number of Ostia

In most of the studies, the double Ostia is about 2% to 2.5%. But in our study, the double Ostia is somewhat higher about 8% (Table 2).

Table 2 Number of Ostia

References	Number of Ostia	
	1	2
Dakane, et al. [1]	98%	2%
Nasi, et al. [2]	97.50%	2.50%
Present study	92%	8%

Level of Ostia

The level of Ostia is below the level of sino-tubular junction in all the (100%) specimens reported in the Dakane, et al. study [1].

But Cavaleanti, et al. study mentioned about 40% of specimens the level of Ostia was above the sino-tubular junction, in 42% it was below the sino-tubular junction, and in 18% it was at the level of the sino-tubular junction [3].

In Alam's study, 98% of specimens reported the coronary ostium is above the sino- tubular junction [4].

Our study didn't match with the above studies and no specimens had the Ostia is at the level of the sino-tubular junction and in 64% of specimens the level of Ostia is below the sino-tubular junction (Table 3).

Table 3 Level of Ostia

References	Level of Ostia		
	Below Sino-tubular junction	At Sino-tubular junction	Above Sino-tubular junction
Ray, et al. [5]	65%	Nil	35%
Cavaleanti, et al. [3]	42%	18%	40%
Doube, et al. [6]	79%	17.20%	3%

Kumar, et al. [7]	78%	15%	7%
Bhele, et al. [8]	78%	16%	4%
Sultan Ruma Alam [4]	2%	Nil	98%
Dakane, et al. [1]	100%	Nil	Nil
Present study	64%	Nil	34%

Branching Pattern

Our study findings are more or less similar to Anbusudar, et al. study [9]. In Ray, et al. and Doube, et al. studies reported tetrafurcation in 2% and 7.8% specimens [5,6]. But in our study tertafurcation of the left coronary artery is not reported (Table 4).

Table 4 Branching pattern

References	Branching pattern		
	Bifurcation	Trifurcation	Tetrafurcation
Cavalcanti, et al. [3]	60%	38.18%	Nil
Ray, et al. [5]	56%	40%	2%
Doube, et al. [6]	54.70%	35.90%	7.80%
Bhele, et al. [8]	70%	24%	6%
Sultan Ruma Alam [4]	74%	26%	Nil
Anbusudar, et al. [9]	80%	20%	Nil
Present study	84%	16%	Nil

Length of Left Coronary Artery

Our present study didn't match any studies and the length of the stem of the left coronary artery is between 12.45 mm to 25.2 mm (Table 5) [10].

Table 5 Length of left coronary artery

References	Average length of left coronary artery
Bhele, et al. [5]	2 mm to 17 mm
Sultan Ruma Alam [6]	5 mm to 20 mm
Present study	12.45 m to 25.2 mm

CONCLUSION

The knowledge of the branching pattern of the coronary artery is helpful for radiologists and Interventional cardiologists to perform various therapeutic and diagnostic procedures like coronary angiogram, coronary angioplasty, and bypass graft procedures. Knowledge of the number and position of coronary Ostia is mandatory for performing coronary artery catheterization. Proper knowledge of the anatomy of coronary arteries and their variations is useful for a successful outcome following treatment of coronary artery disease.

DECLARATIONS

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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