

MORPHOMETRIC ANALYSIS OF CORONARY ARTERIES IN HARYANVI POPULATION

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ABSTRACT

Objective: The present study aimed to record the length of coronary arteries was carried out for better anatomical knowledge about the branches of coronary arteries and its variation is essential for cardiologists and interpretation of coronary angiograms by radiologists.

Methods: The study group was comprised 60 human cadaveric hearts retrieved from the dead bodies of the age group 18–50 years brought for medicolegal autopsy.

Results: In 60 heart specimen's length of right coronary artery (RCA)-I (34.4–128.8 mm, 81.5±18.1), RCA-II (6.2–43.4 mm, 20.3±9.9), RCA-III (9.6–69 mm, 38.2±18.7), length of left coronary artery (3.4–19 mm, 12.6±3.74 mm), length of left circumflex artery (31.9–144.5 mm, 79.2±26.2 mm), and length of left anterior descending artery (33.4–154.4 mm, 105.3±27 mm).

Conclusion: The name and nature of a coronary artery or a branch define that vessel's vascularization pattern or territory, rather than its origin. Better anatomical knowledge about the branches of the coronary artery and its variation is essential for cardiologists and interpretation of coronary angiograms by radiologists.

Keywords: Heart, Right coronary artery, Left coronary artery.

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INTRODUCTION

The "Coronary" term meaning crown is derived from the Latin word "Corona." The heart pumps the blood for the entire tissues in the human body through the aorta. However, the heart itself gets its nutrition through coronary arteries. In congenital and acquired cardiovascular diseases, management of a good and precise knowledge of normal and anomalous coronary circulation is crucial [1]. The normal and variations in the anatomy of the coronary arteries have been studied for a long time, utilizing cadaveric dissection and various medical imaging techniques. Some of the benefits of cadaveric studies are that they are typically more simplistic because the coronary arteries can be studied in a 3D structure and can be followed from their origin or termination [2].

The right coronary artery (RCA) originates from the right sinus of the Valsalva in the aortic root. The RCA almost immediately enters the right atrioventricular sulcus and courses between the right atrium and right ventricle [3].

The left coronary artery (LCA) originates from the left sinus of Valsalva in the aortic root. The LCA is a short trunk that may divide and can give two branches (bifurcate), three branches (trifurcate), or four branches (quadrifurcate). The trunk of the artery passes behind the pulmonary trunk and then appears forward and to the left between the pulmonary trunk and left auricle [1].

METHODS

The present study was conducted in the Department of Anatomy in collaboration with the Department of Forensic Medicine, Pt. B. D. Sharma PGIMS, Rohtak, after obtaining due permission from the Institutional Ethical Committee. The study group was comprised of 60 human cadaveric hearts retrieved from the dead bodies of the age group 18–50 years brought for medicolegal autopsy which had been

performed within 18 h of death, as the morphology and morphometry of the heart are not altered because of decomposition or putrefaction [4,5] by that time in the mortuary of the Department of Forensic Medicine, Pt. B. D. Sharma PGIMS, Rohtak.

Morphometric parameters analyzed

1. RCA
 - a. Length
 - i. RCA-I (A-B): Origin to right border of heart (Fig. 1).
 - ii. RCA-II (B-C): Right border to crux of heart (Fig. 2).
 - iii. RCA-III (C-D): Crux of heart to endpoint (Fig. 3).
2. LCA
 - b. Length
 - i. LCA (E-F): From origin to bifurcation (Fig. 4).
 - ii. Left circumflex artery (LCX) (F-G): LCX artery (Figs. 5 and 6).
 - iii. Left anterior descending (LAD) (F-H): LAD artery (Fig. 7).

RESULTS

The length of coronary arteries is measured as mentioned in Table 1.

DISCUSSION

The branching pattern and distribution of coronary arteries have been studied by various workers in the past. Coronary artery disease is one of the most common causes of death due to changing dietary habits, sedentary habits, smoking, etc., in developing countries such as India. With the advancement of medical technology, the incidence of coronary angiography and coronary bypass surgeries, stent, and balloon angioplasty is also increasing. The present study was done with the hope that the data analyzed in the study may help clinicians to interpret properly the findings which will lead to its remedy [2]. In the present study, the range of RCA-I (34.4–128.8 mm), RCA-II (6.2–43.4 mm), and RCA-III (9.6–69 mm) were recorded in 60 heart specimens. The range of 1st segment was similar to the study done by Nguyen (32–127.8 mm) [3] and segments 2nd and

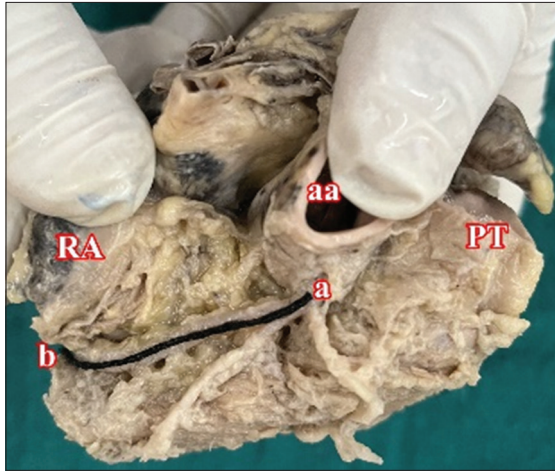


Fig. 1: Length of right coronary artery (RCA)-I (origin to right border of heart): aa-ascending aorta, RA-right atrium (reflected), PT-pulmonary trunk, a and b-RCA



Fig. 4: Length of main trunk of left coronary artery: LV-left ventricle, RV-right ventricle, Ax-apex of heart, aa-ascending aorta, a-left coronary main trunk, b-left anterior descending artery

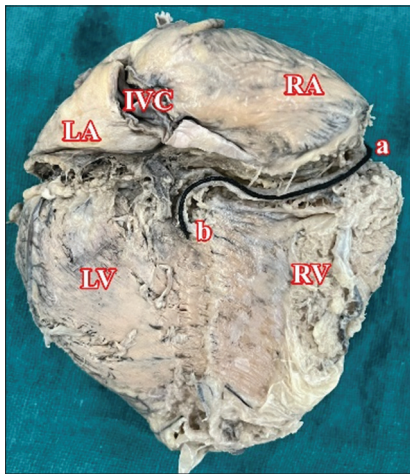


Fig. 2: Length of right coronary artery-II (right border to crux of heart): IVC-inferior vena cava, LA-left atrium, LV-left ventricle, RA-right atrium, RV-right ventricle, a-right border of heart, b-crux of heart

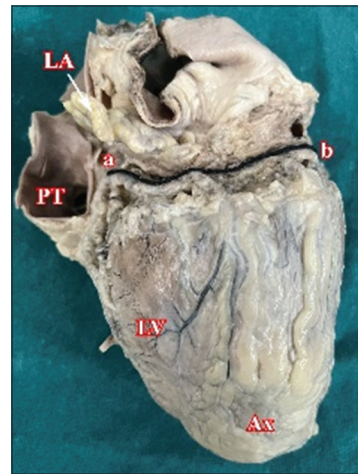


Fig. 5: Length of left circumflex artery: LA-left auricle, PT-pulmonary trunk, LV-left ventricle, Ax-apex of heart, a and b-left circumflex artery

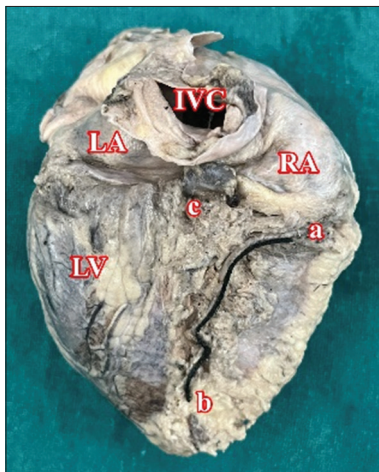


Fig. 3: Length of right coronary artery (RCA)-III (crux to termination): IVC-inferior vena cava, LA-left atrium, RA-right atrium, LV-left ventricle, a and b-length of RCA-III, c-crux of heart

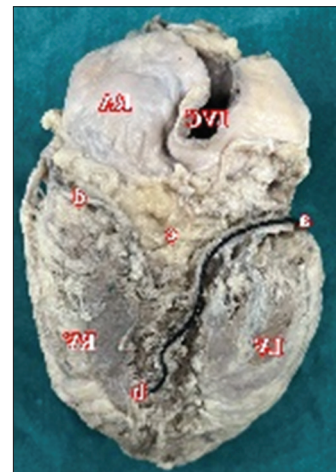


Fig. 6: Length of left circumflex artery: IVC-inferior vena cava, RA-right atrium, LV-left ventricle, RV-right ventricle, a-left circumflex artery, b-posterior interventricular artery, c-crux of heart, d-Mid right coronary artery

Table 1: Showing data of variations in length of coronary arteries

Parameter	Right			Left		
	RCA-I	RCA-II	RCA-III	LCA	LCX	LAD
Mean±SD (mm)	81.5±18.1	20.3±9.9	38.2±18.7	12.6±3.74	79.2±26.2	105.3±27
Range (mm)	34.4–128.8	6.2–43.4	9.6–69	3.4–19	31.9–144.5	33.4–154.4

RCA: Right coronary artery, LCA: Left circumflex artery, LCX: Left circumflex, LAD: Left anterior descending, SD: Standard deviation

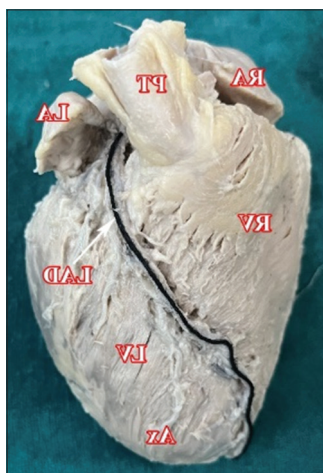


Fig. 7: Length of left anterior descending artery: PT-pulmonary trunk, RA-right atrium, LA-left auricle, RV-right ventricle, LV-left ventricle, Ax-apex of heart, LAD-left anterior descending artery

3rd were greater in the present study. The findings of the study by Atta-Alla *et al.* (1st segment range: 57–80 mm, mean±standard deviation (SD): 63±6 mm, and 2nd segment range: 34–60, mean±SD: 49±7 mm) [6] were lesser than the length observed in the present study. The length of the LCA trunk is generally about 5–15 mm long. Short and long LCA trunks were therefore considered to be variants in length [7]. In the present study, length of LCA (3.4–19 mm, 12.6±3.74 mm) is greater than Kulkarni (5–10 mm, 7.5±2.7 mm) [8], Hosapatna *et al.* (6–15, 8.86±2.96 mm) [9], and Bhele *et al.* (5–10 mm, 7.5±2.7 mm) [10] and was observed lesser than Reddy (15–25 mm, 20±2.65 mm) [2]. The study findings were analogous to Kumar (2–16 mm, 10.2±3.5 mm) [8]. In The length of the left circumflex artery (31.9–144.5 mm, 79.2±26.2 mm), the minimum range was greater in comparison to Kumar *et al.* [11] but found to be shorter than Kulkarni [8] and the maximum range is found to be greater than Kumar *et al.* and Kulkarni. In the present study, the length of left anterior descending artery (33.4–154.4 mm and 105.3±27 mm), the mean length is greater than Kumar *et al.* [11] and lesser than Kulkarni [8]. The minimum range is lesser than both Kulkarni [8] and Kumar *et al.* [11] and the maximum range is lesser than Kulkarni [8] but greater than Kumar *et al.* [11].

CONCLUSION

The name and nature of a coronary artery or a branch defines that vessel's vascularization pattern or territory, rather than by its origin-

suggests the variations in origin and length of coronary arteries. Better anatomical knowledge about the branches of the coronary artery and its variation is essential for cardiologists and interpretation of coronary angiograms by radiologists. Work done in the present study was just like scanning the tip of iceberg [2]. The rest of it needs have been explored. An in-depth knowledge of the anatomy of the coronary arteries, that are "crown" of the heart [6], is a self-evident pre-requisite for a complete understanding of coronary artery disease or more intelligent planning of surgery. The present study on the RCA, its origin, course, branching patterns, termination, and the presence of anomalous arteries was to be of some use to the specialists during cardiac catheterizations and to effectively plan bypass surgeries using normal or anomalous coronary arteries. This study would be of use to interventional radiologists and cardiologists for their invasive or non-invasive procedures.

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