

## Analysis of Posterior Interventricular Artery in Post Mortem Hearts-A Hospital Based Study

Dr. Mamotaj Sohely<sup>\*1</sup>, Dr. Rakibul Hasan Khan<sup>2</sup>, Dr. Sarwar Mahboob<sup>3</sup>, Dr. Chandan Banik<sup>4</sup>, Dr. Biplob Kumar Saha<sup>5</sup>

<sup>1</sup>Lecturer, Department of Community Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

<sup>2</sup>Assistant Professor, Department of Forensic Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

<sup>3</sup>Assistant Professor, Department of Community Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

<sup>4</sup>Lecturer, Department of Community Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

<sup>5</sup>Assistant Professor, Department of Hepatology, Pabna Medical College, Pabna, Bangladesh

DOI: [10.36347/sasjm.2022.v08i12.003](https://doi.org/10.36347/sasjm.2022.v08i12.003)

| Received: 24.10.2022 | Accepted: 03.12.2022 | Published: 08.12.2022

\*Corresponding author: Dr. Mamotaj Sohely

Lecturer, Department of Community Medicine, Sheikh Hasina Medical College, Tangail, Bangladesh

### Abstract

### Original Research Article

**Introduction:** Coronary artery recurrently develops over periods. Symptoms may go hidden until a substantial blockage causes complications or a heart attack takes place. The particular anatomy of the myocardial blood supply varies significantly from person to person and generally, there are two prime coronary arteries, the left and the right. The coronary arteries mainly rise from the upper section of the sinus where the wall is fibroelastic and expands up to 16% in systole. According to the origin of the posterior interventricular artery (PIVA) if it arises from RCA, then it is right dominance and if PIVA arises from LCA, it is left dominance. **Methods:** A cross-sectional study was carried out in the Department of Forensic Medicine of Dhaka Medical College and Hospital from September 2017 to January 2019. A total of 120 dead patients' hearts (N=120) were used in this study. All observations were noted in the clinical data sheet. Completed data forms were reviewed, edited, and processed for computer data entry. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. **Result:** Among the study population (N=120), one hundred hearts were male & of them, seventy males belonged to Group A (20 to 40 years), sixteen belonged to Group B (41 to 60 years), fourteen belonged to Group C (61 to 75 years) and twenty hearts were of female & of them fourteen belonged to Group A, six belonged to Group B, but no one belonged Group C. In Group A, the posterior interventricular artery arose from the right coronary artery in sixty-four males (64,91.4%), & the left coronary artery in six males (6,8.6%) and, the posterior interventricular artery arose from the right coronary artery in twelve females (12,85.7%). In Group A, the posterior interventricular artery terminated in the distal half of the posterior interventricular groove in fifty-six males (56,80.0%), in the proximal half of the posterior interventricular groove in twelve males (12,17.1%), & at the apex in two males (2,2.9%). **Conclusion:** Coronary control is vital as inferior wall myocardial infarctions are very common. The posterior interventricular artery has a discrete meaning as it accumulates coronary dominance. The outcomes of the current study can be useful to cardiovascular surgeons and cardiologists in the appropriate diagnosis and management of heart diseases.

**Keywords:** Coronary arteries, Heart disease, Posterior interventricular artery.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

## INTRODUCTION

The coronary arteries are the main blood vessels, supplying blood to the heart of the body to make the heart beat and pump blood throughout the body as the heart muscle requires oxygen-rich blood to function [1]. The word 'coronary' has derived from the Latin 'corona' and Greek 'koron' meaning crown, a disease in which there is a narrowing or blockage of the coronary arteries which may be subjected to arteriosclerosis and is typically caused by a buildup of fatty material and plaque inside the coronary arteries [2-

4]. Coronary artery frequently develops over decades [5]. Symptoms may go undetected until a significant blockage causes difficulties or a heart attack takes place [6]. The exact anatomy of the myocardial blood supply varies significantly from person to person and generally, there are two prime coronary arteries, the left and the right [7]. The left coronary artery (LCA) arises from the left aortic sinus of the ascending aorta and it lies primarily between the auricle of the left atrium and the pulmonary trunk [8]. The right coronary artery (RCA) arises from the right coronary sinus. The aortic

sinuses are dilatations of the arterial wall just above the involved base of each aortic cusp. The coronary arteries mainly arise from the upper section of the sinus where the wall is fibroelastic and expands up to 16% in systole [8, 9]. According to the origin of the posterior interventricular artery (PIVA), if it arises from RCA, then it is right dominance and if PIVA arises from LCA, it is left dominance. Proper knowledge of normal and irregular anatomy and irregularities of coronary articular circulation becomes essential for diagnosing and treating heart diseases to develop better feedback [10]. Dominance has become a prime section in evaluating the prognosis of coronary artery disease and in contrast with the right and mixed types of dominance, in which left dominance can be fatal [11]. Bangladesh is one of the least developed countries and has certain health problems. Bangladesh is turning rapidly towards industry-based settings with its vast population and as a result, the life style and food habits of the people have been changed [12, 13]. Being overweight, physically inactivity, having an unhealthy pattern of eating, and smoking tobacco are the risk factors for coronary artery disease [14]. Around half of Americans have at least one to three threat factors for heart disease, such as high blood pressure, high cholesterol, and smoking. Some risk factors cannot be prevented, such as age or family history [15, 16]. The current study intends to determine the posterior interventricular artery in the post-mortem heart of a young adult human.

## OBJECTIVES

To understand the posterior interventricular artery in post-mortem heart of young adult human.

## METHODS

A cross-sectional study was carried out in the Department of Forensic Medicine of Dhaka Medical College and Hospital from September 2017 to January 2019. A total of 120 dead patients' hearts (N=120) were used in this study. All observations were noted in the clinical data sheet. The results were calculated and interpreted through appropriate statistical analysis with the help of a statistician and presented with a table with other illustrations. Verbal consent was taken from the family. Ethical clearance was taken from the hospital. The information was kept confidential only to be used for the study purpose.

### Sample Collection

After requisite legal formalities, the samples were collected from the dead bodies as early as possible, before any sign of putrefaction developed. The samples were washed thoroughly with tap water and gently squeezed to remove the blood clots from the cavity of the heart and the lumen of the blood vessels as much as possible. Then the samples were taken to the Department of Anatomy of Dhaka Medical College and Hospital. In the dissection room, the hearts were cleaned by removing all fat and other associated tissue

from the surface of the heart. Then the hearts were preserved in a 10% formal saline solution.

## Data Analysis

The study coordinators performed random checks to verify data collection processes. Completed data forms were reviewed, edited, and processed for computer data entry. Frequencies, and percentages were used for descriptive analysis.  $\chi^2$  test was used to analyze statistical significance. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0.

## RESULT

Among the study population (N=120), one hundred hearts were male & of them seventy males belonged to Group A (20 to 40 years), sixteen belonged to Group B (41 to 60 years), fourteen belonged to Group C (61 to 75 years) and twenty hearts were of female & of them fourteen belonged to Group A, six belonged to Group B, but no one belonged Group C [Table 1]. In Group A, the posterior interventricular artery arose from the right coronary artery in sixty-four males (64,91.4%), & the left coronary artery in six males (6,8.6%) and, the posterior interventricular artery arose from the right coronary artery in twelve females (12,85.7%), & the left coronary artery in two females (2,14.3%). In Group B, the posterior interventricular artery arose from the right coronary artery in fourteen males (14,87.5%), & the left coronary artery in two males (2,12.5%), and, the posterior interventricular artery arose from the right coronary artery in six females (6,100.0%). In Group C, the posterior interventricular artery arose from the right coronary artery in twelve males (12,85.7%), & the left coronary artery in two males (2,14.3%). Statistical analysis between sex did not show any significant difference ( $p>0.50$ ,  $p>0.10$ ) [Table 2]. In Group A, the posterior interventricular artery terminated in the distal half of the posterior interventricular groove in fifty-six males (56,80.0%), in the proximal half of the posterior interventricular groove in twelve males (12,17.1%), & at the apex in two males (2,2.9%) and terminated in the distal half of the posterior interventricular groove in ten females (10,71.4%), in the proximal half of the posterior interventricular groove in two females (2,14.3%) & & at the apex in two females (2,14.3%). In Group B, the posterior interventricular artery terminated in the distal half of the posterior interventricular groove in ten males (10,62.5%), in the proximal half of the posterior interventricular groove in four males (4,25.0%), & at the apex in two males (2,12.5%) and terminated in the distal half of the posterior interventricular groove in four females (4,66.7%), in the proximal half of the posterior interventricular groove in two females (2,33.3%). In Group A, the posterior interventricular artery terminated in the distal half of the posterior interventricular groove in fifty-six males (56,80.0%), in the proximal half of the posterior interventricular groove in twelve males (12,17.1%), &

at the apex in two males (2,2.9%). In Group C, the posterior interventricular artery terminated in the distal half of the posterior interventricular groove in eight males (8,57.1%), in the proximal half of the posterior

interventricular groove in four males (4,28.6%), & at the apex in two males (2,14.3%). Statistical analysis between sex did not show any significant difference ( $p>0.50$ ,  $p>0.50$ ) [Table 3].

**Table 1: Distribution of the study subjects based on Age (N=120)**

Group	Age range (years)	Male	Female
A	20-40	70	14
B	41-60	16	6
C	61-75	14	0

**Table 2: Distribution of the study subjects based on Site of origin (N=120)**

Group	Site of origin			p-value
	n	RCA No (%)	LCA No (%)	
<b>Male</b>				
A	70	91.4%	8.6%	
B	16	87.5%	12.5%	>.50 <sup>ns</sup>
C	14	85.7%	14.3%	
<b>Female</b>				
A	14	85.7%	14.3%	>.10 <sup>ns</sup>
B	6	100.0%	0.0%	

**Table 3: Distribution of the study subjects based on Site of termination (N=120)**

Group	Site of termination				p-value
	n	In the distal half of the posterior interventricular groove (%)	In the proximal half of the posterior interventricular groove (%)	At the apex (%)	
<b>Male</b>					
A	70	80.0%	17.1%	2.9%	
B	16	62.5%	25.0%	12.5%	>.50 <sup>ns</sup>
C	14	57.1%	28.6%	14.3%	
<b>Female</b>					
A	14	71.4%	14.3%	14.3%	>.50 <sup>ns</sup>
B	6	66.7%	33.3%	0.0%	

## DISCUSSION

Coronary artery disease is the paramount cause of death globally. It arises when the accrual of plaque, a fatty material; such as cholesterol, connective tissue, white blood cells & some smooth muscle cells within the walls of the arteries obstruct the flow of blood and lessens the flexibility or defiance of the vessels [17].

This current study was implemented on one-hundred twenty (120) adult human hearts with a male predominance of 83.3%. A similar study also found male predominance [18]. A journal of the American Heart Association stated that women had a markedly lower hazard of fatal coronary heart disease in contrast with men [19]. A related article based on Madhya Pradesh, India showed 32 hearts were of males and 28 hearts were of females [20].

In this current analysis, the majority of patients were from 20 to 40 years old. Another related study demonstrated that the mean age of patients were 26±3.9 years, with a maximum number of patients (60.2%) being between the age of 25 to 30 years and the rest in the age group of 20-25 years [21]. Another study

suggested that the mean age of the patients was 61 years with a range of 18 to 84 years old [22].

In this current analysis, the posterior interventricular artery arising from the right coronary artery for males in groups A, B, and C was 91.4%, 87.5%, and 85.7% respectively & for females were 85.7% & 100% respectively and from the left coronary artery for male in group A, B, C was 8.6%, 12.5%, 14.3% respectively & for female was 14.3%. Another similar analysis described that 65% of people were affected by the right coronary artery [23].

Another published article showed that the circulation was right-dominant in 87.1% of people and the left dominant in 9.5% of people [24]. Another related study suggested that the posterior interventricular artery grew from the right coronary artery by 90% & from the left coronary artery by 10% [18]. Another related article showed that the left anterior descending artery was involved in 0.01% of patients [22]. Another analysis revealed that the LCA was separated in 46% of hearts [25]. A related analysis described that in 68.8% of hearts the CONUS artery originated from RCA [26]. From an old thesis, the

author found that the posterior interventricular artery that arose from the RCA was 87% and LCA was 9% [27]. Another related article found that the posterior interventricular artery arose from the RCA was 78.6%, from the LCA was 17.1% and from both 4.28%. here, the percentages in the site of origin of the posterior interventricular artery from the left coronary artery were lower and the right coronary was higher [28]. A similar analysis revealed that the posterior interventricular artery that arose from the RCA was 89% and from the LCA was 11% [10]. Right dominance was found in 70.0% and left dominance was found in 18.5% depicted in another study [11].

In this present analysis, the posterior interventricular artery was terminated in the distal half of the posterior interventricular groove for males in groups A, B, and C was of 80.0%, 62.5%, 57.1% respectively & for females were 71.4%, 66.7% respectively and in the proximal half of the posterior interventricular groove for male in group A, B, C was of 17.1%, 25.0% 28.6% respectively for female was of 14.3% respectively. At the apex for males in groups A, B, and C was 2.9%, 12.5%, and 14.3% respectively for females was 14.3% respectively. An article found that the posterior interventricular artery was terminated at 11.0% at the apex, 22.2% in the proximal half of the posterior interventricular groove, and 63.0% in the distal half of the posterior interventricular groove [28]. A related study found that the marginal artery was terminated for males in groups A, B, and C was of 28.1%, 28.6%, and 33.3%, respectively for females was of 16.7%, and 33.3% respectively [29]. In an old study, the author found that the artery was terminated 48% in the distal half of the posterior interventricular groove, 9% in the proximal half of the posterior interventricular groove and 43% at the apex [30].

Coronary artery disease is an increasingly essential medical and public health concern in South Asian, mostly in Bangladeshis. People often are excessively prone to develop coronary artery disease, which is almost premature in onset, and follows a rapidly advanced and angiographically more certain [31].

## CONCLUSION

The coronary arteries are one of the major reasons behind death. Coronary control is essential as inferior wall myocardial infarctions are very common. The posterior interventricular artery has distinct significance as it accumulates coronary dominance. The source of the blood of the inferior myocardium depends on the dominance. Awareness of these deviations plays an enhanced role in treating inferior wall infarcts. The outcomes of the current study can be helpful to cardiovascular surgeons and cardiologists in the appropriate diagnosis and management of heart diseases.

## REFERENCES

1. Coronary Arteries. Cleveland Clinic. [Available at: <https://www.google.com/https%3A%2F%2Fmy.clevelandclinic.org>] [Last Accessed on 26-11-2022]
2. Archacki, S. R. (2011). Molecular Identification of Novel Genes Associated with Atherosclerosis (Doctoral dissertation, Cleveland State University).
3. Feldman, C. L., Ilegbusi, O. J., Hu, Z., Nesto, R., Waxman, S., & Stone, P. H. (2002). Determination of in vivo velocity and endothelial shear stress patterns with phasic flow in human coronary arteries: a methodology to predict progression of coronary atherosclerosis. *American heart journal*, 143(6), 931-939.
4. Lu, L., Liu, M., Sun, R., Zheng, Y., & Zhang, P. (2015). Myocardial infarction: symptoms and treatments. *Cell biochemistry and biophysics*, 72(3), 865-867.
5. Ambrose, J. A., & Singh, M. (2015). Pathophysiology of coronary artery disease leading to acute coronary syndromes. *F1000prime reports*, 7.
6. Warnes, C. A. (2009). Adult congenital heart disease: importance of the right ventricle. *Journal of the American College of Cardiology*, 54(21), 1903-1910.
7. Coronary Arteries. Wikipedia. [[https://www.google.com/https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FCoronary\\_arteries&usq](https://www.google.com/https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FCoronary_arteries&usq)] Last Accessed on 26-11-2022]
8. Mahadevan, V. (2018). Anatomy of the heart. *Surgery (Oxford)*, 36(2), 43-47.
9. Ashworth, M. T. (2020). Development of the Heart. *Fetal and Neonatal Pathology*, 571.
10. Kalpana, R. (2003). A study on principal branches of coronary arteries in humans. *J Anat Soc India*, 52(2), 137-40.
11. Das, H., Das, G., Das, D. C., & Talukdar, K. (2010). A study of coronary dominance in the population of Assam. *Journal of Anatomical Society of India*, 59(2), 187-191.
12. Streatfield, P. K., & Karar, Z. A. (2008). Population challenges for Bangladesh in the coming decades. *Journal of health, population, and nutrition*, 26(3), 261.
13. Chang, A., Van Horn, L., Jacobs Jr, D. R., Liu, K., Muntner, P., Newsome, B., ... & Kramer, H. (2013). Lifestyle-related factors, obesity, and incident microalbuminuria: the CARDIA (Coronary Artery Risk Development in Young Adults) study. *American journal of kidney diseases*, 62(2), 267-275.
14. Peltzer, K., & Pengpid, S. (2018). Prevalence, risk awareness and health beliefs of behavioural risk factors for cardiovascular disease among university students in nine ASEAN countries. *BMC public health*, 18(1), 1-9.
15. Murray, C. J., Lauer, J. A., Hutubessy, R. C., Niessen, L., Tomijima, N., Rodgers, A., ... &

- Evans, D. B. (2003). Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular-disease risk. *The Lancet*, 361(9359), 717-725.
16. Rapsomaniki, E., Timmis, A., George, J., Pujades-Rodriguez, M., Shah, A. D., Denaxas, S., ... & Hemingway, H. (2014). Blood pressure and incidence of twelve cardiovascular diseases: lifetime risks, healthy life-years lost, and age-specific associations in 1· 25 million people. *The Lancet*, 383(9932), 1899-1911.
  17. Coronary Circulation. Medicine Libre Texts. [Available at: <https://www.google.com2Fmed.libretexts.org>] [Last Accessed on 26-11-2022]
  18. Hussain, M. A., Nahar, A., Hakim, M. M., & Ara, S. (2011). Study on Posterior Interventricular Artery in Post Mortem Heart of Adult Bangladeshi Peopl. *Journal of Chittagong Medical College Teachers' Association*, 22(2), 22-26.
  19. Kim, C., Cushman, M., Khodneva, Y., Lisabeth, L. D., Judd, S., Kleindorfer, D. O., ... & Safford, M. M. (2015). Risk of incident coronary heart disease events in men compared to women by menopause type and race. *Journal of the American Heart Association*, 4(7), e001881.
  20. Singh, B., & Ghughe, S. H. (2016). To Determine the Origin of Posterior Interventricular Artery. *Journal of Advanced Medical and Dental Sciences Research*, 4(5).
  21. Sinha, S. K., Krishna, V., Thakur, R., Kumar, A., Mishra, V., Jha, M. J., ... & Varma, C. M. (2017). Acute myocardial infarction in very young adults: A clinical presentation, risk factors, hospital outcome index, and their angiographic characteristics in North India-AMIYA Study. *ARYA atherosclerosis*, 13(2), 79.
  22. Tuncer, C., Batyraliev, T., Yilmaz, R., Gokce, M., Eryonucu, B., & Koroglu, S. (2006). Origin and distribution anomalies of the left anterior descending artery in 70,850 adult patients: multicenter data collection. *Catheterization and Cardiovascular Interventions*, 68(4), 574-585.
  23. Posterior interventricular artery: Anatomy and supply – Kenhub. [ Available at: <https://www.google.com?url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQ5qSRuMb7AhUUGwGHeYBhoQFnoECBUQAQ&url=https%3A%2F%2Fwww.kenhub.com%2Fen%2Flibrary%2Fanatomy%2Fposterior-interventricular-artery&usg=AOvVaw0vKr2buqbAxZ5RqkOSWgLk>] [ Last Accessed on 26-11-2022]
  24. Ozturk, E., Duran, C., Sonmez, G., Sildiroglu, H. O., Velioglu, M., Bozlar, U., & Hagspiel, K. D. (2011). Arterial supply of the posterior interventricular sulcus: a CT coronary angiographic study. *Surgical and Radiologic Anatomy*, 33(1), 27-34.
  25. Fazliogullari, Z., Karabulut, A. K., Unver Dogan, N., & Uysal, I. I. (2010). Coronary artery variations and median artery in Turkish cadaver hearts. *Singapore medical journal*, 51(10), 775.
  26. Nguyen1A, V. H., & Talarico Jr, E. F. (2019). A morphometric anatomical study of the right coronary artery in Vietnamese. *Eur. j. anat*, 23(5), 341-353.
  27. Sarkar, M. S. (1996). An anatomical study of coronary arteries and the arch of aorta in adult Bangladeshi people [thesis]. Dhaka: University of Dhaka. 12-65.
  28. Rahman, A. S. (1989). Anatomy of coronary circulation and dimensions of adult postmortem human hearts in Bangladesh [thesis]. Dhaka: Univ. of Dhaka.
  29. Hossain, A., Ara, A., & Ara, S. (2009). Study of Right Marginal Artery in Post Mortem Hearts of Adult Bangladeshi People. *Cardiovascular Journal*, 1(2), 165-168.
  30. Baroldi, G., MANTERO, O., & SCOMAZZONI, G. (1956). The collaterals of the coronary arteries in normal and pathologic hearts. *Circulation research*, 4(2), 223-229.
  31. Islam, A. M., & Majumder, A. A. S. (2013). Coronary artery disease in Bangladesh: A review. *Indian heart journal*, 65(4), 424-435.