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Variation in Origin and Termination of Posterior Interventricular Artery - Cadaveric Study

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ABSTRACT

BACKGROUND: Human heart is supplied by both coronary arteries. Posterior interventricular artery determines the coronary dominance. Variation in origin, course and termination of posterior interventricular artery may affect the blood supply of heart.
MATERIALS & METHODS: 30 formalin fixed human adult cadaveric heart were dissected in Department of Anatomy, Coimbatore Medical College, Coimbatore and studied the origin, termination of posterior interventricular artery in posterior interventricular sulcus.
RESULTS: Out of 30 specimens, in 28 (93%) specimens the PIVA arises from RCA and in 2 (7%) specimens the PIVA arises from LCA. The termination of PIVA, at 1/4th way down to PIVS noted in 7specimens (23%), at 1/2th way down to PIVS noted in 12 specimens (40%), at 3/4th way down to PIVS noted in 9 specimens (30%), at apex noted in 2 specimens (7%).
CONCLUSIONS: Posterior interventricular artery has special features, since it determines the coronary dominance. Blood supply of inferior myocardium depends on coronary dominance. Hence awareness of origin of PIVA is important in treating myocardial infarction. Knowledge about variation in origin, course and termination is important for radiologist, interventional cardiologist, cardiothoracic surgeons.

KEY WORDS: Posterior Interventricular artery, Coronary dominance, Right dominance, Left dominance, Codominance

INTRODUCTION

Heart supplied by both coronary arteries. Posterior Interventricular Artery usually arises from right coronary artery. It supplies both ventricles and posterior 1/3rd of interventricular septum [1]. Sometimes Posterior Interventricular artery arises from left coronary artery. PIA determines the coronary dominance. Blood supply for inferior myocardium depends on coronary dominance. So present study is focused on origin, termination of PIA in human cadaveric hearts. Hence knowledge about variations in PIA is important for cardiologist, cardiothoracic surgeons and also in treating inferior wall myocardial infarction

MATERIALS AND METHODS

The present study includes 30 human adult cadaveric heart with formalin fixed used for routine dissection procedure for undergraduate in the department of anatomy, Coimbatore medical college, Coimbatore during the year 2022-2023. The study was done by dissection method with the help of Cunningham's Manuel of Practical Anatomy. We ensured that all the selected heart were with intact posterior interventricular artery. We excluded the heart with gross pathological deformity. Right coronary artery and left coronary artery were identified. Posterior Interventricular artery origin, course and its termination were studied. The data was tabulated and compared with earlier studies.

OBSERVATION

In this study 30 adult human cadaveric hearts were assessed and observed for origin and termination of posterior interventricular artery. In most of the specimen posterior interventricular arises from right coronary artery. Only in 2 cases it arises from left coronary artery [Table – 1].

Table -1: Origin of posterior interventricular artery

Origin of PIVA	Specimen	Percentage
RCA	28	93%
LCA	2	7%

Termination of posterior interventricular artery in posterior interventricular sulcus was observed [Table - 2].

Table -2: The level of termination of posterior interventricular artery in posterior interventricular sulcus originated from right coronary artery

Level of termination of PIVA	Specimen	Percentage
1/4thway down PIVS	7	23%
1/2thway down PIVS	12	40%
3/4thway down PIVS	9	30%
Till the apex	2	7%

Level of termination of posterior interventricular artery in posterior interventricular sulcus was also noted. Termination of PIVA at 1/4th way down in PIVS was seen in 7 specimens (23%), 1/2th way down in PIVS was seen in 12 specimens (40%) (Fig-3), 3/4th way down in PIVS was present in 9 specimens (30%) (Fig-1) and at apex was noted in 2 specimens (7%) (Fig-2 A, B)

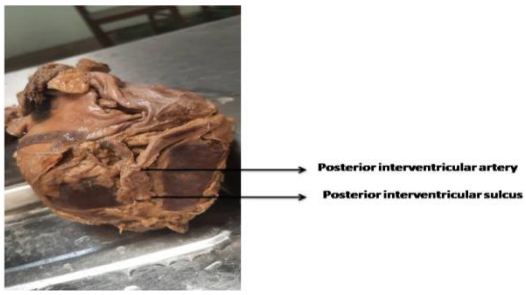

Figure 1: Shows the posterior interventricular artery terminates at 3/4th way down in posterior interventricular sulcus

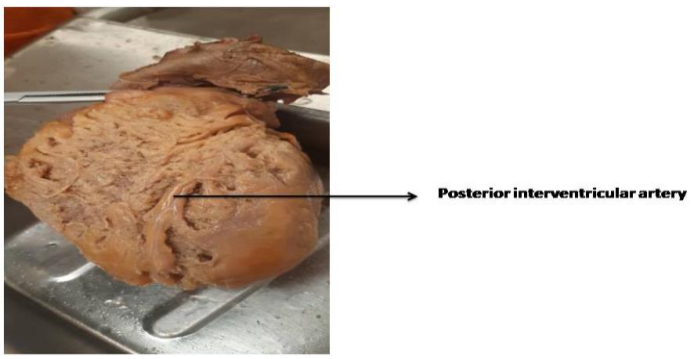

Figure 2 A: Shows the posterior interventricular artery terminates at apex of posterior interventricular sulcus

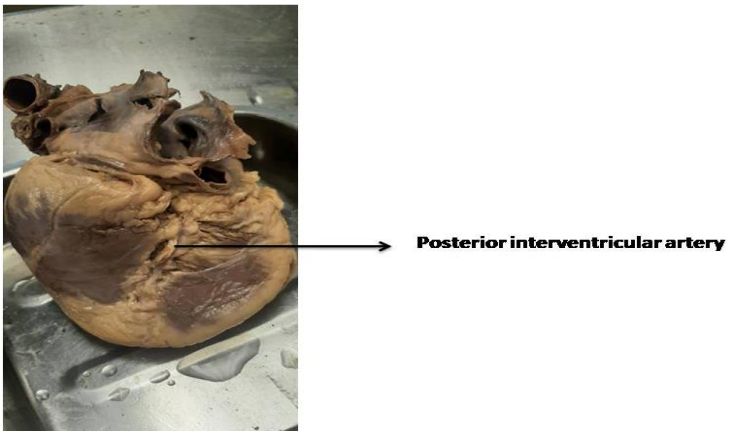

Figure 2 B: Shows the posterior interventricular artery terminates at 1/2th way down in posterior interventricular sulcus

DISCUSSION

According to Nerantzis C E *et al.,* found that among 60 corrosion casting of human hearts, in seven hearts (12%) the posterior interventricular artery appeared as continuation of left circumflex artery. In 53 hearts (88%) the posterior interventricular artery arises from right coronary artery.[1]

According to Kalpana R, right coronary dominance was 89% and left coronary dominance were 11%.[2]

Ersin Ozturk *et al.,* studied in 356 coronary CT angiograms the right coronary dominance was found in 310 specimens (87.1%), left coronary dominance in 34 specimens (9.5%) and co-dominance in 12 specimens (3.4%).[3]

Sabnis A.S, found that posterior interventricular artery arises from right coronary artery (76.80%), from left coronary artery (18.50%) and codominance (4.60%).[4]

Ranjana Agrawal *et al.,* found that in 50 cadaveric human hearts, there was right coronary dominance in 86%specimens, in 8% specimens there was left coronary dominance, in one (6%) specimen there was co-dominance.[5]

Comparison with other studies for origin of Posterior Interventricular artery

Various Studies	RCA	LCA	Codominance
Kalpana R	89%	11%	Nil
Erzin Ozturk et al.,	87.1%	9.5%	3.4%
Ranjana Agrawal et al.,	86%	8%	6%
Kannan Subramanian et al.	91.7%	6.7%	1.7%
Lekshmey Vijay et al.,	84%	16%	Nil
Sabnis	76.8%	18.5%	4.6%
Eesha Kharade	86.7%	3.4%	1.7%
Present Study	93%	7%	Nil

According to Kannan Subramanian *et al.,* the posterior interventricular artery arises from right coronary artery (91.7%), from left coronary artery (6.7%), co-dominance (1.7%) and the level of termination of posterior interventricular artery 1/4th way down posterior interventricular sulcus 28.5%, 1/2th way down posterior interventricular sulcus 37.5%, 3/4th way down posterior interventricular sulcus 23.2%, till the apex 10.7%.[6]

According to Lekhmey Vijay *et al.,* the posterior interventricular artery arises from right coronary artery (84%), from left coronary artery (16%) and the level of termination of posterior interventricular artery 1/4th way down posterior interventricular sulcus 9.8%, 1/2th way down posterior interventricular sulcus

37.5%, 3/4th way down posterior interventricular sulcus 34%, till the apex 18.7%.[7]

Dr. Mamotaj Sohely *et al.,* found that in male (20-40yrs) posterior interventricular artery arises from right coronary artery (91.4%), from left coronary artery (8.6%), in male (40-60yrs) it arises from right coronary artery (87.5%), from left coronary artery (12.5%), in male (61-75yrs) it arises from right coronary artery (85.7%), from left coronary artery (14.3%). In female (20-40yrs) posterior interventricular artery arises from right coronary artery (85.7%), from left coronary artery (14.3%), in female (40-60yrs) it arises from right coronary artery (100%), from left coronary artery (0%).[8]

According to Easha Kharade, posterior interventricular artery arises from right coronary artery (86.7%), from left coronary artery (3.4%) and codominance (1.7%).[9]

Comparison of termination of posterior interventricular artery in posterior interventricular sulcus with various studies

Various Studies	1/4th way down PIVS	1/2nd way down PIVS	3/4thway down PIVS	Till the Apex of PIVS
Kannan Subramanian et al.	28.5%	37.5%	23.2%	10.7%
Lekshmey Vijay et al.	9.8%	37.5%	34%	18.7%
Present Study	23%	40%	30%	7%

In our study the right coronary dominance was 93% and left coronary dominance were 7% coincides with earlier studies [2,3,6]. Termination of PIVA at 1/4th way down in PIVS was seen in 7 specimens (23%), 1/2th way down in PIVS was seen in 12 specimens (40%), 3/4th way down in PIVS was present in 9 specimens (30%) and at apex was noted in 2 specimens (7%) coincides with earlier studies. [6,7]

CONCLUSIONS

Knowledge of variations in PIA is more important for interventional cardiologists, Cardiothoracic surgeons and in treating inferior wall MI, since PIA determines the coronary dominance and also supplies inferior myocardium

List of Abbreviations:

RCA – Right coronary artery
LCA – left coronary artery
PIVA – Posterior Interventricular artery
PIVS – Posterior interventricular sulcus

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: We, the authors declared that there is no conflict of interest related to this work.

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