

The Anatomical Study of Third Coronary Artery in Cadaveric Human Heart



Medical Science

KEYWORDS : Third Coronary Artery, Right Coronary Artery, Conus Artery

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ABSTRACT

The Third Coronary Artery (TCA) is a direct branch originates from the Right Aortic Sinus (RAS) without any apparent common trunk with the Right Coronary Artery (RCA). It supplies the infundibulum of the Right Ventricle (RV) which is usually supplied by the conal branches of both the RCA and the Left Anterior Descending (LAD). Distribution of this artery may be important in various diagnostics and surgical procedures related to coronary heart diseases. According to literature the direct connection of Third Coronary Artery with aorta enhances its value as an effective pathway of collateral blood supply. This study was planned with keeping above facts in mind. Study was done on 50 cadaveric heart specimens obtained from department of Anatomy, Netaji Subhash Chandra Bose Medical College Jabalpur (M.P.). Coronary Arteries were traced by underwater micro-dissection and incidences of Third Coronary Arteries were noted. In the study, in 18% specimens the Right Conus Artery arose directly from the anterior aortic sinus (Third Coronary Artery).

INTRODUCTION:

In the vast majority of people, there are two main coronary arteries, right and left, these arteries arise from ascending aorta from anterior and left posterior aortic sinus respectively. The first branch of Right Coronary artery is the arteriaconiarteriosis or conus artery. When it originates separately from the anterior aortic sinus (in approx 36% of individuals), it is termed as the 'Third Coronary Artery'. It may anastomose with a similar left conus branch from the left anterior descending artery to form the 'Annulus of Vieussens', which is a tenuous anastomotic 'circle' around the right ventricular outflow tract¹ terminating in small "twigs" near the superior aspect of the anterior interventricular sulcus.²

There are many different terms in the literature to describe Third Coronary Artery viz. Supernumerary Right Coronary Artery, Infundibular Artery, Right Vieussens Artery, Arteria Accessoria, or Adipose artery^{2,3,4}

The pattern of distribution of Third Coronary Artery may be important in various cardiac surgical and diagnostic procedures and in understanding the extent and progression of acute myocardial infarction. The TCA may extend epicardially to supply the apex of the heart. Therefore a concern should be made during various surgical procedures around the anterior wall of the right ventricular and infundibulum since such a long TCA may present and surgical hazard may occur due to its damage⁵.

MATERIAL AND METHOD:

The heart specimens for this study were obtained from cadavers in the department of Anatomy, Netaji Subhash Chandra Bose-Medical College Jabalpur (M.P.). The sample size for the study was 50 human hearts. Hearts without any obvious macroscopic pathology within age group 20-60 years were included in the study. The dissection was done under water. The visceral pericardium was removed and by micro dissection the RCA and LCA were exposed and prevalence of Third Coronary Artery was noted. To confined third coronary artery the ascending aorta was cut longitudinally to see the numbers of coronary ostium.

RESULTS:

Table-1: Origin of right conus artery and third coronary artery

Origin From	Number and percentage of specimens	
	No.	%
Right Coronary Artery	41	82
Anterior aortic sinus (as a TCA)	9	18

In 82% specimen the right conus artery was seen arising from the

proximal part of Right Coronary Artery. In the remaining 18% specimens the right conus artery was seen arising from anterior aortic sinus directly called as Third coronary artery (TCA).

DISCUSSION:

Table-2

Author	% of incidence
Kalpna R(2003) ⁶	24
Ivan & Milica(2004) ⁷	34.8
OLABU et al(2007) ⁵	35.1
Gajbe U L, Gosavi S et al(2010) ⁸	16
Present Study	18

As shown in table, Kalpana R noted incidences of Third Coronary Artery in 24% cases. It was noted in 34.8%, 35.1% & 16% cases by Ivan & Milica (2004), Olabu et al(2007) and Gajbe U L & Gosavi S et al (2010) respectively.

In the present study in 18% specimen third coronary arteries were present. Incidence percentage of the present study is lesser than the study of Kalpana R, Ivan & Milica and Olabu et al but greater than Gajbe U L & Gosavi S et al. There are comparatively more incidences of TCA in subjects older than two years. Edwards BS and group (1981)^{9,10} have given three possible explanations for this –

1. Difficulty in identification of conus artery arising from the aorta in small specimens from fetal and infantile subjects.
2. There is progressive age related increase in the caliber of the aorta, resulting in moulding of structures, so that a conus artery arising initially from the proximal segment of RCA is carried into the aorta.
3. Post natal budding of the conus artery from the aorta.

Collateral circulation play key role in the patho-physiology of Coronary Artery Disease (CAD). Symptoms and prognosis in patients with advanced CAD depend mostly on the degree of collateral circulation.¹¹ The branches of TCA opens up in some cardiac pathology to provide collateral circulation and it has also been seen that they improves with age¹² TCA may contribute to collateral circulation to the interventricular septum (IVS) during left anterior descending (LAD) occlusions therefore it may be shielding the septum. According to Gounda et al as medico-legal point of view, having a third coronary artery may help in establishment of partial identity of an individual if ante mortem records of third coronary is available.¹³

CONCLUSION-

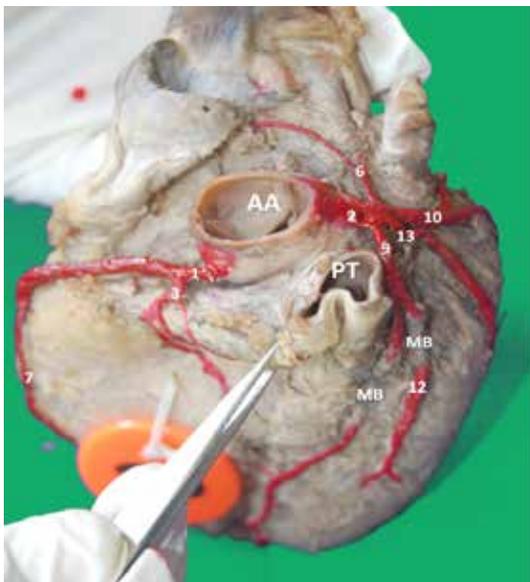
For accurate understanding of coronary angiograms Occurrence and distribution of *third coronary artery* is very imperative. The conus branch of the RCA i.e. TCA has a special anatomic and functional significance in the development of collaterals between the right and left coronary arterial systems. The direct connection of third Coronary artery with aorta enhances its value as an effective pathway of collateral blood supply, hence, adequate knowledge of TCA is essential not only for the Anatomists but also for the cardiologists, interventional radiologists and forensic medicine experts.



Photograph No. 1 – Origin of Third coronary artery. (Superior view)



Photograph No. 2 – opening of TCA in Anterior Aortic Sinus. (Superior view).



Photograph No. 3 – The origin of Right conus

artery(Anterior view)

Keys to Photographs

- | | |
|-------|---|
| 1 - | Right Coronary Artery |
| 2 - | Left Coronary Artery |
| 3 - | Right Conus Artery |
| 4 - | Atrial branch |
| 5 - | Ventricular branch |
| 6 - | Sinu-atrial Nodal Artery |
| 7 - | Right Marginal Artery |
| 8 - | Posterior Interventricular Artery |
| 9 - | Left Anterior descending Artery
(Anterior Interventricular Artery) |
| 10 - | Left Circumflex Artery |
| 11 - | Left Marginal Artery |
| 12 - | Left Diagonal Artery |
| 13 - | Intermediate artery/ Ramus diagonalis/ Median artery |
| 14 - | Posterior Right Diagonal Artery |
| 15 - | Atrioventricular Nodal Artery |
| 16 - | Third Coronary Artery |
| 17 - | Fourth Coronary Artery |
| RA - | Right Atrium |
| LA - | Left Atrium |
| AA - | Ascending Aorta |
| PT - | Pulmonary trunk |
| AAS - | Anterior Aortic Sinus |
| PAS - | Posterior Aortic Sinus |

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