



A Comparative Study of the Position of Right And Left Coronary Ostia in Relation to the Sinotubular Junction

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ABSTRACT

A total of 43 hearts were collected from the Department Of Forensic Medicine And Department Of Anatomy, Gauhati Medical College, Guwahati with the aim to study the variation in the position of coronary ostia in relation to the sinotubular junction. The specimens were collected irrespective of age, sex, socio-economic status, religion, educational status. In 30 (69.77%) specimens location of right coronary ostium was below sinotubular junction and in 13(30.23%) specimens it was at the sinotubular junction. While in the case of left coronary ostium, in 7 (16.28%) specimens the ostium was at the sinotubular junction and in 30 (69.77%) specimens below the sinotubular junction and in 6 (13.95%) specimens above it. In 20 specimens both the right and the left coronary ostia were below the sinotubular junction and in none of the specimens it was seen that both the ostia were above the sinotubular junction.

KEYWORDS

coronary ostia, sinotubular junction, sinus of valsalva.

Introduction:

An efficient coronary vascular system is the key to the efficient functioning of the heart. The coronary arteries are the first branches of the aorta. The ascending aorta has a bulbar dilatation lying in direct connection of the aortic valves. The aortic sinuses of Valsalva are bounded caudally by three thin semilunar valves. Coronary ostia are normally placed in the sinuses of Valsalva, just above the upper free margin of the leaflets of the semilunar valves or at the junction of the sinus and tubular portion of the aorta (sinotubular junction) or slightly below it.^[1-5]

The right coronary artery arises from the right sinus and the left from the left sinus, with no coronary arteries coming from the remaining sinus which is termed as non coronary sinus. Therefore, the terminology for the sinuses of Valsalva refer to the rise of the particular coronary artery (i.e, right or left) rather than the position of the sinus relative to right or left coordinates of the body.^[6]

The position of the coronary ostia, i.e., the origin of the coronary arteries variable. The origin can be high above the normal position or further down below from what can be considered as the normal position. If the artery arises from an ostium situated in the lower most part of the aortic sinus then it is called a "low take off artery" and conversely if the artery arises from an ostium situated around 10 mm above the Sinotubular junction then it is called a "high take off artery". The latter being more dangerous than the former, not only because of the position but also a high take off left coronary artery usually have a longer course and hence makes it more vulnerable to surgical injuries.^[7]

These variations of the coronary ostia can be attributed to the fact that the coronary arteries do not sprout out from the aorta (in which case the position would have been more less fixed but rather they grow into the aorta from the peritruncal arterial vasculature.^[8]

Materials and Method:

The present study was carried out in the Department of Anatomy, Gauhati Medical College, Guwahati. Specimens (heart with proximal part of aorta) were collected from unclaimed or donated human cadavers taken from the following two sources -

- 1) Department of Anatomy, Gauhati Medical College
- 2) Department of Forensic Medicine, Gauhati Medical College.

In the present study, a total of forty three hearts had been studied. The specimens were collected irrespective of age, sex, socio-economic status, religion, educational status. The hearts with the proximal part of aorta were collected after fulfilling all medico legal formalities within six hours of death and with no obvious pathological changes and decomposition. Hearts with mechanical damage and gross deformity were excluded.

The collected specimens were washed with free flowing tap water. All the blood and clots were removed from the chambers of the heart by gently squeezing the heart. Coronary arteries and their branches were particularly squeezed out in the direction from the apex towards the ostia, so that the clots pass through the ostia. The specimens were then preserved in 10% formalin.

The preserved specimens were dissected for gross anatomical examination. The visceral pericardium was first removed to expose the coronary arteries. Subepicardial fats were also removed carefully. With the help of scalpel and fine forceps, the coronary arteries were dissected out and traced. Then the ascending aorta was sectioned transversely approximately one cm above the commissure of aortic leaflets. Next the aorta was longitudinally opened at the level of non coronary sinus to enable visualization and analysis of right and left aortic leaflets and their respective coronary ostia. Position of coronary ostia in relation to the aortic sinuses were noted and the relation of coronary ostia with sinotubular ridge (at, above or below sinotubular ridge) was done by observation

Statistical Analysis:

The statistical analysis had been done using statistical software SAS 9.3 to find out the appropriate results from the collected data by applying the appropriate tests.

Results:

Table 1: Location of coronary ostia in relation to Sinotubular junction.

RELATION TO SINOTUBULAR JUNCTION		NO. OF SPECIMEN	PERCENTAGE
RIGHT	LEFT		
BELOW	BELOW	20	46.51

ABOVE	ABOVE	0	0
ABOVE	BELOW	0	0
BELOW	ABOVE	4	9.30
AT	AT	1	2.33
AT	BELOW	10	23.26
BELOW	AT	6	13.95
AT	ABOVE	2	4.65
ABOVE	AT	0	
TOTAL		43	100

In the course of present study it was seen that 20 specimens had both the coronary ostia located below the sinotubular junction and one specimen both the ostia were located at the sinotubular junction. During the study it was also seen that four specimens had the right coronary ostia below the sinotubular junction with the corresponding left coronary ostia above the sinotubular junction, ten specimens had the right coronary ostia at the sinotubular junction with its corresponding left coronary ostia below the junction. The right coronary ostia and their corresponding left coronary ostia were placed below and at the sinotubular junction in respectively in six specimens and two specimens had the right coronary ostia at the and the corresponding left coronary ostia above the sinotubular junction. The locations have been represented in pie diagram in fig 4.

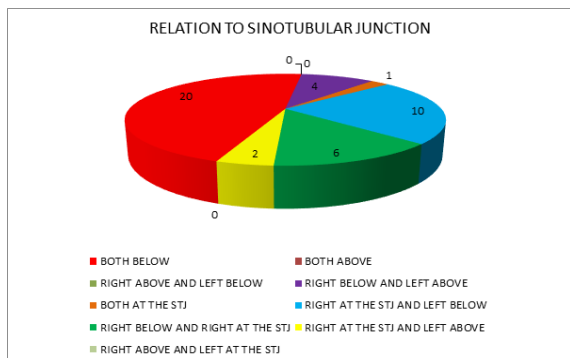


Fig 1: Pie diagram showing different locations of coronary ostia in relation to Sinotubular Junction.

Table 2: Incidence of various locations of coronary ostia in relation to sinotubular junction.

LOCATION	% OF INCIDENCE	
	RIGHT	LEFT
AT THE SINOTUBULAR JUNCTION	13(30.23%)	7(16.28%)
ABOVE THE SINOTUBULAR JUNCTION	0	6(13.95%)
BELOW THE SINOTUBULAR JUNCTION	30(69.77%)	30(69.77%)

In 30 (69.77%) specimens location of right coronary ostium was below sinotubular junction and in 13 (30.23%) specimens it was at the sinotubular junction. In 7 (16.28%) specimens the left coronary ostium was at the sinotubular junction and in 30 (69.77%) specimens below the sinotubular junction and in 6 (13.95%) specimens above it. ()

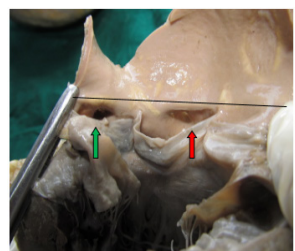


Fig 2: Photograph showing both the coronary ostia below the sinotubular junction

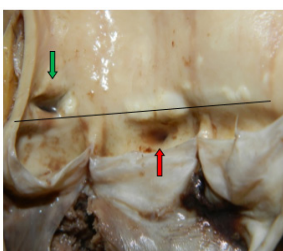


Fig 3: Photograph showing right coronary ostium below and the left coronary ostium above the sinotubular junction

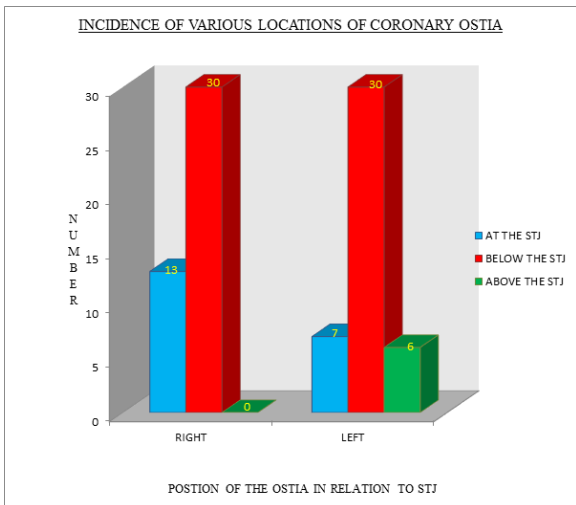


Fig 4: Bar diagram showing incidence of various locations of coronary ostia in relation to sinotubular junction.

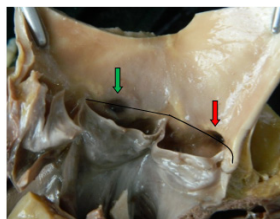


Fig 5: Photograph showing both the coronary ostia at the level of the sinotubular junction.

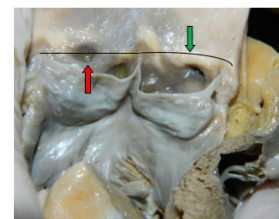


Fig 6: Photograph showing right coronary ostium at and left coronary ostium below the sinotubular junction

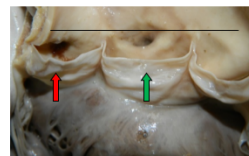


Fig 7: Photograph showing right coronary ostium below and left coronary ostium at the sinotubular junction

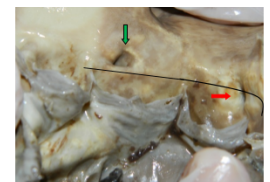


Fig 8: Photograph showing right coronary ostium at and left coronary ostium above the sinotubular junction

Discussion:

In the present study majority of the coronary ostia in both the aortic sinuses were situated below the sinotubular junction (69.77% for both Right and left coronary ostia). Similar results were also obtained by Muriago et al. (1997), Das (2008), Govsa et al.. (2010), Joshi et al. (2010), Bhimalli et al. (2011) and Kaur et al. (2012).^[9-14]

Table 3: Comparison of the incidence of various locations of coronary ostia in relation to sinotubular junction.

Studies	Coronary ostium					
	Right			Left		
	Above	At	Below	Above	At	Below
Muriago et al. (1997)	13%	9%	78%	22%	9%	69%
Das (2008)	17.1%	28.6%	54.3%	21.4%	18.6%	60%
Govsa et al.. (2010)	9%	13%	78%	13%	29%	58%
Bhimalli et al. (2011)	0	16%	84%	3.3%	6.66%	93%
Kaur et al. (2012)	3%	14%	83%	7%	15%	78%
Present study	0	30.23%	69.77%	13.95%	16.28%	69.77%

Conclusion:

Coronary ostia are highly variable in their position. The variability in the origin of the coronary arteries is important for various disciplines of medical sciences including the forensic medicine, cardiology, radiology and of course anatomy. Some of the variable positions of the coronary ostia may cause heart diseases in patients and also increase the risk of sudden death during exertion and normal activities. Eren et.al, had highlighted the importance of the anomalies in origin of coronary artery to the forensic specialists.^[15] The present suggests that the position of the coronary ostia in relation to the sinotubular junction is normal (i.e, at or below the sinotubular) in majority of the specimens however, there were variations in the position of the left coronary ostium, in which 13.95% specimens had the left coronary ostium above the sinotubular.

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