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Research Article

Morphometric Study of Human Cadaveric Coronary Artery

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Abstract: Detail knowledge of normal and anomalous coronary anatomy is necessary to prevent misinterpretation & disastrous complications during increasing coronary intervention & cardiac surgery. Morphometric Study of coronary arteries of 20 cadaveric hearts (both sexes) was done. 20 Cadaveric heart were dissected to study coronary arteries morphologically i.e. no. and position of ostia, length & type of division of left main trunk, & origin of Sino-atrial nodal artery. The incidence of right "DOMINANCE" was 75%, left "DOMINANCE" 10%, co-dominance 15%. In 4% cases two ostia were present for left & right coronary artery. Incidence of short left trunk (<5mm) was 10%, long trunk (>15mm) was 25%. In 15% left trunk was trifurcating (presence of median artery). In 90% cases sino-atrial nodal artery was originating from right coronary & in 10% from circumflex artery. Histological changes were present in 45% cases & significantly involving the proximal segment of anterior interventricular artery.

Keywords: Coronary Artery, Dominance, Anterior Interventricular Artery, Sino-Atrial Nodal Artery

INTRODUCTION

Coronary artery disease is one of the major causes of death in developing countries. Viiallonga J.Reig (2003) described the term normal coronary anatomy refers to the structures that are habitually observed. The term anomaly is used for variations that occur in less than 1% of the general population[14]. Failure to distinguish between normal and anomalous structures may lead to misinterpretation and disastrous complications during cardiac surgery. The present work aims to broaden our knowledge and to understand morphometric and histological aspect of normal and anomalous coronary artery in detail.

Most often cause of death from coronary artery disease was found due to histopathological changes like fatty streak, diffuse intimal thickening and fibrous plaques inside coronary artery lumen and its wall. The earliest lesion of atherosclerosis, fatty streak are present in the aorta from early childhood. Napoli C, D'Armiento FP (1997) described atherosclerosis begins early, particularly in fetuses of hypercholesterolemic mothers .Atherosclerosis is a focal intimal disease of large and medium sized arteries, including coronary arteries specially in its proximal few centimeter and near bifurcation [8].

MATERIALS AND METHODS This study was conducted in hearts of 20 fresh cadavers (Both sexes). Coronary arteries along with its branches were dissected .Morphometric and histological aspect of both coronary arteries were studied .In morphometric study, parameters i.e. number and location of ostium and its variation, length of coronary artery from ostium to bifurcation and type of division of coronary artery were studied in left coronary artery. Location of coronary ostium and its variation, and origin of sinoatrionodal artery were studied in right coronary artery.

OBSERVATION AND RESULT

MORPHOMETRIC STUDY

LEFT CORONARY ARTERY: Out of 20 cadaveric hearts, in 19 cadaveric hearts (95%) only one ostia was present for anterior interventricular and circumflex artery. Only in one heart (5% cases) two ostia were found (table 1). In this study left coronary artery originated from left posterior aortic sinus (100% cases) in all cadaveric hearts. Position of ostium in aortic sinus may also vary (anterior, midthird or posterior). In our study all the ostium (100% cases) for left coronary artery were originated in midthird position of left posterior aortic sinus. Length of main trunk was measured from origin to division of artery. Normal length of main trunk is considered between 5-15mm. less than 5mm is considered as short trunk and more than 15 mm is considered as long trunk(29). Out of 20 cadaveric hearts, in 12 cadaveric hearts (60%) the length of main trunk was found between 5-15mm. In 5 cadaveric hearts (25%) more than 15 mm length was observed. In one heart (5%) trunk for the artery was absent (Table-2). Out of 20

cadaveric hearts, in 16hearts (80%), left coronary artery was divided into anterior interventricular artery and circumflex artery i.e. bifurcated. In 3 cadaveric hearts (15%) trifurcation of coronary artery was present, where third artery is known as median artery. Median artery is one, which originates in the vertex of the angle formed by the main terminal arteries of the left coronary artery it possesses a substantial caliber and has an area of distribution extending half way down the free wall of the left ventricle. In one cadaveric heart, trunk was absent (5%) (Table-3).

RIGHT CORONARY ARTERY: Out of 20 cadaveric hearts, in 19 cadaveric hearts (95%) one ostia was present. In one cadaveric heart 2 separate ostia were present for right coronary and conus artery (Table-4, Fig. 4,5). Sinoatrial nodal artery originated from right coronary artery in18 cadaveric hearts (90%). In 2 cadaveric hearts (10%) it originated from left circumflex artery (Table-5).

DISCUSSION: In 95% of cadaveric hearts there was one ostia for left coronary artery and in 5% of hearts, left trunk was absent and two ostia were present for direct branches of left coronary artery i.e. anterior interventricular artery and circumflex artery. In previous study James and Burch (1958) found its incidence in 1% of cadaveric hearts[4]. Length of main trunk is generally considered to be between 5mm to 15mm. less than 5mm is considered as short trunk and more than 15 mm is considered as long trunk. There is statistically significant relationship between short main trunk and presence of atherosclerosis. Long main trunk is associated with high position of ostium. This high position of ostium can lead to difficulty during aortic bypass surgery during clamping of aorta. In this study normal length was observed in 60% of cadaveric hearts and short main trunk (up to 5mm) in10% and long main trunk (more than 15mm) in 25% of hearts. The morphometric study done by Reig and Petit (2004) revealed normal length of main trunk in 74% and long trunk in 19% of hearts[11]. The Fox at el (1988) described prevalence of short main trunk in 73% of cases but in our study and study done by Reig and petit it was less than10%[1,11]. Kronzen et al statistically proved the relationship between short main trunk and presence of left dominance[5]. But in our study and study done by Reig and Petit there was no such correlation established. Gazetopoulous et al(1976) described statistically significant relationship between short main trunk and presence of atherosclerosis[2]. Short main trunk may make coronary angiography difficult due to catheter insertion in one of the bifurcating branch and poor visualization of another branch.

In 80% of cadaveric hearts left main trunk was bifurcated into two branches and trifurcation was present in 15 % cases. Reig and Petit (2004) found bifurcation in 62% and trifurcation in 38% of cadaveric hearts. The third branch of trifurcation named median artery may have larger area of distribution and has clinical importance[11]. Levin (1982) states that we should not focus our search for atherosclerotic lesion only in anterior interventricular and circumflex artery because involvement of median artery depending upon its distribution may be as dangerous as involvement of other two arteries[6].

RIGHT CORONARY ARTERY: Out of 20 cadaveric hearts, in one cadaveric heart (5%) two ostia was present one for right coronary and other for conus artery. Schlensinger et al (1949) described presence of accessory ostia for conus artery as most frequent coronary variation and given a name of its own third coronary artery. He described the prevalence from 33% to 51%[12]. In our study out of 20 cadaveric hearts, in 18 hearts (90%) sinoatrionodal artery originated from right coronary artery. In two cadaveric hearts (10%) it originated from circumflex artery. James and Burch (1958) described its origin from right coronary artery in 54% cases, from circumflex artery in 42% cases and from both artery in 2% cases[4]. Mc alpine (1975) reported origin of sino atrial nodal artery directly from bronchial artery or from internal thoracic artery[7].

CONCLUSION: We have observed low incidence two ostia for left coronary artery. In majority of cadaveric hearts, length of left trunk was normal. In few cadaveric hearts short and long trunk was observed which has clinical importance during angiography .Bifurcation of left main trunk was observed in maximum number of cadaveric hearts .In few cadaveric hearts trifurcation (median artery) was also observed . The incidence of presence of median artery also has clinical significance because sometime atherosclerotic lesion found in only in median artery. So importance of angiographic lesion of median artery is also necessary in such cases because it supplies larger area of cadaveric heart.

Table 1: No. of Ostia for left coronary artery

No. of Ostia	*No. of heart*	*Percentage*
1	19	95%
2	1	5%

Table 2: Length of main trunk

Length in mm	*No. of heart*	*Percentage*
< 5 mm (S)	2	10%
5 – 15 mm (N)	12	60%
> 15 mm (L)	5	25%
No trunk	1	5%

S=short , N= Normal , L=Long

Table 3: Type of division of artery

Type of division	*No. of heart*	*Percentage*
Bifurcation	16	80%
Trifurcation	3	15%
Quadrifurcation	0	0%
Absent trunk	1	5%

Table 4: No. of ostia in RCA

No. of Ostia	*No. of heart*	*Percentage*
1	19	95%
2	1	5%

Table 5: Variation in origin of Sinoatrialnodal artery

Sinoatrialnodal artery A	***No. of heart***	***Percentage***
From Right Coronary Artery	18	90%
From Left Coronary Artery	2	10%

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