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STUDY ON VARIATIONS IN NUMBERS OF CORONARY OSTIA AND ANOMALOUS ORIGIN OF CORONARY ARTERIES WITH ITS CLINICAL SIGNIFICANCE.

Anatomy

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ABSTRACT

Introduction: The word 'coronary' (Latin word co-ro-ne) refers to a crown like arrangement of all coronary arteries in atrio ventricular sulcus as they "encircling in manner of crown". Usually the heart is vascularised by the first two aortic branches called as Right and Left coronary arteries arising from anterior aortic and left posterior aortic sinuses respectively, sometime apart from the right and the left coronary arteries a third coronary artery (supernumerary artery) is also take part in the vascularisation of heart tissue significantly arises as a separate branch from anterior aortic sinus.

Objective:(1)To detect prevalence of variation in number & position of coronary Ostia in aortic sinuses. (2) To detect anomalous origin of coronary arteries.

Material & Method: This study was conducted on 50 formalin fixed human cadaveric hearts at Department of Anatomy Shyam shah medical college Rewa MP during 2011-12. Samples (cadaveric hearts) for this study were collected from department of Anatomy as well as from mortuary of SGMH hospital, Rewa, (M.P.), India.

Result: In 16 (32 %) of the cases, two (anomalous) coronary ostia were seen in the anterior aortic sinus and in 34 (68%) of cases single normal coronary ostium was seen. In 01(2%) of cases the Lt Circumflex artery arising from Rt coronary artery was observed.

Conclusion: No openings were observed in the pulmonary sinuses. Multiple ostia were mostly seen in the right anterior aortic sinus. Left Coronary ostia lies in left posterior aortic sinus mostly single in number and it located centrally , whereas the right coronary ostia shifted posteriorly towards the right posterior aortic sinus. And abnormal extra separate ostium lies just left to RCA ostium in anterior aortic sinus.(32%).

KEYWORDS

Anterior Aortic sinus, Right conus artery, Left Circumflex artery,

Introduction: The word 'coronary' (Latin word co-ro-ne) refers to a crown like arrangement of all coronary arteries in atrioventricular sulcus as they "encircling in manner of crown"[1]. Usually the heart is vascularised by the first two aortic branches called as Right and Left coronary arteries arising from anterior aortic and left posterior aortic sinuses respectively, sometime apart from the right and the left coronary arteries a third coronary artery (supernumerary artery) is also take part in the vascularisation of heart tissue significantly arises as a separate branch from anterior aortic sinus[2,3].

The knowledge of variation in numbers of coronary Ostia (openings of coronary arteries) and the origin of the coronary arteries is essentially important in cardiac surgeries for obtaining accurate interpretation of coronary angiograms, assessment of severity of coronary insufficiency and appropriate planning of myocardial revascularisation procedure[4]. Present study also founds the variation and anomalous in number of coronary ostia as well as origin of different coronary arteries.

Objective: (1) To detect prevalence of variation in number & position of coronary Ostia in aortic sinuses. (2) To detect anomalous origin of coronary arteries.

Material & Method: After taken ethical approval, this study was conducted on 50 formalin fixed human cadaveric hearts at Department of Anatomy Shyam shah medical college Rewa MP during 2011-12. Samples (cadaveric hearts) for this study were collected from department of Anatomy as well as from mortuary of SGMH hospital, Rewa, (M.P.) India.

Normal hearts from the cadavers of age groups 20-60 were included. Hearts with the gross abnormalities and pathologies or external deformities were excluded. The dissection was done under water, the heart was dissected and the courses of right and left coronary artery were traced from the ostia by cleaning the epicardium and fat by dissection. The coronary arteries and its branches were observed. The coronary veins were removed to avoid confusion. The ascending aorta was sectioned transversely approximately 1 cm above the commissure of aortic leaflets then carefully observed the no of coronary ostia in aortic sinuses normally in maximum hearts anterior aortic sinus shows one osmium and from this the Rt coronary artery is originated , the left posterior aortic sinus shows presence of one ostium of Lt coronary artery. Study reports the multiple coronary ostia and anomalies in origin of coronary arteries in hearts were observed. The specimens were duly numbered, preserved in 10% formaldehyde solution, and then probe is inserted into the multiple ostia of right anterior aortic sinus. To give contrast in photograph red enamel paint was used to paint the main coronary artery and their branches in selected specimens. After noting all these parameters related to variation in numbers and origin of coronary arteries from the aortic sinus.

Result: In 16 (32 %) of the cases, two (anomalous) coronary ostia were seen in the anterior aortic sinus and in 34 (68%) of cases single normal coronary ostium was seen. In all case the left posterior aortic sinus present single normal coronary ostium was seen. And no opening was seen in right posterior aortic sinus. (Table No 1, Fig 1&2). In 34 (68%) of cases RCA originates from single coronary ostium of anterior aortic sinus, and the rt conus artery is the first ventricular branch arises from proximal part of RCA. In 16 (32 %) of the cases, RCA is having same single coronary ostium in anterior aortic sinus ,but the rt conus artery is originating from separate ostium were seen in the anterior aortic sinus and refers as Third coronary artery. (Table No 2 Fig 3). Lt Coronary artery and left circumflex artery- In all case the LCA originates from single ostium in left posterior aortic sinus. And the Lt Circumflex artery arises as the one of the trunk branch. In 01(2%) of cases the Lt Circumflex artery arising from Rt coronary artery was observed (Fig 4).

Table 1: Showing variations in number of coronary Ostia (single/multiple) in aortic sinuses.

No. of Openings	Anterior aortic sinus		Left post. aortic sinus		Right post. aortic sinus	
	No. of cases	Frequency (%)	No. of cases	Frequency (%)	No. of cases	Frequency (%)
1 (Single)	34	68	25	100	0	0
2(Multiple)	16	32	0	0	0	0

Table 2: Showing variations in origin of coronary arteries and their main branches from aortic sinuses.

SN	Coronary artery/ branches	Location of Coronary ostia in Aortic sinus (anterior/left posterior)	No. of Cases	Frequency (%)
1	Rt coronary artery	Ant. aortic sinus	50	100
2	Lt coronary artery	Left post. sinus	50	100
3	Rt conus artery as a Third coronary artery(TCA)	Ant. aortic sinus From separate ostium (opening lies left to ostium of RCA)	16	32
	Rt conus artery as a direct branch of RCA.	Ant. aortic sinus (From common ostium of RCA) no separate opening.	34	68

Figure 1 multiple opening in anterior aortic sinus (Posterior View) AA= Ascendig aorta

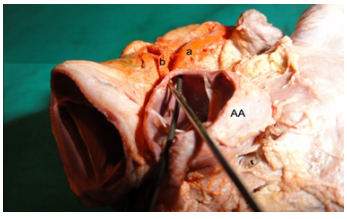

Figure 2 Probe inserted in Multiple opening in anterior aortic sinus (Posterosuperior View) a= RCA , b= Third Coronary Artery ,AA= Ascending Aorta

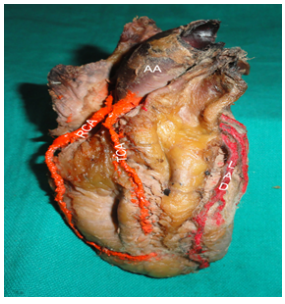

Figure 3 separate origin of Rt conus artery from Aorta as Third coronary artery (Anterior- view)
RCA= Right Coronary Artery
TCA= Third Coronary Artery
LAD= Left Anterior Descending (br.of LCA)

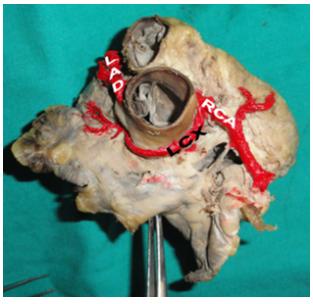

Figure 4 Abnormal origin of circumflex artery from RCA (Posterosuperior view)
RCA= Right Coronary Artery
LCX= Left circumflex artery
LAD= Left Anterior Descending

Discussion:

Anomalous origins of the coronary arteries often cause heart disease in young patients and increase the risk of sudden death during physical exertion [5]. The variations of the origin of coronary arteries and presence of multiple anomalous ostia are rare and could cause certain clinical consequences. When multiple ostia are observed in the anterior aortic sinus, the most common variation observed is an accessory orifice for right conus artery, It is also called as third coronary artery[6].

The first ventricular branch of right coronary artery is called the right conus artery or the third coronary artery when it arises directly from the aorta[7]. This branch may arise separately from the anterior aortic sinus in 36% of the individuals. It ramifies anteriorly on the lowest part of pulmonary conus and upper part of right ventricle. It may anastomose with a similar left coronary branch from the left anterior descending artery to form the annulus of Vieussens, which is a tenuous anastomotic circle around right ventricular outflow tract[3].

Kalpana R. found that the right conus artery arising separately from the anterior aortic sinus is the Third coronary artery, in 24% of the specimens studied[8]. In study of Udaya Sankari T also observed that the right conus artery was arises from separate ostium in anterior aortic sinus[9].

In present study, observations revealed that in 16 out of 50 specimens (32%),the anterior aortic sinus show presence of two coronary ostia and in 34 out of 50 specimen(68%) present only single ostium for RCA.The right conus artery arising from anterior aortic sinus directly as the third coronary artery and with its prevalence of 32%. We were seen single coronary ostium in left posterior aortic sinus for LCA in all specimens (50/50) 100% and not a single ostium found in Rt posterior aortic sinus

In present study we also found one rare variation of origin of left circumflex artery (LCX) in which the LCX arise from the Rt coronary artery instead of LCA, incidence of such anomalous origin of LCX in 01 out of 50 specimen (2%).

The frequency of multiple Ostia in anterior aortic sinus in various studies are compared in the (Table No.3)

Table3 Frequency of multiple No .of Ostia in anterior aortic sinus by various workers

SN	Authors	Frequency (%)
1	Joshi SD[10]	29.52
2	Gajbe UL et al[4]	6.67
3	Kalpana R[8]	24
4	Blake [11]	23
5	Present study	32

The frequency of the no. Of coronary ostia and variation in origin of coronary artery noted in our study is comparable to the values noted in the previous studies on cadavers[4,8,10,and11]. Wide variation is observed in previous studies may be attributed to racial differences, age and gender. Different methodologies used for obtain the knowledge of existence of such multiple ostia is important to correctly interprete the angiographic findings. Individual which are detected to be having multiple ostia should be followed up regularly to watch out for any related symptoms of angina, myocardial infarction, left ventricular dysfunction, myocardial stunning, paroxysmal AV blockade etc[6]

Conclusion:

The present study describes the normal and variant anatomy of the ostia of the coronary arteries in cadaveric human hearts. No openings were observed in the pulmonary sinuses. Multiple ostia were mostly seen in the right anterior aortic sinus. Left Coronary ostia lies in left posterior aortic sinus mostly single in number and it located centrally , whereas the right coronary ostia shifted posteriorly towards the right posterior aortic sinus. And abnormal extra separate ostium lies just left to RCA ostium in anterior aortic sinus.(32%). On occasion, such multiple ostia, may confuse the interpretation of the images and may pose a difficulty during procedures, such as angiography, angioplasty, and coronary artery bypass grafting. Individuals who are detected to be having multiple ostia should be followed up regularly to watch out for any related symptoms of angina, myocardial infarction, left ventricular dysfunction etc.

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