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## EXPERIMENTAL RESEARCH

# The Anomalous Origin Of Multiple Coronary Ostia And Their Clinical Significance

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### ABSTRACT

The anomalous origin of multiple coronary ostia from a single coronary sinus is a very rare finding. In this study of 30 hearts, we found out the origin of multiple ostia of coronary arteries from a single coronary sinus. The courses of arteries arising from these anomalous ostia were also studied in detail and the findings were correlated with clinical findings and pathophysiological conditions. Very few data exist on the clinical relevance of anomalies in different coronary arteries, which necessitate a proper management and follow up protocol. This study helps the cardiologist during routine diagnostic work up for cardiac diseases and in the management of these Diseases.

**Key Words:** Coronary arteries, Ostia, Anomalous.

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lack of physical activities and other disorders which cause functional impairment and damage to vascular cells. But, the risk factors don't explain the local distribution of atherosclerotic lesions. The pattern of this distribution corresponds to zones of disturbed flow with vortex formations and low velocity flow in coronary arteries. The anatomical details and pathophysiological patterns of most coronary artery anomalies are presently well known. On the contrary, few data exist on the clinical relevance of the variation of different coronary arteries, which necessitate a proper management and follow up protocol.

Certain authors proposed that coronary arterial patterns are not fully established at the time of birth. The fact that human adult heart has a higher incidence of existence of multiple orifices than human foetal heart, suggested that these ostia may have developed after birth.

Considering the significance of the knowledge of the coronary arterial pattern in cardiac surgeries and keeping in mind the ever evolving and yet unexplored facets of

### Introduction:

The word 'coronary' is derived from a Latin word. It refers to a crown like arrangement of all coronary arteries as they encircle the heart in the atrioventricular sulcus. Anomalous coronary ostia are very rare anomalies detected in a small population.

According to the World Health Organization (WHO), coronary heart diseases constitute the main cause of death in the industrial world. The main risk factors are lipid disorders, hypertension, diabetes, obesity,

this subject, the present study was undertaken to shed more light on this topic.

Normally, the anterior aortic sinus shows the presence of one ostium of origin of the right coronary artery and the left posterior aortic sinus shows the presence of one ostium of the left coronary artery.

The present study reports the anomalous origin of multiple coronary arteries from anomalous coronary ostia and shows light on their clinical significance.

### Material And Methods

The study was carried out in the Department of Anatomy, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha. A total of thirty hearts were obtained from the cadavers of adult individuals of both sexes, aged between 17-60 years. First the hearts were fixed in 10% formalin.

Dissections conducted on the heart included the removal of the epicardium and subepicardial adipose tissue and the tracing of each artery. The dissections of the ascending aorta were done and the origin of the coronary arteries was observed minutely. The ascending aorta was transversally sectioned approximately 1 cm above the commissures of the aortic leaflets. After that, the aorta was longitudinally opened at the level of the posterior aortic sinus (non coronary sinus) to enable the visualization and analysis of the right and left aortic leaflets and their respective coronary ostia. Then, the courses of coronary arteries arising from the anomalous ostia were traced minutely with the help of fine forceps. The most representative preparations were photographed.

### Aims And Objective

The present study was aimed:

1. To study the number of coronary ostia.
2. To study the courses of the coronary arteries arising from the anomalous ostia.

3. To study the clinical significance of the anomalous coronary ostia.

### Observation And Results:

In the present study of 30 hearts, the following observations were recorded and presented under the following headings:

1. The site of ostia
2. The number of ostia
- 3., Arteries arising from the anomalous ostia

#### 1. Site of ostia

Normally the right coronary artery arises from the right aortic sinus and the left coronary artery from the left posterior aortic sinus.

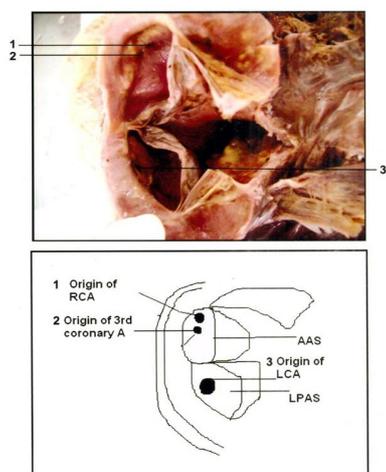
In the present study, ostia for the left coronary artery in all 30 hearts were observed to be situated in the left posterior aortic sinus region.

In right coronary artery, ostia was seen originating in relation to the anterior aortic sinus or the sinu-aortic junction in all the cases.

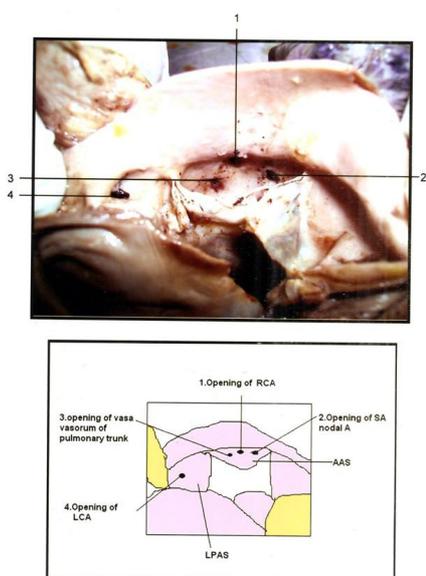
#### 2. No of ostia

Out of 30 hearts, 5 hearts showed more than one ostium in the anterior aortic sinus region.

**(a)Two ostia** :Two specimens showed two ostia in the anterior aortic sinus, one for the right coronary artery and one for the right conus artery, respectively [Table/Fig 1].The right conus artery, arising separately from the anterior aortic sinus, is also called as the third coronary artery. **(b)Three ostia**: Three specimens had 3 separate ostia in the anterior aortic sinus. They were for the right coronary artery, the right conus artery and a vasa vasorum to the pulmonary trunk, respectively [Table/Fig 2].



(Table/Fig 1) Anterior aortic sinus showing openings of RCA & RCoNA



(Table/Fig 2) Anterior aortic sinus showing three openings

## Discussion

The variations of the origin of coronary arteries and the 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 the right conus artery. The 3<sup>rd</sup> coronary artery usually forms an anastomosis with the likewise branch of the left coronary artery. This anastomosis lies on the distal part of the

pulmonary trunk and is known as the “vieussens arterial ring”. The functional significance of this anastomosis is still under question. However, several authors have proposed that it functions as an important collateral path between the right and left coronary arteries [Table/Fig 3].

The following [Table/Fig 4] reports the incidence of the 3<sup>rd</sup> coronary artery, as reported by various authors and compared it with the present study.

Several authors have reported multiple supernumerary ostia in the anterior aortic sinus.

The following [Table/Fig 5] shows the anomalous origins of different arteries from the aortic and pulmonary sinuses as reported by different authors and compared them with the present study.

(Table/Fig 3) The following table detects the extra ostia seen in AAS.

Coronary artery	No. of hearts they were found	Percentage
3 <sup>rd</sup> coronary artery	2	6%
RCA, RCoA, vasa vasorum of pulmonary trunk	3	10%

(Table/Fig 4) Reports the incidence of the 3<sup>rd</sup> coronary artery, as reported by various authors and compared it with the present study

Author	Percentage of incidence
Blake (1964)	23.50%
Miyazaki (1986)	36.50%
Regi (2003)	33.80%
Gray's anatomy (38 <sup>th</sup> edition)	50%
Koerig (2006)	50%
Present study (2008)	16%

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## The Importance Of The Anomalous Origin Of Arteries

1. During open heart surgeries, it is very difficult to cannulate these vessels which arise from the anomalous ostia.
2. While performing coronary arteriography and angiography, a preliminary aortic root injection of the dye must be given to locate

the exact no. of orifices and coronary arteries so that fatal outcomes can be prevented.

3. The multiple coronary ostia may be associated with cardiac abnormalities like hypertrophic cardiomyopathy and are rarely associated with congenital coronary anomalies.
4. The knowledge of the existence of such multiple ostia is important to correctly interpret the angiographic findings.

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The presence of multiple ostia has not been associated with clinical symptoms as reported in literature.

To confirm the clinical association between anomalous ostia and pathophysiological conditions, this correlation needs to be studied in live subjects who are investigated for multiple ostia by non invasive techniques like computed tomography. 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. Although this process would be very expensive, impracticable and time consuming, it will eliminate any selection bias associated with cardiac patients and help to confirm any association between the presence of multiple ostia and clinical symptoms.

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