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Case Report

Common origin of the coronary arteries: A rare coronary artery anomaly

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Introduction

Coronary artery anomalies fall in a diverse group of congenital disorders that have variable manifestations. Traditionally, the coronary artery anomalies have been described on the basis of anatomic dissection, but in the past two decades, an increasing number of studies on incidence and significance of these anomalies have been based on conventional coronary angiography as well as coronary CT angiography. Here, we present a case of anomalous origin of left circumflex artery (LCx) and left anterior descending (LAD) from right coronary sinus in a 33-year-old male patient, which is one of the rarest anomalies of origin of the coronary arteries.

Case report

A 33-year-old male patient was referred to the cardiology OPD of this hospital with complaints of anginal chest pain. The pain was typically dull, aching type in the retro-sternal location

with onset during exertion. There was no family or past history contributory to any cardiovascular or atherosclerotic risk factors.

The general examination and routine laboratory parameters were unremarkable. On detailed cardiovascular evaluation, the findings on cardiac 2D echo and resting ECG were within normal limits. However, he developed anginal chest pain at 8 METS on the Treadmill Test (Bruce protocol).

A coronary CT angiographic study was requisitioned to rule out any coronary artery disease as the cause of angina.

Images for the angiographic study were acquired covering the arch of aorta to the base of heart using retrospective ECG gating.

The study revealed common origin of right coronary artery (RCA), LCx and LAD from a single ostium in the right coronary sinus (Figs. 1 and 2). The RCA followed its normal course from the origin along the right atrio-ventricular groove. The LCx, following its origin from the common ostium, took a retro-aortic course to reach the left atrio-ventricular groove (Fig. 1). The LAD exhibited a “malignant” inter-arterial course traversing between the ascending aorta and the pulmonary trunk to reach the anterior inter-ventricular groove (Fig. 1).

No atherosclerotic changes were seen in the coronary circulation.

Discussion

Coronary artery anomalies have been broadly classified into four groups based on anomalies of origin and course, anomalies in the intrinsic anatomy, anomalies of termination and anomalous anastomotic vessels by Angelini.¹ A normal coronary circulation is considered to be one where the RCA

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Fig. 1 – Axial image showing common origin (*) of right coronary artery (arrowhead), left anterior descending (LAD) (white arrow) and left circumflex (black arrow) arteries from right coronary sinus at the root of aorta (Ao). Also note inter-arterial “malignant” course of left anterior descending artery between aorta and origin of pulmonary trunk (★) and retro-aortic course of left circumflex artery (curved arrow) between the Ao and left atrium (LA).

arises from right anterior sinus and LCx and LAD share a common proximal trunk arising from the left anterior sinus. The ostium is located in the upper midsection of the respective sinus with angle of take-off varying between 45° and 90°. The course of the arteries should be subepicardial with adequate branching for the myocardium supplied and termination in the capillary bed.

Fig. 2 – 3D-maximum intensity projection (MIP) image showing the common origin of right coronary artery (black arrow), left anterior descending (LAD) (black arrowhead) and left circumflex arteries (LCx) (white arrowhead) from the right coronary sinus and the inter-arterial course of LAD between aorta (Ao) and pulmonary trunk (PA).

The great individual variation found in the coronary circulation is largely explained by the embryogenesis of the coronary arteries, wherein the connections of the coronaries to their aortic supply and to each other occur subsequent to the formation of the coronary stems in the myocardium.

Becker et al. have defined coronary artery anomaly as any variation from the normal anatomy occurring in less than 1% of the general population.²

Anomalies involving abnormal origin of the coronary arteries are clinically important and are commonly associated with some form of congenital heart disease, and the presence of coronary artery anomalies in the absence of any other congenital heart defect is considered rare. The overall incidence of isolated coronary artery anomalies in various studies ranges from 5.6% in a study by Angelini¹ (using conventional catheter angiography) to an incidence of approximately 18.5% in a study by Cademartiri et al.³ (based on 64-slice coronary CT angiography). Anomalies of origin and course of coronary arteries are rarer still and were seen in 0.95% of test subjects undergoing conventional catheter angiography in an Indian study⁴ and in up to 1.5% of patients in an European study.³ Cademartiri concluded that coronary CT angiography is superior to catheter angiography in the diagnosis of an anomaly.³

Common origin of left coronary artery and RCA from right coronary sinus is one of the rarest anomalies with an incidence rate of around 0.15%,³ and we have not come across any cases in literature of an absent left main artery with LCx and LAD sharing a common origin with RCA from right coronary sinus.

Out of the four potential paths that an anomalous coronary artery may take, i.e. pre-pulmonic, retro-aortic, septal and inter-arterial, an inter-arterial course (between the aorta and pulmonary artery), also called “malignant” course, is seen to be closely associated with an increased risk of myocardial ischaemia, myocardial infarction and even sudden cardiac death.

Anomalous coronaries as a cause of sudden death have been implicated in 5–35% of sudden deaths in young athletes.⁵ In a study by Taylor et al.,⁶ the incidence of sudden cardiac death in cases of isolated coronary artery anomalies was approximately 32%, and out of these, 45% sudden deaths occurred during exercise. Also, the risk of sudden death was significantly higher in younger patients (<30 years).⁶ Various hypotheses for this increased risk include compression between the pulsating vessels during heavy exercise, presence of a slit-like opening or an acute angulation at the origins of such arteries.⁷

Although the incidence of coronary artery anomalies is low, clinicians should always keep a high index of suspicion, and angiographic recognition of these anomalies is considered important for making an appropriate diagnosis. Choices available for ‘at-risk’ patients include lifestyle modifications/primary PCI as well as coronary bypass surgery.

Coronary CT angiography apart from being non-invasive is currently, the ideal imaging tool for the diagnosis and delineation of coronary artery anomalies.⁸ Thus by early diagnosis of this anomaly using a non-invasive modality, various treatment options can be offered to the patient in order to avoid a fatal outcome.

Conflicts of interest

The authors have none to declare.

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