

# Anomalous origin of right coronary artery causing myocardial ischemia in a young patient

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## ABSTRACT

**Anomalous right coronary artery from left coronary sinus can have dynamic narrowing and kinking causing symptoms of myocardial ischemia and sudden cardiac death. Surgical repair of the anomaly is required in the symptomatic patient because of risk of ischemia or ventricular arrhythmia. Asymptomatic incidentally diagnosed low-risk patients can be closely followed up with exercise restriction as per present guideline.**

**Keywords:** Anomalous right coronary artery, myocardial ischemia, surgical repair

## INTRODUCTION

Anomalous origin of the right coronary artery (RCA) from left aortic sinus is a rare anomaly causing myocardial ischemia and sudden death.<sup>[1]</sup> We report a case of a young 17-year-old patient who presented with symptoms of angina.

## CASE REPORT

A 17-year-old boy presented with symptoms of angina at rest. Electrocardiogram (ECG) showed ST elevation in leads II, III, arteriovenous fistula, and ST depression in leads I, accessory vein ligation suggestive of inferior wall myocardial infarction [Figure 1]. His creatine phosphokinase (MB) was 121 U/L (normal range 0–25 U/L). Coronary angiogram showed normal left main coronary artery from the left aortic sinus. The RCA had anomalous origin from left coronary sinus. There was no evidence of any obvious narrowing of RCA in conventional angiogram [Figure 2a and b, Videos 1 and 2]. He was treated with oral aspirin, paracetamol, and beta blocker. His symptoms improved over the next 12 h with normalization of ECG. Computed tomographic (CT)

coronary angiogram showed RCA originating from left coronary sinus had a course in between aorta and pulmonary artery. Careful analysis of the right coronary anatomy in different stages of cardiac cycle showed adequate RCA caliber in diastole (taken at 70% of RR interval). In end systole (taken at 35% of RR interval), the RCA was compressed at the origin in it is inter-arterial course [Figures 3a, b and 4]. He underwent surgical repair at another hospital in view of RCA compression causing ischemia and is doing well without any further ischemic symptoms.

## DISCUSSION

Anomalous origin of coronary artery from opposite coronary sinus is reported in up to 0.84% cases referred for CT coronary angiogram. The RCA from the left coronary sinus constitutes 15% of the anomaly.<sup>[1]</sup> It can have a smaller orifice, an acute angle of origin, and a narrower diameter of the proximal RCA.<sup>[2]</sup> The takeoff angle of anomalous RCA with an inter-arterial course is correlated with the relative narrowing of luminal diameters at the orifice and the inter-arterial course causing ischemia.<sup>[3]</sup> Two types of the inter-arterial course

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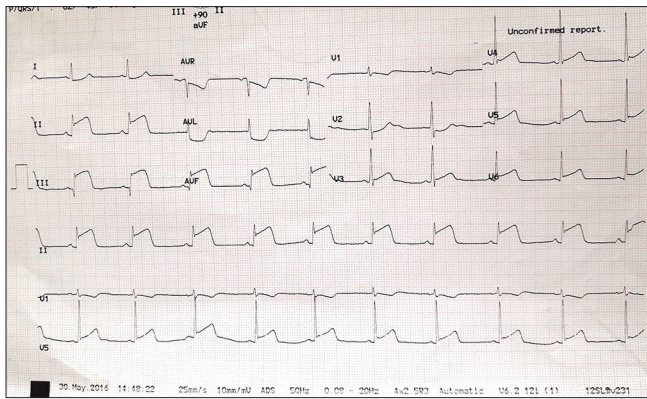
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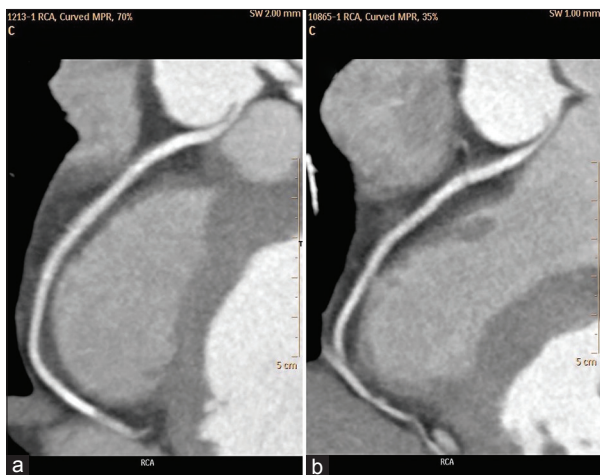
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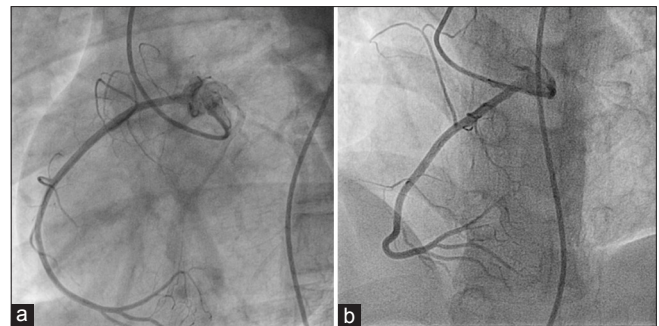
**Figure 1: Electrocardiogram on admission showing evidence of inferior wall ischemia**



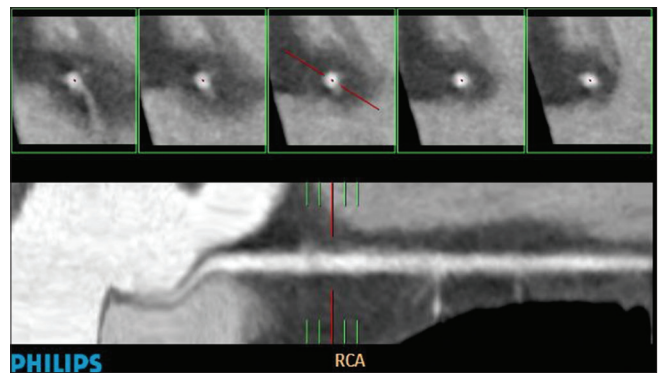
**Figure 3: Computed tomographic coronary angiogram in global image showing (a) diastolic frame (taken at 70% of RR interval) good right coronary artery caliber. In end, systolic frame (b) taken at 35% of RR interval the right coronary artery seen significantly compressed at origin in its inter-arterial course**

of anomalous RCA is described.<sup>[4]</sup> In the high inter-arterial course, the anomalous RCA courses between aorta and pulmonary artery. It has a high possibility of getting compressed during systole. The low inter-arterial course variant has the anomalous RCA running between aorta and right ventricular outflow tract (RVOT). During systole when the aorta distends, the RVOT contracts and the change of RCA compression is lesser than the high inter-arterial course of RCA. Most cases show a benign course. The narrowing of the coronary artery may not be well visualized in the conventional coronary angiogram as noted in the index case. Dual-source CT can clearly show the anomalous origin, orifice, angle, and course of RCA and dynamically evaluate the diameter changes of proximal RCA during the cardiac cycle, providing useful clues to clarify the mechanism of myocardial ischemia.<sup>[5]</sup>

Treatment strategies for anomalous origin of coronary artery from opposite sinus are determined by the presence of symptoms from cardiac ischemia, arrhythmia, and the



**Figure 2: (a and b) Right coronary angiogram showing right coronary artery anomalously originating from left coronary sinus. No apparent obstruction seen**



**Figure 4: Linear reconstructed computed tomographic coronary angiogram showing compression of the right coronary origin between aorta and pulmonary artery**

risk of sudden cardiac death. Cases with no documented cardiac ischemia have been reportedly treated medically with excellent long-term follow-up.<sup>[6]</sup> The asymptomatic incidentally diagnosed patients with low risk of sudden cardiac death can possibly closely followed up with exercise restriction as per current guideline.<sup>[7]</sup> The risk of sudden death is increased in symptomatic patients, as well as in the presence of some risk factors such as intense physical activity, young age <35 years, aggravating anatomical features such as intramural inter-arterial course, slit-like ostium, and acute angle of takeoff. Some favor intervention even in the high-risk asymptomatic patients.<sup>[4]</sup> Different types of surgical repair techniques are described, and they include bypass graft to the anomalous RCA, direct reimplantation of the RCA into the right coronary sinus, and unroofing of anomalous coronary anatomy with good results.<sup>[8,9]</sup>

## CONCLUSION

Anomalous origin of coronary artery from opposite sinus is a rare entity which can cause the symptom of myocardial ischemia and arrhythmia and could potentially/lead to sudden cardiac death. Careful anatomical evaluation with an accurate imaging modality such as CT coronary angiogram helps in diagnosis and

management plan. In the symptomatic high-risk patients, surgical intervention is the definite repair, and a good long-term outcome can be expected. The asymptomatic low-risk patients can be followed-up closely with exercise restriction.

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#### Conflicts of interest

There are no conflicts of interest.

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