

Case report:**Anomalous right coronary artery arising from left anterior descending artery****M.L. Sreenivas Kumar, D. Rajasekhar, V. Vanajakshamma, C. Shashanka***Department of Cardiology, Sri Venkateswara Institute of Medical Sciences, Tirupati***ABSTRACT**

A 54-year-old male patient presented with acute myocardial infarction involving left anterior descending and right coronary artery territories. Coronary angiogram showed a single coronary artery with right coronary artery arising from left anterior descending artery (LAD), which coursed anterior to right ventricular outflow tract and thrombotic lesion in mid left anterior descending artery before origin of right coronary artery. The patient was treated with thrombolytic therapy and glycoprotein IIb/IIIa inhibitors. Anomalous origin of right coronary artery as a branch of LAD is a very rare type of congenital coronary artery anomalies. It is important to recognize this anomaly as it can be associated with extensive myocardial ischemia and sudden cardiac death in young persons even without atherosclerosis.

Key words: Congenital coronary anomaly, Single coronary artery

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INTRODUCTION

Coronary artery anomalies are found in 0.2%-1.3% of patients undergoing coronary angiography (CAG). They may occur alone or in association with congenital heart disease or acquired secondary to congenital heart disease. The most common anomaly is the origin of left circumflex artery (LCX) from right coronary artery (RCA) while the least common, but most important anomaly is the origin of left main coronary artery from the right coronary sinus. Single coronary artery anomaly which is the case report here is seen in 5% to 20% of major coronary artery anomalies.¹

CASE REPORT

A 54-year-old male patient who was a smoker and alcoholic, nondiabetic and non hypertensive presented with acute chest pain with presyncope. There was no history of diabetes mellitus or hypertension. He was diagnosed to have coronary artery disease, acute anterior and inferior wall myocardial infarction, right bundle branch block, moderate left ventricular (LV) systolic dysfunction with LV ejection fraction of 36% and Killip class-IV presentation. Patient was thrombolysed with streptokinase outside our hospital and was started on inotropic

support. During the in-hospital course patient had ventricular tachycardia which was reverted with cardioversion. Patient also had transient complete heart block which reverted spontaneously to sinus rhythm. Initial electrocardiogram (ECG) obtained prior to visiting our hospital showed ST elevation in V₁-V₆, inferior leads, right bundle branch block and reciprocal ST depression in AVL. Echocardiogram done in our hospital showed regional wall motion abnormality in left anterior descending (LAD) and right coronary artery territory with LV ejection fraction of 36%. Patient had haemoglobin of 15.4 g/dL, platelet count of 2.59 lakh/mm³, blood urea of 39 mg/dL and serum creatinine of 1.16 mg/dL. Patient underwent CAG which showed single coronary artery arising from left coronary sinus which coursed anterior to right ventricular outflow tract, thrombotic lesion in mid LAD, distal LCX having significant stenosis and anomalous origin of RCA from mid-LAD distal to the thrombotic lesion (Figures 1 and 2). As the course of anomalous artery was anterior to right ventricular outflow tract and unlikely to cause sudden cardiac death, patient was treated with intravenous tirofiban [a glycoprotein IIb/IIIa (Gp IIb/IIIa) inhibitor] for thrombotic lesion in the mid-

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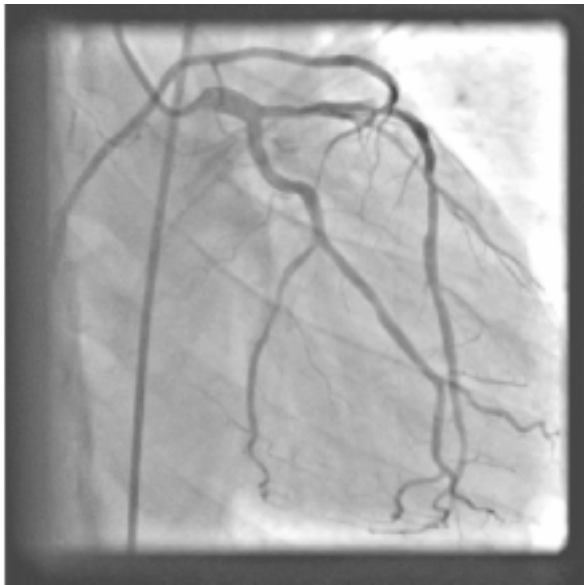


Figure 1: Coronary angiogram (right anterior oblique caudal view) showing the origin of right coronary artery from mid left anterior descending artery.

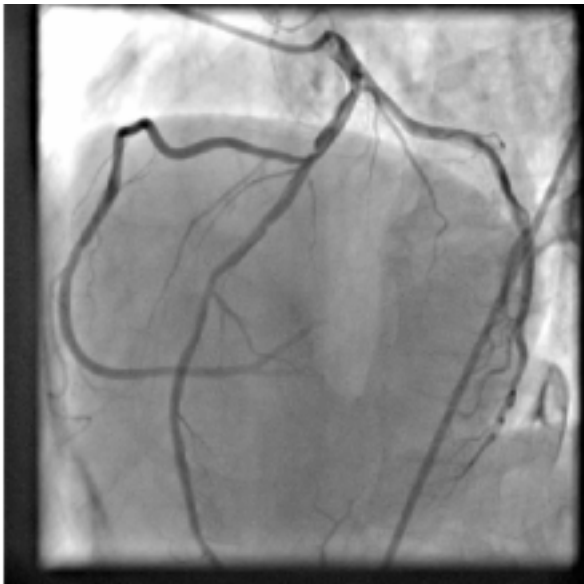


Figure 2: Coronary angiogram (left anterior oblique cranial view) showing the origin of right coronary artery from mid left anterior descending artery distal to the thrombotic lesion, coursing anterior to right ventricular outflow tract and passing normally in the right atrio ventricular groove and terminating by giving rise to the posterior descending artery and posterior left ventricular branches

LAD. The patient also underwent balloon angioplasty to LCX. Stenting was not done to LCX as it was a small vessel. Patient was symptomatically and haemodynamically stable at the time of discharge, and was advised to take

therapy with aspirin, clopidogrel, statin, Angiotensin converting enzyme inhibitor and diuretics.

DISCUSSION

Single coronary artery is a very rare variant of coronary artery anomalies. The clinical presentation can be completely asymptomatic, angina with exertional syncope in young, myocardial infarction in young involving multiple territories and sudden cardiac death in young. They are the second common cause of death in athletes after hypertrophic cardiomyopathy.² They can also increase surgical risk during surgeries for congenital heart disease due to their aberrant course. Our patient had myocardial infarction involving both LAD and RCA territories. Death is due to myocardial ischaemia in these anomalies but exact mechanism is unknown. However suddenness of death in these patients prevents infarction from occurring. Mechanisms postulated include accelerated atherosclerosis,³ acute angulation of the anomalous vessel with slit like opening at origin, compression of the anomalous vessel during physical activity if it runs close to a great artery or in between the great arteries. The course which is associated with sudden death is the anomalous RCA running between the aorta and pulmonary trunk.⁴ Previously a case report published by us⁵ reported anomalous origin of LAD from RCA which coursed between aorta and pulmonary trunk. In this patient, the anomalous RCA coursed anterior to right ventricular outflow tract after originating distal to the thrombotic lesion in mid LAD and the mechanism of myocardial ischaemia was thrombosis of mid LAD prior to origin of RCA. The most common course described in previous literature is similar.⁶ Patients with single coronary artery usually present with chest pain associated with syncope after exertion. Our patient gave similar history while he was working in the field. The ECG in these patients can be deceptively normal and echocardiogram may not be able to

detect this coronary anomaly. Hence exertional syncope or severe exertional chest pain in a young adult warrants further investigation even if the above tests are normal.⁷ However, our patient presented with acute anterior wall myocardial infarction which was diagnosed by the above tests.

Conventional CAG is the current *gold standard* for the diagnosis of coronary anomalies and for the assessment of coronary artery disease. Intravascular ultrasound helps if coronary angiogram is equivocal. Three dimensional and high resolution assessment on multi detector row computed tomography allows precise description of origin and course of these anomalous coronary arteries in relation to the great vessels.¹ Lipton classification modified by Yamanaka and Hobbs^{8,9} that precisely describes the course of anomalous vessel, is shown in Table 1. According to this classification our patient anomaly is classified as L-IIA which is

considered to be a course less likely to be associated with sudden cardiac death.

Most of these patients need either percutaneous or surgical revascularization as atherosclerosis is the most common cause of myocardial ischemia. Of 35 cases described in one report,⁶ 19 patients had significant CAD, at least 14 required revascularization, 13 cases did not have significant CAD and 3 cases were unclear. For patients with anomalous course between aorta and pulmonary artery, rerouting of the coronary artery to the appropriate sinus can also be considered along with surgical revascularization, particularly in young patients with severe symptoms who are at risk of sudden cardiac death.¹⁰

In our patient the anomalous vessel coursed anterior to right ventricular outflow tract which is unlikely to cause sudden cardiac death. Hence our patient was treated with Gp IIb/IIIa inhibitors for the thrombus in mid LAD prior to origin of RCA and balloon angioplasty to LCX.

Table 1: Classification of coronary artery anomalies by site of origin, anatomical course and relationship with major vessels

Site of origin	Anatomical course	Relationship with major vessels
L Type Single coronary artery arising from the left sinus of Valsalva	Group I Anomalous coronary artery as a distal portion of other coronary artery follows the anatomical course of either a right or left coronary artery	A (Anterior) Anomalous coronary artery passes anterior to the pulmonary artery
	Group II Anomalous coronary artery that arises from the proximal part of the normally located contralateral coronary artery then crosses the base of the heart to assume its inherent normal position	B (Between) Anomalous coronary artery arises from the opposite sinus of Valsalva and passes between the aorta and the pulmonary artery
R Type Single coronary artery arising from the right sinus of Valsalva	Group III The left anterior descending and circumflex arteries arise separately from the proximal part of the normal right coronary artery	P (Posterior) Anomalous coronary artery passes posterior to the aorta
		S (Septal) Anomalous coronary artery passes through the interventricular septum
		C (Combined) Ectopic origin of the left coronary and circumflex arteries passes the other side with several combinations

Source: references 8,9

In conclusion, RCA arising from mid LAD is a very rare congenital coronary anomaly. Myocardial ischaemia in multiple territories in a young patient with or without atherosclerotic risk factors should raise a suspicion. Apart from the identification of coronary artery disease, management depends on identifying the origin and course of these anomalous vessels.

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