

Case Report

Single coronary artery with origin of right coronary artery from left circumflex in a patient with ventricular tachycardia: a case report

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ABSTRACT

Only a few cases of a single coronary artery (CA) have been described. Almost all cases reported so far also had associated atherosclerotic coronary artery or valvular heart disease. We present a 48 years old male with atypical chest pain with an episode of Ventricular Tachycardia (VT) on treadmill test (TMT). Coronary angiography (CAG) showed a single Left coronary artery (LCA) with Right coronary artery (RCA) arising from left circumflex artery (LCX) without any atherosclerotic disease.

Keywords: Coronary anomalies, Single coronary ostium, Single coronary artery

INTRODUCTION

A single CA occurring in isolation, without associated congenital heart disease, is a rare anomaly. The reported incidence is 0.02% to 0.04% of the general population.¹ The pattern of branching and distribution differs and prognosis varies. We report an interesting pattern in which the single left CA was seen to encircle the heart like a wreath in the left anterior oblique (LAO) view of the coronary angiogram.

CASE REPORT

A 48-years-old male presented with atypical chest pain. He had history of tobacco use and social alcohol drinking with a sedentary lifestyle but no history of any systemic disease such as diabetes, hypertension or dyslipidemia. In his family, there was a history of myocardial infarction in his father at the age of 75. All his siblings are healthy and alive. General Physical examination revealed a well-nourished male with a blood pressure of 110/80 and a pulse rate of 80 beats per minute with normal systemic

examination. All peripheral pulsations were normal. The patient's laboratory investigations were normal.

ECG showed non-specific ST-T changes. Echocardiography showed normal left ventricular morphology and EF of 60% with no abnormal regional wall motion. Exercise TMT (Bruce's protocol) was performed that showed episode of VT at the 6:54 minutes of the test (Figure 1) at which the test was stopped and the VT settled spontaneously at 2:30 minutes post recovery. The patient was taken up for coronary angiography performed via the right femoral approach (Seldinger technique). Left coronary injection showed normal Left main and LAD. The LCX was hyperdominant with course to the right AV groove (Figure 2 and 3). The posterior descending was arising from the LCX. Several attempts for catheterization of RCA failed. Although aortic root injection was done with suspicion of arterial cut off from the origin, RCA was not apparent. Aortic root angiography showed single LCA and absence of right coronary ostium (Figure 4).

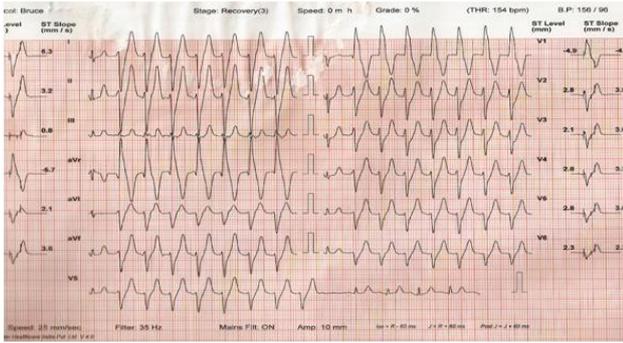


Figure 1: Tracing showing VT during TMT.



Figure 2: coronary angiogram showing LCX continuing into the right AV groove as anomalous RCA in LAO cranial view.

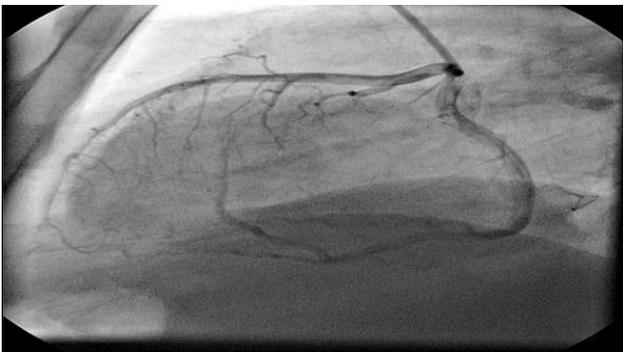


Figure 3: Coronary angiogram showing LCX continuing into the right AV groove as anomalous RCA in lateral view.

DISCUSSION

CA anomaly is a heterogeneous group of diseases with variable prognosis ranging from very common anomaly but benign nature to very rare anomaly but carrying a high risk of SCD. Like our patient most anomalies are discovered incidentally during CAG. Rarely, they produce symptoms, but we see here that chest pain was one of the presenting symptoms in our patient followed by an episode of VT during TMT.

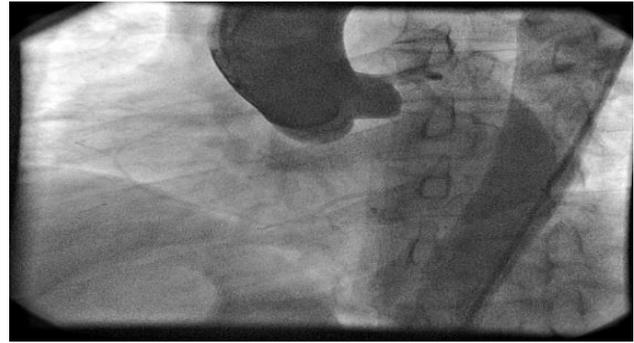


Figure 4: Aortic root angiography showing single LCA and absence of right coronary ostium.

The coronary vasculature embryologically begins as a proepicardial protrusion from the primordial liver. The epicardial cells undergo epithelial mesenchymal transformation and form nascent blood vessels, which mature, fuse, and penetrate the aorta, contrary to the former belief that coronary buds arise from the aorta and fuse with the coronary vessels. Multiple growth factors, adhesion molecules, and chemotactic factors are involved in the development of the coronary vasculature. Anomalies of these signalling pathways are probably responsible for CA anomalies.² A single LCA arises as an undivided trunk from a single ostium in the left sinus with agenesis of the right coronary ostium.

Anomalous origin of the RCA as a rare congenital anomaly was first described by White and Edwards.³ The prevalence of this anomaly in the white population, as determined from autopsy studies, is 0.026%.⁴ The prevalence of this anomaly in other populations, however, is significantly higher. In a study of 13010 patients in Florida, 80 (0.61%) patients had coronary anomalies, out of which 50 (0.37%) had anomalous origin of RCA with one arising from LCA.⁵ To our knowledge, there is no Indian study about the prevalence of RCA anomaly. RCA arising from the left circumflex artery in the absence of a normally situated right coronary ostium is considered a variant of single LCA and is a rare phenomenon.

Based on angiographic analysis, a classification was proposed, according to the site of origin and anatomical distribution of the branches by Lipton et al.⁶ Yamanaka and Hobbs modified the Lipton classification grouped as I, II, III, designated with “R” or “L”, depending upon whether the ostium is located in the right or left sinus of Valsalva, and also described with the letters “A”, “B” and “P”, for “anterior”, “between”, and “posterior” patterns of the single coronary artery in relation to great vessels.⁷

In type L1 of Lipton (as in our case), the RCA is congenitally absent, the LCx is markedly dominant and provides the posterior descending branch and thereafter ascends in the right AV groove where it provides branches to right atrium and right ventricle. Yamanaka from 1960 to 1988 at Cleveland clinic reported 20 such

anomalies in 126,595 diagnostic angiograms and 1,686 coronary anomalies (0.016% incidence and 1.2% of all anomalies) and remarked on the generally benign course of this anomaly.⁷ In the even rarer L2 subtype, the right coronary ostium is congenitally absent and the RCA arises from left main stem or from the proximal branches of left coronary artery. If arising from the main stem, the anomalous RCA can course anterior, posterior or in between the great vessels, the last anomaly being not only the most common but also most likely to be associated with external compression and ischaemic symptoms.

Shammas et al reported two cases of a single LCA with continuation of left circumflex artery as the distal RCA without stenotic disease.⁸ In a series of 8500 consecutive coronary angiographies, Neuhaus et al reported 3 (0.035%) cases of anatomically single LCA with origin of RCA from the AV branch of dominant LCx in the absence of any CAD or other cardiovascular abnormalities.⁹ Tavernarakis described one case of anomalous origin of RCA from peripheral segment of circumflex artery among 3100 selective angiograms performed in the absence of any clinical abnormality.¹⁰ Ho et al reported a case of anomalous origin of RCA from the left coronary sinus who presented with episodic syncope.¹¹ Kaul and Javangula described a patient with a single LCA and absent right coronary ostium in whom the RCA has a dual origin. The proximal RCA originated from the left anterior descending and the distal RCA arose as a continuation of left circumflex artery.¹² Mahilmaran et al described a patient presenting with unstable angina with single left CA and the distal circumflex artery continued the course of the right coronary artery.¹³

In our patient attributing the symptoms & arrhythmia to this coronary anomaly is reasonable. Moreover, it is well established that an anomalous origin of the RCA can lead to angina pectoris, myocardial infarction, malignant arrhythmias and/or sudden death, in the absence of atherosclerosis.¹⁴

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