Single coronary artery from right coronary sinus presenting with acute coronary syndrome

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Single coronary artery

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Abstract

A single coronary artery is a rare coronary artery anomaly. A 39 year-old female underwent coronary angiography for unstable angina. This revealed a common coronary trunk arising from the right sinus of Valsalva giving rise to a right coronary artery (RCA) and a long left main trunk further dividing into a Type-I left anterior descending artery (LAD) and co-dominant left circumflex coronary artery. Distal RCA showed a discrete lesion in the posterior descending artery. Her treadmill test (TMT) was negative for reversible ischaemia. Considering her stable condition and TMT results, she was discharged on medical treatment.

Key words: coronary artery anomaly; unstable angina; single coronary artery; Type-I left anterior descending artery

Introduction

Coronary artery anomalies are found in 0.6 to 1.5% of coronary angiograms, and are usually incidental findings [1]. Single coronary artery (SCA) is a rare congenital anomaly that describes the origin of both the right coronary artery and left main coronary artery from a
single aortic sinus. It is usually diagnosed incidentally during coronary artery angiograms or in post-mortem. Anomalous origin of the right or left coronary artery from the contralateral sinus of Valsalva is often asymptomatic, but many patients, particularly young ones, present with sudden death or myocardial ischaemia.

Case report

A 39 year-old female with dyslipidemia and diabetes as cardiovascular risk factors was admitted with resting angina of six hours’ duration. Her 12-lead electrocardiogram showed minimal T wave inversions in leads I and aVL with normal sinus rhythm. Transthoracic echocardiography did not show any regional wall motion abnormality or valvular heart disease; she had a normal ejection fraction and her cardiac biomarkers including CK-MB, troponin I and T were negative. Chest skiagram was normal. Therefore, she was diagnosed as suffering from acute coronary syndrome. Coronary angiography was planned after proper consent through the transfemoral approach. Left main artery could not be cannulated with a Judkins left (JL) catheter. Right coronary system was cannulated with a Judkins right (JR) which revealed a single coronary artery which was giving rise to the right coronary artery and the long left main artery which was further giving rise to the left anterior descending artery (LAD) and the left circumflex artery (Figure 1). As the LAD was terminating before the apex, it was diagnosed as Type I (Figure 2). Furthermore, the left circumflex artery (LCx) was also giving rise to a postero-lateral branch, and therefore was co-dominant. The RCA was dominant with 80% stenosis in its posterolateral branch (Figure 1). To rule out any dual LAD, an aortic root angiogram was performed with a pigtail catheter which did not reveal any artery, thus our finding was confirmed. As the diseased branch was terminal and the patient was asymptomatic, it was decided to continue her with medical treatment. Before discharge, a treadmill test was performed which was negative for any reversible ischaemia. She was discharged with aspirin-150 mg, clopidogrel-150 mg, rosuvastatin-20 mg, metoprolol- 50 mg, ramipril-5 mg, and gilbenclaimide- 1mg. To delineate the course of the left main trunk, multidetector computed tomography of coronary artery (MDCT) was performed. This revealed an inter-arterial course of the left main trunk as it was travelling between the aorta posteriorly and pulmonary artery anteriorly (Figures 3, 4).

Discussion
In a large series of 126,595 patients undergoing coronary angiography by Yamanaka et al, a single coronary artery from the right sinus of Valsalva was found in 0.019% [1]. Myocardial ischaemia or sudden cardiac death are usually associated with its course between the aorta and main pulmonary artery [2]. Catheter based angiograms are sometimes not very accurate in delineating the course of left main trunk or left anterior descending artery. This is where computed tomography, magnetic resonance imaging, or pulmonary catheterisation may be preferable. This assumes importance when patients present with recurrent chest pain without atherosclerosis because dynamic compression might be responsible for the symptoms. Additionally, echocardiography is another important tool to shed light on an associated valvular pathology such as a bicuspid aortic valve. The treatment strategy for a single coronary artery is governed by the nature of presentation, the atherosclerotic burden, and the course of the artery. Coronary artery bypass surgery may be beneficial in patients with an inter-arterial course e.g. when the anomalous coronary artery runs between the aorta and main pulmonary artery or/and patients with atherosclerosis may benefit from revascularisation strategies. Successful percutaneous coronary intervention has also been reported in some cases depending upon the presentation and site of the lesion [3].

Angiographically, Lipton et al. classified single coronary arteries (SCA) into various types depending on their origin, branching pattern and course of the anomalous vessel [4]. Type-L represents a right coronary artery originating from the left main stem, while type-R indicates that the right coronary artery originates from its usual location. Furthermore, in single coronary arteries arising from the right coronary sinus, the left system often arises either from the distal RCA after its usual distribution (R-I), or as a single artery (left main coronary artery, R-II), or two separate arteries (LAD and LCX, R-III) from the proximal part of the common trunk. Although an anomalous LAD arising from the right coronary artery can follow any of the four courses: septal, anterior free wall, retro-aortic, or inter-arterial, it more often follows one of the first two named of these courses. The septal course is largely benign, and no case of sudden cardiac death has yet been attributed to it. Classes II and III are then designated as anterior (type A) or posterior (type P) according to their route in relation to the pulmonary artery, or inter-arterial (type B) if it courses between the ascending aorta and pulmonary trunk. Type B morphology has been associated with a high risk of clinical consequences when associated with an intramural course. Recently, Angelini et al proposed a slightly different classification according to the anatomical course within the interventricular sulcus and atroventricular groove, as well as the location of penetrating side branches [5].
Until the advent of more sophisticated imaging modalities such as MDCT and MRI, the delineation of the anatomical course relied solely on the ‘dot and eye’ method and/or pulmonary artery catheter placement. These two modalities allow accurate visualisation of coronary artery anomalies, which can be at times difficult to delineate fluoroscopically in a two-dimensional plane.

Our case illustrates a Lipton type RIIB anomaly with type II LAD, which in itself is exceedingly rare.

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References


**Figure 1.** Right coronary artery giving rise to left main artery which gives rise to left anterior descending and left circumflex arteries. Distal RCA showing critical lesion: A. Left anterior oblique view; B. Left anterior oblique view with cranial angulation

**Figure 2.** Selective cannulation of left main trunk showing left anterior descending and left circumflex artery; A. Antero-posterior view with caudal angulation; B. Antero-posterior view with cranial angulation

**Figure 3.** MDCT showing single coronary artery (A); volume rendered (VR) imaging showing Type I LAD with inter-arterial course; Ao — aorta; PA — pulmonary artery [“B” is missing]

**Figure 4.** Volume rendered (VR) imaging showing type I LAD (A); axial section showing inter-arterial course of left main trunk; Ao — aorta; PA — pulmonary artery [“B” is missing]