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Case Report Open Access

Anomalous Origin of Left Main Coronary Artery from Right Sinus of Valsalva: A Case Report

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Abstract

We present a case of a 79 years old man in whom diagnostic coronary angiography showed anomalous left main arising from the right sinus of Valsalva and followed an intraseptal course beneath right ventricular infundibulum. He also had obstructive lesion in left circumflex artery. In view of his recent ischemic symptoms he was successfully treated by left circumflex angioplasty.

Keywords: Coronary artery anomalies; Coronary angiography

Introduction

Coronary artery anomalies are found in 0.6% to 1.55% of patients who undergo coronary artery radiographic tomography [1-5] and the increasing use of diagnostic coronary angiography (CAG) is uncovering even more such abnormalities. Anomalous origin of the left main coronary artery (LMCA) from the right sinus of Valsalva is reported in 0.09% to 0.15% of cases [1-6]. Indeed, most coronary anomalies are found incidentally during CAG. Although these anomalies are present at birth, relatively few manifest cardiac symptoms in childhood. Anomalous origin of a coronary artery does not usually lead to myocardial ischemia.

The origin of the LMCA from the right sinus of Valsalva is one of the rarest anatomic variations of the coronary artery circulation. We report a case of single ostium originating from the right sinus of Valsalva, giving rise to an anomalous LMCA and right coronary, confirmed by coronary angiography.

Case

A 79 years old Indian male presented to the emergency department with complaint of chest heaviness. He sought medical attention when his chest discomfort did not abate even after seven days. His past medical history included medically controlled diabetes and hypertension. On general physical examination patient was seen to be anxious, his heart rhythm was regular with a rate of 90 beats per minute; the blood pressure was 130/80 mmHg and respiration was thoraco-abdominal with a rate of 20 breaths per minute. Cardiac auscultation revealed a left ventricular fourth heart sound. Findings from review of the systems, other than as reported above were normal. Baseline electrocardiogram (Figure 1) revealed left axis deviation and left bundle branch block with secondary ST-T changes. Trans-thoracic echocardiography revealed concentric left ventricular hypertrophy, mild aortic regurgitation, grade 1 left ventricular (LV) diastolic dysfunction and LV ejection fraction of 50%.

Diagnostic CAG (Figure 2) revealed a long LMCA arising from right sinus of Valsalva (Single coronary artery) with first septal arising from LMCA itself. Distal course of left anterior descending and left circumflex (LCx) was normal. Angiogram identified circumflex as the culprit vessel with multiple significant tandem lesions from proximal to distal segments. In view of CAG findings he underwent LCx angioplasty and 2 drug eluting stents viz 3.5 x 38 mm Resolute integrity (Medtronic Cardio Vascular, Santa Rosa, CA) and 4.0 x 38 mm Resolute integrity (Medtronic Cardio Vascular, Santa Rosa, CA) were sequentially deployed from distal to proximal segment and adequately post dilated with noncompliant balloon. The remainder of his hospitalization was uncomplicated, and he was discharged 2 days after the procedure. His predischage echo showed concentric left ventricular hypertrophy, mild aortic regurgitation, grade 1 left ventricular (LV) diastolic dysfunction and LV ejection fraction of 55%.

Discussion

The origin of the LMCA from the right sinus of Valsalva is one of the rarest anomaly; the incidence ranges from 0.09% - 0.15% [1-5]. Anomalous origin of the LMCA from the right sinus of Valsalva can be classified into 4 major groups according to the course taken by the LMCA in relation to the aorta and pulmonary trunk en route to the LV [7-11]. 1) the septal course beneath the right ventricular infundibulum, 2) the anterior course, 3) the retro-aortic course, and 4) the inter-arterial course between aorta and main pulmonary artery. Among all

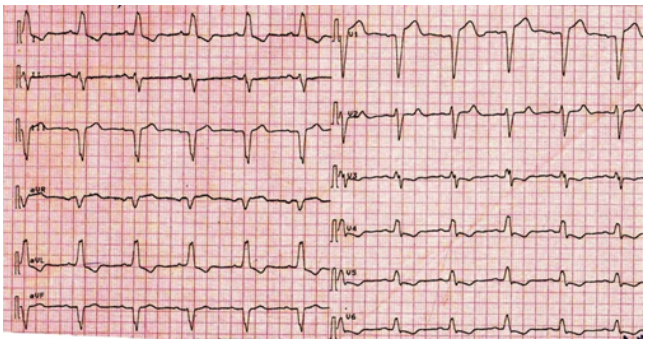

Figure 1: Baseline electrocardiogram showing normal sinus rhythm, left axis deviation of QRS complex, left bundle branch block with secondary ST-T changes.

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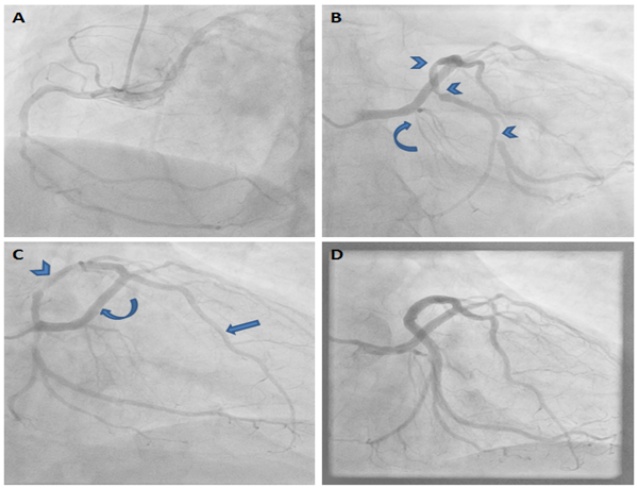

Figure 2: Coronary angiogram in the left anterior oblique view shows single ostia from right sinus of Valsalva giving both the left and right coronary artery; **B.** left coronary angiogram in the modified right anterior oblique view shows that anomalous LMCA runs through the septum along the floor of the right ventricular outflow tract, travelling upward in the mid-septum, then branching into the left anterior descending and left circumflex artery. Septal perforating arteries (curved arrow) branching from the LMCA itself help identify the septal course. Multiple discrete tandem lesions (arrowhead) identified in the circumflex-obtuse marginal complex; **C.** left coronary angiogram in the right anterior oblique view with cranial angulation shows that the anomalous LMCA and the circumflex coronary artery form an ellipse, with the LMCA forming the inferior portion (curved arrow) and the circumflex artery forming the superior portion (arrowhead). Because the LMCA divides in the mid-septum, the LAD artery (straight arrow) is relatively short and the initial portion of the circumflex artery courses toward the aorta; **D.** Left circumflex after successful coronary angioplasty.

the pathways the inter-arterial course is the least common but the most malignant pathway and responsible for sudden cardiac death during strenuous activities. Benson and Lack [12] and Cohen and Shaw [13] postulated that in inter-arterial course LMCA is squeezed between the aorta and the main pulmonary artery as a result of distension of these vessels during strenuous activities, resulting in acute myocardial ischemia in the left coronary system. However, in the absence of pulmonary hypertension, it is unlikely that the coronary artery with systemic pressure could be compressed by the low pressure pulmonary artery.

The four pathways can be best identified during CAG in right anterior oblique (RAO) projection by the "dot and eye" method coined by Serota et al. [14]. In the "septal" course, the LMCA and LCx form an ellipse (eye) like configuration, with the LCx forming the superior and LMCA forming the inferior margins of the ellipse. Septal perforators originating from the LMCA further corroborate this course from other variants. Similarly in the second anterior subtype, the LMCA and LCx form an ellipse but here the LCx forms the inferior and LMCA forms the superior margins of the ellipse. In the third retro-aortic subtype, the LMCA passes "posterior" to the aorta and a radio-opaque dot representing the artery seen end-on is noted on the posterior aspect of the aorta. In the fourth most potentially fatal "interarterial" subtype a radiopaque dot is noted on its anterior aspect.

In our patient, during RAO projection (Figure 2B), the anomalous long LMCA and the LCx coronary artery form an ellipse, with the LMCA forming the inferior portion and the LCx artery forming the superior portion, confirming its septal variant. Septal perforators branching from the LMCA further validate this anomaly. Considering its benign course among other LMCA anomalies we planned for LCx angioplasty in view of patient symptoms. We achieved a satisfactory result with coronary angioplasty and his symptoms have completely resolved after angioplasty (Figure 2C,2D).

Conclusion

Our 79-year-old patient is a unique case of a single ostium from the right sinus of Valsalva (single coronary artery) which is giving right and left coronary system. The right coronary system is normal in course and anomalous LM runs a septal course before dividing into left anterior descending and left circumflex. We conclude that the anomalous origin of the LMCA is not always malignant. A meticulous approach is imperative to analyse coronary angiograms carefully and treatment for such a condition should be tailored to the individual patient.

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