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Title: Percutaneous Coronary Intervention in a rare case of single coronary ostium presented with ST elevation myocardial infarction

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Abstract

Anomalous aortic origin of the left coronary artery (AAOLCA) from the right sinus of Valsalva is a very rare coronary anomaly which can lead to sudden cardiac death (SCD), usually during or after strenuous exercise. The anatomical variation can follow five different courses: interarterial, subpulmonic (intraconal or intraseptal), prepulmonic, retroaortic, or retrocardiac. The interarterial variation is the pattern that has a stronger relationship with SCD. In patients with AAOLCA, ST-segment elevation myocardial infarction (STEMI) is a rare clinical presentation and the management of an anomalous infarct-related coronary artery may be technically challenging. Here we report a patient with an AAOLCA presented with inferior

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STEMI and underwent successful percutaneous coronary intervention of the right coronary artery.

1. Introduction

Coronary artery anomalies presenting with ST-segment elevation myocardial infarction (STEMI) are uncommon and often are challenging to manage [1]. The reported incidence of the right sided origin of the left coronary artery (LCA) is only 0.02% to 0.15% [2,3]. An anomalous aortic origin of the left coronary artery (AAOLCA) coursing between the aorta and pulmonary artery has a fatal risk of altered coronary flow due to compression of the anomalous coronary artery between the great vessels during exercise [4]. Herein, we report a case of successful percutaneous coronary intervention (PCI) of a right coronary artery (RCA) in a patient presented inferior STEMI and an anomaly of the left and right coronary arteries with a single coronary ostium in the right sinus of Valsalva. The presentation of this rare coronary anomaly with its imaging features and possible management options were also discussed.

2. Case presentation

A 47 year-old-man was admitted with the diagnosis of ongoing inferior STEMI. He was thrombolysed with reteplase at another center and referred to our hospital for rescue angioplasty on the same day. During diagnostic coronary angiography, it was impossible to engage the left coronary ostium. The right coronary angiography revealed that the right and left main coronary arteries were arising from the right sinus of Valsalva with a common ostium (Fig. 1). The left anterior descending (LAD) and left circumflex (LCX) coronary arteries were found to be free of any coronary artery disease (CAD). There was a residual thrombotic lesion in the proximal

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RCA and we decided to perform rescue PCI with stenting. A 6F JR4 guiding catheter was used to engage the right ostium and the lesion was crossed with a 0.014-inch floppy guidewire (Abbott Corporation, San Francisco, California) and predilated with a 2.5x12 mm Invader balloon (Alvimedica, Istanbul, Turkey). During predilatation, the guiding catheter sucked in the vessel and pressure damping was noted. Because difficulty was encountered during stent delivery, buddy-wire technique was used and a 3.0x 20 mm drug eluting stent (Boston Scientific Corporation, Marlborough, USA) was successfully implanted to the proximal RCA lesion. Subsequent coronary computed tomography angiography (CTA) revealed a RCA originating from the usual location and a LCA arising from the same ostium that coursing between the aorta and pulmonary artery (Fig. 2). At 1-month follow-up, myocardial scintigraphy revealed no arguments for cardiac ischemia and at 6-month follow-up, no evidence of ischemia or arrhythmias was detected. Written informed consent was obtained from the patient for publishing this case report.

3. Discussion

The incidence of coronary anomalies during routine coronary angiography is about 0.6-1.3 % [2]. The rarest anomaly among coronary anomalies with miscellaneous variations is the anomalous aortic origin of a coronary artery (AAOCA) from the opposite coronary sinus [5,6]. The incidence of AAOCA from the opposite sinus is reported to be between 0.1% and 0.7%, with an anomalous aortic origin of the right coronary artery (AAORCA) reported more commonly than an AAOLCA [2,3]. Patients with an AAOLCA should be sought for other congenital heart diseases such as bicuspid aortic valve, mitral valve prolapse and pulmonary

stenosis [7]. In our patient, origin of the LCA from the right sinus occurred in isolation. In the

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majority of cases, an AAOLCA has an intramural aortic course which can lead to impaired coronary flow due to compression of the anomalous left main coronary artery between the great vessels during exercise [2,4-5].

There are several classification systems for coronary artery anomalies. Hauser [5] classified the anomalous origin of the LCA from the right sinus of Valsalva into one of four types: 1) the LCA courses between the aorta and pulmonary artery, posteriorly and adjacent to the pulmonary trunk; 2) the LCA courses anteriorly over the right ventricular outflow tract; 3) the LCA courses along the crista supraventricularis subendocardially or intramyocardially, surfacing in the proximal interventricular sulcus; and 4) the LCA may rise to the right of the RCA and course posteriorly to the aortic root or anterior to the pulmonary trunk. According to the anatomical course within the interventricular sulcus and atrioventricular groove, as well as the location of penetrating side branches, Angelini et al.[2] suggested a slightly different classification.

Coronary anomalies can be related to sudden cardiac death (SCD), however, they have benign character most of the time [3]. The clinical manifestations of coronary anomalies may range from clinically benign to severe symptoms including arrhythmias, syncope, myocardial infarction, or SCD. SCD risk is high in young individuals who have anomalies coursing between the aorta and pulmonary artery. Several potential mechanisms have been proposed to account for myocardial ischemia in patients with AAOCA: compression of the anomalous coronary artery between the great vessels, especially during exercise; an oblique take-off from the aorta associated with ostial stenosis; ostial ridge; spasm of the anomalous coronary artery, probably due to endothelial injury; or a hypoplastic intramural course [4,6].

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The “interarterial course” is usually the one associated with angina pectoris, acute coronary syndrome, and sudden death in the absence of significant CAD [3]. Although the presence of an anomalous coronary artery does not appear to be associated with an increased risk for development of coronary atherosclerosis [8], Sohrabi et al.[9] demonstrated that there was a high prevalence of atherosclerotic CAD in patients who had an AAORCA. This may be explained by altered blood flow pattern. According to a study by Garg and his colleagues, incidence of coronary atherosclerosis in patients with coronary artery anomaly was found to be %10.25 [7]. In a study which consisted of 126,595 coronary angiographies, the most common coronary artery anomaly (anomalous LCX originating from RCA/the right sinus of Valsalva) was identified in 467 cases [3]. In that study, AAOLCA was found in only 22 patients. Interestingly, none of these patients had angina pectoris or acute coronary syndrome. However, some patients with an AAOCA can present with STEMI due to atherosclerosis of a normally arising coronary artery as in our case [10].

In conclusion, the culprit lesions in an interarterial course may pose a great challenge in the stented cases due to compression of the vessel during strenuous exercise. In PCI of anomalous coronary arteries, it is important to know the course of the arteries before any intervention. CTA is a useful diagnostic tool to delineate a probable malignant variation to be stented or the anatomical relationship of the anomalous coronary trunk with the other cardiac structures. As demonstrated here, CTA should be performed even after successful revascularization for the detection of a malignant course. Although PCI seems really attractive, it may be performed only in selected cases and after an exhaustive study of the anatomy. PCI is currently not considered a routine option for revascularization except in patients presenting with myocardial infarction and/or

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cardiogenic shock [1,4]. There is also no guideline recommendation for the optimal time window for PCI after fibrinolysis in patients with an AAOCA.

Informed Consent: Informed consent was obtained from the patient.

Conflict of Interest: Authors have no conflicts of interest to declare.

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Figure legends;

Figure 1: Coronary angiography image (right anterior oblique view) showing the anomalous left main coronary originating from a common trunk. RCA-Right coronary artery, LAD-Left anterior descending artery, LCX-Left circumflex coronary artery

Figure 2: Three-dimensional reconstruction computerised tomography image demonstrating the course of the left main coronary artery (LMCA) between the ascending aorta (Ao) and pulmonary artery (PA).

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