Clinical Case

Myocardial infarction in a patient with anomalous origin of the right coronary artery.

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ABSTRACT

Congenital coronary artery malformations affect between 1% and 5.6% of the general population and include several conditions characterized by the abnormal origin or course of any of the three main epicardial coronary arteries.

We describe the case of a 62-year-old female patient with a history of hypertension, diabetes mellitus, and obesity, who presented to the emergency department with chest pain. An inferior myocardial infarction was found.

Coronary angiography revealed an intermediate lesion in the left anterior descending artery, as well as an anomalous origin of the right coronary artery (RCA) from the left main coronary artery, with a total occlusive lesion in the mid-segment of the RCA. Percutaneous transluminal coronary angioplasty with placement of a drug-eluting stent (3.0 x 30 mm) in the RCA was performed, resulting in successful restoration of coronary flow.

Anomalous coronary artery origins complicate emergency angioplasty and require tailored strategies to achieve revascularization. Using multimodal imaging could guide angioplasty and minimize complications and mortality.

INTRODUCTION

Congenital malformations of coronary arteries affect between 1 and 5.6% of the general population, and include several diseases characterized by an abnormal origin or trajectory of any of the 3 main epicardial coronary arteries.[1] The anomalous origin of the opposite sinus is the most relevant clinically, being more frequent in the anterior descending artery and the circumflex artery; while the origin of the right coronary artery (RCA) from the left Valsalva sinus represents just 0.1%.[2]

Specifically, the anomalous origin of the RCA has been associated with ischemia, acute myocardial infarction (AMI) and sudden cardiac death of cardiac origin in young patients.[3,4] The prevalence of this anomaly ranges from 0.026% to 0.92% in the series analyzed from the registries of invasive and noninvasive coronary angiography.[5] The physiological hypotheses that explain these phenomena include a mechanical compression of the artery by the great vessels, due to an anomalous trajectory between the aorta and the pulmonary artery, or a collapse during exercise at the point where the anomalous RCA meets with the left coronary sinus.[6] It currently represents a true therapeutic challenge, with worse outcome due to its anatomical characteristics, such as ostium diameter and an acute start angle.

The anatomical conditions proper of these coronary anomalies and the effect of cardiovascular risk factors may increase the occurrence of acute coronary events, when compared to the general population.[7] In spite of its relationship with sudden cardiac death; the presence of anomalous coronary origin has not been associated with a greater risk of major adverse cardiac events.[8] It is imperative to carry out research to approach the evolution and prognosis of these anomalies in populations with an elevated cardiovascular risk. The goal of this work is presenting a clinical case that related the occurrence of acute myocardial infarction with the presence of an anomaly in the origin of the RCA.

CLINICAL CASE

Female, 62-year-old patient, with personal history of hypertension, diabetes mellitus and obesity. She came to the ER reporting very intense precordial pain radiating to the left arm, accompanied by nausea and feeling of imminent death, so she was admitted in a rural hospital. During her hospital stay, elevated values of troponin I, were observed, as well as electrocardiographic alterations compatible with inferior wall AMI (myocardial necrosis and negative T waves in leads DII, DIII and aVF) *(Figure 1)*. Before this situation, the patient was moved to a secondary level hospital, and percutaneous coronary interventionism was performed.

The results from coronary angiography show intermediate lesion of anterior descending artery, as well as anomalous origin of RCA from the left main coronary artery, with total occlusive lesion in the middle segment of RCA *(Figure 2)*. Percutaneous transluminal angioplasty was carried out, with placement of drug-

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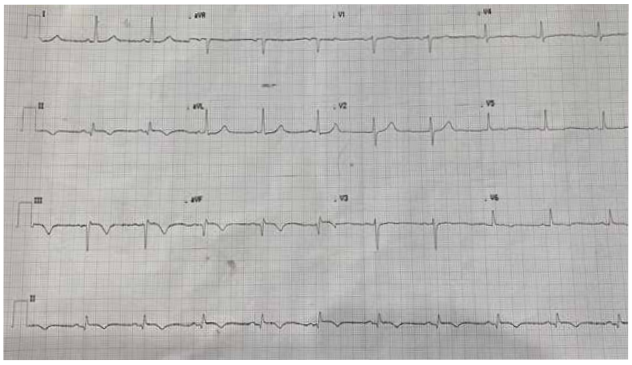

FIGURE 1.
Twelve-lead electrocardiogram
ST segment elevation of <1 mm in DII, DII and aVF with pathological Q waves and symmetrical negative T waves.

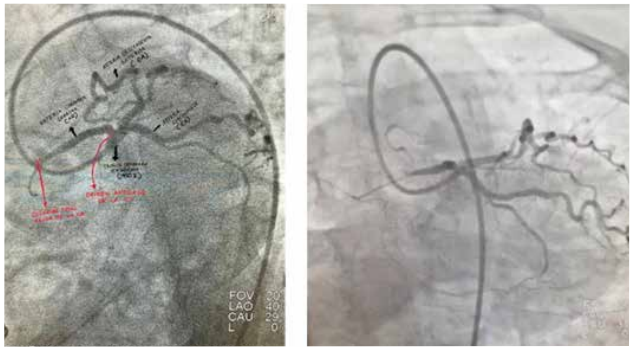

FIGURE 2.
Anomalous origin of RCA with terminal branch of the left coronary artery, with total occlusion in its middle segment.
a) 40° LAO view and 30° caudal view; b) 30° caudal view.

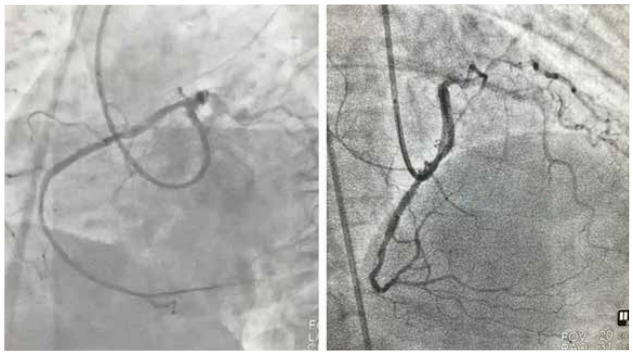

FIGURE 3.
Successful revascularization of the RCA with coronary flow restoration.
a) 45° LAO view; b) 30° cranial view and 30° RAO.

eluting stent (3.0 x 30 mm) in the RCA, obtaining a successful result in coronary flow restoration *(Figure 3)*. Subsequently, the patient was moved to the Intensive Care Unit to continue with the pharmacological treatment and to guarantee an appropriate hemodynamic monitoring.

During the second day of hospitalization, she evolved favorably, with elevated values of troponins (0.48 ng/ml), creatinine (0.73 mg/dl), and the rest of auxiliary tests within normal ranges. In echocardiogram, regional motion alterations were verified in the territory of the inferior and inferobasal wall. After 7 days of hospitalization, she presented a favorable course and she was discharged.

DISCUSSION

The anomalous origin of the RCA is a rare congenital malformation, first described in 1948 by White and Edwards.[9] The prevalence in the white population, according to autopsy studies, is 0.026%; however, in other populations it may be significantly higher.[10,11] In a recent investigation of 10,928 patients referred to CT, 28 cases with anomalous origin of RCA were identified, presenting interatrial trajectory; the average age was 55±17 years, while 64% were men, and 11 (39.3%) presented stable cardiac symptoms.[12]

These anomalies course asymptomatically in general, and their diagnosis in most cases is incidental. Nevertheless, a wide spectrum of cardiac symptoms has been associated with these congenital anomalies, including myocardial ischemia and sudden cardiac death.[13] The patients presenting ischemia, usually do it before the fifth decade of life, and the degree of elevation of troponin is very variable.[14] As it occurred with our patient, diagnosis was made by coronary angiography made after an acute coronary event, and at an age similar to that reflected in the consulted bibliography. A recent investigation has documented myocardial ischemia in patients with anomalous aortic origin of the RCA, even asymptomatic or with minimal symptoms.[15]

A single coronary artery is a rare anomaly that could be associated to acute coronary events like AMI. Antunes et al. documented the occurrence of type 2 AMI in a 22-year-old patient, secondary to cocaine consumption.[16] Likewise, more recent investigations have shown the presence of occlusive plaques in patients with AMI and anomalous origin of the coronary arteries.[17,18] In acute coronary syndromes, these anomalies complicate their management as they present challenges during percutaneous coronary intervention (PCI), such as an acute angle and intramural and intraarterial trajectory between the great vessels; hence, fibrinolytic treatment constitutes a feasible alternative. Currently, a few reports of cases of successful PCIs for these anomalies have been reported in patients presenting AMI; this is why this presentation is significant. However, in some given patients with intraarterial trajectory of the anomalous coronary artery, surgical unroofing of the right coronary ostium could be a reasonable alternative for these patients.[14,19]

CONCLUSIONS

The anomalous origin of the coronary arteries complicates emergency angioplasty and requires adjusted strategies to achieve revascularization. Using multimodal images helps with risk evaluation and to differentiate between malignant and benign trajectories. An early identification of this anomaly may guide PCI and minimize complications and mortality.

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