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Percutaneous treatment of anomalous origin of the right coronary artery with malignant course in a patient with aborted sudden death

Tratamento percutâneo de origem anômala de coronária direita com trajeto maligno em paciente com morte súbita abortada

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ABSTRACT - Coronary anomalies are less frequent than acquired coronary diseases, such as atherosclerosis, and have been implicated as a cause of cardiovascular events. This case report describes an incidental finding on angiography of an anomalous right coronary artery with origin in the left coronary sinus and an intra-arterial course, after an episode of aborted sudden death. The Heart Team analysis indicated a percutaneous approach with drug-eluting stent implantation at the origin of the right coronary artery as the best treatment, and the procedure was successfully performed. This case report and recent studies have demonstrated percutaneous treatment of coronary anomalies is a safe option for selected patients, considering clinical presentation, anatomy study, and training of the cath lab team.

Keywords: Death, sudden; Cath lab; Coronary angiography; Incidental findings

RESUMO - Anomalias coronarianas são menos frequentes em relação às doenças coronarianas adquiridas, como a aterosclerose, e têm sido implicadas como causa de eventos cardiovasculares. Este relato de caso descreve um achado incidental por angiografia de coronária direita anômala com origem no seio coronariano esquerdo e trajeto intra-arterial, após episódio de morte súbita abortada. A análise do Heart Team indicou como melhor tratamento a abordagem percutânea com implante de stent farmacológico em origem de coronária direita, procedimento este que foi realizado com sucesso. Este relato de caso e estudos recentes têm demonstrado que o tratamento percutâneo de anomalias coronarianas é uma opção segura para pacientes selecionados, levando em consideração quadro clínico, estudo anatômico e capacitação da equipe de hemodinâmica.

Descritores: Morte súbita; Hemodinâmica; Angiografia coronária; Achados incidentais

INTRODUCTION

Coronary anomalies are less frequent than acquired coronary diseases, such as atherosclerosis, and have been implicated as a cause of cardiovascular events, such as chest pain, sudden death, syncope, and myocardial infarction. They are usually diagnosed incidentally, after the first cardiovascular event, or by imaging method, through coronary angiography or coronary computed tomography angiography (CCTA).^{1,2}

The anomalous origins of coronary arteries are uncommon and can be found in 0.3 to 5.6% of population, and they are related to morbidity and premature mortality in young adults. They are potentially serious, and the origin and proximal course of the anomalous coronary arteries are the main predictors of severity. The anomalous origin of the coronary artery in the opposite aortic sinus is rare and is estimated at 0.05% to 0.1%.^{3,4}

This case report describes an incidental finding on angiography of an anomalous RCA with origin in the left coronary sinus and intra-arterial course, after an episode of aborted sudden death.

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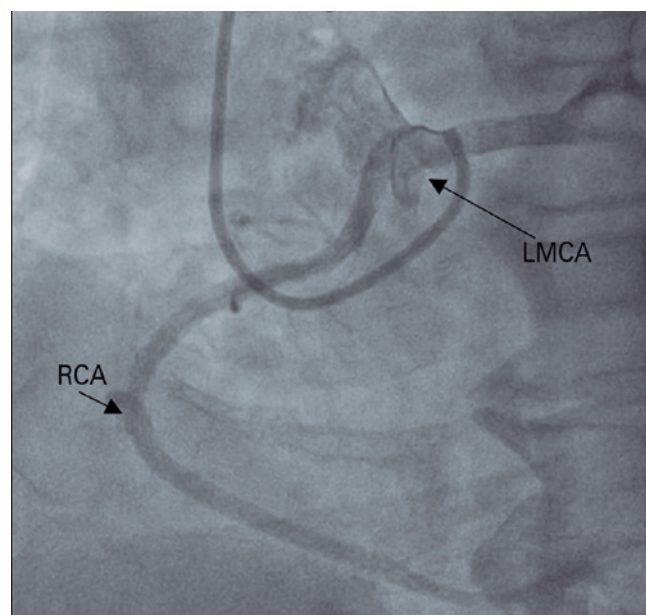
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CASE REPORT

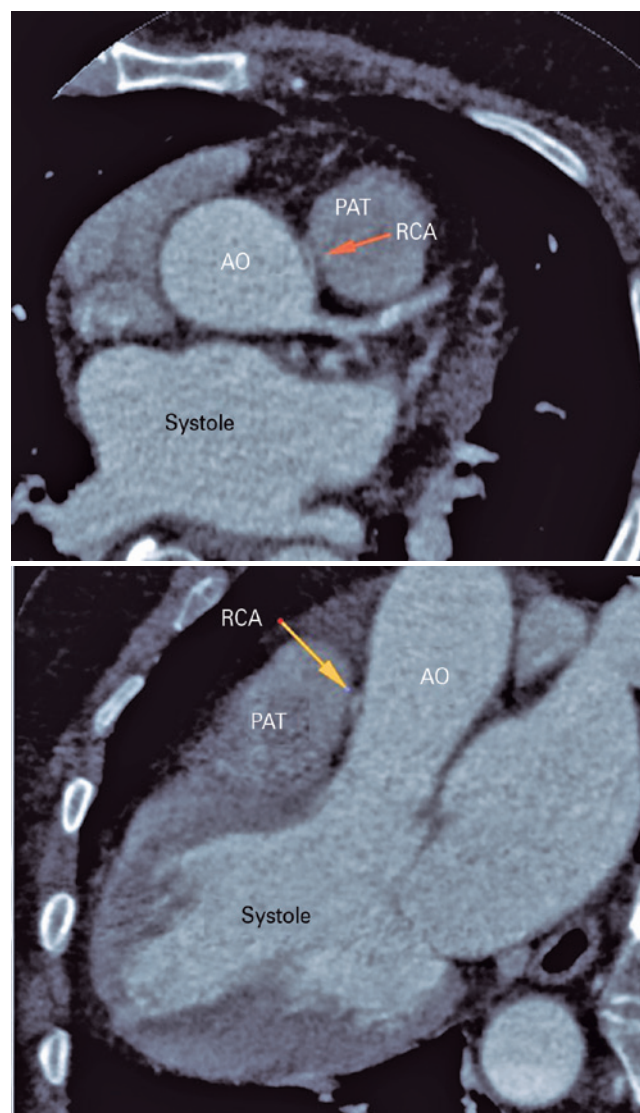
On October 10, 2022, a 65-year-old male patient, with Chagas cardiomyopathy, and slightly reduced left ventricular ejection fraction (LVEF = 44%) had an episode of out-of-hospital cardiac arrest (CA) in shockable rhythm, reversed after 30 minutes of cardiopulmonary resuscitation (CPR), according to the ACLS protocol by the *Serviço de Atendimento Móvel de Urgência* (SAMU). He was referred to the nearest Cath Lab Service, where a coronary angiography was performed with no evidence of atherosclerotic lesions, dissection or intracoronary thrombus, showing a possible anomalous origin of the RCA artery in the left Valsalva sinus (Figure 1). He was referred to our Cardiology Department, where a CCTA was performed, confirming the anomalous origin of the RCA with an intra-arterial malignant course (between the aorta artery and the pulmonary artery trunk), with significant obstruction during systole (Figure 2). The Heart Team analysis indicated a percutaneous approach with implantation of a drug-eluting stent in the origin of RCA as the best treatment. A puncture

was performed in the right femoral artery, a JR catheter and a 0.035"x180cm guidewire were inserted, the RCA ostium was catheterized and the region to be treated was crossed by a 0.014"x180cm guidewire. Pre-dilation was performed with a 3.5x12mm balloon, and a 4x32mm drug-eluting stent was successfully implanted under final release pressure at 12 ATM (Figure 3). Coronary computed tomography angiography was performed 24 hours after the intervention, with excellent results (Figure 4). The patient was discharged 48 hours after the procedure, asymptomatic and on dual antiplatelet therapy.



RCA: right coronary artery; LMCA: left main coronary artery.

Figure 1. Coronary angiography showing dominant right coronary artery with anomalous origin close to the left main coronary artery in the left Valsalva sinus.



AO: aorta; PAT: pulmonary artery trunk; RCA: right coronary artery.

Figure 2. CT angiography showing right coronary artery with a malignant course between the aorta and the pulmonary artery trunk during pre-stent intervention systole.

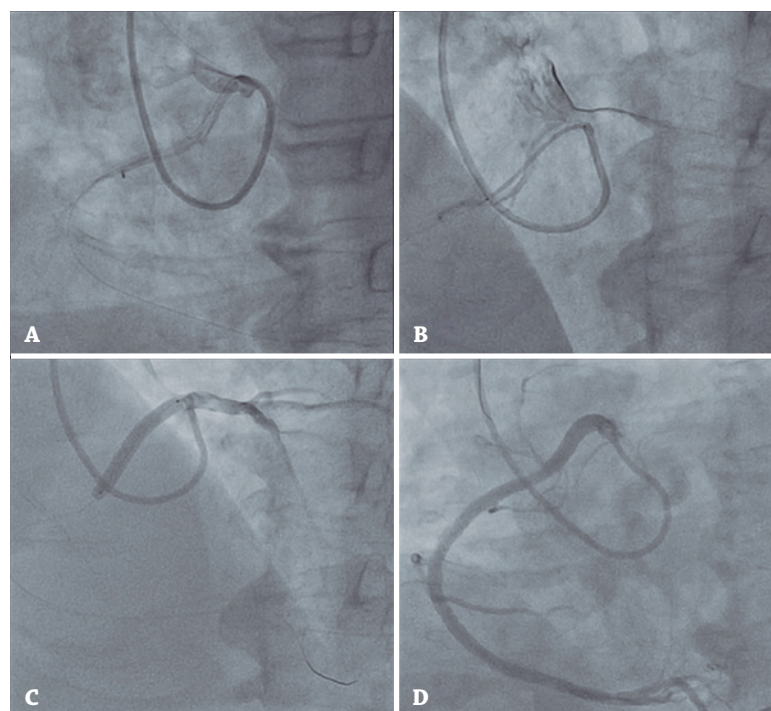
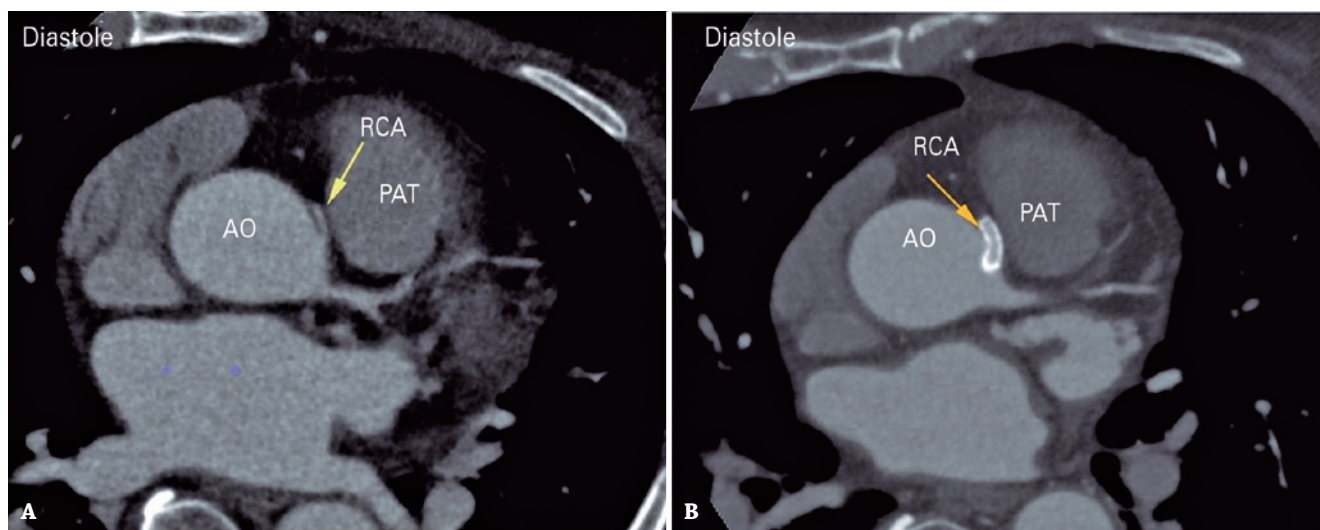


Figure 3. Coronary angiography showing sequence of percutaneous intervention. (A) Catheterization of the right coronary artery and passage of the guidewire. (B) Positioning of drug-eluting stent in the right coronary ostium. (C) Insertion of drug-eluting stent in the proximal third of the right coronary artery. (D) Post-intervention angiographic result.



AO: aorta; RCA: right coronary artery; PAT: pulmonary artery trunk.

Figure 4. (A) CT angiography showing the right coronary artery with a malignant course between the aorta and the pulmonary artery trunk during diastole before intervention with stent. (B) CT angiography showing right coronary artery with a malignant course between the aorta and the pulmonary artery trunk during diastole after intervention with stent.

DISCUSSION

The reported case addresses the effective percutaneous treatment of anomalous origin of RCA originating from the left coronary sinus with an intra-arterial course between the aorta and the pulmonary artery.

The discovery of the anomalous origin of coronary arteries is often incidental, and patients are usually asymptomatic, but when symptomatic, the results can be severe and catastrophic, as it happened with our patient after aborted sudden death.^{1,5,6}

A study carried out by Yamanaka et al. demonstrated that 19% of patients classified as having malignant anomalies had ectopic coronary origin from the pulmonary artery; single coronary artery; large coronary fistula, and origin in the opposite aortic sinus, as in the reported case.⁷

There are several hypotheses regarding the pathophysiological mechanism involved to explain the higher incidence of sudden death in this type of anomaly. Some authors proposed the vessel with this course would be prone to obstruction during exercise or stress, due to compression by the aorta and the pulmonary artery. A study carried out by Angelini with *post mortem* histological findings, mostly showed characteristics of an ischemic event in the absence of thrombi, suggesting the adrenergic stimulus could be associated with spasm of the anomalous artery.^{5,6}

The treatment of coronary anomalies can be performed using a conservative, percutaneous, or surgical approach, depending on clinical and imaging aspects. According to the 2008 ACC/AHA Guidelines for the Management of Adults with Congenital Heart Disease, there are guidelines for surgically treating the origin of the left coronary artery in the right coronary sinus and intra-arterial course and anomalies with an intra-arterial course and evidence of ischemia. In the new lines of techniques and drug-eluting stents that have emerged in recent years, percutaneous treatment has been performed with satisfactory results and low mortality in late follow-up.^{8,9}

In the reported clinical case, after the anomalous origin of the coronary artery was noted on coronary angiography, an anatomy study by CT angiography was performed for determining the treatment method, because, during the procedure, technical difficulties might occur due to anatomical differences. Therefore, it was important to analyze the anatomy of the coronary circulation and determine, in a more effective manner, the relation between the coronary artery and the other mediastinal structures.^{10,11}

Although current guidelines indicate revascularization surgery for an anomalous origin with a course between the aorta and the pulmonary artery as the treatment of choice, as reported in a multidisciplinary discussion with the Heart Team, an anatomical analysis of the patient was performed and the technical experience of the cath lab team was taken into account, and a percutaneous approach was performed, with success.

Our group, in a previous study conducted by Prudente et al., reported three different cases of symptomatic patients with chest pain and a diagnosis of right coronary anomaly in the opposite Valsalva sinus, undergoing subsequently a successful percutaneous approach.¹² Another publication from our service, by Fernandes et al., described the successful percutaneous treatment of a clinical case with anomalous origin from the left main coronary artery in the right Valsalva sinus, with a course anterior to the pulmonary trunk and bifurcating into an anterior descending branch, at the level of the interventricular septum, with a

90% lesion in the bifurcation.¹¹ A third study, conducted by Araújo et al., described a rare case of anomalous origin of the right coronary artery, from the pulmonary artery with conservative treatment.¹³

At the time, this case report and recent studies demonstrated percutaneous treatment of coronary anomalies with stent implantation is a safe option for selected patients, taking into account the clinical presentation, anatomy study, and training of the cath lab team.

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None.

CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: LXAO, MLP and GG; data collection: LXAO and PFD; data interpretation: LXAO; AMMJ, MLP, PCM and GG; text writing: LXAO and GG; approval of the final version to be published: LXAO, PCM, PFD, MLP, AMMJ and GG.

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