Journal of Morphological Sciences
J Morphol Sci
Brazilian Society of Anatomy

Case Report
J Morphol Sci 2023;40:55-58

Anomalous Origin of the Right Coronary Artery from the Left Valsalva Sinus and its Repercussion in the Cardiac Rythm after an Inferior Wall Myocardial Infarct

Eduardo Poletti Camara[1], Murilo Adolfo Fernandes[1], Guilherme de Oliveira Marciliano[1], Yuri Maynard Barreto[1], Leandro da Silva Elias[1], Larissa Teotonio Maria[1], Ana Luiza Lemos Freitas[1], Luis Fernando Soares Medeiros[1], Valeria Paula Sassoli Fazan[2]

[1]Departament of Cardiology, São Francisco Hospital, Ribeirão Preto, SP, Brasil
[2]Departament of Surgery and Anatomy, School of Medicine of Ribeirão Preto, University of São Paulo, Ribeirão Preto, SP, Brasil

Disclose and conflicts of interest: none to be declared by all authors

ABSTRACT

Introduction: the anomalous origin of the right coronary artery from the left sinus of Valsalva is a rare congenital anomaly found between 0.026% and 0.250% of the general population of patients undergoing coronary angiography.

Case Report: we present a case of a 67-year-old female patient who presented with nonspecific sudden malaise and lipothymia associated with nausea and arterial hypotension at home. The cinecoronariography showed a dominant right coronary circulation and its anomalous origin close to the Valsalva sinus of the left coronary artery, which was occluded in the initial third. A bifurcated left coronary artery without obstructive lesion in the trunk was present, giving off a long anterior descending branch, with severe obstructions after giving off the diagonal branch and in the middle and distal segments. Several other obstructed arteries were identified. The stenotic lesion was bypassed with a 0.14 guide. Pre-dilation was performed with a 2.5x10mm balloon catheter followed by implantation of a 3.0x16mm Inspiron Stent at 12 atm pressure. The patient presented extreme bradycardia and total atrioventricular block requiring the passage of an emergency temporary transvenous pacemaker to ensure a viable cardiac rhythm.

Conclusion: anatomy remains a vital part of cardiovascular training.

Keywords: Right coronary artery, Anomalous origin, Coronary angiography.

Introduction

Anomalous coronary arteries are the second most common cause of sudden death in young athletes, followed only by hypertrophic cardiomyopathy, and are associated with an increased risk of the genesis of coronary atherosclerosis in the variant arterial bed[1]. The presence of coronary anatomical variations or anomalous coronary arteries was observed in 1.3% of the patients who underwent cardiac catheterization[2].

The anomalous origin of the right coronary artery from the left sinus of Valsalva is a rare congenital anomaly found between 0.026% and 0.250% of the general population of patients undergoing coronary angiography. Its clinical manifestations are variable and most patients are asymptomatic[2]. Nevertheless, the presence of an anomalous right coronary artery is usually related to ischemia resulting from the compression of the coronary artery located between the great vessels that emerge from the heart, being associated with unexplained syncope[3,4]. We present and discuss a case of an anomalous coronary artery with clinical repercussions.

Case report

We present a case of a 67-year-old female patient who presented with nonspecific sudden malaise and lipothymia associated with nausea and arterial hypotension at home. Patient with type 2 diabetes mellitus and previous surgery to reconstruct the gastrointestinal tract after complicated diverticulitis more than 20 years ago. There was no history of stroke or a family history of cardiac death.

The patient became normotensive after volemic expansion and general physical examination showed no alterations, except for sinus bradycardia. Laboratory tests were within normal limits except for an elevation of cardiac enzymes. The renal function was preserved. Electrocardiogram showing sinus rhythm, isolated monomorphic ventricular ectopy, first-degree atrioventricular block, and ST-segment elevation in DII, DIII, and AVF corresponding to

DOI: 10.51929/jms.40.55.2023
ISSN 2177-0298

the inferior wall. The echocardiogram revealed preserved left ventricular systolic performance and moderately depressed right ventricular systolic performance, with an ejection fraction of 60%, concentric left ventricular remodeling, and mild tricuspid insufficiency. Also, segmental mobility of the left ventricle showed akinesia of the lower basal third and lower basal septum, hypokinesia of the lower middle third, and other segments with normal mobility. The patient underwent coronary angiography via the right radial artery approach.

The cinecoronariography showed a dominant right coronary circulation and its anomalous origin close to the Valsalva sinus of the left coronary artery, which was occluded in the initial third. A bifurcated left coronary artery without obstructive lesion in the trunk was present, giving off a long anterior descending branch, with severe obstructions after giving off the diagonal branch and in the middle and distal segments. Thin diagonal branches with diffuse parietal atheromatosis and the circumflex branch giving off atrioventricular branches with 40% obstruction at the initial segment were present together with severe and diffuse obstructions after the left marginal branch. Tortuous bifurcated anterior and marginal left ventricular branches with severe obstruction throughout the segment were found. Collateral circulation from the left coronary artery to the right grade II coronary artery was identified. Angioplasty was then performed with drug-eluting stent implantation for the anterior descending branch (anterior interventricular artery).

The stenotic lesion was bypassed with a 0.14 guide. Pre-dilation was performed with a 2.5x10mm balloon catheter followed by implantation of a 3.0x16mm Inspiron Stent at 12 atm pressure. Control coronary angiography reveals the absence of residual stenosis and TIMI III distal flow. The patient evolved after the percutaneous procedure with extreme bradycardia and total atrioventricular block on the electrocardiogram, requiring the passage of an emergency temporary transvenous pacemaker to ensure a viable cardiac rhythm. After 48 hours of observation in the intensive care unit a permanent pacemaker was implanted due to failure to return to self-rhythm.

Discussion

The coronary artery was first described by Antopol and Kugel in 1933[2]. Coronary anomalies have been associated with a huge range of cardiac symptoms; however, the mechanisms behind the symptoms are still poorly understood[5]. Compression of the anomalous origin of the right coronary artery between the aorta and the pulmonary artery caused by the increase in cardiac output during daily activities and physical exercise may be related[6]. Intussusception of the initial portion of the right coronary artery into the aortic wall may make it vulnerable to compression by the expanding aorta as cardiac output increases[7]. Up to one-third of sudden cardiac deaths in the young population are caused by coronary anomalies and their early diagnosis is crucial for the survival of these patients[8]. This case report describes a rare condition with the potential to be fatal and thus justifies the importance of early awareness of this condition. In addition, it is essential to optimize images of the anatomy of the aortic annulus with individualized projections.

Different therapeutic strategies for the management of coronary anatomical variations have been used, and recently the conduct has changed from expectant to surgical[9]. However, such an approach depends exclusively on the symptoms presented. The surgical techniques used are the same as for coronary artery bypass grafting, performing reimplantation of the coronary ostium, and translocation of the pulmonary artery[10-13]. In this report, we found the main complication as an acute myocardial infarction, affecting the inferior ventricular wall, which is the territory of the right coronary artery. Also, this artery irrigates the sinus node and in this case, the deprivation of blood flow to the sinus node region, responsible for controlling the heart rhythm, resulted in a total atrioventricular block followed by extreme bradycardia requiring immediate interventional correction using a transvenous pacemaker.

In this way, anatomy remains a vital part of cardiovascular training. Through hundreds of hours of practice, not to mention significant prior knowledge and experience, this plays a vital role in providing the first descriptions of basic cardiac anatomy and complex anomalies. It is through this precedent that discoveries are being made with advanced imaging. It is certain that the increased use of three-dimensional imaging techniques, such as magnetic resonance imaging, computed tomography, and echocardiography, will elucidate in more detail the anatomical variations and anomalous origins that surround the right coronary artery. Therefore, the identification of this rare left origin makes this report of vital importance for the management of complex cases

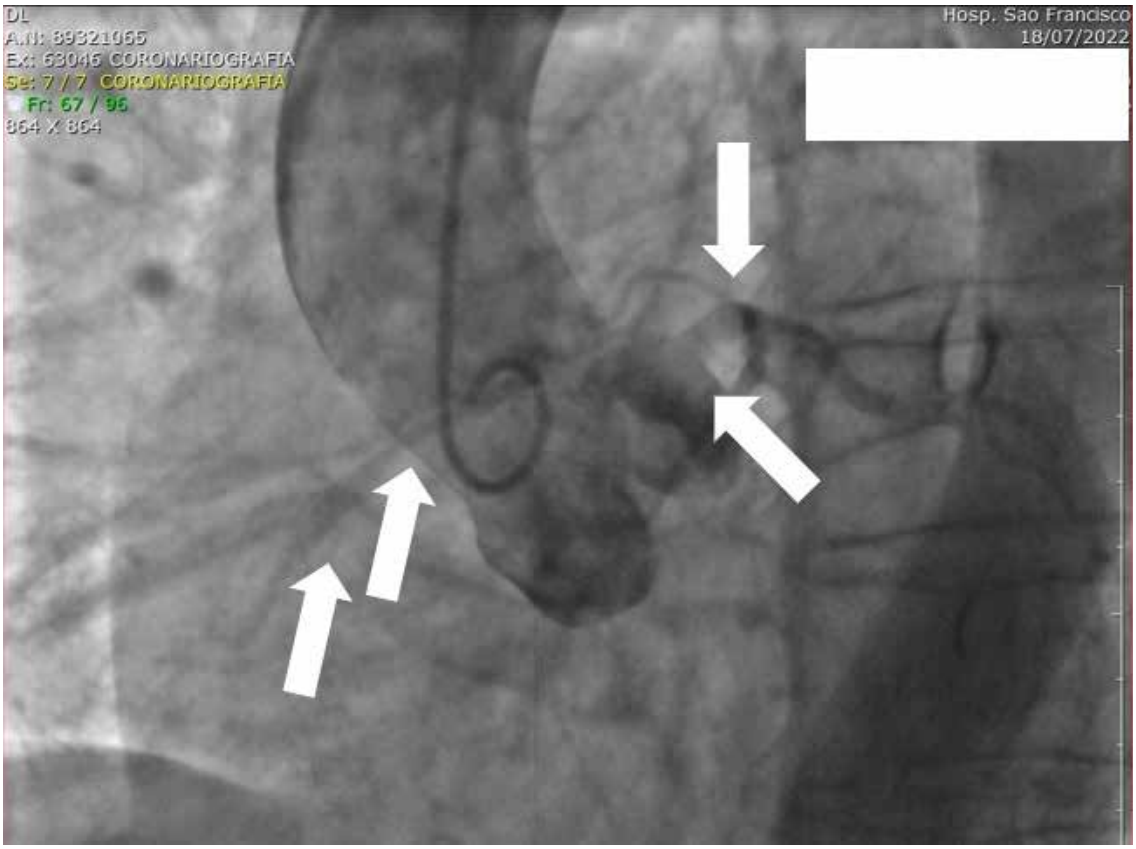

Figure 1. Aortic cinecoronariography, showing anomalous origin of the right coronary artery in the left sinus of Valsalva, showing its course and its occlusive lesion at the beginning of its emergence (in arrows).

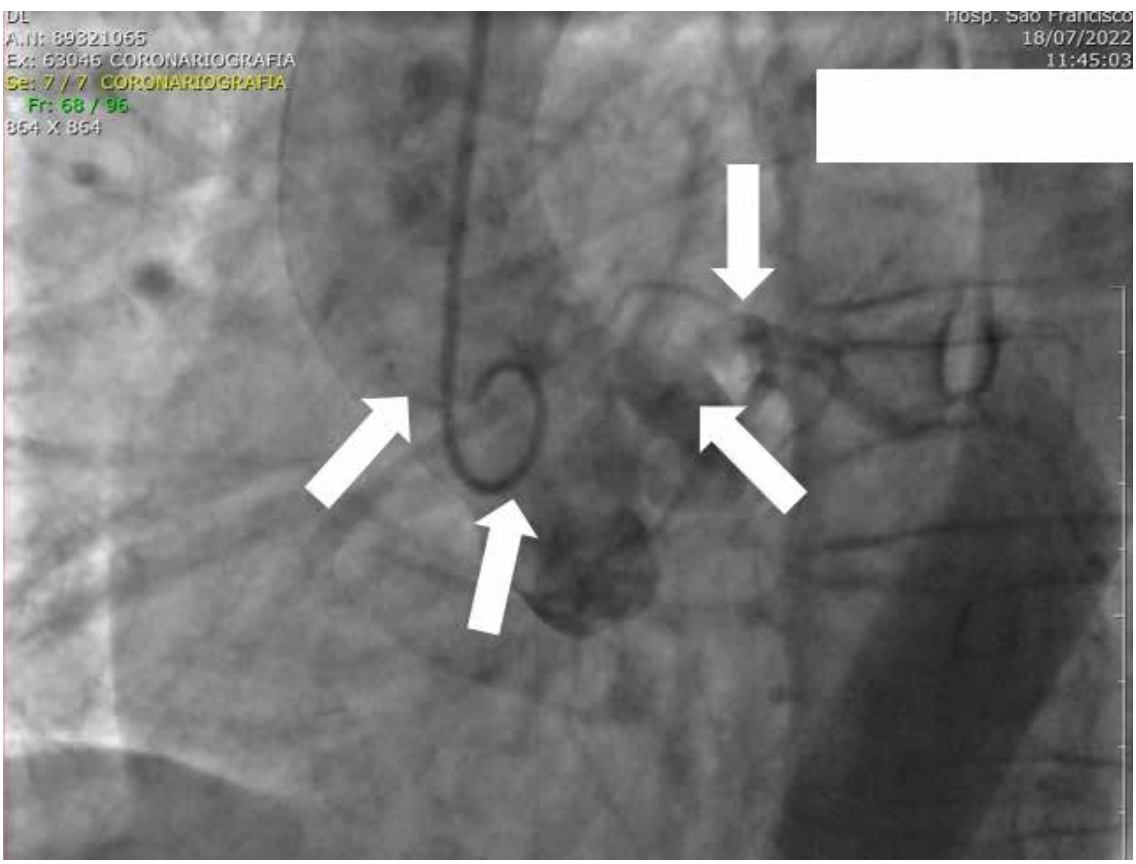

Figure 2. Aortic cinecoronariography, showing anomalous origin of the right coronary artery in the left sinus of Valsalva, showing its course and its occlusive lesion at the beginning of its emergence and bent right cardiac catheter due to the impossibility of cannulating the right sinus of Valsalva (in arrows).

References

1. Brian G, Adriana Q, Monvadi S, Sripal B, Robert OR. Anomalous right coronary artery and sudden cardiac death. Circ Arrhythm Electrophysiol. 2012;5: e111-e112.
2. Louis IB. Coronary artery anomalies. Emedecine. 2019 Dec 30.
3. Budi YS, Anggoro BH, Putrika PRG, Nahar T. Anomalous origination of right coronary artery from left sinus in asymptomatic young male presenting with positive ischemic response on treadmill test. Hindawi Publishing Corporation. Case Rep Cardiol. 2016;2016: 7652869.
4. Rosseel L, Bonnier H, Sonck J. Anomalous right coronary artery in a middle-aged patient: a case report and review of the literature. Medicine (Baltimore). 2016 Dec;95(49): e5508.
5. Paolo A. Coronary artery anomalies: an entity in search of an identity. Circulation. 2007 Mar 13;115(10): 1296-305.
6. Paolo A, Carlo U, Jorge M, Jonathan MT, MacArthur AE, James TW *et al*. Origin of the right coronary artery from the opposite sinus of valsalva in adults: characterization by intravascular ultrasonography at baseline and after stent angioplasty. Catheter Cardiovasc Interv. 2015 Aug;86(2): 199-208
7. Raul GR, Javier S, Samuel O, Hernán C, Jorge C, Cyd Q *et al*. Surgical treatment of right coronary arteries with anomalous origin and slit ostium. Ann Thorac Surg. 2004 May;77(5): 1525-9.
8. Kaku B, Shimizu M, Yoshi H, Ino H, Mizuno S, Kanaya H *et al*. Clinical features of prognosis of Japanese patients with anomalous origin of the coronary artery. Jpn Circ J. 1996; 60: 731-41.
9. R.a. Krasuski, D. Magyar, S. Hart, V. Kalahasti, R. Lorber, R. Hobbs, G. Pettersson, E. Blackstone, Long-term outcome and impact of surgery on adults with coronary arteries originating from the opposite coronary cusp, Circulation 123 (2) (2011) 154–162.
10. R.L. Romp, J.R. Herlong, C.K. Landolfo, S.P. Sanders, C.E. Miller, R.M. Ungerleider, J. Jaggers, C. Backer, S. Bradley, C. Mavroudis, J.W. Brown, Outcome of unroofing procedure for repair of anomalous aortic origin of left or right coronary artery, Ann. Thorac. Surg. 76 (2) (2003) 589–596.
11. K. Kumagai, H. Kin, A. Ikai, H. Okabayashi, Successful neo-ostium creation using pulmonary artery tissue in a case of anomalous origin of the left coronary artery from the right sinus of Valsalva, Interact. Cardiovasc. Thorac. Surg. 18 (Febuary 2014) 695–697.
12. W. Heo, H.-K. Min, D.K. Kang, H.J. Jun, Y.-H. Hwang, H.C. Lee, Three different situations and approaches in the management for anomalous origin of the right coronary artery from the left coronary sinus: case report, J. Cardiothorac. Surg. 9 (1) (2014) 21–26.
13. K. Nimdet, J. Soongswang, S. Sriyodchati, An interarterial course of anomalous coronary artery and an alternative surgical option, Cardiol. Young 22 (05) (2012) 536–538.

Mini Curriculum and Author's Contribution

1. Eduardo Poletti Camara. Responsible for idealizing the project, collecting data, analyzing the results, patient follow-up, and drafting the manuscript. ORCID: 000-0003-4928-0800

2. Murilo Adolfo Fernandes. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

3. Guilherme de Oliveira Marciliano. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

4. Yuri Maynard Barreto. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

5. Leandro da Silva Elias. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

6. Larissa Teotonio Maria. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

7. Ana Luiza Lemos Freitas. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

8. Luis Fernando Soares Medeiros. Responsible for collecting data, analyzing the results, patient follow-up, and drafting the manuscript.

9. Valéria Paula Sassoli Fazan. Responsible for case discussion, revising the data, and revising and approving the final version of the manuscript. ORCID: 0000-0003-1293-5308

Received: November 9, 2020
Accepted: December 23, 2020

Corresponding author
Valéria Paula Sassoli Fazan
E-mail: vpsfazan@yahoo.com.br