

Anomalous Aortic Origin of Coronary Arteries: Case Report of Unroofing With Coronary Re-Implantation Technique

Carlos Riera-Kinkel^{1*}, David Roldán-Morales¹, Martin Rosas-Peralta², Gabriela Borrayo-Sánchez², Alberto Ramírez-Castañeda¹, Luis A. Moreno-Ruíz³, Yatsil Necochea-Osuna³, Erick Ramirez-Arias⁴, Alberto López-Gutiérrez¹, Jaime Salgado-Vázquez¹, Sebastián Inzunza-Saldaña⁵, Horacio Márquez-González⁶, Lucelli Yañez-Gutiérrez⁶, Guillermo Saturno-Chiu⁷

¹Cardiothoracic Surgery División. Cardiology Hospital, National Medical Center SXXI-IMSS, México

²Programa "A todo Corazón", National Medical Center, SXXI-IMSS, México City, Mexico

³Cardiology Department, Cardiology Hospital, National Medical Center SXXI-IMSS, México

⁴Emergency Room, Cardiology Hospital, National Medical Center SXXI-IMSS, México

⁵Anesthesia Department, Cardiology Hospital, National Medical Center SXXI-IMSS, México

⁶Congenital Heart Disease Department, Cardiology Hospital, National Medical Center SXXI-IMSS, México

⁷General Director, Cardiology Hospital, National Medical Center SXXI-IMSS, México

Received: February 15, 2019; Accepted: April 01, 2019; Published: April 19, 2019

*Corresponding author: Dr. Carlos Riera Kinkel, Chief of the Division of Cardiothoracic Surgery, Hospital of Cardiology, National Medical Center Siglo XXI, IMSS, Cuauhtémoc 330, Col. Doctores, CP 06720, Mexico DF, Mexico, Tel: 56276900 ext 22195, E-mail: rierac7@gmail.com

Abstract

Anomalous Aortic Origin of Coronary Arteries is a coronary disorder uncommon but occasionally lethal. The possibility of sudden death is the indication for surgery. We inform a case of a patient with anomalous aortic origin of right coronary artery which emerged from left sinus of Valsalva, catalogued as type III. He was previously treated by CBAG, however the bypass was occluded and therefore he was sent to our service. We made a correction using the unroofing technique. Unroofing technique is a reproducible technique with good results, ultimately solving the problem. The outcome was excellent, 6 months later he was reported asymptomatic.

Keywords: Anomalous Origin; Coronary Arteries; sudden death; México

Introduction

Anomalous Aortic Origin of Coronary Arteries is a rare but potentially lethal condition. The incidence data in different series of autopsies oscillates between 0.03-0.3% of the population and reaches up to 25-32% in patients with sudden death [1, 2].

The anomalous origin can be classified as those who had origin from pulmonary artery or from opposite sinus aortic origin, those who had origin between the semilunar valves or those who had origin behind atria-ventricular valves [3]. For those cases who had origin in opposite sinus there are three types: type 1, retro-cardiac; type II, retro-aortic; Type III, pre-cardiac or inter-arterial; Type IV, intra-septal; Type V pre-cardiac or pre-pulmonar (Figure 1) [4].

The mechanisms by which ischemia occurs are those related

to the form of the aberrant ostium (fusiform or trench), those associated with the proximal path which may be intramural or interatrial with possible extrinsic compression which can led to acute angulation and later to resume its normal course, Vasospasm and those relating to the possible secondary endothelial lesion to the turbulent flow [4, 5].

In the majority of cases the patients are asymptomatic, however, this anomaly can arise with pictures of Dyspnea and angina, to condition the appearance of acute infarct myocardium and even sudden death, in USA, it is accepted as the second leading cause of sudden death [4].

Clinical Case

Female of 55 years old, she had hypertension history (15 years), pre-diabetes and dyslipidemia. Six years before this assessment, she had chest pain during exercise and she was diagnosed to have Anomalous Aortic Origin of Coronary Arteries because of she had right coronary artery origin in left coronary sinus and therefore a CBAG was performed with bypass of internal left mammary artery (Figure 2). Two years after she began with dyspnea and fatigue (Class III of NYHA) and one episode of syncope. Severe ischemia was documented in the inferior wall of left ventricle; angio-tomography demonstrated occlusion of previous bypass (Figure 3).

Therefore we decide to offer surgical handling with correction with unroofing technique, the procedure consists of unroofing of intra-arterial segment of the ostium of the right coronary artery, aortic tissue redundant, up to put a suitable lumen of the left coronary artery, where there is no angulation of the coronary

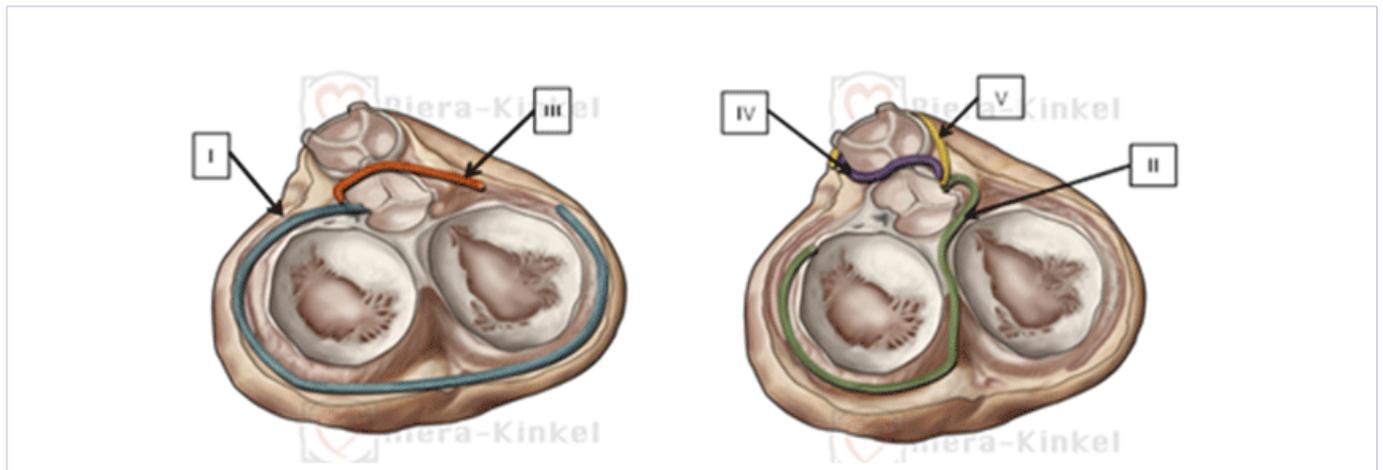


Figure 1: Diagram of possible trajectories of anomalous aortic origin of Coronary Arteries: Type I: retrocardiac; Type II: retro-aortic; Type III: inter-arterial; Type IV: prepulmonary

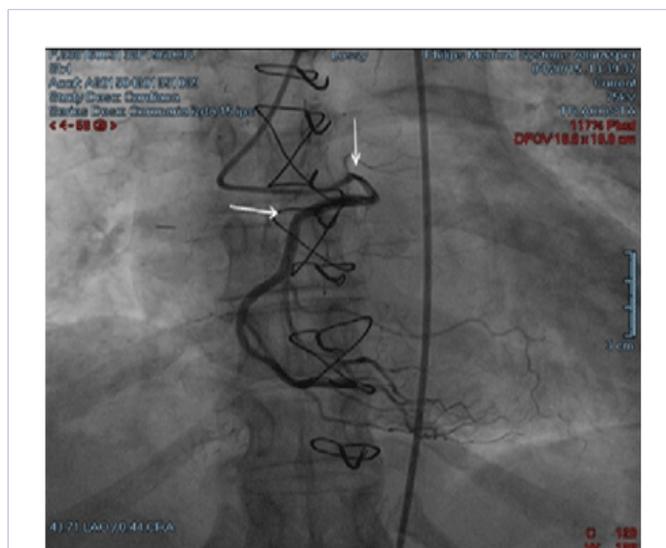


Figure 2: Catheterization. The origin of the CD from the opposite with a torn ostium sinus is shown, as well as a narrowing in its proximal portion to recover the normal route at the level of the right sinus

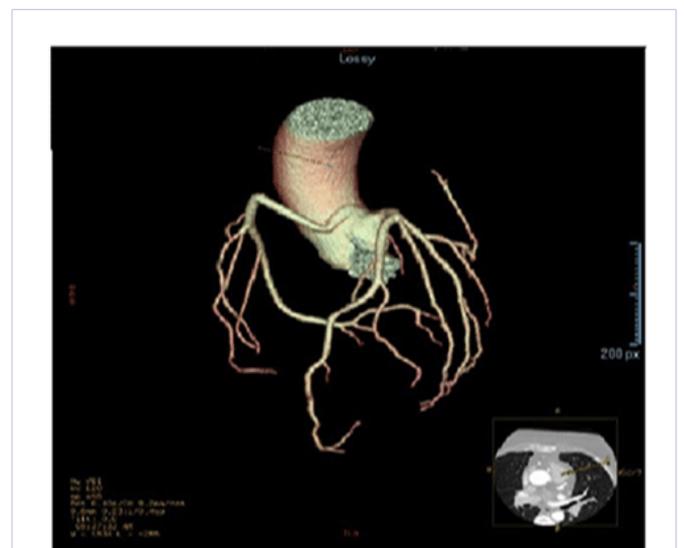


Figure 3: Angio-Tomography. Three-dimensional tomographic reconstruction where narrow sites can be seen in the right coronary artery

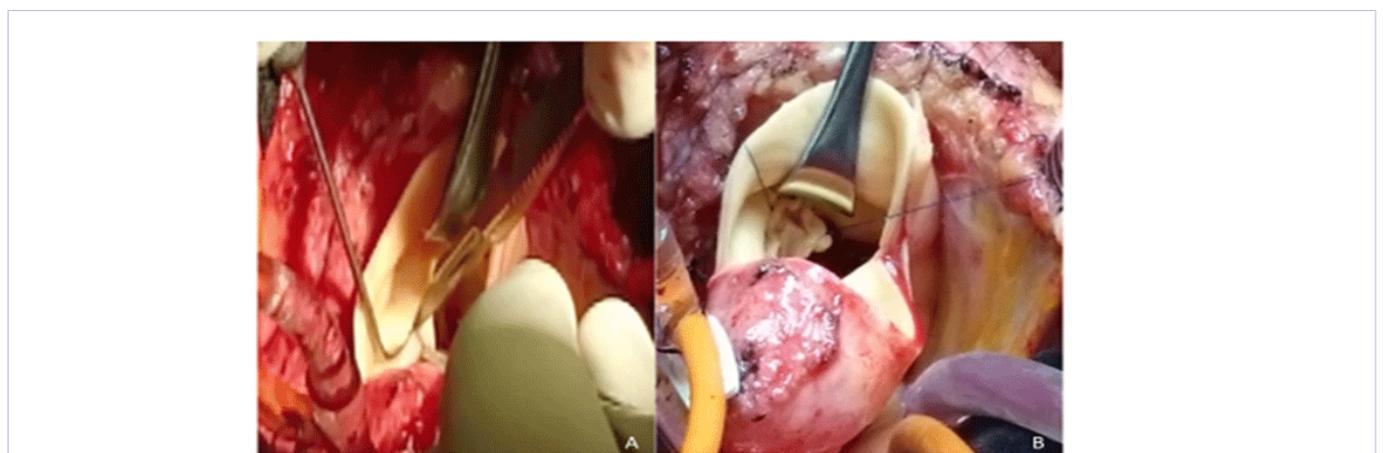


Figure 4: Incision through the aortic wall connecting the anomalous coronary artery lumen with the aortic lumen

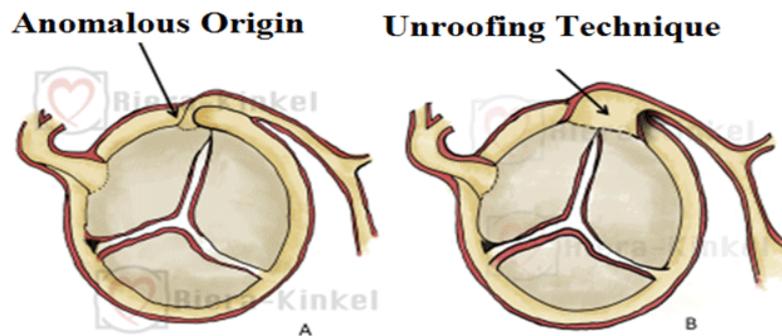


Figure 5: Details of unroofing technique. In this case the ostium of right coronary was expanded and reinserted into aortic wall and then unroofing of the intramural segment was done

artery, communicating both the procedure was performed without any complication. Patient was discharged in functional class I of NYHA (Figure 4, 5).

Comment

While the anomalous origin of the coronary arteries is uncommon, its potential lethality requires awareness of your presentation and forms of management. Those factors that indicate one increased risk of sudden death among which the interatrial journey (type III), the dominance of the anomalous coronary artery, the appearance of symptoms and patients with less have been described than 35 years of age [4]. Something that highlights the importance of this entity is the relative risk of sudden death, it is estimated that in athletes with coronary artery disease risk is 2.6, in those with cardiomyopathy, ventricular Arrhythmogenic reaches 5.4, but the relative risk of sudden death for anomalous origin of a coronary artery of an opposite breast is 79% [6].

In a review published by Shah et, al. with a 20-year follow-up found only 69 case reports of right coronary artery with anomalous origin of the left coronary sinus, where angina was the most frequent symptom, followed by sudden death and arrhythmia [7].

Medical management consists of monitoring, the promotion of a sedentary lifestyle and the administration of beta-blockers, which greatly limits the daily activities of many patients [4]. The surgical management alternatives include surgery, coronary artery bypass, coronary reimplantation and unroofing in its conventional form or modified (6.8). The review carried out by Shah et, al. found that 45 patients were subjected to surgical management being the most used revascularization [7]. Frommelt and his team published their experience to ten years with the use of unroofing technique in 27 patients, with an average follow-up of 1.8 years, with a maximum of 8.4 years, finding all asymptomatic patients and without restriction of activities [6].

Mainwaring et, al. published his experience of 76 cases of anomalous origin of coronary artery with 61% of cases with

condition of the right coronary artery [9]. Unroofing technique was the most widely used (55 cases), followed by six years in which there were no deaths. Given the very high risk of sudden death that determines the anomalous origin of the coronary arteries the recommendation of surgical management should be in all cases. Although bypass surgery is more commonly used, as a procedure with which the majority of cardiovascular surgeons are familiar, the duration of a patent hemoducto is still a point against her.

Unroofing technique has shown good results, with a reproducible technique and that reduces the risk of bleeding associated with the reimplantation of coronary artery, being these two procedures that achieve a restoration of normal Anatomy and therefore offer best results in the medium and long term.

References

1. Fedoruk LM, Kern JA, Peeler BB, Kron IL. Anomalous origin of the right coronary artery: Right internal thoracic artery to right coronary artery bypass is not the answer. *J Thorac Cardiovasc Surg.* 2007;133(2):456-460. doi: 10.1016/j.jtcvs.2006.10.011
2. Hata Y, Kinoshita K, Kudo K, Ikeda N, Nishida N. Anomalous origin of the right coronary artery from the left coronary sinus with an intramural course: comparison between sudden-death and non-sudden-death cases. *Cardiovas Pathol.* 2015;24(3):154-159. doi: 10.1016/j.carpath.2014.11.004
3. Lluri G, Aboulhosn J. Coronary Arterial Development: a Review of Normal and Congenitally Anomalous Patterns. *Clin Cardiol.* 2014; 37(2):126-130. doi: 10.1002/clc.22237
4. Barriaes-Villa R, Morís de la Tassa C. Congenital anomalies of the coronary arteries originating in the contralateral sinus of Valsalva: what attitude should be followed? *Rev Esp Cardiol.* 2006;59(4): 360-370.
5. Levin R, Degrange M, Lezana F, Marcos Sobre, Flavio Salvaggio et al. Diagnosis and surgical treatment of the anomalous origin of the coronary arteries. *Rev Argent Cardiol.* 2011;79(2):125-131.
6. Frommelt PC, Sheridan DC, Berger S, Frommelt MA, Tweddell JS. Ten-year experience with surgical unroofing of anomalous aortic origin of

- a coronary artery from the opposite sinus with an interarterial course. *J Thorac Cardiovasc Surg.* 2011;142(5):1046-1051. doi: 10.1016/j.jtcvs.2011.02.004
7. Shah AS, Milano CA, Lucke JP. Anomalous origin of the right coronary artery from the left coronary sinus: case report and review of surgical treatments. *Cardiovasc Surg.* 2000;8(4):284-286.
 8. Romp RL, Herlong JR, Landolfo CK, Sanders SP, Miller CE, Ungerleider RM. Outcome of Unroofing Procedure For Repair of Anomalous Aortic Origin of Left or Right Coronary Artery. *Ann Thorac Surg.* 2003;76(2):589-596.
 9. Mainwaring RD, Reddy VM, Reinhartz O, Petrossian E, Pun R, Hanley FL. Surgical repair of anomalous origin of a coronary artery. *Eur J CardioThor Surg.* 2014;46(1):20-26. doi: 10.1093/ejcts/ezt614