HSPI The Open Access Publisher

JCCM JOURNAL OF CARDIOLOGY AND CARDIOVASCULAR MEDICINE
ISSN 2575-0143

Case Presentation

Single Coronary Artery Associated with an Arteriovenous Communication: An Incremental Diagnostic Value of Coronary CTA

Rabih Touma[1,2]*, Karan T Singh[2], Ramanjit Kaur[1,2], James F Mastromatteo[1,2] and Aiden Abidov[1,2]

[1]Wayne State University, Detroit, MI, USA
[2]John D. Dingell VAMC, Detroit, MI, USA

Abstract

Single coronary artery and coronary arteriovenous communication are rare congenital cardiac anomalies with potentially harmful effects, making the diagnosis essential for the appropriate management. The coexistence of these two anomalies is exceptional. We present a case illustrating the diagnostic power of Coronary CTA in depicting this unusual combination.

More Information

***Address for correspondence:** Rabih Touma, MD, Department of Medicine/Section of Cardiology, Wayne State University/John D. Dingell VAMC, 4646 John R Street, 11-M, Detroit, Michigan, 48201, USA, Email: rabih.touma@va.gov

Submitted: July 29, 2024
Approved: August 10, 2024
Published: August 12, 2024

How to cite this article: Touma R, Singh KT, Kaur R, Mastromatteo JF, Abidov A. Single Coronary Artery Associated With An Arteriovenous Communication: An Incremental Diagnostic Value of Coronary CTA. J Cardiol Cardiovasc Med. 2024; 9(2): 118-119. Available from: https://dx.doi.org/10.29328/journal.jccm.1001190

Keywords: Arteriovenous communication; Coronary computed tomographic angiogram; Single coronary artery

Abbreviations: AV: Arteriovenous; CCTA: Coronary Computed Tomography Angiogram; CAD: Coronary Artery Disease; ICA: Invasive Coronary Angiogram; PLB: Posterolateral Branch; RCA: Right Coronary Artery; SCA: Single Coronary Artery

Introduction

Coronary artery congenital anomalies are rare incidental findings discovered upon cardiac imaging for different indications. Their incidence is estimated between 0.2% and 1.3% [1]. The single coronary artery (SCA) is defined as one coronary artery that takes off from one coronary ostium and supplies blood to the whole myocardium [2]. Coronary arteriovenous (AV) malformation is an abnormal communication between a higher-pressure coronary artery and a lower-pressure venous structure. The clinical course of these anomalies is usually benign however some patients may have a life-threatening cardiac presentation leading to sudden cardiac death [2,3]. The recognition and early diagnosis of these conditions are of utmost importance to prevent such unfavorable outcomes. Coronary Computed Tomography Angiogram (CCTA) is a versatile non-invasive cardiac imaging modality able to illustrate complex cardiac anatomy.

Case report

A 65-year-old man with symptoms of occasional exertional chest pain, lightheadedness, and fatigue and a history of recent onset left ventricular (LV) systolic dysfunction with LV ejection fraction of 35-40%, hypertension, hyperlipidemia, diabetes mellitus, tobacco use, was referred for CCTA after an abnormal Invasive Coronary Angiogram (ICA). On ICA, we suspected an SCA arising from the left coronary cusp with the right coronary artery (RCA) originating from the mid-left anterior descending artery (LAD) and mild non-obstructive coronary artery disease (CAD) (Figure1, panel A). His physical exam was unremarkable.

CCTA confirmed the presence of SCA emanating from the left sinus of Valsalva, with the RCA deriving from the mid-LAD and coursing anteriorly to the pulmonary trunk (Figure 1, panels B and C). In addition, we have diagnosed an AV communication between the distal left posterolateral branch (PLB) and the left marginal cardiac vein (Figure 1 panel D). Subsequent cardiac magnetic resonance imaging revealed non-ischemic cardiomyopathy with linear intramural minimal enhancement in the basal interventricular septum. Qp/Qs was abnormal (1.2:1) but did not reach surgical indication. We have continued conservative management using guideline-directed medical therapy that includes aspirin, statin, beta-blocker, angiotensin receptor-neprilysin inhibitor, and sodium-glucose cotransporter-2 inhibitor; no adverse events were noted in the four-year follow-up.

Discussion

SCA and coronary AV malformations are rare congenital anomalies with potentially unfavorable outcomes [4,5].

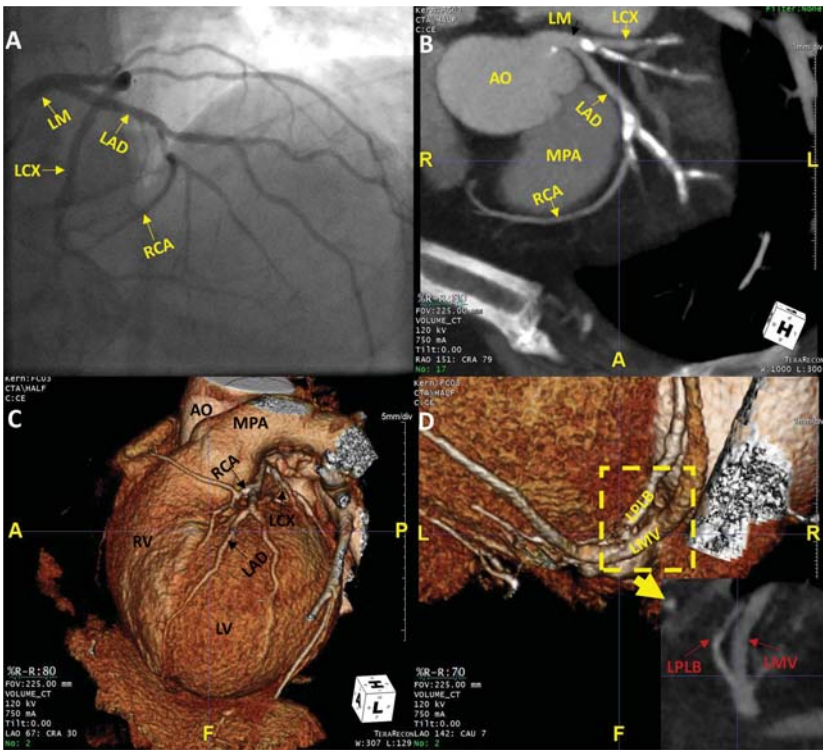

Figure 1: Panel A represents an invasive coronary angiogram image in the right anterior oblique cranial view demonstrating a single coronary artery (SCA) from the left coronary cusp, right coronary artery (RCA) arising from the mid-left anterior descending artery (LAD). Panels B and C reveal a maximum intensity projection (MIP) and a 3-dimensional (3D) volume-rendered (VR) CCTA image of the heart in diastole demonstrating the SCA from the left coronary cusp, RCA arising from the LAD and coursing anteriorly to the main pulmonary artery (MPA). Panel D shows a 3D VR and Multiplanar reconstruction (MPR) CCTA image of an arteriovenous communication between the left posterolateral branch (LPLB) and the left marginal vein (LMV). AO: Aorta; CCTA: Coronary Computed Tomography Angiogram; LCX: Left Circumflex Coronary Artery; LM: Left Main Coronary Artery; LV: Left Ventricle; RV: Right Ventricle.

Their unique combination in one setting has not been previously described in the literature. Surgical treatment with repositioning of the vessel or coronary bypass is warranted for symptomatic patients with SCA that has a malignant inter-arterial course between the aorta and pulmonary artery [1]. Limited data is available regarding the optimal management of coronary AV malformations, nevertheless, surgical ligation or percutaneous coil embolization is indicated for symptomatic and/or intermediate to large-size malformations [3]. ICA is the gold standard for diagnosing CAD but it is complemented by CCTA, a non-invasive imaging tool with high spatial and temporal resolution that illustrates the specifics of the anomalous coronary vessel anatomy and successfully detects coexisting conditions further guiding the management decision. Subtle findings such as contrast opacification difference/ contrast leak between two AV structures may further assist in identifying intracardiac shunt.

Conclusion

Congenital coronary anomalies require in-depth evaluation of the cardiac anatomy using multimodality imaging to identify associated pathology requiring further diagnostic workup before management decision. Our case represents a unique coexistence of two rare cardiac anomalies, demonstrating the value of CCTA in assessing complex cardiac anatomy. To our knowledge, this is the first case reported of SCA associated with an AV communication of the distal left PLB and the left marginal cardiac vein.

Ethical declaration

A written permission for completely anonymous data publication was obtained from the privacy officer.

References

1. Muhtaroglu M, Fahrioglu SL, Beton O, İlgi S. The Anatomical History of a Single Coronary Artery Anomaly: A Case Report. Heart Surg Forum. 2021;24(5):E772-E775. Available from: https://doi.org/10.1532/hsf.4119

2. Al Umairi R, Al-Khouri M. Prevalence, Spectrum, and Outcomes of Single Coronary Artery Detected on Coronary Computed Tomography Angiography (CCTA). Radiol Res Pract. 2019;2019:2940148. Available from: https://doi.org/10.1155/2019/2940148

3. Dimagli A, Malas J, Chen S, Sandner S, Schwann T, Tatoulis J, et al. Coronary Artery Aneurysms, Arteriovenous Malformations, and Spontaneous Dissections-A Review of the Evidence. Ann Thorac Surg. 2024;117(5):887-896. Available from: https://doi.org/10.1016/j.athoracsur.2023.11.033

4. Sampath A, Chandrasekaran K, Venugopal S, Fisher K, Reddy KN, Anavekar NS, et al. Single coronary artery Left (SCA L)-Right coronary artery arising from mid-left anterior descending coronary artery: New variant of Lipton classification (SCA L-II) diagnosed by computed tomographic angiography. Echocardiography. 2020;37(10):1642-1645. Available from: https://doi.org/10.1111/echo.14669

5. Khachatryan T, Karnwal S, Hamirani YS, Budoff MJ. Coronary arteriovenous malformation, as imaged with cardiac computed tomography angiography: A case series. J Radiol Case Rep. 2010;4(4):1-8. Available from: https://doi.org/10.3941/jrcr.v4i4.313