



Percutaneous coronary intervention to left anterior descending artery/right coronary artery bifurcation: this is not a typo! A case report

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Received 28 February 2019; first decision 16 April 2019; accepted 30 July 2019; online publish-ahead-of-print 19 August 2019

Background

Anomalous origin of the right coronary artery (RCA) is a rare congenital anomaly. A single coronary artery arising from the left sinus of Valsalva, with the RCA originating from the left anterior descending artery (LAD), is extremely rare. We report the case of an anomalous origin of the RCA from the mid LAD with a significant bifurcation lesion, in the setting of an acute coronary syndrome, endangering both the RCA and LAD territories.

Case summary

An 85-year-old female presented with a non-ST elevation acute coronary syndrome. Transradial coronary angiography revealed an anomalous origin of the RCA arising from the mid LAD beyond a large first septal perforator. There was significant stenosis involving anomalous RCA/LAD bifurcation classified as Medina 1, 1, 1. Following discussion at heart team meeting, she underwent successful percutaneous coronary intervention. The LAD/RCA bifurcation was treated using a two-stent culotte technique without any complications. Computed tomography coronary angiogram was performed which confirmed a benign course of the anomalous RCA anterior to aorta and pulmonary artery.

Discussion

This anomaly poses a significant challenge in revascularization due to the large area of myocardium subtended by the LAD and RCA and usually an acute angle of bifurcation. Moreover, CTCA can be useful to ascertain the course of anomalous RCA.

Keywords

Case report • Acute coronary syndrome • Coronary artery anomalies • Percutaneous coronary intervention • Computed tomography coronary angiogram (CTCA)

Learning points

- Knowledge of rare anomalies of coronary circulation is vital especially for cardiologists performing coronary angiography.
- In patients with single coronary arteries, meticulous bifurcation percutaneous coronary intervention is important due to a larger myocardial territory subtended by the bifurcation branches.
- Computed tomography coronary angiography is the gold standard and should be performed where possible to better characterize the origin and the course of the anomalous coronary artery before the revascularization strategy is chosen.

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Handling Editor: Vijay Kunadian

Peer-reviewers: Panagiotis Xaplanteris, Rafael Vidal-Perez, and Dejan Milasinovic

Compliance Editor: Rahul Mukherjee

Supplementary Material Editor: Peregrine Green

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Introduction

Anomalous origin of the right coronary artery (RCA) is a rare congenital anomaly. A single coronary artery arising from the left sinus of Valsalva, with the RCA originating from the left anterior descending artery (LAD), is extremely rare.¹⁻³

We report the case of an anomalous origin of the RCA from the mid LAD with a bifurcation lesion in the setting of an acute coronary syndrome, endangering both the RCA and LAD territories. The patient underwent successful complex percutaneous coronary intervention (PCI) to the LAD/RCA bifurcation lesion.

Timeline

19 December 2017	Patient presented with left-sided chest and arm pain
21 December 2017	Diagnostic coronary angiography performed
29 December 2017	Percutaneous coronary intervention to right coronary artery/left anterior descending artery bifurcation was performed after discussion in heart team meeting
29 December 2019	Patient was discharged home following successful percutaneous coronary intervention
23 March 2018	Outpatient computed tomography coronary angiography performed

Case presentation

An 85-year-old lady presented with left-sided chest and arm pain associated with nausea and clamminess. Electrocardiography showed widespread inverted T-waves (see [Figure 1](#)). High sensitivity Troponin T levels were elevated at 1927 ng/L (0–14 ng/L), confirming a non-ST-elevation myocardial infarction.

Transthoracic echocardiogram demonstrated normal left ventricular function without regional wall motion abnormalities and no significant valvular disease. Transradial coronary angiography revealed an anomalous origin of the RCA arising from the mid LAD beyond a large first septal perforator. There was significant stenosis involving anomalous RCA/LAD bifurcation classified as Medina 1, 1, 1. Only mild atheroma of the left circumflex artery was seen (see [Figure 2A and C](#)).

Following coronary angiography, this lady's case was discussed at the heart team meeting on the basis that the LAD/RCA bifurcation lesion subtended such a large territory of the myocardium analogous to a left main stem bifurcation lesion. While the Syntax Score may not have truly applied in this case it was calculated. Even though it would not be considered conventional, we decided to classify the LAD/RCA lesion as two separate bifurcation lesions given the significance of the myocardium at risk. Even when we assumed this, the Syntax Score was only 12 making this low tertile disease. Given that she was a frail 85-year-old lady with low tertile disease, PCI was the chosen revascularization strategy. Percutaneous coronary intervention was performed using right radial access and a 7.5-Fr sheathless Judkins left 3.5 (JL 3.5) guide catheter. The LAD/RCA bifurcation was treated using a two-stent culotte technique. Sion blue wires were passed down the LAD and anomalous RCA. A 3.5 × 28 mm

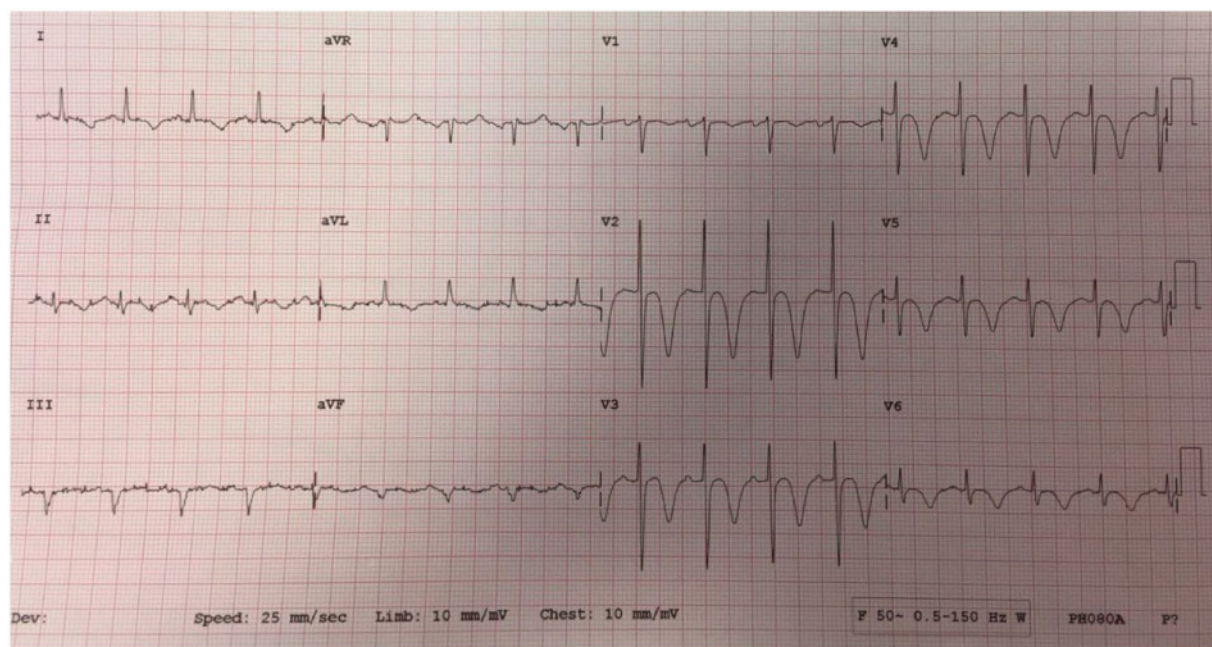


Figure 1 A 12-lead electrocardiogram of the patient showing widespread inverted T-waves.

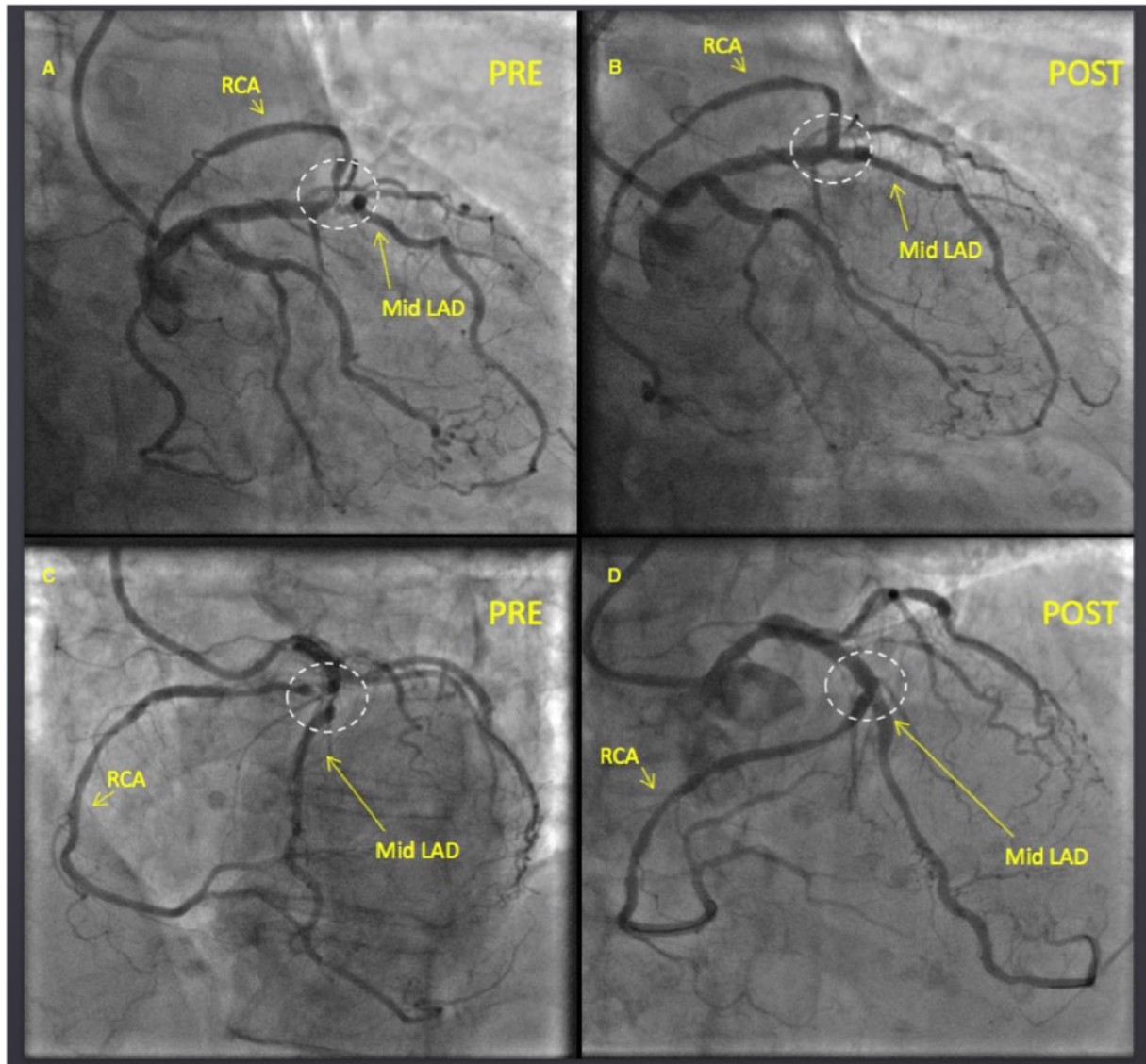


Figure 2 (A and C) Coronary angiogram showing high-grade lesion at the left anterior descending artery/right coronary artery bifurcation. (B and D) Coronary angiogram post-successful percutaneous coronary intervention to left anterior descending artery/right coronary artery bifurcation.

Xience drug-eluting stent (DES) was deployed to the RCA. A proximal optimization technique (POT) was then performed with a 4.5×8.0 mm non-compliant (NC) balloon. Wires were switched and a 3.5×23 mm Xience DES was deployed in the mid LAD. A POT was again performed using a 4.5×8.0 mm NC balloon. Optimization at the level of the bifurcation was performed using two 4.5×8.0 mm simultaneous kissing balloons. Overall the final angiographic result was very satisfactory without any complications (see [Figure 2B and D](#)).

The patient was enrolled in a cardiac rehab programme and discharged home on aspirin, ticagrelor, bisoprolol, perindopril, and atorvastatin.

Follow-up computed tomography coronary angiography (CTCA) was performed which confirmed a benign course of the RCA

anterior to the aorta and pulmonary artery, and patent stents in the LAD and RCA (see [Figure 3](#)).

Discussion

The prevalence of a single coronary artery anomaly, with a structurally normal heart, ranges from 0.008% to 0.067% following coronary angiography.¹⁻³ In most cases, the origin of the anomalous RCA has been from the proximal or mid portion of the LAD.⁴⁻⁶ In vast majority of the cases, similar to ours, the RCA runs anterior to the pulmonary trunk and therefore are clinically benign.⁷

The exact origin of anomalous coronary arteries, their course and relationship with other cardiac structures must be studied in detail.

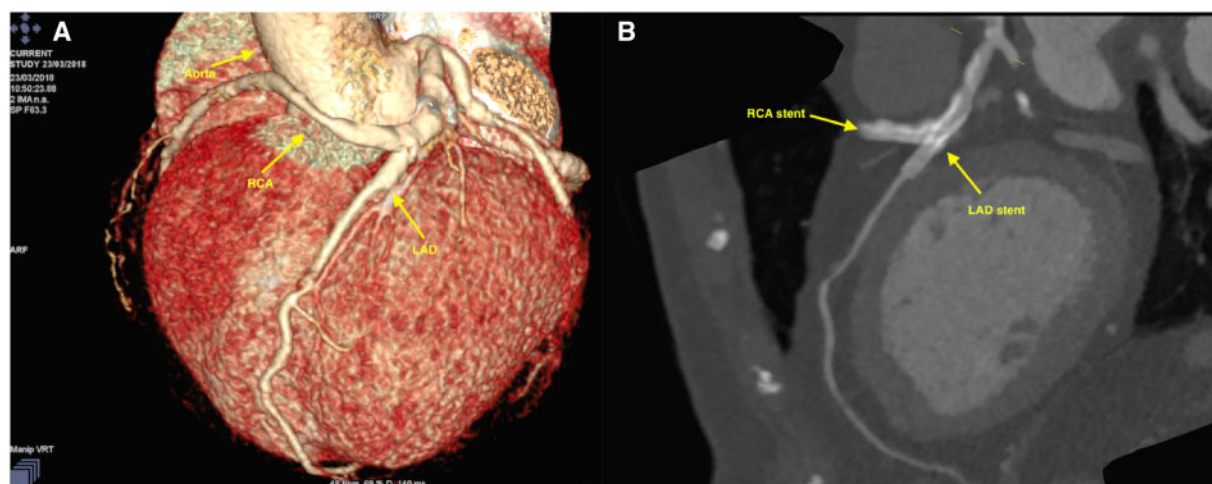


Figure 3 (A) Volume-rendered 3D reconstruction shows the course of anomalous right coronary artery. (B) Multiplanar reconstruction of multi-detector computed tomography showing patent stents at the left anterior descending artery/right coronary artery bifurcation.

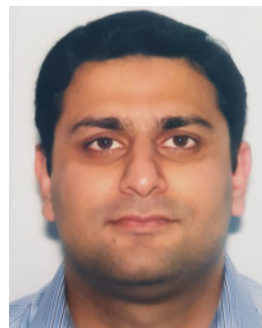
Computed tomography coronary angiography is currently the gold standard to characterize coronary artery anomalies providing us with information on the course and origin.⁸ It would be preferable to perform CTCA prior to PCI to have more information in relation to the course and origin of the anomalous coronary artery as this may alter the revascularization strategy, particularly if the anomalous artery ran a malignant course. In this particular case, we felt that it was unlikely that this anomaly would have a malignant course given that this lady had reached 85 years of age without any prior cardiac events, therefore, we opted to treat first.

This rare anomaly poses a significant challenge in revascularization due to the large area of myocardium subtended by the LAD and RCA and usually an acute angle of bifurcation. A heart team discussion plays a valuable part in deciding the appropriate management for these patients. When we reviewed the angiogram in this case, we felt that this was a true Medina 1, 1, 1 bifurcation lesion. Furthermore, the side branch on this occasion was in fact a main RCA as opposed to a conventional side branch bifurcation lesion. Therefore, given the significance of the bifurcation and the classification, we felt that it was important to adopt a two-stent strategy. We opted for a culotte technique to make sure that we did not miss the ostium of the RCA as this was the best approach despite the unusual perpendicular angulation of the lesion.

In the literature, this extremely infrequent anomaly, where the RCA arises from the mid LAD has been described in only 36 cases. Of the 36 cases reported to date, 20 have had a greater than 50% stenosis involving one or more vessels with only five of those proceeding to PCI and 10 to coronary artery bypass grafting. In each of the cases undergoing PCI only the LAD has been treated with stents, and no cases of stenting to this type of anomalous LAD/RCA have been reported.⁷

To our knowledge, we describe the first case of PCI to a true LAD/RCA bifurcation lesion treated with a two-stent approach.

Lead author biography



Dr Usman Azhar Khan is a specialty trainee registrar (StR) in Cardiology in Northern Ireland, UK. He is a member of the Royal College of Physicians of the United Kingdom (MRCPUK) and Royal College of Physicians of Ireland (MRCPI). He has a special interest in interventional cardiology and has represented the Northern Ireland deanery in a number of national and international cardiovascular meetings.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

References

1. Topaz O, DeMarchena EJ, Perin E, Sommer LS, Mallon SM, Chahine RA. Anomalous coronary arteries: angiographic findings in 80 patients. *Int J Cardiol* 1992;**34**:129–138.

2. Barriales Villa R, López Muñiz A, Hernández LC, San Román L, de la Hera JM, Morís C, Barriales Álvarez V, Testa A, Sanmartín JC, Cortina A. Adult congenital anomalies of the coronary arteries described over 31 years of angiographic studies in the Asturias Principality: main angiographic and clinical characteristics. *Rev Esp Cardiol* 2001;**54**:269–281.
3. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. *Cathet Cardiovasc Diagn* 1990;**21**:28–40.
4. Erdogan O, Buyuklu M, Aktoz M. Anomalous origin of the right coronary artery from the left anterior descending artery in a patient with single left coronary artery: a rare coronary artery anomaly and review of the literature. *Int J Cardiol* 2008;**127**:280–283.
5. Meric M, Demircan S, Pinar M, Yuksel S. Single coronary artery: right coronary artery originated from middle of left anterior descending artery in a patient with severe mitral regurgitation. *Clin Cardiol* 2010;**33**:E48–E50.
6. Balghith M. Anomalous origin of the right coronary artery from the proximal left anterior descending artery and a single coronary artery anomaly: three case reports. *J Saudi Heart Assoc* 2013;**25**:43–46.
7. Wilson J, Reda H, Gurley JC. Anomalous right coronary artery originating from the left anterior descending artery: case report and review of the literature. *Int J Cardiol* 2009;**137**:195–198.
8. Villa AD, Sammut E, Nair A, Rajani R, Bonamini R, Chiribiri A. Coronary artery anomalies overview: the normal and the abnormal. *World J Radiol* 2016;**8**:537–555.