

## CASE REPORT

# An anomalous story of a rare percutaneous intervention to left anterior descending/right coronary artery bifurcation

Harinder Kumar Bali<sup>1</sup>  | Amreen Dhindsa<sup>2</sup> | Sankalp Bharti<sup>3</sup><sup>1</sup>Cardiac Sciences, Paras Hospitals, Panchkula, India<sup>2</sup>Cardiology, Paras Hospitals, Panchkula, India<sup>3</sup>Cardiology, Civil Hospital, Panchkula, India**Correspondence**Harinder Kumar Bali, Cardiac Sciences, Paras Hospitals, Panchkula 134109, India.  
Email: hkbali@parashospital.com**Abstract**

Bifurcation lesions in anomalous coronary arteries are rare. Percutaneous intervention in such lesions is challenging and necessitates use of nonstandard hardware like GuideLiner catheter (Vascular Solutions) for adequate access and support.

**KEYWORDS**

anomalous, bifurcation, GuideLiner, intervention, percutaneous

## 1 | INTRODUCTION

We report a rare percutaneous intervention to the left anterior descending (LAD) and right coronary artery (RCA) bifurcation in a 77-year-old male patient with anomalous origin of the right coronary artery from mid-left anterior descending artery and Medina 1,1,1 disease at the bifurcation. The LAD/RCA bifurcation lesion was successfully treated using the mini-crush technique. To the best of our knowledge, this is the third such intervention reported in world literature and the first from India.

A single coronary artery arising from the left coronary sinus, with the right coronary artery arising from the left anterior descending artery, is an extremely rare coronary artery anomaly. Usually benign, it may result in ischemia by various mechanisms including atherosclerotic involvement of the vessels, rendering a critical area of myocardium at risk. Percutaneous intervention in anomalous coronary arteries is particularly challenging. Use of nonstandard hardware may be required for adequate access and support. We describe a complex and rare percutaneous intervention to the left anterior descending and right coronary artery bifurcation in a 77-year-old patient with anomalous origin of the right coronary artery from mid-left anterior descending artery and Medina 1,1,1 disease at the bifurcation. The Left anterior

descending artery (LAD)/Right coronary artery (RCA) bifurcation lesion was successfully treated using the mini-crush technique.

## 2 | CASE REPORT

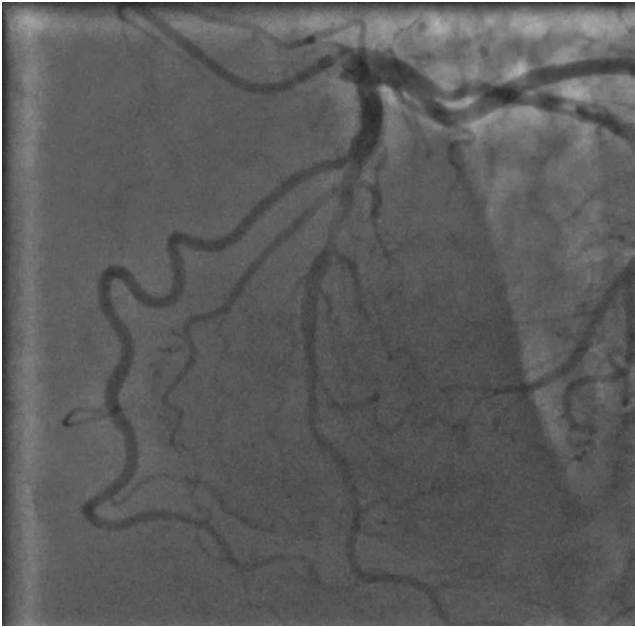
A 77-year-old male patient with coronary artery disease and a history of percutaneous intervention in LAD and Left circumflex artery (LCx) two years ago was admitted with complaints of exertional angina. Comorbidities included hypertension and metastatic hepatocellular carcinoma (HCC).

ECG was normal. Echocardiography revealed an ejection fraction of 45% with hypokinesia of anterolateral and inferior wall. Troponin I was 0.03 pg/mL. Coronary angiography was performed through right radial route using the 5F Tiger catheter (Terumo Corporation). It revealed a normal left main coronary artery, a heavily calcific LAD with ostio-proximal patent LAD stent and diffuse 70%-80% stenosis in mid-LAD, a dominant RCA with anomalous origin from mid-LAD and ostial 90% stenosis (Medina 1,1,1 disease at the mid-LAD and anomalous RCA bifurcation). The LCx was diffusely diseased with patent mid-LCx stent. Diffuse calcific 80%-90% stenosis in OM1 and 50% stenosis in OM2 was present (Figure 1).

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

In view of symptomatic disease with a large area of myocardium at risk and a life expectancy of >1 year, a decision to revascularize was taken. Preprocedural clearance and bleeding risk stratification from the gastroenterologist was taken in view of Hepatocellular carcinoma (HCC). Procedure was

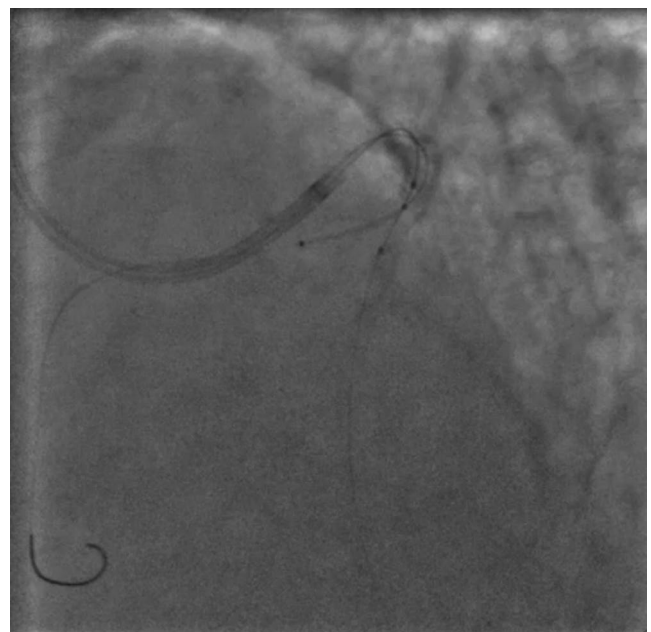


**FIGURE 1** Left coronary angiogram showing a heavily calcific LAD with ostio-proximal patent LAD stent and diffuse 70%-80% stenosis in mid-LAD, a dominant RCA with anomalous origin from mid-LAD and ostial 90% stenosis (Medina 1,1,1 disease at the mid-LAD and anomalous RCA bifurcation)

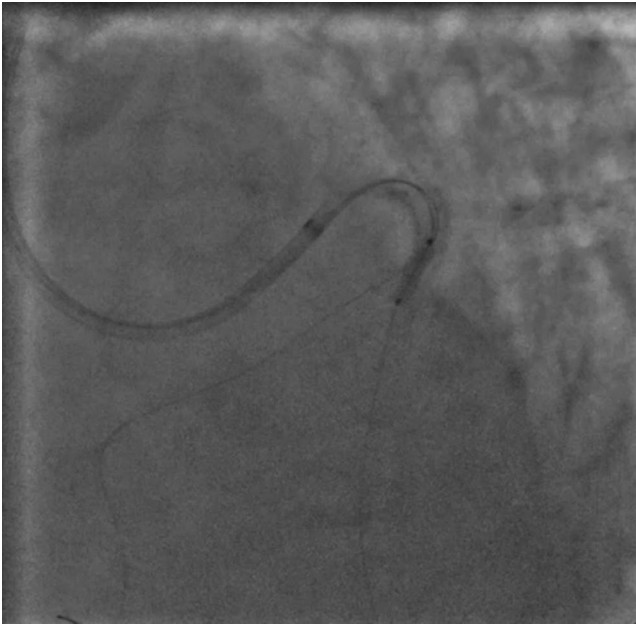


**FIGURE 2** The RCA lesion crossed with a 0.14 inch BMW universal wire (Abbott Vascular) with its distal end parked in the PDA. 2.5 × 15 mm Sprinter balloon (Medtronic Inc) advanced into anomalous RCA using a 6F GuideLiner catheter (Vascular Solutions) and predilatation done

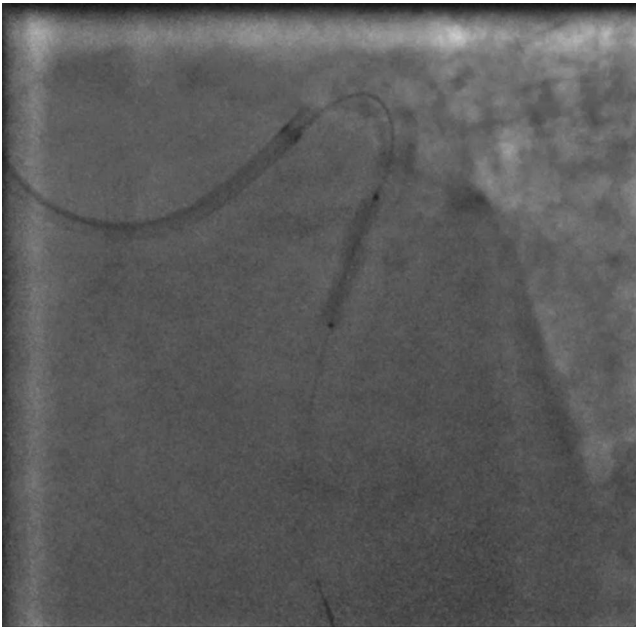
done through right femoral route using 7F sheath. The left main artery was engaged with an XB3 7F (Cordis) guiding catheter. A 0.14 inch Balance middleweight (BMW) universal wire (Abbott Vascular) was used to cross the LAD lesion and was positioned in distal LAD. The RCA lesion was then crossed with another 0.14 inch BMW universal wire (Abbott Vascular) and parked in the posterior descending artery. Negotiating a balloon into the anomalous RCA was little challenging because of a sharp angle, necessitating the use of a 6F GuideLiner catheter (Vascular Solutions). A 2.5 × 15 mm Sprinter balloon (Medtronic Inc) was advanced into the anomalous RCA and predilatation of ostial anomalous RCA was done at 14 atmospheric pressure (Figure 2). The LAD lesion was predilated using a 2.5 × 15 mm Sprinter balloon (Medtronic Inc). A Xience Xpedition 2.75 × 15 mm stent (Abbott Vascular) was negotiated into the anomalous RCA using the 6F GuideLiner catheter. It was positioned in proximal RCA with slight protrusion into the LAD and deployed at 12 atmospheric pressure (Figure 3). This stent was then crushed with a 2.75 × 18 mm Sprinter balloon (Medtronic Inc; Figure 4). A 3 × 23 mm Xience Xpedition stent (Abbott Vascular) was placed in mid-LAD and deployed at 12 atmospheric pressure (Figure 5). Fielder XT wire (Asahi Intecc) was used to recross RCA stent. Use of a 6F GuideLiner catheter close to the origin of RCA ostium facilitated the negotiation of the balloon to the ostial RCA. Serial dilatation of ostium of RCA was done first with 1.5 × 8 mm, 2.0 × 10 mm, and finally with 2.5 × 10 mm Sprinter balloon (Medtronic Inc; Figure 6). Final kissing balloon postdilatation of this bifurcation at mid-LAD and RCA was done with two noncompliant



**FIGURE 3** A Xience Xpedition 2.75 × 15 mm stent (Abbott Vascular) positioned in proximal RCA and with slight protrusion into the LAD and deployed at 12 atmospheric pressure



**FIGURE 4** RCA stent crushed with a  $2.75 \times 18$  mm Sprinter balloon (Medtronic Inc)

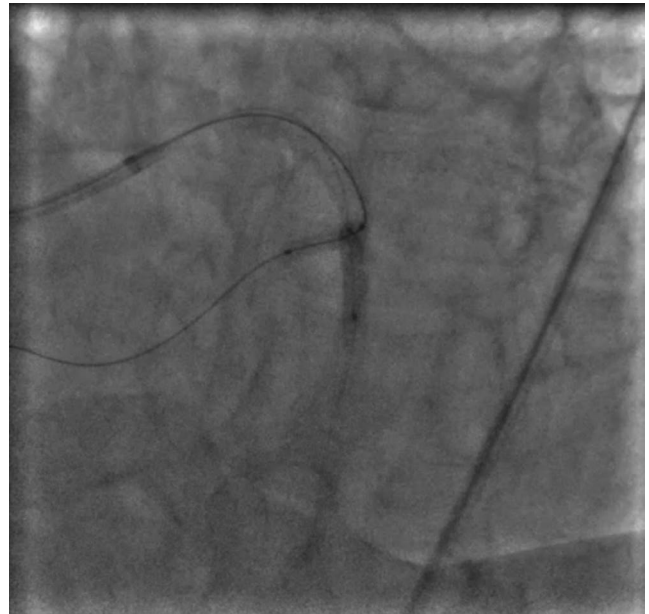


**FIGURE 5**  $3 \times 23$  mm Xience Xpedition stent (Abbott Vascular) placed in mid-LAD and deployed at 12 atmospheric pressure

balloons, Voyager NC  $3 \times 15$  mm (Abbott Vascular) in mid-LAD and Voyager NC  $2.75 \times 15$  mm (Abbott Vascular) in RCA (Figure 7). Proximal optimization was done with a  $3.5 \times 12$  mm Voyager NC balloon (Abbott Vascular) at 20 atmospheric pressure. A satisfactory angiography result with Thrombolysis in myocardial infarction (TIMI) 3 flow in both LAD and RCA was seen with no residual stenosis and no dissection (Figure 8). Patient made uneventful recovery and was discharged two days after procedure.



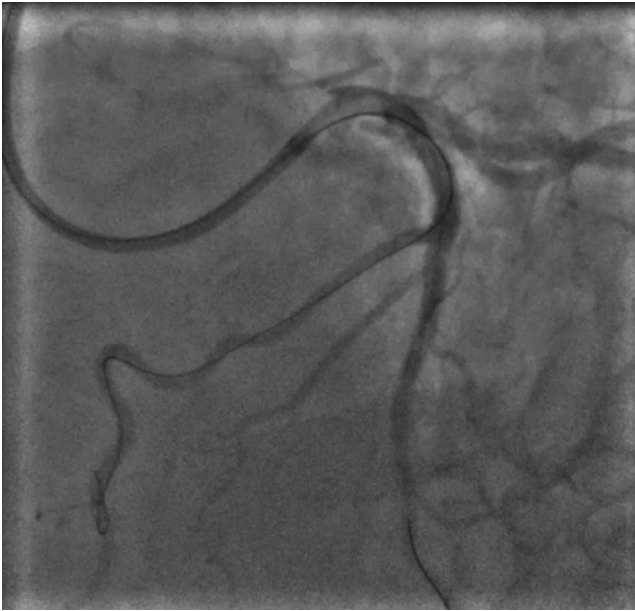
**FIGURE 6** After recrossing the RCA stent with a Fielder XT wire (Asahi Intecc, 6F GuideLiner catheter (Vascular Solutions) used to facilitate passage of balloon and serial dilatation of ostium of RCA done



**FIGURE 7** Final kissing balloon postdilatation done with two noncompliant balloons, Voyager NC  $3 \times 15$  mm (Abbott Vascular) in mid-LAD and Voyager NC  $2.75 \times 15$  mm (Abbott Vascular) in RCA at 20 atmospheric pressure

### 3 | DISCUSSION

A single coronary artery arising from the left coronary sinus, with the right coronary artery arising from the left anterior descending artery, is an extremely rare coronary



**FIGURE 8** After proximal optimization, a satisfactory angiography result with TIMI three flow in both LAD and RCA seen with no residual stenosis and no dissection

artery anomaly. In a series of 126 595 coronary angiograms reported by Yanmanaka et al,<sup>1</sup> it accounted for only 11 cases. More recently, Wilson et al<sup>2</sup> in a review of literature reported 36 published cases describing this type of anomaly. In most cases, the origin of the anomalous RCA is from the proximal to mid-portion of the LAD.<sup>3-5</sup> Usually benign, anomalous RCA from LAD may occasionally cause ischemia by various mechanisms. These include atherosclerosis frequently present at the proximal points of branching,<sup>6</sup> or reduced flow velocities in the anomalous vessel due to acute angle of take off.<sup>7</sup>

Few case reports of percutaneous intervention for revascularization in this type of coronary anomaly exist. Of the 36 cases reviewed by Wilson et al,<sup>2</sup> 4 underwent PTCA and stenting.<sup>8-11</sup> In each of these, the LAD was stented. Apart from our case, only two cases of bifurcation stenting to anomalous RCA/LAD have been reported till date. Das et al<sup>12</sup> first reported percutaneous intervention in bifurcation lesion of anomalous RCA/LAD. They performed rotational atherectomy to debulk the bifurcation followed by simultaneous kissing stenting to RCA and LAD. Khan et al<sup>13</sup> recently reported another case of bifurcation stenting in anomalous RCA/LAD with the Culotte technique. Our case differed from these two cases in respect of the bifurcation stenting technique used. In our patient, the difficulties associated with revascularization included a large myocardium at risk as well as the sharp angle between the RCA and LAD. The lesion was a Medina 1,1,1 lesion with the side branch in fact being a dominant RCA. An elective two stent approach was adopted using the mini-crush technique. As the acute angle between the LAD and anomalous RCA posed difficulty in passing the balloon in the RCA, a GuideLiner catheter

was used to facilitate its passage and subsequent angioplasty and stenting. As in our case, the use of guide extension has been found to be extremely helpful in challenging and complex PCIs. Though it has been associated with certain complications like coronary dissection and loss, the rate of these complications is extremely low with an experienced operator.

## 4 | CONCLUSION

An anomalous RCA from LAD is an uncommonly encountered coronary artery anomaly. It poses significant challenges to percutaneous intervention due to tortuous course, sharp angulations, and a large area of myocardium at risk. However, with the use of unconventional hardware for optimum access and support, bifurcation stenting of an anomalous coronary artery can be performed successfully. We found the use of GuideLiner catheters in particular to be of great help in providing support and facilitating the passage of balloon and stent to the anomalous right coronary artery.

## ACKNOWLEDGMENTS

None.

## CONFLICT OF INTEREST

None declared.

## AUTHOR CONTRIBUTION

HKB: first operator in the case, planned and performed the procedure and took decisions on hardware and technique used. AD: assisted in procedure and drafted the manuscript. SB: assisted in procedure. All authors read, revised and approved the final manuscript.

## ETHICAL APPROVAL

Informed consent was obtained from the patient.

## DATA AVAILABILITY STATEMENT

Further supporting data is available from the authors on request.

## ORCID

Harinder Kumar Bali  <https://orcid.org/0000-0002-4364-0783>

## REFERENCES

1. Yanmanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary angiography. *Cathet Cardiovasc Diagn.* 1990;21:28–40.
2. 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.

3. 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.
4. 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.
5. 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.
6. Halon DA, Sapoznikov D, Lewis BS, Gotsman MS. Localization of lesions in the coronary circulation. *Am J Cardiol.* 1983;52:921–926.
7. Amasyali B, Kursaklioglu H, Kose S, Iyisoy A, Kilic A, Isik E. Single coronary artery with anomalous origin of the right coronary artery from the left anterior descending artery with a unique proximal course. *Jpn Heart J.* 2004;45:521–525.
8. Calabrò P, Bianchi R, Palmieri R, Sordelli C, Bigazzi MC, Calabrò R. Evidence of right coronary from mid-left anterior descending coronary: a rare case of coronary anomalous origin. *Eur Heart J.* 2009;30(5):565.
9. Ocal A, Kilci H, Altunkas F, Tumuklu MM. Successful percutaneous coronary angioplasty in a patient with anomalous origin of the right coronary artery from the left anterior descending artery. *Int J Cardiol.* 2008;127:e42–e44.
10. Takano M, Seimiya K, Yokoyama S, et al. Unique single coronary artery with acute myocardial infarction: observation of the culprit lesion by intravascular ultrasound and coronary angiography. *Jpn Heart J.* 2003;44:271–276.
11. Dewilde W, Ten Berg JM, Scholzel B. An anomalous right coronary artery originating from the mid portion of the left descending artery. *Int J Cardiol.* 2008;134:e68–e69.
12. Das PK, Meredith IT. Rotational atherectomy and simultaneous kissing stenting of a bifurcation stenosis of left anterior descending and anomalous right coronary arteries. *Heart Lung Circ.* 2006;15(5):342–345.
13. Khan UA, Sharma D, McGlinchey P, Peace A. Percutaneous coronary intervention to left anterior descending artery/right coronary artery bifurcation: this is not a typo! A case report. *Eur Heart J Case Rep.* 2019;3(3):ytz137.

**How to cite this article:** Bali HK, Dhindsa A, Bharti S. An anomalous story of a rare percutaneous intervention to left anterior descending/right coronary artery bifurcation. *Clin Case Rep.* 2021;9:e03764. <https://doi.org/10.1002/ccr3.3764>