

MINI-FOCUS ISSUE: INTERVENTIONAL COMPLICATIONS AND THEIR MANAGEMENT

INTERMEDIATE

CASE REPORT: CLINICAL CASE

Successful Bail-Out Stenting for Iatrogenic Right Coronary Artery Dissection in a Young Male



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ABSTRACT

Catheter-induced coronary artery dissection is a serious complication of coronary angiography. Percutaneous intervention is usually indicated in case of large spiral dissections, however, wiring into the true lumen can be challenging. This case reports the novel use of intravascular ultrasound-guided rescue percutaneous coronary intervention for stenting an iatrogenic spiral dissection of the right coronary artery. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2019;1:108-12) © 2019 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

A 44-year-old man presented with symptoms of shortness of breath on exertion. The shortness of breath started after walking for 10 min and made him slow down his pace. This was associated with mild chest pain that improved with rest. He had an unremarkable physical examination.

PAST MEDICAL HISTORY

His past medical history was significant for inferior wall ST-segment elevation myocardial infarction

encountered 2 months prior for which he underwent primary percutaneous coronary intervention (PCI) to the right coronary artery (RCA) at a community hospital.

INVESTIGATIONS

An electrocardiogram performed at the clinic visit showed pathological Q waves with symmetric T-wave inversions in inferolateral leads (**Figure 1**).

An echocardiogram showed left ventricular ejection fraction of 50% with hypokinetic inferior wall and inferoseptal segments. A stress myocardial perfusion scan was performed and showed a moderate-sized reversible perfusion defect in the inferolateral territory (**Figure 2**).

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Because of persisting symptoms and abnormal stress test results, coronary angiography was initiated via right femoral access, utilizing standard 5-F Judkins diagnostic catheters. The left system was free of significant disease. As the diseased ostium of RCA was engaged, the patient experienced severe chest pain,

LEARNING OBJECTIVES

- Once the diagnosis of catheter-induced coronary artery dissection is confirmed, repeated contrast injections should be avoided to minimize the hydraulic propagation of dissection.
- Real-time IVUS imaging and double wiring technique can be used in cases of ostial dissections where wiring the TL would be challenging; the first guidewire can be placed in a proximal branch or into the FL, and a second wire can be repositioned into the TL using IVUS guidance.

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significant ST-segment elevation in inferior leads along with hypotension, and complete heart block.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included catheter-induced coronary artery dissection, coronary arterial spasm, aortic dissection, and worsening ischemia due to contrast injection and underlying ostial coronary stenosis.

MANAGEMENT

Angiography revealed a large spiral type D dissection extending from the RCA ostium down to the mid-posterior descending artery (Figure 3). Interestingly, the dissection did not stop at the prior stent and extended beyond it, likely because the prior RCA stent was undersized and incompletely endothelialized (Figure 3A). Flow to the distal vessel was significantly compromised. An urgent temporary

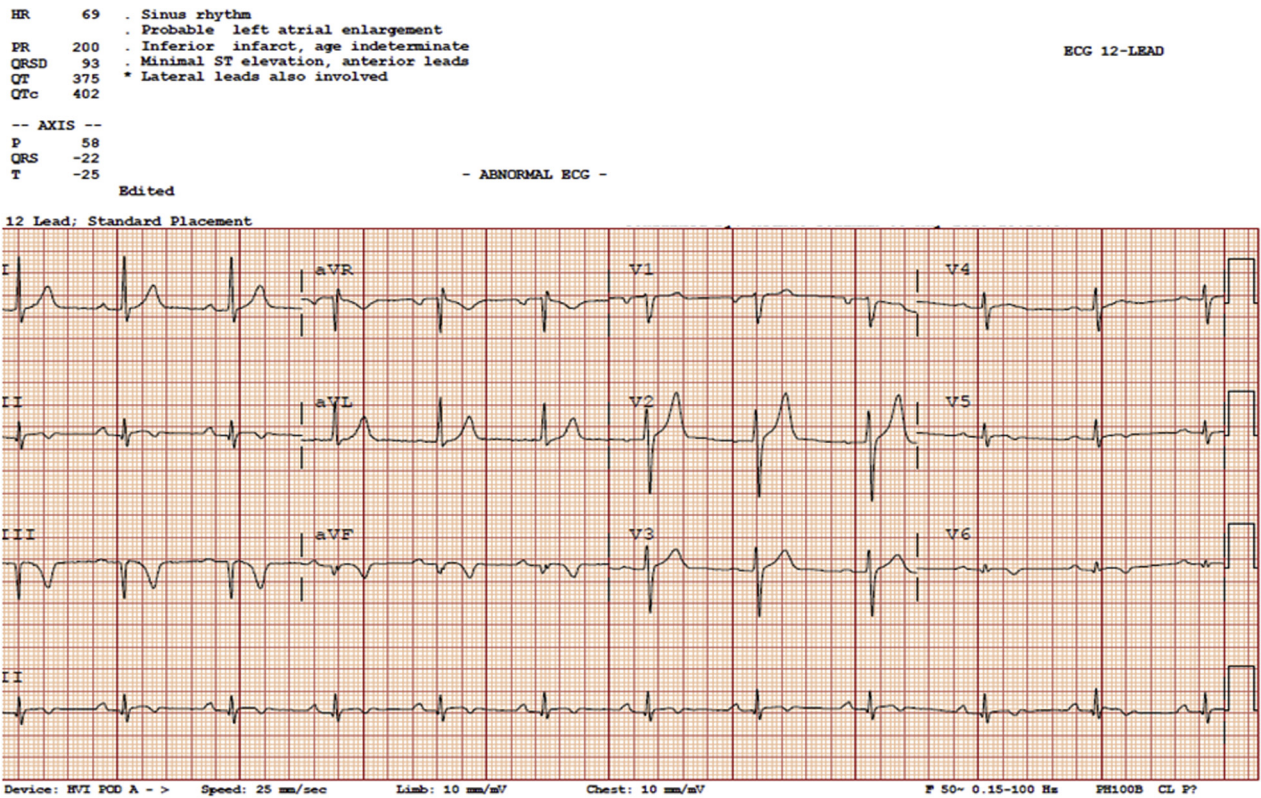
pacemaker was inserted through the right femoral vein.

Our initial bailout strategy consisted of trying to wire the true lumen of the dissected artery with a Judkins right coronary catheter (JR) 4 guiding catheter and 0.014-inch Balance Middleweight (BMW) wire (Abbott Vascular/Guidant, Santa Clara, California). However, due to extent and size of the dissection, it was difficult to differentiate whether the wire was in the true lumen (TL) versus the false lumen (FL). Initial antegrade contrast injections to visualize the wire resulted in hydraulic expansion of FL without confirming wire position. We then utilized live intravascular ultrasound (IVUS) imaging (Eagle Eye; Volcano Corp., Rancho Cordova, California) over the same wire, which confirmed that the BMW wire was in the FL and the TL was compressed due to the size of FL. We then placed the IVUS catheter at the ostium

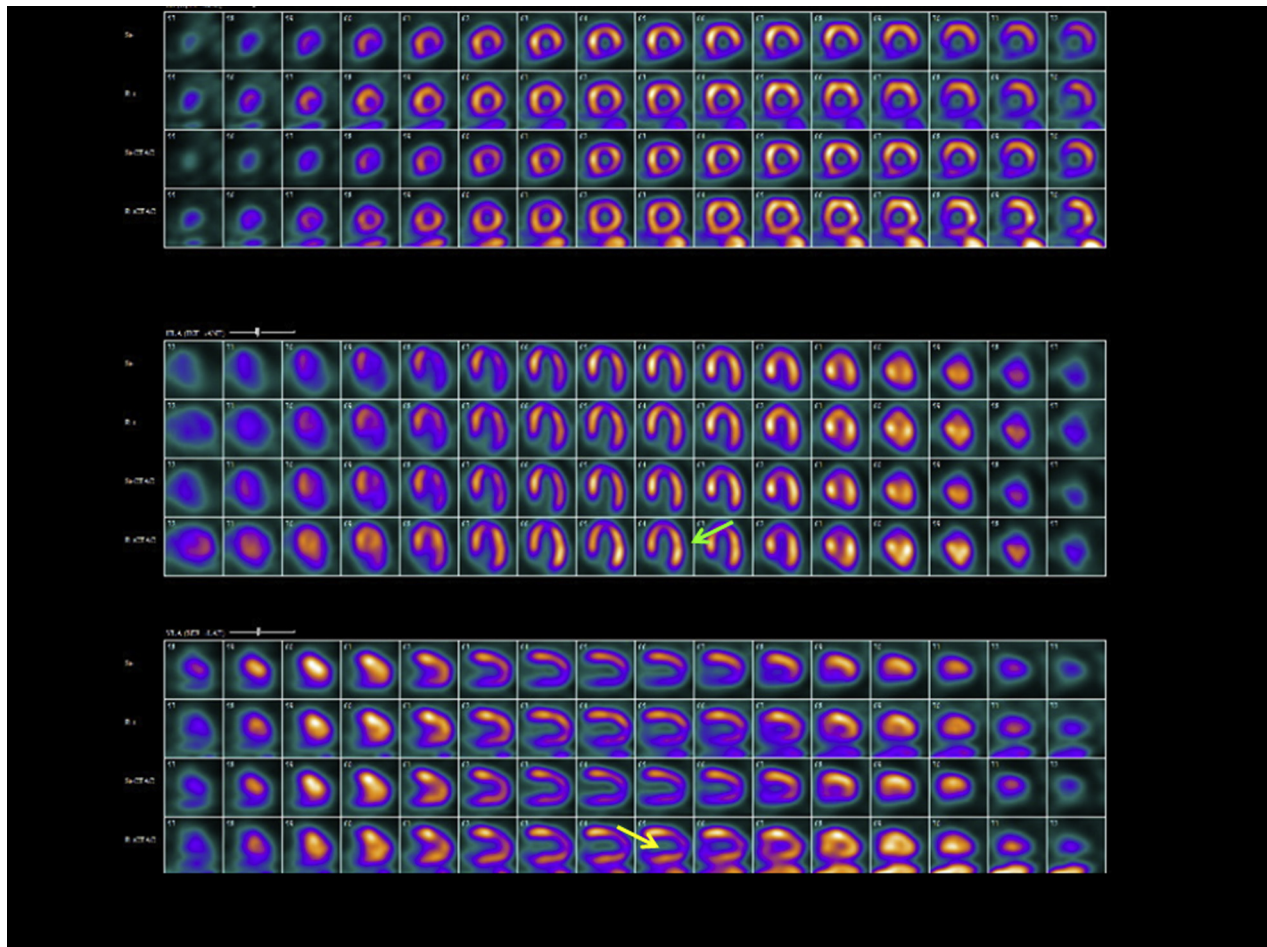
ABBREVIATIONS AND ACRONYMS

- CICAD** = catheter-induced coronary artery dissection
- IVUS** = intravascular ultrasound
- PCI** = percutaneous coronary intervention
- RCA** = right coronary artery
- TL** = true lumen
- FL** = false lumen
- BMW** = balance middle weight
- OCT** = optical tomography

FIGURE 1 Abnormal ECG



The patient's electrocardiogram (ECG) showed pathological Q waves in leads III and aVF, symmetric T wave inversions in inferolateral leads, and subtle 0.5-mm ST-segment elevations in anterior precordial leads.

FIGURE 2 Myocardial Perfusion Scan

Myocardial perfusion scan showing moderate-sized reversible perfusion defect (**yellow and green arrows**) in the inferolateral wall territory.

of RCA to guide rewiring of TL using the same guiding catheter and utilizing another 0.014-inch BMW wire. Despite using real-time IVUS, the second wire was biased toward entering the FL. Hence, we decided to obtain dual access, keeping the initial BMW wire within the FL.

A second JR 4 guiding catheter was then positioned at the close proximity to the RCA ostium (**Figure 3C**). The IVUS catheter was left over the original BMW wire in the FL visualizing both TL and FL at the RCA ostium (**Figure 3D**). A second BMW wire was then advanced via the second guiding catheter. After a few attempts, we finally visualized the wire entering the compressed TL. This wire was then advanced with IVUS guidance into the distal RCA. IVUS was repeated over the second BMW wire and confirmed its position in TL.

No further contrast injections were performed. PCI was done as usual and 4 stents were deployed. Final IVUS imaging confirmed fully expanded and well apposed stents (**Figure 3E**). Normal flow was restored in the vessel (**Figure 3F**).

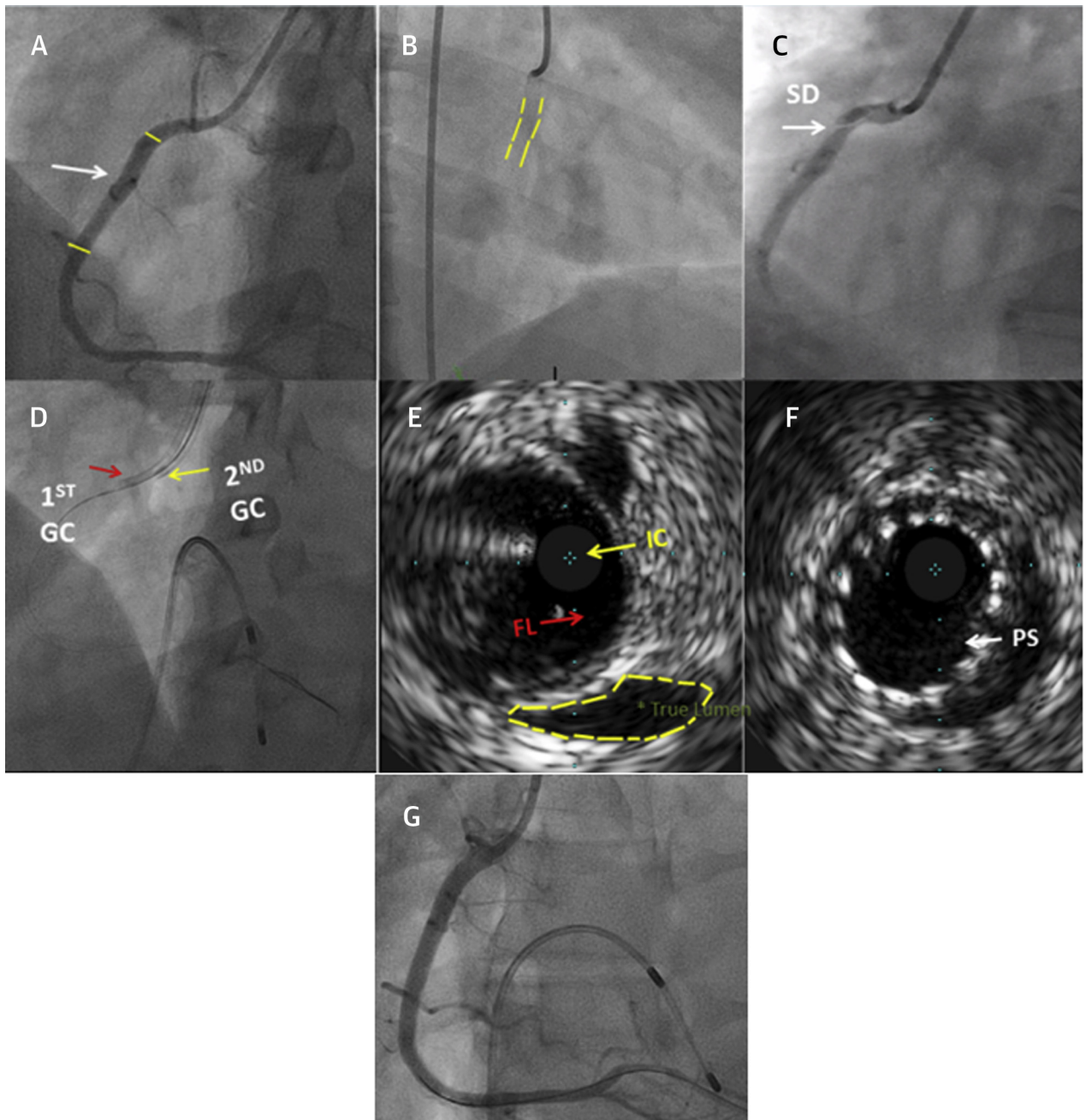
FOLLOW-UP

The patient was pain-free and had an uncomplicated post-procedural recovery with preserved ventricular function on echocardiography at 6-month follow-up visit.

DISCUSSION

Catheter-induced coronary artery dissection during diagnostic angiography is a rare (<0.2%) but

FIGURE 3 Coronary Angiogram and IVUS Imaging Showing Iatrogenic RCA Dissection With Rescue PCI



Coronary angiogram showing prior stent in mid-right coronary artery (RCA) (yellow dotted lines) (A,B), iatrogenic spiral dissection (SD) (white arrow) of proximal RCA with compromised flow distally (C), and dual guiding catheters (GC) (red and yellow arrows) (D), showing first GC with wire in false lumen and the second GC at the ostium of RCA to wire the true lumen. (E) Intravascular ultrasound (IVUS) imaging showing IVUS catheter (IC) in the false lumen (FL), and the true lumen (yellow broken line) is compressed to one side. (F) IVUS imaging post-stenting (PS). (G) Final angiographic image showing restoration of normal flow in RCA. PCI = percutaneous coronary intervention.

potentially catastrophic complication (1). Iatrogenic injury can result from either catheter manipulation within the diseased ostia or forceful injection of contrast medium (2).

Management depends on the hemodynamic status of the patient, the extent of dissection, and distal coronary blood flow. Options include wiring and stenting of the RCA at the entry point of dissection if no significant resistance is encountered (3), optical coherence tomography- (4) or IVUS-assisted PCI (5), or emergent coronary artery bypass graft, especially if the dissection extends to involve the aorta (6).

However, PCI can be challenging as it is difficult to advance a guidewire into the TL (7) and there is risk for both the propagation of dissection and intramural hematoma, which can compromise the distal coronary blood flow. Both optical coherence tomography and IVUS can be used to identify the TL, origin and extent of the dissection, and placement of guidewire in the TL (4,5).

Although double wiring technique has been described previously for the treatment of this complication (8), we report a novel method of using real-time IVUS guidance and the use of 2 guiding catheters to wire the TL in a case of an iatrogenic ostial RCA dissection.

CONCLUSIONS

Iatrogenic spiral coronary artery dissection represents a life-threatening complication of coronary angiography. In case of difficulty in wiring the TL, IVUS-guided “double wiring technique” and the use of 2 guiding catheters represent a potentially useful treatment strategy.

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KEY WORDS iatrogenic coronary artery dissection, intravascular ultrasound, percutaneous coronary intervention