

MINI-FOCUS ISSUE: INTERVENTIONS

ADVANCED

CASE REPORT: CLINICAL CASE

Drive-By Radial Artery Re-Entry Extending Chronic Total Occlusion Techniques to the Peripheral Arteries



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ABSTRACT

Despite the success of the hybrid coronary chronic total occlusion percutaneous coronary intervention techniques, there has been little translation of these techniques into peripheral interventions. We describe a case of recanalization of an occluded radial artery that was dissected and re-entered using chronic total occlusion techniques before moving on to revascularize the coronary artery. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2020;2:2404-7) © 2020 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/>).

The radial artery has become the preferred access site in contemporary percutaneous coronary intervention (PCI), with lower rates of vascular complications. This finding was supported in 2 large trials, RIVAL (Radial Vs

FemorAL access for coronary intervention) and MATRIX (Minimizing Adverse Haemorrhagic Events by TRansradial Acces Site and Systematic Implementation of angioX), which reflected a reduction in morbidity and mortality associated with access site complications (1,2).

In this case report, we describe a patient with complex right coronary artery CTO PCI through a radial approach where the occluded radial artery was dissected and recanalized using CTO techniques before moving on to revascularize the coronary artery.

LEARNING OBJECTIVES

- To consider radial artery access as a first choice because it is safer than femoral artery access and has fewer complications.
- To understand that coronary CTO skills can be transferred successfully to the peripheral arteries with good outcome.
- To understand that in this case the time invested to recanalize the radial artery has allowed the completion of the coronary intervention through the radial artery and helped to avoid the femoral artery with its higher rate of potential complications.

HISTORY OF PRESENTATION

A 71-year-old woman with established ischemic heart disease, diabetes mellitus, and hypertension was referred for coronary angiography. Clinically, she was well, and her physical examination was normal.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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PAST MEDICAL HISTORY

She had a past medical history of established ischemic heart disease, diabetes mellitus, and hypertension and was overweight. She previously had both radial and femoral approaches used for

coronary intervention and has had femoral vascular complications.

DIFFERENTIAL DIAGNOSIS

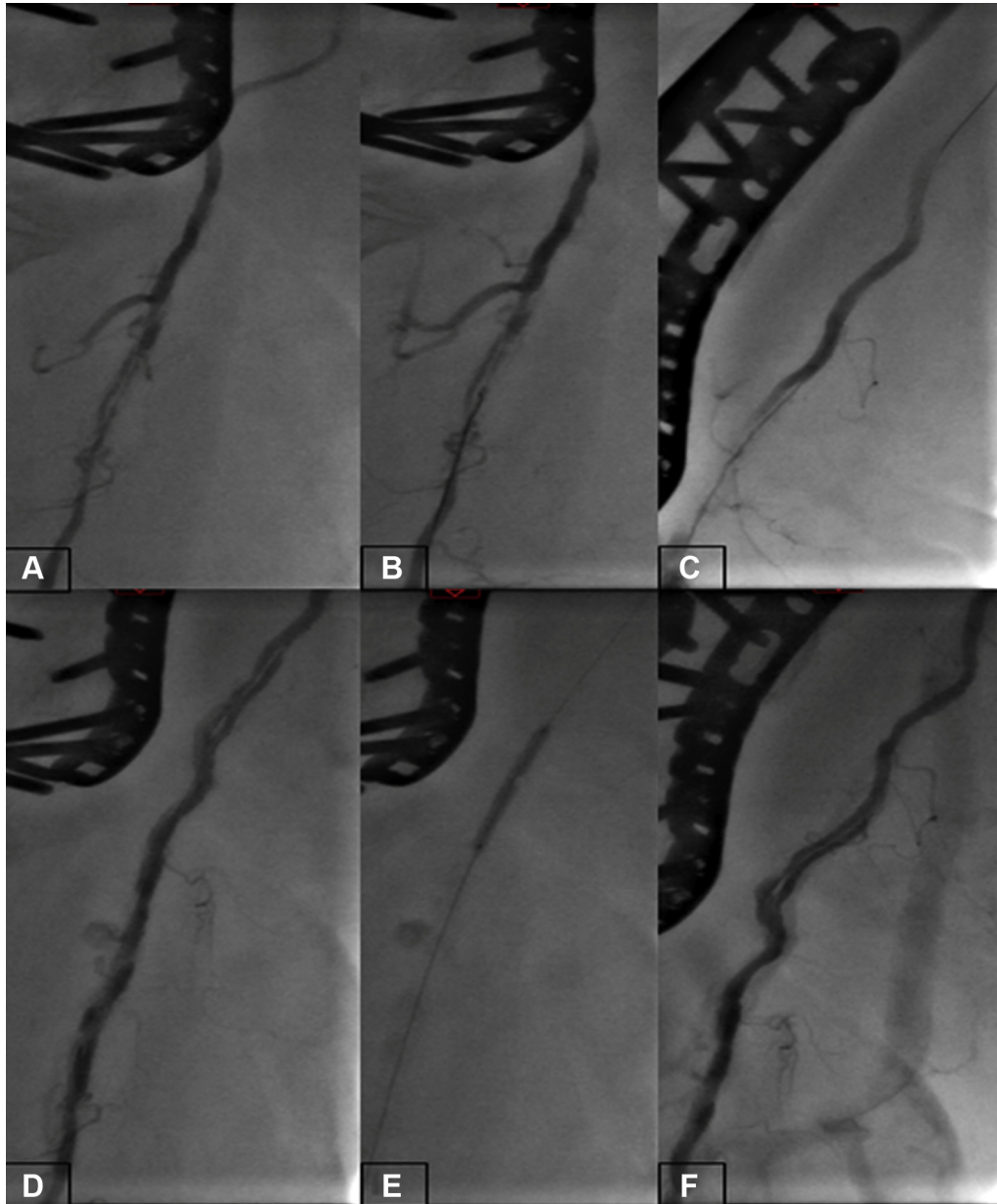
Her symptoms were angina and cardiac in origin, with no indication of other causes.

ABBREVIATIONS AND ACRONYMS

CTO = chronic total occlusion

PCI = percutaneous coronary intervention

FIGURE 1 Radial Artery With Subintimal Tracking and Re-Entry and Balloon Dilatation



(A) Spastic distal radial artery with chronic dissection and 2 clear lumina. **(B)** Advancement of a coronary guidewire through the dissection. **(C)** Clear separation of the wire and vessel. **(D)** Appearance of the downstream radial artery after balloon angioplasty. **(E)** Balloon dilatation with a 2.0-mm-diameter balloon. **(F)** Appearance of the artery at the end of the case with 2 clear lumina and an obvious dissection plane. The patient has had previous orthopedic operation to fix a broken elbow.

INVESTIGATIONS

Apart from elevated blood glucose, all blood test results were within normal limits. Her echocardiogram showed a normal left ventricular ejection fraction with mild aortic valve stenosis.

MANAGEMENT

The decision was made to perform coronary angiography with a view to intervention. The access on this occasion was through the right radial approach. On accessing the radial artery, there was a clear occlusion and possible dissection with clear delineation of a dual-lumen system and bridging collateral vessels (Figure 1A, Video 1). A hydrophilic coronary guidewire (Video 2) was used to negotiate the small lumen and tracked up to the top of the dissection plane with balloon inflation (Figure 1B). A Pilot 200 (hydrophilic stiff coronary guidewire with a tip load for of 4.5 g, Abbott Vascular, Santa Clara, California) (Video 3) was used to facilitate a wire-based re-entry into the upstream true lumen of the radial artery (Figure 1C, Video 4). After that was done, balloon dilatation (Figures 1D and 1E, Videos 5, 6, and 7) and then balloon-assisted tracking were used to track guiding catheters to the coronary anatomy and complete the case. The final image of the RA shows 2 separate lumens (Figure 1F, Video 8).

DISCUSSION

Both U.S. and European guidelines currently endorse a “radial-first” approach, with a general increase in radial access uptake worldwide (3-5). Complex coronary interventions, including rotational atherectomy and chronic total occlusion (CTO) PCI, are now routinely performed through a radial artery approach (6-8). This radial-first approach has been shown to decrease morbidity and mortality associated with femoral artery access. With incorporation and uptake of the hybrid CTO algorithm, success rates are now approximately 90% in expert hands (9). Peripheral vascular intervention in patients with peripheral vascular disease can greatly improve symptoms.

Despite the success of percutaneous CTO PCI with retrograde and dissection re-entry techniques, there has been little adaptation of these skills to the peripheral vascular system, even though peripheral interventions are performed by cardiologists in many European countries. In this case, we have demonstrated the translation of dissection re-entry to the radial artery. The iatrogenic radial artery dissection created a dual-lumen system. Using a hydrophilic Pilot 200 wire, which is highly torquable and has a 4.5-g tip load, we successfully re-entered the true lumen of the radial artery proximal to the dissection. Then, by using the balloon-assisted tracking technique, we were able to transmit a 6-F guiding catheter through the radial artery and into the ascending aorta and finish the coronary intervention without having to switch to the other radial artery or to the femoral approach.

FOLLOW-UP

The patient’s angina resolved, and she remains asymptomatic. However, no direct assessment of her radial pulse was undertaken because of the restrictions imposed as a result of the current pandemic.

CONCLUSIONS

The techniques used in CTO PCI have transformed coronary revascularization success rates. As demonstrated in this case, these techniques can be transferable to the peripheral vascular system. Greater collaboration and joint education events between coronary and peripheral operators are required to obtain the best clinical outcomes for patients.

AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.


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KEY WORDS dissection, myocardial ischemia, percutaneous coronary intervention

 **APPENDIX** For supplemental videos, please see the online version of this paper.