MINI-FOCUS ISSUE: INTERVENTIONS

CASE REPORT: CLINICAL CASE

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

Conor Mcquillan, MBBcH, BS,a Mohaned Egred, BSc (HONS), MBChB, MDa,b

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 MA-TRIX (Minimizing Adverse Haemorrhagic Events by TRansradialAcces 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.

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.
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.

**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.

| ABBREVIATIONS AND ACRONYMS |
|-----------------------------|
| CTO = chronic total occlusion |
| PCI = percutaneous coronary intervention |
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 torqueable 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 transferrable 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.

ADDRESS FOR CORRESPONDENCE: Dr. Mohaned Egred, Cardiac Department, Freeman Hospital, Newcastle Upon Tyne NE7 7DN, United Kingdom. E-mail: m.egred@nhs.net. Twitter: @mohanedegred.

REFERENCES

1. Jolly SS, Yusuf S, Cairns J, et al. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. Lancet 2011;377(9779):1409–20.
2. Valgimigli M, Frigoli E, Leonardi S, et al. Radial versus femoral access and bivalirudin versus unfractionated heparin in invasively managed patients with acute coronary syndrome (MATRIX): final 1-year results of a multicentre, randomised controlled trial. Lancet 2018;392:835–48.
3. Mason PJ, Shah B, Tamis-Holland JE, et al., American Heart Association Interventional Cardiovacular Care Committee of the Council on Clinical Cardiology, Council on Cardiovascular and Stroke Nursing, Council on Peripheral Vascular Disease; and Council on Geromic and Precision Medicine. An update on radial artery access and best practices for transradial coronary angiography and intervention in acute coronary syndrome: a scientific statement from the American Heart Association. Circ Cardiovasc Interv 2018;11:e00035.
4. Neumann FJ, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS guidelines on myocardial revascularization. Eur Heart J 2019;40:87–165.

5. Waldo SW, Gokhale M, O’Donnell CI, et al. Temporal trends in coronary angiography and percutaneous coronary intervention: insights from the VA clinical assessment, reporting, and tracking program. J Am Coll Cardiol Intv 2018;11:879–88.

6. Egred M. Feasibility and safety of 7-Fr radial approach for complex PCI. J Intervent Cardiol 2011;24:383–8.

7. Gioia G, Comito C, Moreira AE. Coronary rotational atherectomy via transradial approach: a study using radial artery intravascular ultrasound. Catheter Cardiovasc Interv 2000;51:234–8.

8. Taketani Y, Kaneda H, Saito S. Successful coronary intervention for chronic total occlusion using a retrograde approach with biradial arteries. J Invasive Cardiol 2007;19:E281–4.

9. Brilakis ES, Grantham JA, Rinfret S, et al. A percutaneous treatment algorithm for crossing coronary chronic total occlusions. J Am Coll Cardiol Intv 2012;5:367–79.

KEY WORDS: dissection, myocardial ischemia, percutaneous coronary intervention

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