

Acute Hand Ischemia and Digital Amputation

After Transradial Coronary Intervention in a Patient With CREST Syndrome

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The radial artery approach for coronary angiography and intervention is rapidly replacing the femoral artery approach, largely because it reduces bleeding and vascular access site complications. However, complications associated with transradial access warrant attention, notably radial artery occlusion. This report focuses on a case of radial artery occlusion after percutaneous coronary intervention in a 46-year-old woman with CREST (calcinosis, Raynaud phenomenon, esophageal dysfunction, sclerodactyly, and telangiectasia) syndrome, which ultimately led to acute hand ischemia necessitating amputation of her middle and index fingers. (Tex Heart Inst J 2020;47(4):319-21)

The radial artery approach for coronary angiography and intervention procedures is rapidly replacing the femoral artery approach, largely because it reduces bleeding and vascular access site complications.¹⁻³ The transradial approach is especially advantageous in treating acute coronary syndromes and ST-segment-elevation myocardial infarction.^{1,4} Although complications associated with transradial access are rare, they are distinct and warrant attention, as do strategies aimed at reducing them.⁵ One particular complication, radial artery occlusion (RAO) with acute hand and digital ischemia, occurred in a woman who underwent transradial percutaneous coronary intervention (PCI) and whose case emphasizes the need for close monitoring.

Case Report

A 46-year-old woman presented with a non-ST-segment-elevation myocardial infarction. Her medical history included CREST (calcinosis, Raynaud phenomenon, esophageal dysfunction, sclerodactyly, and telangiectasia) syndrome and tobacco use. The patient underwent heart catheterization through the radial approach via a 6F sheath. An Allen test was not performed before the procedure. Verapamil and nitroglycerin were administered through the sheath to alleviate radial artery vasospasm. Unfractionated heparin (5,000 IU) was given intravenously after sheath insertion. Coronary angiograms showed stenoses in the right coronary artery and obtuse marginal branch; both were successfully treated with drug-eluting stents. An additional dose of unfractionated heparin (3,000 IU) was given before percutaneous coronary intervention, although her activated clotting time (ACT) remained low, peaking at 160 seconds. To improve her ACT, tirofiban (0.15 µg/kg/min) was given intravenously for several hours after PCI. Aspirin and clopidogrel were also prescribed postoperatively. Patent hemostasis was achieved with use of a compression band; as part of our protocol, a reverse Barbeau test was performed after sheath removal. Next, serial deflation of the compression device was started 10 minutes after the procedure was completed and continued for 2 hours. The patient recovered well and was discharged home the next day.

Two weeks later, the patient returned to the hospital with a painful and discolored right hand. A duplex ultrasonogram showed total occlusion of the radial artery and the absence of flow on pulsed-wave Doppler (Fig. 1). A subsequent selective angiogram of the right arm showed distal RAO (Fig. 2). The occlusion was successfully treated by means of mechanical thrombectomy, catheter-assisted thrombolysis, and balloon angioplasty (Fig. 3). Afterward, the patient was prescribed amlodipine to alleviate arterial vasospasm. Although her postprocedural course was unremarkable, she had

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recurrent episodes of hand ischemia; 3 months later, dry gangrene necessitated amputation of the patient's middle and index fingers at the proximal phalanges.

Discussion

Transradial arterial access for cardiac catheterization procedures has been increasingly adopted worldwide.⁶ Radial artery occlusion is among the most common complications of transradial catheterization, occurring in up to 10% of cases.^{7,8} However, a substantial proportion of occluded radial arteries recanalize spontaneously during the postoperative follow-up period.⁹ The presumed mechanism of RAO is endothelial injury and

vascular stasis leading to thrombus formation; distal embolization and in situ thrombosis of collateral vessels have also been implicated.⁹ Multiple risk factors for RAO have been identified including age, female sex, low body weight, tobacco abuse, increased sheath-to-artery size ratio, lack of intraprocedural anticoagulation, and absence of patent hemostasis after the procedure.⁹⁻¹² Hahalis and colleagues¹³ reported the superiority of high-dose heparin (100 IU/kg body weight) over standard low-dose heparin (50 IU/kg body weight) in reducing RAO after transradial catheterization for coronary angiography, suggesting that aggressive anticoagulation strategies help to preserve radial artery patency.

Few authors have reported RAO that led to digital ischemia.¹⁴⁻¹⁶ Our patient's risk factors were female sex, low body weight, and tobacco use; moreover, a potential compounding factor was her underlying CREST syndrome, which is characterized in part by endothelial dysfunction and vasculopathy. Moreover, the low ACT after heparin administration in this patient, suggesting heparin resistance, may have further increased the risk of ischemic complications. Hand ischemia in a patient with CREST syndrome and dry gangrene in a patient with possible Raynaud phenomenon have been reported.^{17,18}

The transradial approach has been shown to improve outcomes across a wide spectrum of patients; however, several important precautions should be taken in selecting patients. Specifically, conditions associated with severe vaso-occlusion, such as Raynaud phenomenon, have been described as relative contraindications.^{12,13} Such patient-specific variables must be carefully considered when evaluating the risks and benefits of transradial

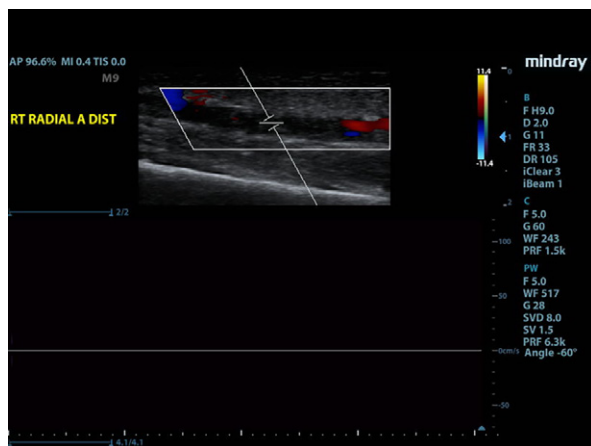


Fig. 1 Duplex ultrasonogram shows thrombotic occlusion of the right radial artery (top), and no flow on pulsed-wave Doppler (bottom).



Fig. 2 Selective angiogram shows a totally occluded right radial artery.



Fig. 3 Follow-up angiogram shows successful recanalization of the right radial artery.

access and integrated into the preprocedural assessment of all patients.

Conclusion

Transradial access can have serious, although rare, complications, and operators must evaluate each patient's individual risk. Strategies to reduce RAO, such as smaller sheath size (4F or 5F), adequate intraprocedural anticoagulation, and liberal use of local vasodilators, as well as use of alternative access sites, should be considered. More data from registries including patients with vaso-occlusive disease who undergo transradial access are needed to define the safety and overall complication rates of this approach.

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