

Total Radial Artery Occlusion Following Transradial Access: Complete Recanalization via the Anatomical Snuffbox

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ABSTRACT: Radial artery occlusion (RAO) is a common complication of procedures requiring transradial access. While radial artery occlusion is most often asymptomatic, there is an elevated prevalence of ischemia in patients with inadequate palmar arch blood supply. Furthermore, treatment options for RAO remain severely limited. We describe a novel technique using distal transradial access in the anatomic snuffbox to recanalize a totally occluded thrombosed radial artery.

INTRODUCTION

Radial artery occlusion (RAO) is a significant complication after transradial coronary angioplasty (TRA), with an incidence between 1% and 10%.¹ The Prophylactic Hyperperfusion Evaluation Trial (PROPHET II) demonstrated that prophylactic ipsilateral ulnar compression during radial artery hemostasis is effective in lowering the risk of RAO after TRA²; however, this procedure is rarely implemented in clinical practice. Although treatment options for RAO remain limited, most cases remain asymptomatic due to extensive collateral circulation via anastomoses between the radial and ulnar arteries, which ensures adequate supply of the palmar arch.^{1,3} Even so, some patients may experience symptoms related to ischemia, such as pain, numbness, or weakness of the affected limb, which necessitate further treatment. In this case, we describe a novel technique to recanalize a thrombosed radial artery via distal transradial access.

CASE DESCRIPTION

A 64-year-old male with a history of hypertension, nonischemic cardiomyopathy, hyperlipidemia, and severe peripheral vascular disease presented with severe intermittent claudication (Rutherford Category 3) in the bilateral lower extremities. Noninvasive testing demonstrated occlusion of both superficial femoral arteries. After failing medical treatment and graded exercise therapy, the patient underwent rotational atherectomy and balloon angioplasty of his right superficial femoral artery via the left common femoral artery (CFA), which significantly improved blood flow. Angiogram of the left lower extremity showed a short segment chronic total occlusion. One month later, the patient returned for intervention of the left lower extremity via right transradial access. A 6F Terumo sheath (Terumo Corporation) was used, and 5,000 units heparin

and 200 mg nitroglycerin were administered. The lesion was crossed with a 0.035" Terumo GLIDEWIRE guidewire and treated with atherectomy and balloon angioplasty with significant improvement in flow. The sheath was removed, and a TR Band® radial compression device (Terumo Corporation) was placed for hemostasis.

The physician was informed post discharge that the patient had been successfully treated for a forearm hematoma with 25 minutes of firm compression by the nursing staff. Following discharge, the patient returned to the clinic with hand claudication, and ultrasound revealed an occluded radial artery spanning from the entry site to the brachial artery. The patient was placed on 4 weeks of anticoagulation with apixiban but continued to have ischemic symptoms, and a repeat noninvasive ultrasound demonstrated persistent RAO. We brought the patient back to the cath lab 1 week later and accessed the distal transradial artery via the anatomical snuffbox. The patient was given 5,000 units heparin and 200 mg nitroglycerine. Initial angiogram confirmed complete occlusion of the radial artery. A 6F-long Terumo sheath and 0.014" RUNTHROUGH NS wire (Terumo Corporation) was used to cross the lesions (Figure 1). Initial ballooning with a 2.5 mm coronary balloon successfully recanalized the vessel, but a large thrombus burden remained (Figure 2). We followed with a Pronto extraction catheter (Teleflex) for aspiration and did multiple runs, but the thrombus remained. Next, we performed a proximal radial artery balloon angioplasty at the level of take-off from the brachial artery and administered 5 mg of tPA through the sheath. After 5 minutes, the balloon was deflated, and 40 cc of blood mixed with thrombus was aspirated. We did two additional Pronto catheter aspirations followed by 3.0 mm balloon dilation at 10 ATM through the entire vessel. Final angiogram showed excellent results with only trace thrombus remaining (Figure 3). The patient was



Figure 1.
Distal transradial access was obtained through the anatomical snuffbox.

discharged with 6 months of planned apixaban therapy. At 30-day follow-up, the patient had 2+ palpable radial pulses and denied any symptoms. Future follow-up with duplex ultrasound was planned prior to discontinuation of apixaban.

DISCUSSION

Although RAO is most often asymptomatic, there is an elevated prevalence of ischemia in cases of inadequate palmar arch blood supply.⁷ In a study of patients undergoing catheterization, a significant proportion were found to have an incomplete superficial palmar arch.¹⁰ Distal transradial access has been demonstrated as a safe and feasible alternative to traditional radial artery access for coronary angiography and other percutaneous interventions.^{5,6} Furthermore, distal transradial access has unique advantages, including distal protection of the hand from ischemia,⁷ and may be an alternative to transfemoral access and its associated complications.^{8,9}



Figure 2.
Preintervention angiogram demonstrating total occlusion of radial artery via distal transradial access.

While recanalization of an RAO via distal transradial access is considered a specialized technique, it has been described in other works.^{4,11,12} In fact, recent evidence has demonstrated significant reduction in RAO via several approaches, such as reduction in sheath size, adequate procedural anticoagulation, and nonocclusive hemostasis.¹³ In addition, treatment with low-molecular-weight heparin has been previously reported,¹⁴ as have isolated cases treated with percutaneous intervention.

Our distal transradial treatment approach included aspiration of the thrombus, balloon angioplasty, and tPA administration. Had there been more thrombus burden, a different device such as a jet-stream or EKOS EndoWave Infusion Catheter System (EKOS Corporation) may have been useful. Furthermore, earlier intervention may have made it easier to aspirate the thrombus.

CONCLUSION

Evidence for the most appropriate treatment of symptomatic RAO is extremely limited, and prospective trials are needed to establish treatment guidelines. In this case, the described technique offers a novel and safe treatment for a long-segment RAO with a significant chronic thrombus burden. The fact that the burden had been present for almost 4 weeks and was



Figure 3.
Post-intervention angiogram via distal transradial access demonstrates a dominant widely patent radial artery.

significant even after a trial of apixaban made it particularly difficult to treat. Notably, the operators were able to intervene safely along this lengthy radial artery occlusion without any complications or recurrent thrombosis at 1-month follow-up. As the use of transradial procedures increases, further research into novel treatment techniques, such as the one described here, will be needed to address complications of symptomatic RAO.

Conflict of Interest Disclosure:

The authors have completed and submitted the *Methodist DeBakey Cardiovascular Journal* Conflict of Interest Statement and none were reported.

Keywords:

radial artery occlusion, peripheral vascular disease, anatomical snuffbox, transradial access, tPA

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