

EDITORIAL COMMENT

Conquering Radial Artery Occlusion

New Skill to Learn*



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For many years, transfemoral access (TFA) has been the default arterial access approach used in everyday clinical practice. TFA was considered simple and not time-consuming. However, it did come with a tradeoff: access site complications (namely bleeding), which have hampered clinical outcomes. Consequently, the development of an alternative vascular access site that was both efficient and safer became a necessity. Almost 3 decades have now passed since the introduction of transradial access (TRA). Nowadays, much of Europe, Japan, India, and many other countries have already adopted the TRA as a default approach. The use of TRA is steadily growing in the United States; it increased from 1% in 2008 to 40.6% in 2017 (1). Despite its obvious advantages, there are specific considerations associated with TRA, including radial artery occlusion (RAO), particularly when reusing this access site, that continue to present specific challenges. Maintaining patency and functional integrity of the radial artery should be an essential aspect of optimal patient care.

In this issue of *JACC: Case Reports* Mcquillan et al. (2) present a fascinating case report in which chronic total occlusion (CTO) techniques used during percutaneous coronary interventions (PCI) were used to

regain access to the right radial artery, which had been occluded following previous PCI. This case demonstrates that coronary techniques can be safely and successfully adopted in the treatment of radial access complications. In addition, it highlights that synergies between coronary and peripheral intervention programs can increase clinicians' expertise to further improve outcomes and manage complications.

The incidence of RAO in TRA ranges from <1% to 33% (3). These wide variations result from various definitions, use of different diagnostic methods, and timing of RAO assessment. Many risk factors for RAO have been reported, including prolonged high-pressure compression, repeated arterial access, and a low radial artery-to-sheath size ratio. Other reported factors included female sex, low body mass index, and advanced age (3). In addition, many other factors may impact RAO: procedural pharmacotherapy (e.g., use of intra-arterial nitroglycerin, verapamil, and administration of heparin), and post-procedure care (e.g., patent hemostasis, ulnar compression) (4-6).

Until a few years ago, crossing over to alternative access sites would have been a standard option. These sites include contralateral TRA or transulnar approach (TUA). Given the patient's history of TFA complication, the authors felt that crossing over to TFA was not a viable option. One interesting option for vascular access is ipsilateral TUA. Studies demonstrate that transulnar catheterization in patients with ipsilateral RAO seems to be a safe and feasible alternative and, therefore, may not be an absolute contraindication (7,8). Notwithstanding, there are insufficient prospective and randomized data to provide a robust recommendation on the use of the ipsilateral ulnar artery over alternate access sites such as the contralateral radial or femoral arteries (5). The brachial artery approach is

*Editorials published in *JACC: Case Reports* reflect the views of the authors and do not necessarily represent the views of *JACC: Case Reports* or the American College of Cardiology.

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rarely used given the increased risk of hand ischemia. For these reasons, it is our opinion that brachial access is the least favorable access site and would not have been a good access choice in this patient (9).

In recent years, however, there has been an increasing trend in recanalization of RAO for regaining access site for reinterventions. This strategy is particularly helpful when no other access sites are available. Recanalization with angioplasty has been described in a number of studies. The occluded part can be approached *retrogradely* from the distal radial artery or the palmar arch or *antegradely* from the brachial artery (4). Mcquillan et al. (2) successfully adopted a *retrograde* coronary CTO strategy (a wire-based reentry into the upstream true lumen) to recanalize the radial artery and skillfully avoided conversion to femoral access. Mori and colleagues (10), in a case series of 22 patients outside emergency settings, reported the feasibility and safety of a novel technique: transoccluded radial access via ultrasound guidance, for diagnostic catheterization or PCI. The success rate was 91% with 2 failed cases (10). This technique, although not intended for recanalization of the RAO, appears safe and feasible for alternative access in patients with preexisting RAO undergoing coronary procedures when alternative vascular access is limited. Another interesting approach to the recanalization of RAO for repeat arterial access was introduced by Valsecchi and colleagues (7). They have successfully used an ipsilateral ulnar approach to recanalize RAO (7). Although these approaches are technically feasible, the durability of RAO recanalization and patency of the ulnar artery should be proven in large case series and at longer follow-up before any recommendations for wider clinical use can be made.

It is hard to argue with success. However, the approach by Mcquillan et al. (2) raises several interesting discussion points. First, the authors do not provide any information on the radial artery patency just before catheterization. Given the substantial rate of asymptomatic RAO following previous catheterizations, performing an oximetry-plethysmography test (reverse Barbeau test) or Doppler ultrasound before the intervention could have proven useful in determining the optimal approach for securing vascular access in this particular patient.

In addition, given that the patient was stable, the decision to continue the procedure via the right TRA or crossing over to another vascular access might have been postponed to give the treating physicians time to plan the optimal strategy and give the patient

a chance to consent to this new strategy. It is easy to make the case that radial artery angioplasty is a peripheral intervention for which the patient should have had consented to separately. One might argue that this clinical scenario might not have justified the use of a “drive-by” approach?

All of these radial recanalization techniques, including the authors’ retrograde coronary CTO approach, offer the option of securing the same radial access site. Should RAO be encountered during reintervention, recanalization procedure as the first step seems to be a reasonable approach. Thus, contralateral radial artery can be saved for future interventions, as a conduit for coronary bypass grafting, or fistula A-V formation for hemodialysis.

SHAPING THE FUTURE

TRA currently has a robustly established role in vascular access. TRA has demonstrated a sizable benefit in terms of hard endpoints compared with TFA both in chronic and acute coronary syndromes. The innovation of TRA equipment focuses on facilitating transradial endovascular and structural interventions, improving strategies to minimize the risk of RAO, and growing use for high-risk and complex PCI. A continuously growing body of evidence is focused on surpassing current TRA limitations (specifically RAO) and expanding alternative vascular accesses such as TUA or distal TRA (“snuff-box” technique). The Slender Club Japan has made remarkable progress in downsizing equipment. Should this downsizing trend continue, we could see a further paradigm shift toward using the snuff-box technique.

The new generation of high-quality evidence together with the availability of training courses for interventional cardiologists and fellows-in-training will ensure systematic use of the TRA approach. The use of social media (e.g., #RadialFirst on Twitter) to educate, discuss, and disseminate the latest evidence will also greatly contribute to these actions and hopefully reduce the risk-treatment paradox in the selection of TRA. Notwithstanding, given the anatomic limitations of the TRA preventing large-bore device use, mastering best practices for femoral access also remains important for future generations of interventional cardiologists.

In conclusion, although infrequent, minor and major access site-associated complications may occur following TRA. Consequently, all interventional cardiologists using the TRA approach should also be proficient at managing these complications. Whether

“TRA RAO CTO” becomes the next big thing... remain alert and watch this space!

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