Transradial Approach for Chronic Total Occlusion Percutaneous Coronary Intervention

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KEYWORDS

• Chronic total occlusion • Transradial • Percutaneous coronary intervention • Recanalization • Bleeding

KEY POINTS

- The transradial approach has an important role in interventional cardiology.
- Bleeding complications have been recognized as powerful adverse predictors of subsequent mortality after percutaneous coronary intervention.
- The transradial approach has emerged as one of the effective bleeding prevention strategies.
- Chronic total occlusion (CTO) recanalization is likely to provide significant clinical benefits, even from a mortality standpoint.
- Transradial approach commit the operator to the use of smaller guide catheters, and this might be a concern when planning a complex PCI procedure such as CTO recanalization; however, experienced transradial operators have learned to overcome such limitations within the CTO recanalization scenario.

INTRODUCTION

Although chronic total occlusion (CTO) recanalization is likely to provide significant clinical benefits, even from a mortality standpoint,[1] no randomized trial has demonstrated such benefit compared with a planned optimal medical therapy strategy. Therefore, CTO remains under scrutiny from the interventional world.

Bleeding complications have been recognized as powerful adverse predictors of subsequent mortality after percutaneous coronary intervention (PCI); therefore, strategies to reduce such complications are likely to provide further benefits to patients. Among those bleeding prevention strategies, the transradial approach has emerged as a very effective one, to the point that an increasing number of operators think this approach has value for many indications, including primary PCI for ST elevation myocardial infarction.[2–7] In many centers around the world, the transradial approach has largely replaced the transfemoral approach, to the point that some operators may be reluctant in performing CTO PCI because many experienced CTO operators have advocated the use of large 8F catheters to achieve success.

The radial approach has come a long way since its initial description, in 1989, by Campeau[8] for coronary angiography. Later, Kiemeneij and Laarman[9] reported its use for percutaneous coronary balloon angioplasty. Then, Kiemeneij and colleagues[10] investigated its use for stent implantation. From that time, the transradial approach has continued to gain a substantial role in interventional

Disclosures: The authors have nothing to disclose regarding the content of this manuscript.
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Intervent Cardiol Clin 1 (2012) 355–363
doi:10.1016/j.iccl.2012.03.003

cardiology. In fact, a large body of evidence now supports the safety and feasibility of transradial approach in a broad spectrum of patients and settings. The spectrum ranges from diagnostic catheterization and staged PCI to ad-hoc PCI in acute coronary syndromes and primary PCI for ST-elevation myocardial infarction. Moreover, for complex PCI, such as unprotected left main PCI, saphenous vein graft PCI and, more recently, for CTO recanalization—even when involving the retrograde approach.[2–6,11–19]

Aside from bleeding reduction, patients undergoing transradial procedures have reported strong preference for the wrist approach because of prompt ambulation and comfort, leading to an improvement in their quality of life soon after the procedure.[20] Also, transradial approach allows for early discharge and, therefore, saves hospital costs.[21] However, in most situations, a transradial approach commits the operator to the use of smaller guide catheters,[5] which is often perceived to be a strong limitation by transfemoral PCI supporters, especially when contemplating a very complex PCI procedure such as CTO recanalization. Experienced transradial operators have learned to overcome such limitations in many situations. This article provides an overview of basic principles and techniques required to perform transradial CTO PCI.

GENERAL CONSIDERATIONS

Several studies have shown that the transradial approach, when compared with the transfemoral route, is associated with fewer access site bleeding complications and improved clinical outcomes, especially in patients with maximal platelet inhibition and/or anticoagulation therapies.[2–5,14,22] Femoral artery access has been traditionally advocated for CTO PCI by most interventional cardiologists because it allows for a broader use of 7F or 8F guide catheters. Large-bore catheters are known to provide better passive support and allow for the use of more equipment in the same guide. Therefore, in most series published on CTO PCI, the use of the femoral approach was largely preferred.[23–25]

However, in most cases of CTO PCI, considering the need for a dual arterial access, even when using contralateral guidance without a retrograde approach, using large catheters probably and logically doubles the risk of access site complication compared with a single arterial access.

Experienced transradial operators have recently reported their favorable experience, mitigating concerns about the effectiveness of the use of transradial approach and smaller catheters for CTO PCI and suggesting extremely safe outcomes, especially regarding bleeding and vascular issues. Kim and colleagues[15] first suggested the feasibility of the transradial approach for CTO PCI, whereas Taketani and colleagues[16] reported the first four cases of retrograde CTO recanalization using bilateral radial access. More recently, these results were echoed by Wu and colleagues,[17] Egred,[19] and Rinfret (coauthor of this article) and colleagues[18] in the early Canadian CTO recanalization experience.

Patient Set-up and Site Access

In the authors' center, which almost exclusively uses the transradial approach in more than 8000 diagnostic catheterizations and 3300 PCI yearly, the assessment of the deep palmar arch is routinely performed on both sides with plethysmography.[26] Both radial artery punctures are performed 1 to 2 cm above the styloid process by the traditional Seldinger technique.[27] Therefore, we prefer to transfix the posterior arterial wall by using a regular 18-G × 1 ¼ in (short) IV sheath (BD Insyte Autoguard, Mississauga, ON, Canada). After removing the needle, the IV sheath is pulled back up to the point of getting back-blood flow. At this point, we advance a short 0.035 in straight guidewire or a Bentson (Cook Medical, Bloomington, IN, USA) 0.035 in guidewire into the radial artery lumen. Following the insertion of a regular (non–hydrophilic-coated) short 6F or 7F introducer (as used for the femoral access), 2.5 mg verapamil is administered through the sheath. The left arm is then brought over the patient's abdomen and the left hand strapped to keep the left wrist toward the pubis, to improve patient and operator comfort (**Fig. 1**). The operator should never have to bend over the patient to reach the left radial access site; it is a matter of taking the time to properly position the patient. Then, the left radial access is used for the right coronary artery (RCA) catheter and the right radial access for the left coronary catheter to optimize support, no matter where the CTO is (in the left system or in the RCA). Although the right radial best serves for both coronary ostia, the authors strongly believe that optimal support is gained using a right radial for the left main guide instead of from a left radial. Importantly, for selected patients in which larger (≥7F) introducers or catheters are planned to be inserted, and based on the concept that the inner luminal diameter of the radial artery is usually smaller near the wrist,[28,29] an alternative is to perform the radial puncture a bit "higher" than usual; hence, puncturing between 5 to 7 cm above the styloid process, when appropriate. However,