Diagnostic and Guide Catheter Selection and Manipulation for Radial Approach

Carlos E. Alfonso, MD, Mauricio G. Cohen, MD, FACC, FSCAI*

KEYWORDS

• Transradial angiography • Transradial percutaneous coronary intervention • Cardiac catheterization • Coronary angiography

KEY POINTS

- Mechanisms and predictors of transradial (TR) failure include arterial spasm, anatomic limitations, failure to cannulate the target vessel, and inadequate guide support.
- Adequate guide catheter support is key for successful TR percutaneous coronary intervention.
- Finesse and careful maneuvering and torquing are important for catheter manipulation and coronary engagement; the operator should never push against resistance.
- Guide catheter selection should depend on the operator's comfort level and expertise.
- A "single-catheter strategy" is feasible and may be beneficial in certain scenarios.

INTRODUCTION

The multiple advantages of transradial (TR) catheterization and percutaneous coronary interventions (PCI) have been enumerated in the past and include reduced bleeding risk; a trend toward decrease in ischemic end points of death, stroke, or myocardial infarction; reduced length of stay and costs; early ambulation; and improved patient comfort for most patients.[1,2]

The current success rate with TR PCI is greater than 90%, which is similar to that of transfemoral (TF) PCI. When the success rate of TR versus TF PCI was compared in a systematic review and meta-analysis of 23 randomized trials with 7020 patients, there was a nonsignificant trend for an increased incidence of inability to cross lesions with TR access compared with the TF approach (3.4% vs 4.7%; $P = .21$).[3] There was also a trend toward increased procedural failure, and a significant difference in the need for access site crossover (odds ratio, 3.82 [2.83–5.15]).[3] A single-center study examined the mechanism of TR PCI procedural failure in 2100 TR PCI procedures (≤6F catheter) performed by low- to intermediate-volume operators. Procedural failure occurred in 98 (4.7%) patients. Mechanisms and predictors of TR PCI procedural failure included inability to puncture the radial artery, arterial spasm, anatomic limitations, failure to cannulate the target vessel, and inadequate guide support (Fig. 1).[4] To further improve success rates with TR catheterization and PCI, it is important to address each of these obstacles. About one-third of failures to complete TR PCI were caused by lack of guiding catheter support either because of subclavian tortuosity or inadequate backup support.

M.G. Cohen is a Consultant for Accumed, Terumo Medical, and Merit Medical. He is on the Speakers' Bureau for Medtronic. C.E. Alfonso has nothing to disclose.

Cardiac Catheterization Laboratory, Cardiovascular Division, Department of Medicine, University of Miami Hospital, University of Miami Miller School of Medicine, 1400 Northwest 12th Avenue, Miami, FL 33136, USA
* Corresponding author. University of Miami Hospital, 1400 Northwest 12th Avenue, Suite 1179, Miami, FL 33136.
E-mail address: mgcohen@med.miami.edu

Intervent Cardiol Clin 4 (2015) 145–159
http://dx.doi.org/10.1016/j.iccl.2014.12.001
2211-7458/15/$ – see front matter

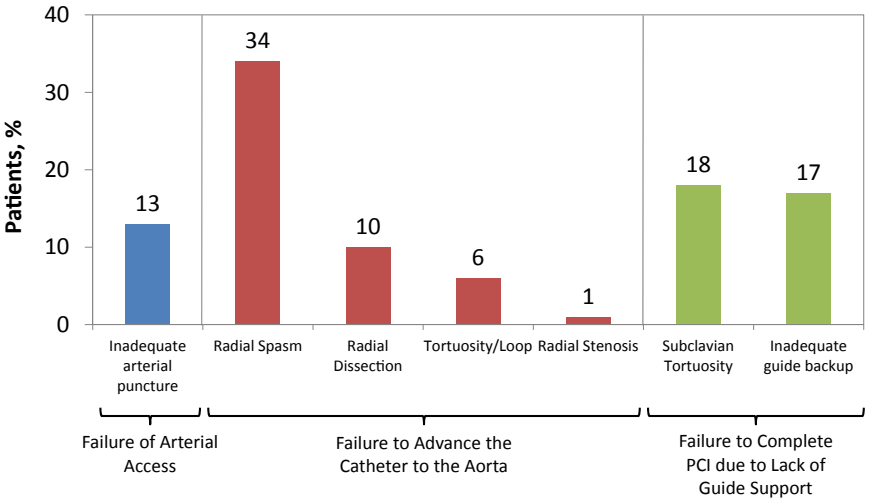

Fig. 1. Failure modes for TR PCI. Data from nearly 100 cases of TR PCI failure, which stratified failure into either failure of arterial access, failure to navigate to ascending aorta, or failure of guide support and their subcategories as shown. (*Data from* Dehghani P, Mohammad A, Bajaj R, et al. Mechanism and predictors of failed transradial approach for percutaneous coronary interventions. JACC Cardiovasc Interv 2009;2:1057–64.)

Guiding catheter selection, use, and engagement are essential factors for coronary interventions in general, but it is compulsory for TR PCI. Although some disadvantages are noted, most of these can be overcome with further refinement of techniques and use of certain tips and tricks. This article reviews some of the essentials for guide catheter selection, navigation of the anatomy, and manipulation during TR catheterization and PCI.

TRANSRADIAL CATHETERIZATION AND INTERVENTION

The general tenets of cardiac catheterization and PCI remain the same either with TR or TF access. However, TR catheterization and interventions require the acquisition of various additional skill sets including radial arterial puncture, the ability to navigate the upper extremity vasculature with full understanding of anatomic variations, and catheter selection and coronary engagement technique.

NAVIGATING THE AORTIC ARCH AND GREAT VESSELS

In most cases, accessing the ascending aorta via the right or left radial artery does not pose major challenges. In some cases, however, the degree of tortuosity within the great vessels, the anatomic variations, and the take-off angle of the great vessels from the aortic arch can make navigation of the arch more challenging (Fig. 2). Although potentially a nuisance, it is still possible to navigate through most of these anatomic variations and safely proceed with TR PCI. Practical tips for navigating the upper extremity vasculature and engaging the coronary arteries are presented in Box 1. Certain anatomic variants, such as arteria lusoria

Box 1
Practical tips for guide catheter navigation and coronary engagement

Advancing guiding catheter to ascending aorta

Perform catheter exchanges with the tip of a 260-cm long wire in the aortic root

Stiff wires can be used in severe cases of tortuosity for additional support

If needed, use hydrophilic wires to navigate tortuous subclavian anatomy

Have patient take deep inspiration to help navigate and straighten tortuosity

If not sure of wire position, perform a limited angiogram to understand anatomy

Engaging coronary artery

Advance catheter and start manipulation over the wire deep into aortic cusp of interest

To prevent knotting and kinking, keep wire within the guide catheter during manipulations

Once the catheter is engaged in the coronary ostium, pull back gently to improve coaxiality and avoid dissections