Radial Artery Access, Hemostasis, and Radial Artery Occlusion

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KEYWORDS

• Access • Hemostasis • Patency • Reaccess

KEY POINTS

- Radial artery access requires dedicated equipment and has a learning curve.
- Counterpuncture technique has a higher first-attempt success rate and seems faster at obtaining radial artery access.
- Using the smallest caliber hydrophilic introducers and administration of vasodilators as well as an adequate dose of unfractionated heparin (UFH) remain best practices.
- Radial artery hemostasis, despite being an apparently simple process and highly efficacious at preventing bleeding complications, has serious implications for radial artery flow and lumen preservation.
- Applying current best practices is the most evidence-based approach to optimal radial hemostasis.

INTRODUCTION

Transradial access (TRA) has been associated with reduction in access site complications[1] and procedure-related cost[2] and is preferred by patients[3] compared with transfemoral access. This review describes the technique and best practices for obtaining radial artery access and the technique of hemostasis and its relationship with postprocedural radial artery occlusion (RAO).

RADIAL ARTERY ACCESS

Patient Selection

Most patients referred for cardiac catheterization or peripheral endovascular procedures are candidates for TRA. In view of extensive microcollateralization and frequent presence of macrocollateral circuits, the forearm arteries do not behave as end arteries and make ideal access sites. Tests for assessment of the presence of macrocollateral circuits have been found to have no utility in triaging patients to or away from TRA.[4] Specific patient subsets deemed less suitable for TRA are limited to patients with scleroderma, due to the risk of diffuse spasm leading to ischemia, and patients with ipsilateral dialysis access.

Patient Set-Up

In a typical catheterization laboratory, the patient is prepped in a supine position, with the right hand gently extended. A variety of drapes covering the arm, exposing the distal forearm, are commercially available and frequently used. An operator may choose to obtain radial artery access with the upper extremity abducted or

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placed in a supinated position next to the patient's trunk. For left radial access, a similar preparation is sufficient, and arterial puncture is accomplished with the operator standing either on the patient's right side or on the patient's left side. Once the guide wire is placed above the elbow joint, the left upper extremity could be adducted over to the patient's midline and the procedure performed with the operator standing on the patient's right side.

Radial Artery Puncture

After local infiltration with 1 to 2 mL of lidocaine, the radial artery is punctured, ideally 2 to 3 finger-breadths above the radial styloid process. A micropuncture needle is used in most instances. Either a bare needle or a Teflon-sheathed needle may be used. The traditional anterior puncture technique may be used, where the operator, after puncturing the anterior wall of the radial artery and visualizing bleeding from the needle hub, immobilizes the needle and advances the guide wire (Fig. 1). The other commonly used technique is the counterpuncture technique (Fig. 2), where, after appearance of blood in the needle hub, indicating anterior wall puncture, the needle is advanced through the lumen and the posterior wall is punctured. The needle is then gently withdrawn into the arterial lumen, and the guide wire is advanced once continuous or pulsatile flow of blood is seen. When a Teflon-sheathed needle is used, the inner stylet is removed after needle stabilization and a similar procedure is used. Counterpuncture technique has been shown faster and more likely to succeed at first attempt and has not been associated with an increase in bleeding or RAO.[5]

Arterial Access

After placement of a micropuncture guide wire (0.018-in or 0.021-in) in the radial artery lumen, an introducer sheath is inserted. Hydrophilic-coated introducer sheaths have been associated with less spasm[6] and found easier to remove.[7] After placement of an introducer sheath, a vasodilator cocktail is administered intra-arterially. Nitrates and/or calcium channel blockers are common ingredients of the vasodilator cocktail; 5000 units of UFH are usually administered to lower the incidence of RAO. UFH can be administered intra-arterially or intravenously with equivalent prophylactic efficacy.[8]

TECHNIQUE OF HEMOSTASIS

Radial artery hemostasis can be achieved fairly easily by local manual compression. The firm and flat base of the radius bone is ideally suitable for compression and in conjunction with a thick-walled structure of the radial artery; bleeding at the puncture site can be stopped by application of modest pressure. Several hemostatic compression practices are prevalent, ranging from manual compression to compression dressings and, recently, the increasing use of circumferential bands capable of applying titratable pressure. All of these modalities are highly effective in achieving hemostasis. The bands allow for patients to be free and ambulate immediately postprocedure.

Caution should be exercised to apply the center point of the bands at the site of arterial puncture (usually proximal to the skin entry site) to prevent bleeding complications when practicing low-pressure hemostasis.

PREVENTION OF RADIAL ARTERY OCCLUSION

RAO is the most frequent structural complication of TRA, with prevalence ranging from 2% to 10%.[9] Several procedural variables affect the occurrence of RAO, including the following:

- Larger-size hardware compared with the radial artery lumen[10]
- Absence of anticoagulation[11]
- Interruption of radial artery flow during and after hemostatic compression[12]

Hemostatic compression using excessive pressure, although increasing the confidence in the hemostatic efficacy, frequently leads to

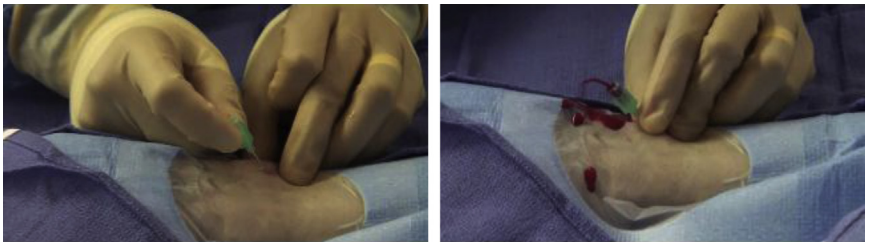

Fig. 1. Anterior puncture technique.