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CASE REPORT

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A novel technique for simultaneous hemostasis of ipsilateral radial and ulnar artery access sites

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Abstract

With the increased use of transradial artery access (TRA) for diagnostic and coronary interventional procedures, crossover to the ipsilateral ulnar artery after TRA failure is being reported more frequently. A major challenge with ipsilateral transradial and ulnar artery access is achieving efficient patent hemostasis of both the radial and ulnar arteries at the completion of the procedure. In this report, we describe two cases of failed TRA with subsequent ipsilateral ulnar artery access. A novel and practical technique of simultaneous patent hemostasis of both the ipsilateral radial and ulnar artery access sites is described, using a QuikClot® Radial® hemostasis pad and a TR Band®.

KEYWORDS
hemostatic devices, radial artery, ulnar artery, vascular hemostasis

1 | INTRODUCTION

The radial artery is becoming the preferred access site for coronary angiography and percutaneous coronary interventions because of its proven clinical benefits [1,2]. However, transradial access (TRA) is unsuccessful in up to 7% of patients, primarily due to the inability of accessing the radial artery or failure of advancing a catheter to the ascending aorta, resulting in crossover to another arterial access site [1,3]. Although access crossover to the contralateral radial artery or the femoral artery is commonly recommended following TRA failure, recent data from large registries and randomized trials indicates that the ipsilateral transulnar approach may represent a reasonable alternative for the performance of coronary procedures [4,5]. In this report, we describe two cases of successful ipsilateral ulnar artery access after TRA failure and a novel technique to achieve simultaneous hemostasis of the ipsilateral radial and ulnar access sites.

2 | CASE REPORTS

2.1 | Case 1

A 62-year-old woman with a newly diagnosed severe cardiomyopathy was brought to the cardiac catheterization laboratory for right and left heart catheterization. Real time ultrasound evaluation of the forearm veins and radial and ulnar arteries (Figure 1) was performed per standard procedure in our cath lab using a SonoSite EDGE portable ultrasound machine with a 6–13 MHz vascular transducer (SonoSite Inc., Bothell, WA) [6]. Under direct ultrasound guidance, 6-Fr Glidesheaths® (Terumo, Tokyo, Japan) were placed in the right brachial vein and right radial artery, and 70 units/kg intravenous heparin (6,000 units) was given after arterial sheath insertion. Upon advancement of a 0.035-inch 1.5 mm J tipped InQwire® (Merit Medical Systems, South Jordan, UT) guidewire into the radial artery, resistance was encountered at the level of the antecubital fossa. Angiography showed a 360° radial artery loop (Figure 2). The loop was able to be straightened with a 5-Fr angled GlideCath® (Terumo, Tokyo, Japan) over a Prowater® 0.014-inch guide wire (Abbott Vascular, Santa Clara, CA), which was then exchanged back for the 0.035 inch guidewire. Advancement of a 5-Fr multipurpose catheter through the straightened radial loop caused severe pain from spasm, and the TRA approach was abandoned, leaving the 6-Fr GlideSheath in the radial artery. The ipsilateral ulnar artery was then accessed under ultrasound guidance, and a 5-Fr GlideSheath was inserted without difficulty. The remaining procedure, left and right heart catheterization, was then completed without difficulty. At the end of the procedure, there were 6-Fr and 5-Fr sheaths in the right radial and ulnar arteries, respectively (Figure 3A).

In order to achieve simultaneous hemostasis of both the radial and ulnar artery access sites, the following hemostasis technique was performed. A QuikClot® Radial® hemostasis pad (Z-Medica, LLC, Wallingford, CT) was placed over the ulnar artery access site with the sheath still in place, but pulled back 4 cm (Figure 3B). The 5-Fr sheath was then removed, allowing a small amount of blood to soak the underside of the QuikClot Radial pad to initiate the kaolin-blood

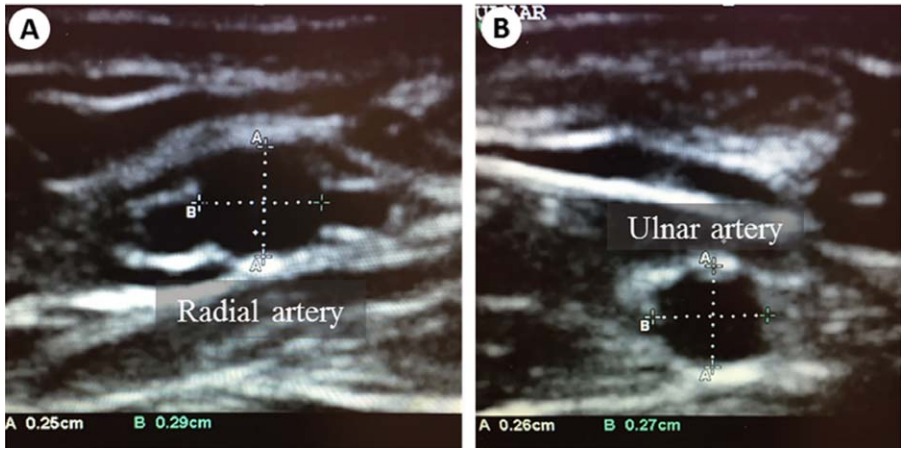

FIGURE 1 Arterial ultrasound evaluation. A, Right radial artery (2.5 mm × 2.9 mm); B, Right ulnar artery (2.6 mm × 2.7 mm) [Color figure can be viewed at wileyonlinelibrary.com]

reaction (Figure 3C). Five minutes of manual pressure was then held over the QuikClot Radial pad to initiate hemostasis (Figure 3D). A TR Band® radial compression device (Terumo, Tokyo, Japan) was then applied snuggly around the wrist, with the balloon over the radial artery and the nonballoon portion covering the QuikClot Radial pad over the ulnar artery, with the sheath still in the radial artery (Figure 3E). The TR Band was then inflated with 10 mL of air and the radial sheath was pulled (Figure 3F,G). Patent hemostasis of both the radial and ulnar arteries was documented by the Barbeau and reverse Barbeau tests (Figure 3H). TR Band weaning began one hour after application by removing 2 mL of air from the TR Band every 20 min until complete deflation was obtained. The TR Band was then removed 140 min after procedure completion, and hemostasis of the radial and ulnar arteries was confirmed. The access sites were covered with a clear adhesive noncompressive film dressing (Tegaderm™, 3M Medical), with the QuikClot Radial pad left in place over the ulnar artery, to be removed the following morning by the patient. The patient was discharged home the same day.

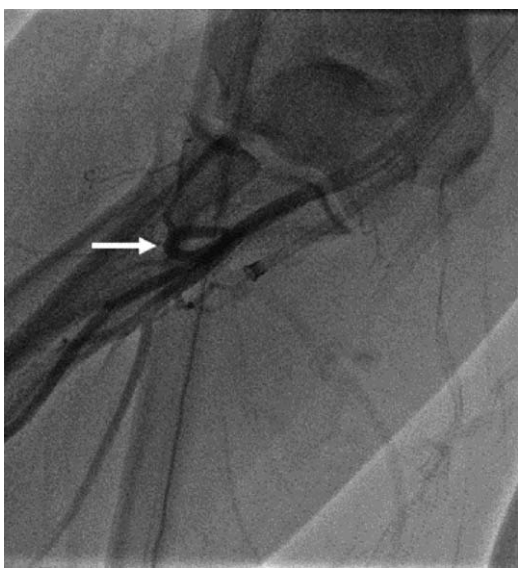

FIGURE 2 Right radial arteriography demonstrates a 360° radial loop (arrow)

2.2 | Case 2

A 66-year-old man was referred for coronary angiography because of a nontransmural myocardial infarction seen on cardiac MR. A 6-Fr sheath was inserted into the right radial artery under direct ultrasound guidance, and 70 units/kg intravenous heparin (5,000 units) was given after arterial sheath insertion. A 0.035-inch 1.5 mm J tipped guidewire met resistance upon advancement at the level of the antecubital fossa. A 360° radial artery loop was demonstrated on angiography, and could not be straightened for catheter advancement. Because he had recent left wrist surgery and was going to require further surgery on his left wrist, the ipsilateral ulnar artery was chosen as the alternative assess site. A 5-Fr sheath was inserted under ultrasound guidance and coronary angiography was completed without complications. Hemostasis of access sites for this case was obtained in the same manner described above for Case 1.

3 | DISCUSSION

One of the major causes of TRA failure is due to anatomical variations of the radial artery, especially a "tight" radial artery loop [7–9]. This occurs in ~2% of patients and may be unilateral or bilateral [7,8]. Several techniques have been used to successfully negotiate radial loops, including the "BAT" technique and the "knuckle-wire" technique [6,10]. Occasionally, a radial loop just cannot be negotiated, and an alternative access site, like the contralateral radial artery or a femoral artery, is commonly recommended [3].

The ipsilateral ulnar artery is not commonly recommended as an alternative access site after TRA failure due to the potential of compromising both major arteries to the hand [11]. Recent studies, though, have documented the safety of using the ipsilateral ulnar artery as an

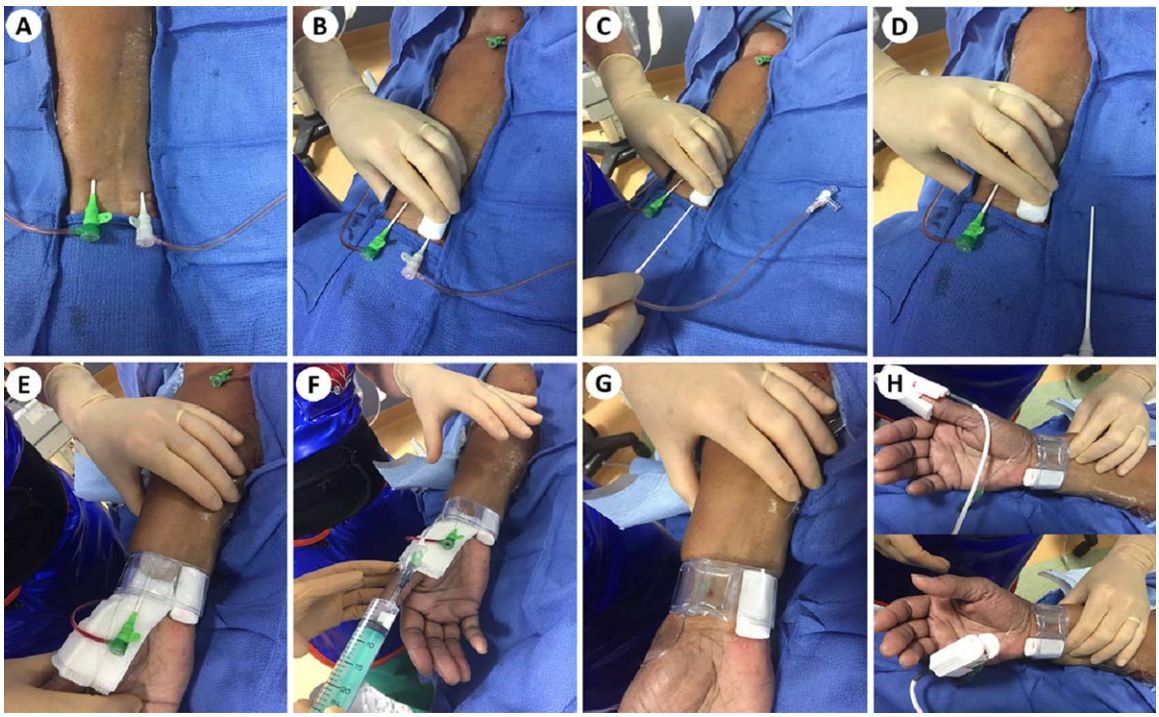

FIGURE 3 Hemostasis technique for simultaneous ipsilateral radial and ulnar artery access sites. A, 6-Fr and 5-Fr Glidesheaths in the right radial and ulnar arteries. B–D, A QuikClot Radial hemostasis pad was placed over the ulnar artery access site, then the ulnar sheath was removed and a small amount of blood was allowed to soak the underside of the QuikClot Radial pad to initiate the kaolin-blood reaction. Five minutes of manual pressure was then held to the QuikClot Radial pad to obtain hemostasis. E, A dry 4 × 4 gauze was placed under the exposed radial sheath, and a TR Band was then snuggly applied over both the radial artery and the QuikClot Radial pad covering the ulnar artery, with the balloon portion of the TR Band over the radial artery. F,G, The TR Band was then inflated with 10 mL of air and the radial sheath was pulled, followed by removal of the 4 × 4 gauze from under the TR Band. H, Patent hemostasis was documented by Barbeau and reverse Barbeau tests. TR Band air weaning then began one hour after application of the Band

alternative access site upon TRA failure [4,5]. The large multicenter SWITCH study, consisting of 2,403 procedures, showed that switching directly to the ipsilateral ulnar artery for percutaneous coronary procedures was feasible and safe, without cases of symptomatic hand ischemia [4]. In a study of 240 patients with documented radial artery occlusion (RAO), procedural success via the ipsilateral ulnar artery was 97% with a crossover rate of 3% to transfemoral access with no occurrences of hand ischemia observed [5].

In the cases presented above, radial loops prevented advancement of catheters. Since both the radial and ulnar arteries were previously evaluated by ultrasound and the ulnar artery was of adequate size for either a 5-Fr or 6-Fr sheath, the ipsilateral ulnar artery was chosen as the alternative site in order to save the time needed to prepare the contralateral wrist or a femoral artery, to decrease the risk of accessing a femoral artery in an anticoagulated patient, and to minimize additional discomfort to the patient. In both cases, left heart catheterization was successfully completed via the ipsilateral ulnar artery, and no access-related complications were observed.

A challenge with using ipsilateral transulnar access after failed TRA is achieving efficient and effective hemostasis of both the radial and ulnar arteries. Several hemostatic devices are currently available specifically for radial hemostasis [12]. However, data on the use of any of these hemostatic devices for simultaneous hemostasis of the ipsilateral radial and ulnar access sites is very limited. Seto and Kern [13] reported achieving successful simultaneous hemostasis by using two TR Bands on both the radial and ulnar arteries, with one TR Band directly over the ulnar access site and the other TR Band positioned proximal to the ulnar TR Band over the radial artery well proximal to the radial artery access site. Singh and Cohen [14] reported a case using a balloon compression device designed with two balloons that align with the radial and ulnar arteries to achieve simultaneous hemostasis in both vessels.

In the two cases reported above, we used a QuikClot Radial pad combined with a TR Band to achieve simultaneous hemostasis of the radial and ulnar arteries. QuikClot Radial is a hemostatic device that is composed of a kaolin-impregnated gauze pad. When kaolin contacts blood it immediately initiates the clotting cascade by activating Factor XII, resulting in shortened hemostasis times [15]. We recently reported that QuikClot Radial pads significantly shortened hemostasis times following TRA when compared with the TR Band, with no increase in complications noted [16]. In that small trial, 5 min of firm manual pressure was applied to the QuikClot Radial pad over the radial artery after sheath removal, and then only light compression was applied with an elastic bandage after that, resulting in 100% hemostasis in all patients with this technique using either 30 min or 60 min of compression. Because of this experience, we were very comfortable applying the nonballoon portion of a TR Band over the QuikClot Radial pad, which

exerted only minimal pressure over the ulnar artery, after only 5 min of firm manual pressure, which proved to be a practical technique for simultaneous hemostasis of both vessels.

4 | CONCLUSION

Crossover to the ipsilateral ulnar artery after TRA failure appears to be a feasible and safe alternative for coronary diagnostic and interventional procedures. Assessment of the ulnar artery diameter by real time ultrasound can ensure appropriate ulnar artery sheath sizing, to prevent inadvertent oversizing, which has been associated with an increased incidence of arterial occlusion when this occurs in the radial artery [17]. Simultaneous patent hemostasis of both vessels can easily be achieved with a QuikClot Radial pad combined with a TR Band as described above.

CONFLICT OF INTEREST

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