Transpedal Arterial Access in Practice

Illustrative case studies highlighting this access option and its applications in treating critical limb ischemia.

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Transpedal access is an evolving technique primarily used in patients after failed femoral antegrade or retrograde access to revascularize complex tibiopedal lesions. Occasionally, transpedal access is used to revascularize femoropopliteal artery lesions. This article presents three case reports illustrating the use of transpedal access to revascularize tibiopedal occlusions and distal femoropopliteal artery lesions.

Case 1: Pedal Artery Access for SFA Intervention in a Morbidly Obese Patient

A 50-year-old morbidly obese woman presented with a nonhealing ulcer of the left heel (Figure 1). Noninvasive studies showed elevated velocities in the distal superficial femoral artery (SFA) indicative of > 75% stenosis; her left leg ankle-brachial index (ABI) was 0.78. A left leg angiogram showed a significant lesion in the left common iliac artery (CIA) and left SFA (Figure 2). Despite stenting the left CIA, her heel ulcer persisted.

Retrograde femoral puncture was attempted. However, it was difficult to cross over due to the presence of the self-expanding stent in the CIA and a narrow aortoiliac bifurcation. An ipsilateral antegrade puncture was also attempted in the proximal portion of the SFA. The sheath was removed, and manual pressure was held.

Percutaneous transpedal artery access was planned. Duplex ultrasound was used to image the dorsalis pedis artery (Figure 3), and a Micropuncture® needle (Cook Medical, Bloomington, IN) was used to access the pedal artery. A 5-F sheath (Figure 4) was placed in the dorsalis pedis artery, and 3,000 units of heparin were administered for anticoagulation.

Retrograde pedal artery imaging showed the dorsalis pedis artery to be patent with a proximal moderate stenosis in the anterior tibial artery. The SFA was crossed with a 0.014-inch wire, and angioplasty was performed using a 4- X 80-mm balloon. Postangioplasty imaging showed a patent SFA with stent-like results and no residual stenosis (Figure 5).

The vascular access management was performed using a transradial band across the dorsalis pedis artery. A transradial band is usually used for access manage-

Figure 1. Heel ulcer upon presentation.

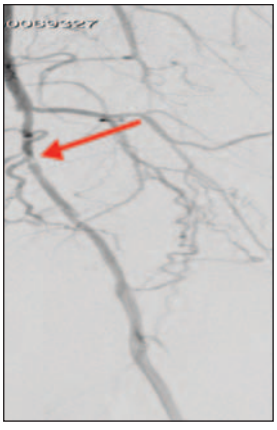

Figure 2. Distal SFA lesion.

Figure 3. Duplex ultrasound imaging of the pedal artery.

Figure 4. A 5-F sheath is placed in the dorsalis pedis artery.

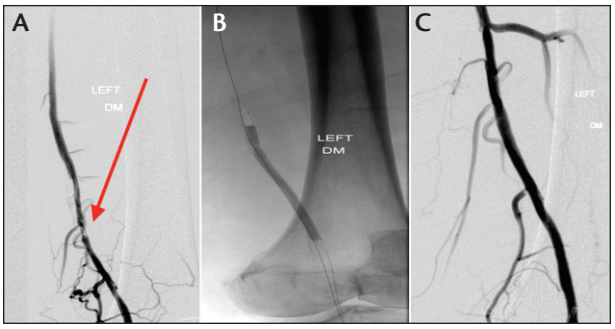

Figure 5. Stenosis of the distal SFA (A). Balloon angioplasty of distal SFA (B). Stent-like results of balloon angioplasty (C).

ment after radial interventions but can be used in the foot if the size accommodates apposition of a transradial band (Figure 6). Upon 12-week follow-up, the patient had complete healing of the heel ulcer, and the access site was also healed (Figure 7).

Figure 6. A transradial band across the access site.

Figure 7. Healing of the access site.

Case 2: Pedal Access to Revascularize a Flush Occluded Anterior Tibial Artery in a Patient With End-Stage Renal Artery Disease

A 78-year-old patient with end-stage renal disease presented with a nonhealing foot ulcer (Figure 1A). Lower extremity angiography revealed patent iliac, superficial femoral (Figure 1B), and popliteal (Figure 1C) arteries. An angiogram of the anterior tibial artery showed a flush occlusion, patent peroneal artery, and occluded posterior tibial artery (Figure 1D). An angiogram of the dorsalis pedis artery showed reconstitution via collaterals (Figure 1E). Percutaneous dorsalis pedis artery access was planned to recanalize the occluded anterior tibial artery.

Duplex ultrasound imaging of the dorsalis pedis artery was obtained, and a 4-F Micropuncture® needle was used to access the artery (Figure 2).

A 4-F Micropuncture® introducer sheath was attached to a Copilot Bleedback Control Valve (Abbott Vascular,

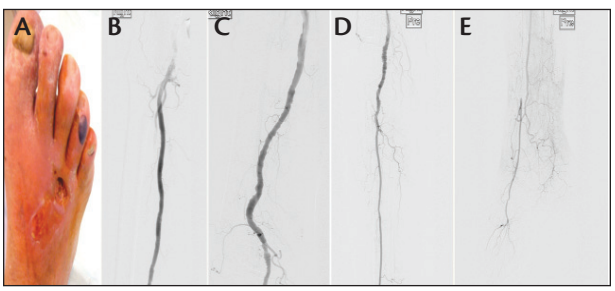

Figure 1. A nonhealing foot ulcer on presentation (A). Lower extremity angiography revealing patent iliac and superficial femoral (B) and popliteal (C) arteries. Anterior tibial artery angiography shows a flush occlusion, a patent peroneal artery, and an occluded posterior tibial artery (D). Dorsalis pedis angiography shows reconstitution via collaterals (E).

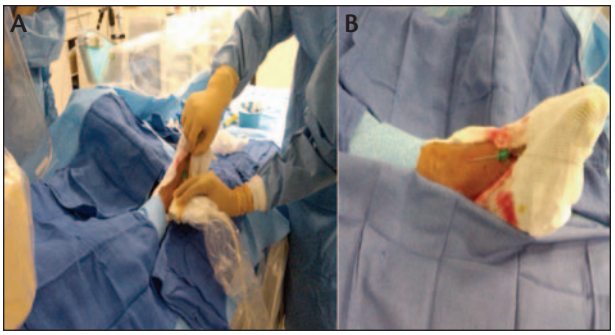

Figure 2. Dorsalis pedis artery access using ultrasound guidance (A) and a Micropuncture® needle (B).

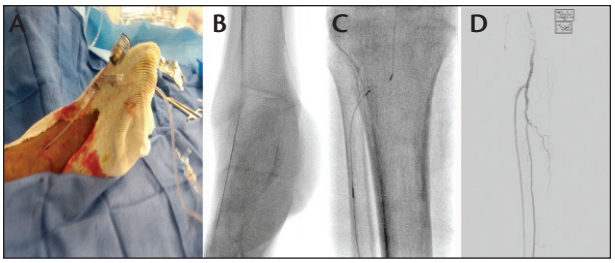

Figure 3. A 4-F Micropuncture® introducer is converted to a sheath with a Copilot valve attached (A). Wire crossing from dorsalis pedis artery (B). Wire in the popliteal artery (C). Patent anterior tibial artery (D).

Santa Clara, CA) to form a temporary sheath (Figure 3A). A 0.018-inch guidewire-compatible CXI catheter (Cook Medical) was used to cross the occluded anterior tibial artery (Figure 3B) into the popliteal artery (Figure 3C).

The wire was removed from the femoral approach, and balloon angioplasty was performed from the femoral artery to treat the occluded anterior tibial artery. The final angiogram showed a widely patent anterior tibial artery (Figure 3D). The 4-F sheath was removed from the pedal artery, and manual pressure was held.

Case 3: SFA Intervention With Dorsalis Pedis Artery Access

A 50-year-old woman with hypertension, diabetes mellitus, hypercholesterolemia, and morbid obesity presented with blue toe syndrome. Physical examination showed palpable pulse in the right femoral artery and absent pulse in the right popliteal artery, dorsalis pedis, and posterior tibial artery. Noninvasive studies showed an ABI of 0.56 in her right lower extremity. A diagnostic angiogram showed a patent right common iliac artery and external iliac artery. The right common femoral artery and popliteal artery were also patent. The SFA was patent in the proximal and mid segments but occluded in the distal segment. The proximal popliteal artery was occluded with reconstitution in the distal segment. The below-knee vessels showed single-vessel runoff via the anterior tibial artery.

The initial attempt at recanalization of the occluded SFA was made with a left femoral artery retrograde access. The wire crossing was subintimal as shown in Figure 1 and failed to reenter the true lumen. Morbid obesity precluded an ipsilateral antegrade approach.

Several options were considered, such as surgical bypass or antegrade puncture of the femoral artery. However, both of these options pose increased risks of complications such as infections and hematoma. We chose the option of pedal access. A dorsalis pedis artery cutdown was performed in the interventional suite (Figure 2). No general anesthesia was used; local anesthesia with conscious sedation was sufficient. A 5-F sheath was placed, and 3,000 intra-arterial units of heparin were administered to prevent clotting and coagulation prior to balloon angioplasty.

The occluded proximal popliteal artery and the distal SFA were crossed with a 0.014-inch wire, and balloon angioplasty was performed using a 4- X 100-mm balloon with prolonged inflation. Postangioplasty images showed a patent distal SFA with a non-flow-limiting dissection (Figure 3). Distal angiography showed patent popliteal and anterior tibial arteries. The dorsalis pedis artery access site was closed with primary sutures. The patient had resolution of her blue toe syndrome and improvement in ABI to 0.72.

CONCLUSIONS

We have discussed three cases of transpedal access to demonstrate the role of this access option in revascularization of tibiopedal vessels and the distal SFA. These cases highlight the role of percutaneous access of the pedal artery. The role of duplex ultrasound to assist pedal artery access is illustrated, and vascular access management ranging from manual pressure, transradial band, and primary surgical closure are shown. The authors hope these case examples will facilitate interventionalists' adoption of the technique of transpedal access in revascularization of tibiopedal lesions and distal femoral popliteal lesions. ■

Figure 1. Retrograde attempt of distal SFA recanalization resulted in subintimal dissection.

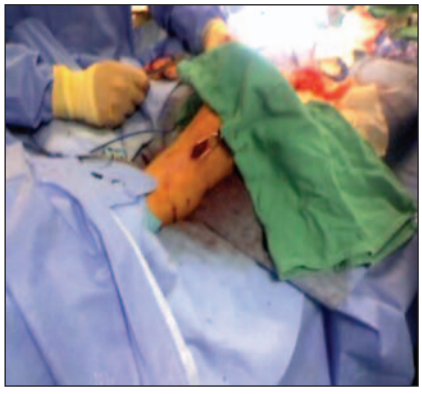

Figure 2. Surgical exposure of the dorsalis pedis artery.

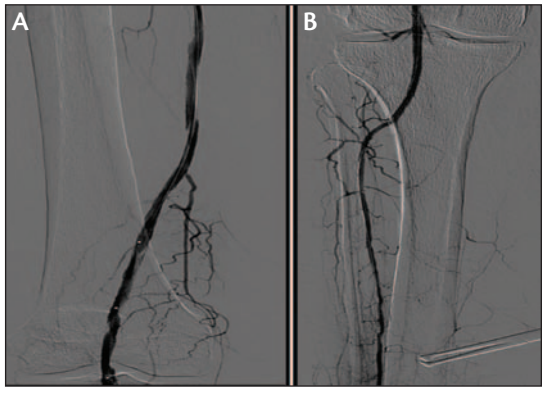

Figure 3. Distal SFA after balloon angioplasty (A). Single-vessel runoff via anterior tibial artery (B).