Lower-Extremity Plaque Excision

New technologies show potential to reduce amputation rates for atherosclerotic lower-limb ischemia.

BY PRAKASH MAKAM, MD

Lower-extremity peripheral artery disease (PAD) is common and can progress to critical limb ischemia if left untreated. The goals of endovascular intervention in patients with severe ischemic changes to the lower extremity include an improvement in symptoms of rest pain and restoration of straightline flow to the foot necessary for the treatment of ischemic ulcers or ischemic gangrene.[1] To prevent progression of ischemic damage, intervention should be undertaken expediently.

CASE STUDY

An 83-year-old woman presented to our clinic with advanced gangrene of the right great toe, Rutherford classification VI, painful ischemia, and right limb hair loss (Figure 1). She had type 2 diabetes mellitus that was controlled by oral agents. Her history was also remarkable for hypertension and dyslipidemia.

Arterial Doppler examination revealed ankle-brachial indices (ABI) of 0.57 on the right and 0.75 on the left. Pulse wave Doppler images showed a significant decrease in the pulse wave between the right popliteal and right superficial femoral arteries and the right posterior tibials and dorsalis pedis arteries, indicating significant obstructive disease distal to the popliteal artery. Less-severe obstructive disease distal to the popliteal artery was noted on the left side.

A previous angiogram obtained by her cardiologist indicated limited runoff below the knee. The patient was told that percutaneous or surgical revascularization was not possible and that she would need a below-the-knee or transmetatarsal amputation. She presented to our office for a second opinion.

Diagnostic angiography showed mild disease in the right femoral artery, moderate disease of the right popliteal artery, and a totally occluded tibioperoneal trunk. The right peroneal and posterior tibial arteries were totally occluded and showed extremely poor runoff (Figure 2A). The right anterior tibial artery was occluded proximally and reconstituted distally just below the ankle at the dorsalis pedis artery, which was the sole vessel supplying the pedal arch and most of the foot and toes (Figure 2B and C).

PROCEDURE

The procedure was performed in the right femoral artery using a 6-F sheath and an antegrade approach. Using a 1.5-mm balloon catheter support system and a .014-inch Miracle Bros. 4.5 guidewire (Asahi Intec, Nagoya, Japan), the occluded right anterior tibial artery was successfully recanalized from its origin to beyond the ankle.

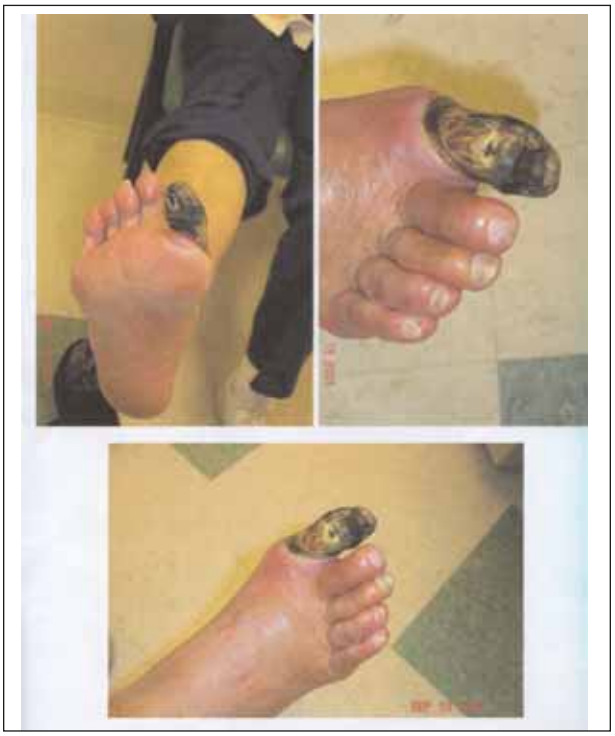

Figure 1. The right foot of an 83-year-old woman with advanced gangrene of the right great toe, Rutherford classification VI, painful ischemia, and right limb hair loss.

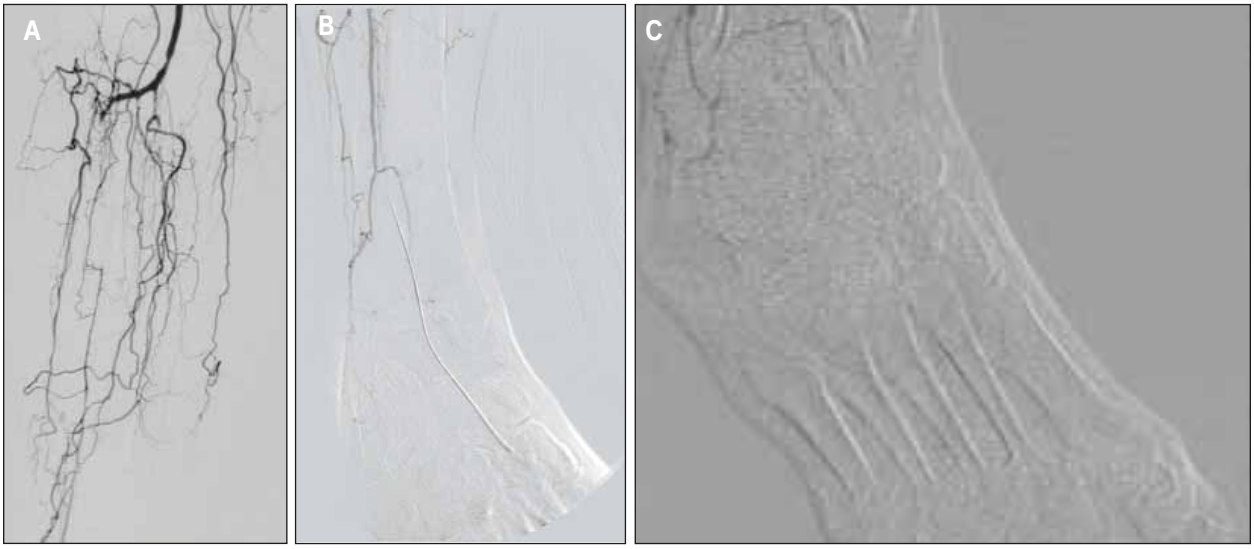

Figure 2. On diagnostic angiography, the right peroneal and posterior tibial arteries were totally occluded and showed extremely poor runoff (A). The right anterior tibial artery was occluded proximally and reconstituted distally just below the ankle at the dorsalis pedis artery, which was the sole vessel supplying the pedal arch and most of the foot and toes (B, C).

The distal portion of the right anterior tibial artery with rigid calcification was dilated with a 1.5-mm balloon catheter at 10 atm to 12 atm, followed by subsequent dilation with a 2-mm X 120-mm balloon in the very distal right anterior tibial artery at the level of the ankle. The balloon was dilated to approximately 6 atm to 7 atm.

With use of the SilverHawk ES Plaque Excision Catheter (FoxHollow Technologies, Redwood City, CA), significant amounts of atherosclerotic material were excised from the entire proximal, mid, and distal right anterior tibial artery. Multiple cutting passes were made.

RESULTS

Follow-up angiography revealed an excellent angiographic result, with a patent right anterior tibial artery with minimal residual disease and brisk distal flow to the dorsalis pedis artery and into the foot and toes—a dramatic improvement compared to preintervention (Figure 3A-C).

Due to the extent of her ischemic damage, the patient still required amputation, but only of her right first toe, not of her lower leg. She had complete resolution of her pain within 1 week of the SilverHawk intervention. At 2-month follow-up, the patient was asymptomatic with a completely healed anterior right big toe amputation site (Figure 4). Her ABI on the right side was 1.12.

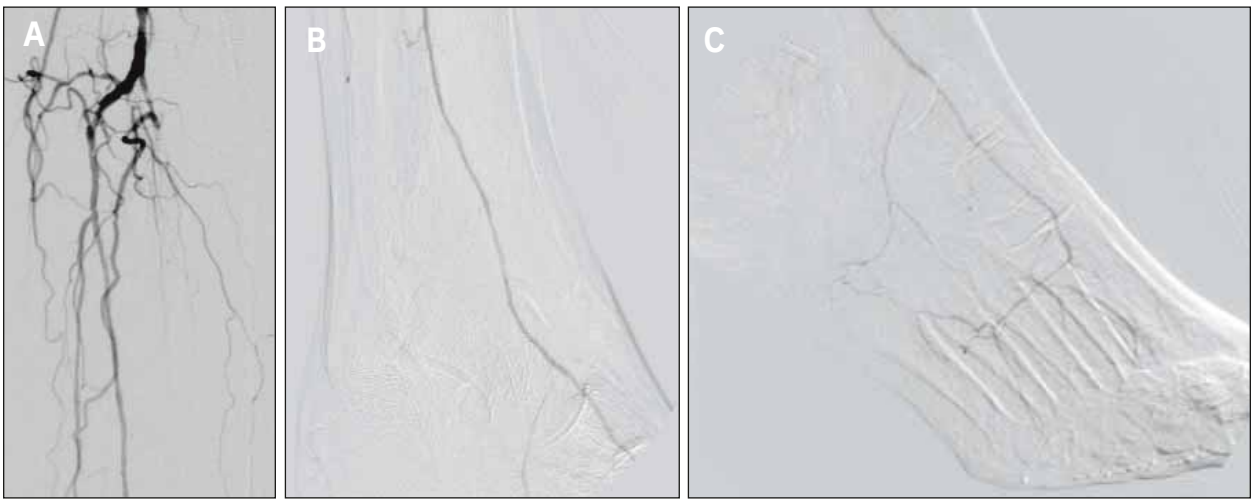

Figure 3. Follow-up angiography revealed a dramatic improvement compared to preintervention, with a patent right anterior tibial artery (A) with minimal residual disease and brisk distal flow to the dorsalis pedis artery and into the foot (B) and toes (C).

Figure 4. Because of the extent of her ischemic damage, the patient still required an amputation of her right first toe. At 2-month follow-up, the patient's amputation site was well-healed, and she was completely asymptomatic. Her right ABI was 1.12.

DISCUSSION

With amputation rates (both below and above the knee) continuing to rise, there is a real need for safe and effective therapies for atherosclerotic lower-extremity ischemia. The SilverHawk plaque excision device represents a novel and exciting alternative. SilverHawk intervention can effectively and safely be used to recanalize small arteries in the lower leg and foot. Without it, I believe this patient would have had no alternative but to undergo a more substantial amputation of her right foot.

The transmetatarsal amputation is more disabling than simple toe amputation, the loss of push-off in the absence of a positive fulcrum in the ball of the foot being chiefly responsible for gait impairment. The goal of endovascular therapy in limb-threatening ischemia is to preserve tissue and/or to make the level of the amputation lower. With additional techniques and devices, it is possible to accomplish this goal, as illustrated in this case. However, there continues to be a critical need for educating the patients and orthopedic surgeons as to the increasing appeal of endovascular intervention in this situation. ■

Prakash Makam, MD, is Director of Cardiovascular Research at Community Health Care System in Munster, Indiana. He has disclosed that he is a stockholder in FoxHollow Technologies and an investigator in the TALON registry. Dr. Makam may be reached at (219) 934-4200; pmakam@canwi.com.

1. Hirsch AT, Haskal ZJ, Hertzer NR, et al. ACC/AHA guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): executive summary. J Am Col Cardiol. In press.