Approaches to Treating Challenging Iliofemoral Lesions

Interventionists must be prepared to handle access difficulties and procedural complications.

BY ARAVINDA NANJUNDAPPA, MD, RVT; STEVEN C. POWELL, MD; MICHAEL STONER, MD; SANGEETA MANDAPAKA, MD; JEFFREY H. FREIHAGE, MD; AND ROBERT S. DIETER, MD, RVT

Percutaneous transluminal angioplasty (PTA) of the superficial femoral artery (SFA) was first pursued by Dr. Charles Dotter in 1964.[1] Since then, PTA of the SFA and nearby vessels has evolved significantly. The percutaneous revascularization options include balloon angioplasty, atherectomy, and stenting.[2] The most common approach to PTA of the SFA is the contralateral retrograde approach.[3] The primary advantages of this technique are ease of arterial access and vascular access management. Long-segment occlusions can also be alternatively approached with antegrade common femoral artery access.[4] The antegrade approach can be cumbersome, both to obtain vascular access and achieve vascular closure in obese patients.

SFA recanalization in difficult cases can also be performed with popliteal artery access[5] and pedal artery access.[6-7] Advantages of such approaches include higher success rates due to the soft fibrous cap noted at the lower end of the SFA occlusions. The disadvantages include a significant learning curve for the novice operator and difficult vascular access management. This article presents four challenging iliofemoral cases; the first two involve creative access approaches, and the latter two describe instances of complications management.

POPLITEAL ARTERY ACCESS FOR PTA OF THE SFA

A 62-year-old man with a history of hypertension, diabetes mellitus, tobacco use, and hypercholesterolemia presented with right leg claudication (Fontaine class IIb) despite cilostazol and aspirin usage as well as exercise therapy. The baseline ankle-brachial index (ABI) was 0.6 in the right leg. The angiogram showed a right distal SFA occlusion and reconstitution of the popliteal artery (Figure 1). An initial attempt at a community hospital to cross distal SFA occlusion in a retrograde fashion failed.

After 2 weeks, popliteal artery access was attempted. The patient was placed in a supine position, and the right leg

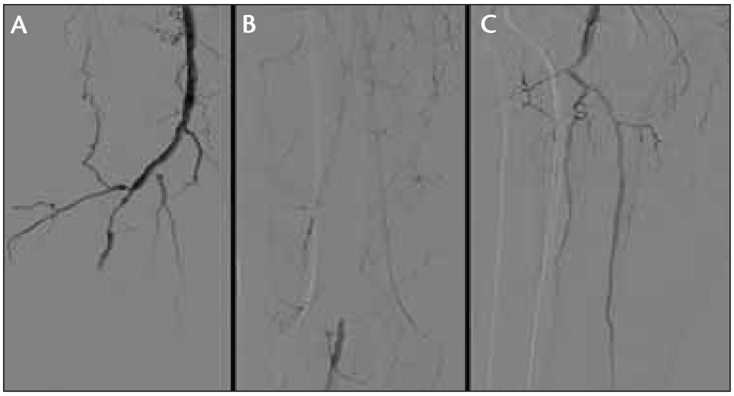

Figure 1. Baseline angiogram. The occluded distal SFA (A). The reconstituted popliteal artery (B). Two-vessel runoff (C).

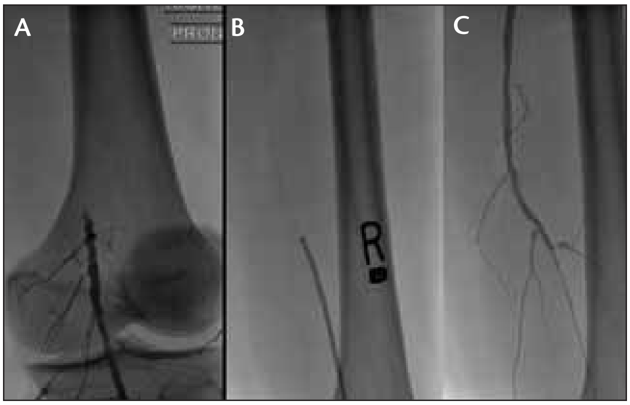

Figure 2. Popliteal access and balloon PTA. A 4-F sheath in the right popliteal artery (A). A balloon angioplasty using a 5- X 60-mm Sterling balloon (B). Post-PTA results (C).

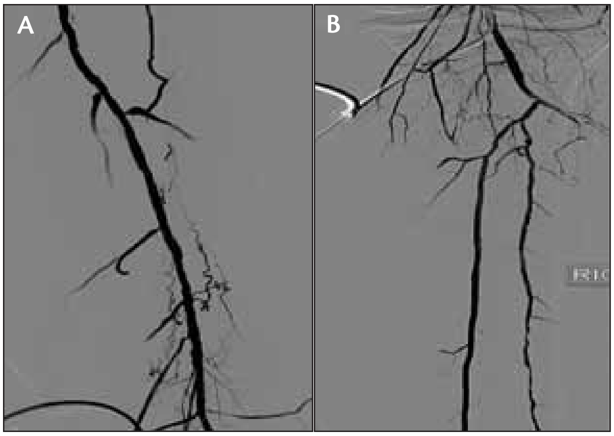

Figure 3. Final angiogram. Patent SFA (A). Two-vessel runoff (B).

was identified for popliteal artery access. The skin over the right popliteal artery area was anesthetized with 1% lidocaine. The right popliteal artery was cleaned and prepared in a sterile fashion, and was then imaged with a surface ultrasound probe, which identified the popliteal artery. The right popliteal artery was accessed with a 5-F micropuncture needle (Cook Medical, Bloomington, IN) and a 4-F sheath was placed. Intravenous unfractionated heparin was administered according to the patient's body weight. An 0.018-inch, V18 control wire (Boston Scientific Corporation, Natick, MA) was used with a 4-F Glide catheter (Terumo Interventional Systems, Somerset, NJ) to successfully cross the occluded distal SFA. The occluded SFA was treated with a 5- X 60-mm Sterling balloon (Boston Scientific Corporation). Two prolonged inflations of 2 minutes each resulted in reduction of 100% occlusion to less than 30% residual lesion without any flow-limiting dissection (Figures 2 and 3). The 4-F sheath was removed and manual compression was held.

DORSALIS PEDIS ARTERY ACCESS TO REVASCULARIZE AN OCCLUDED SFA

A 50-year-old female with a history of hypertension, diabetes mellitus, hypercholesterolemia, and morbid obesity presented with a nonhealing ulcer on her right toe. The patient's ABI was noted to be 0.56 in the right leg. Morbid obesity precluded the approach of antegrade access. A baseline angiogram of the lower extremities showed a patent bilateral iliac artery and a total occlusion of SFA in the distal segment (Figure 4). Retrograde canalization proved to be difficult due to a collateral noted at the site of total occlusion. A subintimal passage of the wire resulted in inability to recanalize into the true lumen.

A hybrid approach was used in this case with the assistance of vascular surgery. A surgical cutdown was performed in the endovascular suite to expose the right dorsalis pedis artery. A 5-F sheath was placed via the dorsalis pedis artery into the distal anterior tibial artery (Figure 5). Intravenous heparin was administered according to weight for anticoagulation. A 5-F Quick-Cross catheter (Spectranetics Corporation, Colorado Springs, CO) for support and an 0.018-inch V18 control wire (Boston Scientific Corporation) were used successfully to cross the occluded distal SFA. The occluded SFA was treated with 5- X 100-mm Sterling balloon inflation (Boston Scientific Corporation). The 100% occlusion was reduced to less than

Figure 4. The distal right SFA occluded and retrograde attempt shows a wire in the false lumen.

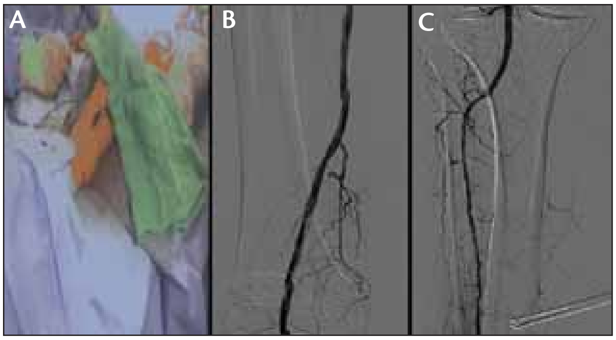

Figure 5. Balloon PTA from pedal access. Pedal access (A), post-PTA (B), and one-vessel runoff (C).

30% residual lesion without any flow-limiting dissection. The 5-F sheath was removed and dorsalis pedis arterial cutdown was closed surgically by a vascular surgeon. This case demonstrates the quintessential need for a combined multispecialty approach to treat complex vascular cases.

TREATMENT OF COMPLEX ILIAC DISSECTION WITH PERFORATION

A 76-year-old man presented with a history of coronary artery disease (status postsurgical revascularization), congestive heart failure (ejection fraction 40%), diabetes, renal insufficiency, deep venous thrombosis, and right lower extremity critical limb ischemia (CLI). During the evaluation of his CLI, it was noted that his right ABI was 0.36. Duplex evaluation revealed an occluded SFA, and computed tomographic (CT) angiogram demonstrated a heavily calcified SFA. Due to his multiple comorbidities, an endovascular approach to his CLI was attempted.

A contralateral approach was taken to approach the right SFA. During the placement of the crossover sheath, the dilator became disconnected from the sheath. Thus, the sheath was advanced through the right iliac system without the dilator. The first angiogram after placement of the sheath showed a complex external iliac and common femoral dissection (Figures 6 and 7). A wire was immediately placed at the distal edge of the sheath, and the sheath was backed out. An angiogram now demonstrated a perforation (Figure 8). An angioplasty balloon was placed immediately outside the sheath (Figure 8). In the event that the patient became hypotensive, this balloon could be immediately inflated in order to occlude arterial inflow. Through this balloon, the dissection was wired, and a covered stent was placed to exclude the perforation. A second stent was placed to cover the dissection while preserving hypogastric flow (Figure 9).

This case highlights several important points. Foremost, at all times, the interventionist must be cognizant of not advancing sheaths without appropriate dilators. Secondly, I now make it a practice to advance the crossover wire more distally, and I always take an angiogram before removing the stiff wire that was used to get the crossover sheath in place. Ideally, if there were a dissection, the wire would already be in the true lumen, and treatment could be much easier and more rapid. Finally, it is of utmost importance to have a backup plan. Without having covered stents available, this patient likely would have required surgical intervention.

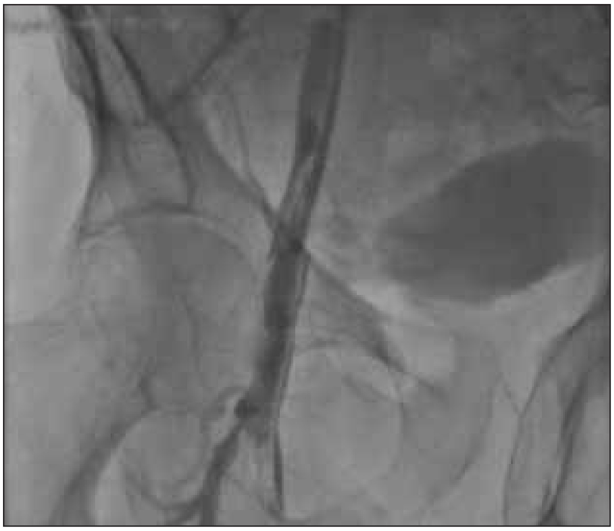

Figure 6. An angiogram demonstrates extensive external iliac and common femoral artery dissection.

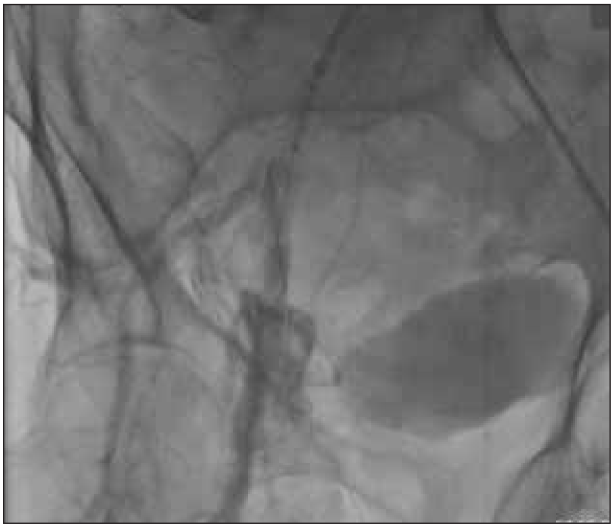

Figure 7. An angiogram demonstrates dye extravasation from the external iliac artery.

TREATMENT OF HEAVILY CALCIFIED ILIAC LESION

A 79-year-old woman presented with CLI of her right leg. She had a history of dialysis-dependent renal failure,

Figure 8. As a precaution, an angioplasty balloon was placed in case the patient became unstable and required occlusion of the iliac inflow. The dissection was wired with the balloon in place.

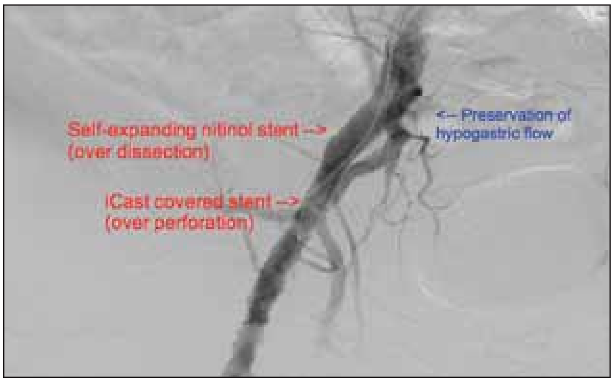

Figure 9. A final angiogram after the iCast covered stent (Atrium Medical Corporation, Hudson, NH) and self-expanding stent placement.

diabetes, hypertension, coronary artery disease, and dyslipidemia. She had already undergone a left below-the-knee amputation for gangrene prior to presenting to us. Her ABIs were noncompressible.

At the time of angiography, a right common iliac artery lesion was identified. A pressure gradient of 60 mm Hg was found across this lesion (Figure 10). The decision was made to treat her inflow lesion first. A 6-mm angioplasty balloon was initially used with significant waist, which eventually gave way at high pressures (Figure 11). An 8- X 29-mm balloon-expandable stent was then placed again with the same waist in the balloon (Figure 12). Due to her porcelain aorta and heavily calcified iliacs, an angiogram was performed with the balloon in place. This was done because if there was a perforation, the balloon could be immediately reinflated to tamponade the leak. Angiography showed a dissection involving the intima, which appeared to be pulsatile; the patient complained of back pain as well. Despite prolonged inflations, there was no resolution of the dissection. At this time, two covered stents were placed to seal the dissection/impending perforation (Figure 13). The patient's pain resolved. A computed tomographic scan the next day demonstrated no evidence of dye extravasation, pseudoaneurysm, or dissection.

This final case highlights the importance of approaching heavily calcified iliac lesions with caution. The angioplasty balloon was intentionally left in place in the event there was a perforation. Furthermore, as in the previous case, this highlights the importance of having backup in case there is a significant complication, particularly in noncompressible areas.

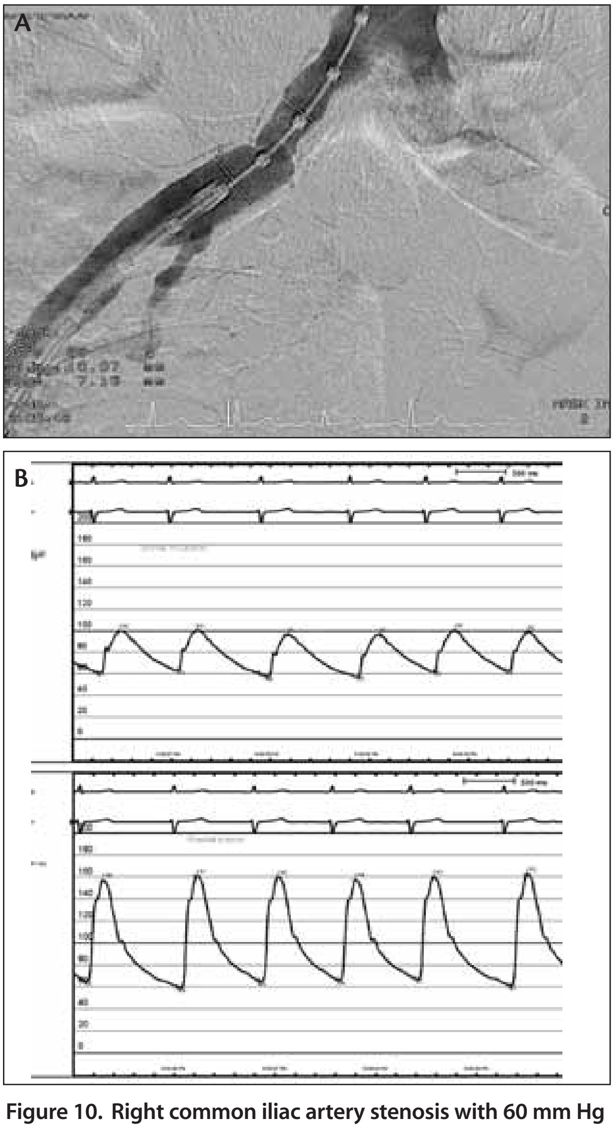

Figure 10. Right common iliac artery stenosis with 60 mm Hg gradient (A). Pressure tracing of the angiogram (B).

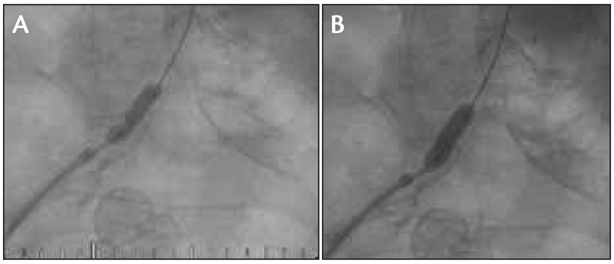

Figure 11. A predilation with a 6-mm balloon.

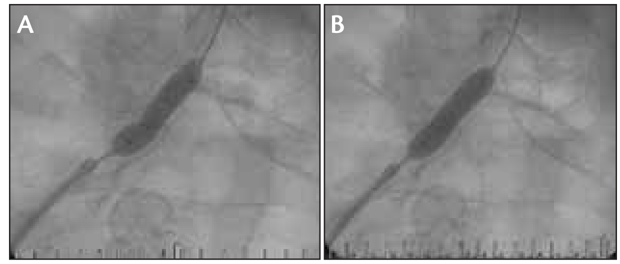

Figure 12. Placement of an 8- X 29-mm balloon-expandable stent.

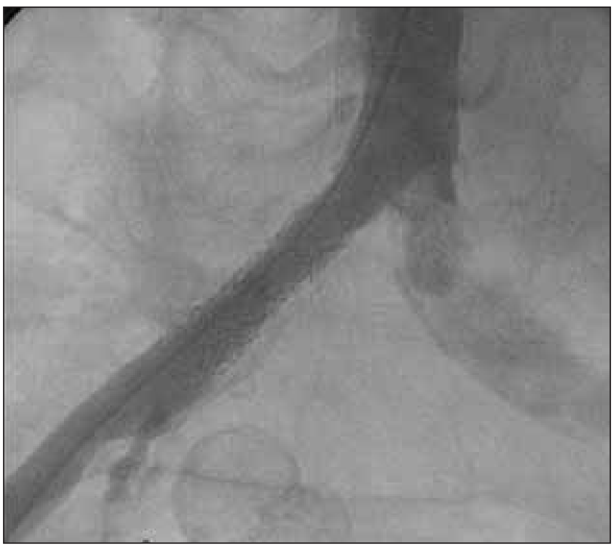

Figure 13. Final angiogram after covered stent placement.

CONCLUSION

Iliofemoral interventions should be reserved for patients with severe lifestyle-limiting claudication, rest pain, or CLI. Percutaneous SFA interventions are less invasive than surgical options and can be considered as a first-line approach. Adjuvant risk factor reductions for all percutaneous vascular interventions are beneficial to reduce the comorbidities of peripheral arterial disease.[8]

These four cases demonstrate several of the difficulties an interventionist can encounter, from challenging access to complications management. Effective peripheral arterial disease management involves a combined multispecialty approach with a firm understanding of current device platforms, strategies, and bailout systems for salvaging potentially catastrophic situations. ■

Aravinda Nanjundappa, MD, RVT, is Associate Professor of Medicine and Surgery at West Virginia University in Charleston, West Virginia. He has disclosed that he holds no interest financial in any product or manufacturer mentioned herein. Dr. Nanjundappa may be reached at (304) 347-1371; dappamd@yahoo.com.

Steven C. Powell, MD, is Professor and Chief of Vascular Surgery for East Carolina Heart Institute at East Carolina University in Greenville, North Carolina. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Powell may be reached at (252) 744-1207; powellcs@ecu.edu.

Michael Stoner, MD, is Assistant Professor of Vascular Surgery for the East Carolina Heart Institute at East Carolina University, in Greenville, North Carolina. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Stoner may be reached at (252) 744-1207; stonerm@ecu.edu.

Sangeeta Mandapaka, MD, is a cardiology fellow in the East Carolina Heart Institute at East Carolina University in Greenville, North Carolina. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Mandapaka may be reached at (252) 744-1429; mandapakas@ecu.edu.

Jeffrey H. Freihage, MD, is with Loyola University Medical Center in Maywood, Illinois. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Freihage may be reached at jfreih&lumc.edu.

Robert S. Dieter, MD, RVT, is Assistant Professor of medicine at the Loyola University Stritch School of Medicine in Maywood, Illinois. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Dieter may be reached at (708) 216-9000; rdieter@lumc.edu.

1. Mueller RL, Sanborn TA. The history of interventional cardiology: cardiac catheterization, angioplasty, and related interventions. Am Heart J. 1995;129:146-172.
2. Wiesinger B, Heller S, Schmehl J, et al. Percutaneous vascular interventions in the superficial femoral artery: a review. Minerva Cardioangiol. 2006;54:83-93.
3. Nice C, Timmons G, Bartholemew P, et al. Retrograde vs. antegrade puncture for infra-inguinal angioplasty. Cardiovasc Interv Radiol. 2003;26:370-374.
4. Marcus AJ, Lotzof K, Howard A. Access to the superficial femoral artery in the presence of a "hostile groin": a prospective study. Cardiovasc Intervent Radiol. 2007;30:351-354.
5. Saha S, Gibson M, Magee TR, et al. Early results of retrograde transpopliteal angioplasty of iliofemoral lesions. Cardiovasc Intervent Radiol. 2001;24:378-382. Epub 2001 Oct 17.
6. Iyer SS, Dorros G, Zaitoun R, et al. Retrograde recanalization of an occluded posterior tibial artery using a posterior tibial artery cut down: two case reports. Cathet Cardiovasc Diagn. 1990:20:251-253.
7. Botti CF, Ansel GM. Percutaneous retrograde tibial access in limb salvage. J Endovascular therapeutics. 2003;10:614-618.
8. Sethi A, Arora RR. Medical management and cardiovascular risk reduction in peripheral arterial disease. Exp Clin Cardiol. 2008;13:113-119.