SFA Revascularization Using the Viabahn Endoprosthesis

Technical considerations from a challenging case.

BY RICHARD D. COATS, MD; JOHN G. ADAMS, JR, MD; AND PAUL W. HUMPHREY, MD

CASE PRESENTATION

A 49-year-old woman was referred to us for symptoms consistent with short-distance claudication involving the left lower extremity. As a respiratory therapist working 12-hour shifts, she ambulated a great deal throughout the day. During the past year, she had experienced cramping and an "achey" type of pain in her left calf after walking approximately 50 feet. This pain was reproducible and was relieved after resting for a few minutes. In the past 2 months, her symptoms had worsened and significantly affected her ability to work. She was initially evaluated by her primary care physician and then referred for further evaluation and treatment.

Upon our evaluation, it was noted that she smoked one pack of cigarettes per day, had a history of hypertension, diabetes mellitus, and hypercholesterolemia. She denied symptoms consistent with rest pain or tissue loss. Pertinent physical examination findings revealed 2+ femoral pulses, 2+ right popliteal, and 1+ right dorsalis pedis and posterior tibial pulses. The left popliteal, posterior tibial, and dorsalis pedis were not palpable. There was no evidence of ulceration, acute ischemia, or limb-threatening ischemia.

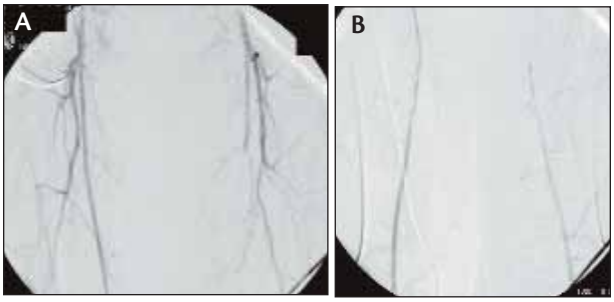

Figure 1. The SFA was occluded 8 cm from the origin with reconstitution in the distal SFA.

How Would You Proceed?

- What is the most likely cause of this patient's leg pain?
- What is the next procedural step that should be initiated?
- Is there a medical treatment option for this patient?
- Should this patient initially be managed medically or surgically?

CLINICAL COURSE

Ankle-brachial indices were obtained for symptoms consistent with left lower-extremity claudication and revealed indices of 0.9 on the right, with biphasic waveforms, and 0.6 on the left, with monophasic waveforms.

Conservative therapy was initiated, including smoking cessation counseling, daily ASA, cilostazol therapy, and description of a walking regimen. Her diabetes mellitus, hypertension, and hypercholesterolemia were well managed by her primary care physician.

The patient was re-evaluated 3 months later. She continued to smoke, and she had realized no improvement in her symptoms. She felt that the pain was significantly affecting her ability to work and requested further treatment.

After discussing the various options with the patient, an abdominal aortogram with runoff was obtained through a right groin puncture. No significant aortoiliac disease was observed. There was a complete occlusion of the left superficial femoral artery (SFA) with a patent popliteal artery and three-vessel runoff (Figure 1). A Glidewire (Terumo Medical Corporation, Somerset, NJ) and a crossover catheter were

used to select the left iliac system. The crossover catheter was exchanged for a Bernstein catheter (AngioDynamics, Queensbury, NY), which was advanced into the proximal SFA (Figure 2). The Glidewire was exchanged for an Amplatz (Cook Incorporated, Bloomington, IN) wire. The catheter and sheath were removed, and a 55-cm 5-F Raabe sheath (Cook Incorporated) was advanced over the iliac bifurcation to the distal external iliac artery (EIA). A multipurpose catheter (MPA, Cordis Corporation, a Johnson & Johnson company, Miami, FL) and a Glidewire were then used to cross the chronic total occlusion of the SFA.

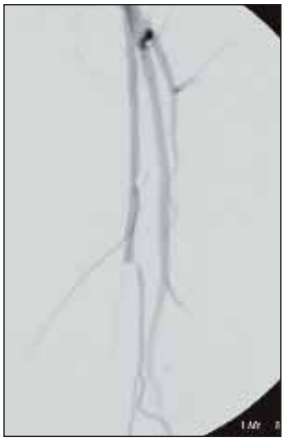

Figure 2. Selective angiogram of the proximal SFA; once contralateral catheterization is achieved and an Amplatz or Jindo wire is placed over the aortic bifurcation to allow passage of a long sheath.

Re-entry into the lumen was confirmed with an angiogram (Figure 3). The Amplatz wire was passed through the catheter, across the lesion, and the catheter and 5-F sheath were removed. An 8-F Pinnacle Destination (Terumo Medical Corporation) sheath was advanced over the wire so that the distal tip was in the EIA. A 5-mm X 8-cm balloon was passed over the wire and used to angioplasty the chronic total occlusion to prepare the artery. A 6-mm X 15-cm Viabahn stent graft (Gore & Associates, Flagstaff, AZ) was passed into the SFA and deployed just proximal to a large collateral in the distal SFA. An additional 6-mm X 10-cm Viabahn stent graft was placed more proximally with approximately 1 cm of overlap into the first stent. A 6-mm X 8-cm angioplasty balloon was used to dilate the stents. There was a residual stenosis distal to the stent graft adjacent to a large collateral. A 6-mm X 4-cm Cryoplasty balloon (Boston Scientific Corporation, Natick, MA) was used to treat this area and thus preserve this collateral.

OUTCOME

A final angiogram revealed revascularization of the SFA (Figure 4) and good runoff to the foot. At the completion of the procedure, the patient had a palpable dorsalis pedis and posterior tibial pulse. The patient was given 300 mg of clopidogrel in the recovery area and then 75 mg by mouth daily for 1 month. The patient's claudication symptoms resolved, and a follow-up ankle-brachial index was 0.92 on the left.

DISCUSSION

Revascularization of a chronic total occlusion of the SFA is a relatively straightforward procedure.[1] Before the operation, we discuss with the patients the possibility of performing an intervention at the time of the diagnostic procedure if there is an amenable lesion. We perform most of the procedures from a contralateral, retrograde approach but, in select cases, we use an antegrade access. The contralateral approach is easier ergonomically, and we have not found a problem with pushability. Also, unlike the antegrade approach, it does not compromise flow at the end of the procedure if the femoral artery is compressed. Full heparinization is used for all interventions, and we do not upsize the sheath until the lesion is crossed. The tip of the sheath is placed in the distal EIA. If it is advanced too far, it can obturate the vessel and cause an acute occlusion of the common femoral artery or the SFA before or after stent placement. This occurred in three of our previous cases in which the distal tip of the sheath was placed in the proximal SFA.

Crossing the lesion is often the most technically challenging part of the case. Flush occlusions of the SFA with the profunda femoris artery are the most difficult and often require an alternative approach. These may include popliteal artery or even tibial artery access. These approaches have been well described elsewhere.[2] Re-entry remains another challenging aspect of the case. We tend to use an MPA catheter and either a Glidewire or Jindo (Cordis Corporation) wire for re-entry. If these measures fail, we use the Outback Re-entry catheter (Cordis Corporation) and have found it helpful on difficult lesions. Once the lesion is

Figure 3. A multipurpose catheter in the distal SFA confirmed successful crossing of the chronic total occlusion. Once the lesion is crossed, the sheath is then upsized appropriately.

crossed, the occluded segment is prepared with an angioplasty balloon prior to positioning the Viabahn stent graft, which allows easier passage of the stent graft and avoids damage to the stent or inaccurate deployment. The graft itself is deployed over a stiff wire such as an Amplatz or Jindo wire, which avoids the phenomena of the graft "jumping." Also, it can be difficult to deploy the graft over a floppy wire because it will tend to bunch up with deployment.

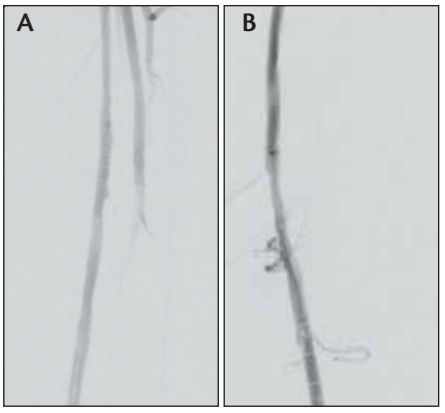

Figure 4. The completion angiogram revealed a widely patent SFA.

We try not to cover large collaterals with the endoprosthesis. We hope that this will avoid acute ischemia in the limb if the stent acutely occludes later by preserving flow through these collaterals. We believe this is the main reason we have had no patients return with acute ischemia even in those rare patients who return with occlusion of their stent graft. We use adjunctive procedures to preserve these collaterals such as Cryoplasty, SilverHawk atherectomy (FoxHollow Technologies, Redwood City, CA), and cutting-balloon angioplasty (Boston Scientific Corporation).

We chose to perform endoluminal bypass in this patient because of her relatively young age. Open surgical bypasses have a limited life expectancy even with vein graft placement[3,4] and, because this patient was only 49 years old, it is doubtful that an open bypass would last her lifetime. Using endoluminal revascularization techniques may delay the need for a bypass for several years and possibly avoid it altogether. Endoluminal bypass can be performed with markedly reduced morbidity and mortality compared to open revascularization.[5] Additionally, open revascularization options are not jeopardized by these endoluminal techniques. In the past, open bypass was reserved for patients with rest pain, tissue loss, or limb-threatening ischemia. With minimally invasive techniques, we are more willing to treat patients who have claudication because of the lower morbidity and mortality rates.[6]

OVERALL CLINICAL EXPERIENCES

We have had excellent success using these techniques. From July 2004 to March 2006, 83 endoluminal bypasses were performed in 63 patients. Debilitating claudication was the indication for intervention in 62% of patients; rest pain and/or tissue loss was the indication in 38%. Endoprostheses were placed in the SFA in the majority of procedures (69) followed by the popliteal artery (eight) and other (six). Chronic total occlusions were encountered in 39 (47%) procedures. Seven (8.4%) complications occurred: four (4.8%) were minor, and three (3.6%) were major. The minor complications consisted of three dissections and one perforation, none of which were believed to be significant. The major complications were three episodes of thrombosis at the time of endoprosthesis insertion, two required thrombolysis, and one required open revascularization. Follow-up ranged from 1 to 20 months (mean, 12 months). There were nine endoprothesis occlusions detected during the first year of surveillance yielding a primary patency rate of 89%. There were no postoperative deaths.

CONCLUSION

Endoluminal revascularization of femoropopliteal disease is a relatively straightforward procedure that is associated with technical challenges. Technical points include the contralateral approach with the tip of the sheath positioned in the EIA, crossing the lesion, prepping the artery, deployment over a stiff wire, and avoidance of covering large collaterals. Adjunctive procedures are often used to preserve collateral flow. Technical success rates are high with this procedure, and 1- and 2-year patency rates are acceptable. It is an attractive alternative to open bypass in select patients. ■

Richard D. Coats, MD, is from Columbia Surgical Associates, Columbia, Missouri. He has disclosed that he is a paid consultant for Gore & Associates and Boston Scientific Corporation. He may be reached at (573) 443-8773; rcoats@columbiasurgical.com.

John G. Adams, Jr, MD, is from Columbia Surgical Associates, Columbia, Missouri. He has disclosed that he is a paid consultant for Gore & Associates and Boston Scientific Corporation. Dr. Adams may be reached at (573) 443-8773; jgadamsjrcsa@aol.com.

Paul W. Humphrey, MD, is from Columbia Surgical Associates, Columbia, Missouri. He has disclosed that he is a paid consultant for Gore & Associates and Boston Scientific Corporation. Dr. Humpherey may be reached at (573) 443-8773; forepable@aol.com.

1. Capek P, Mclean GK, Berkowitz HD. Femoropopliteal angioplasty: factors influencing long-term success. Circulation. 1991;83(Suppl): I70-I80.
2. Younan, SK, Cohen DC. Direct tibial artery access: a new approach to challenging CTOs. Endovasc Today. 2006;5:89-92.
3. Taylor LM, Edwards JM. Present status of reversed vein bypass grafting: 5-year results of a modern series. J Vasc Surg. 1990;11:193.
4. Bergamini TM, Townsend, JB, Bandyk DF, et al. Experience with in situ saphenous vein bypasses during 1981-1989; determinant factors of long-term patency. J Vasc Surg. 1991;13:137.
5. Brossman BJ, Kiel SH, Jahnke T, et al. 3-year patency after implantation of PTFE stent-grafts for the treatment of femoropopliteal occlusive disease. J Vasc Interv Radiol. 2003;14:Part2:S79.
6. Saxon RR, Coffman JM, Gooding JM, et al. Long-term results of ePTFE stent-graft versus angioplasty in the femoropopliteal artery: single center experience from a prospective randomized trial. J Vasc Interv Radiol. 2003;14:303.