Treating the Superficial Femoral Artery

A combination of mechanical thrombectomy and stent placement is used to successfully treat a critical stenosis of the SFA.

BY MAURICE BUCHBINDER, MD, AND JULIE LOGAN, RN

CASE PRESENTATION

A 73-year-old woman with a history of hypertension, a 50 pack-year history of smoking, thyroid dysfunction, and peripheral vascular disease (PVD) with previous PTA and stenting of the left superficial femoral artery (SFA) in February 2000 (6-mm X 60-mm SMART and 7-mm X 20-mm SMART [Cordis Corporation, a Johnson & Johnson company, Miami, FL]), presented with recurrent (left leg) claudication. The patient denied any history of coronary artery disease or diabetes mellitus.

PHYSICAL EXAMINATION

Physical examination of the patient's lower extremity revealed a significant decrease in pulses in both the popliteal and posterior tibial arteries. The patient's ankle/brachial measurements were 0.61 (left) and 1.0 (right). Given her known history of PVD, recurrent claudication, and diminished pulses, an elective abdominal aortic angiogram with bilateral selective runoff was scheduled.

ANGIOGRAPHIC FINDINGS

Angiographic findings revealed widely patent left common iliac, external iliac, and common femoral arteries. The common femoral artery divided into what appeared to be an occluded profunda with dye staining in a critical stenosis of the SFA at the inlet of the previously placed stent. The stents themselves appeared to have significant intimal hyperplasia with total occlusion in the midsegment. Distal flow to the popliteal appeared to originate from antegrade bridge collaterals. The popliteal artery was diffusely irregular yet patent and gave rise to extremely diseased trifurcation vessels with high-grade lesions in the anterior and posterior tibial arteries and diffusely irregular small peroneal artery (Figures 1, 2, and 3).

HOW WOULD YOU PROCEED?

1. Thrombolysis (overnight urokinase/tPA)
2. Percutaneous revascularization using balloon angioplasty and/or stenting
3. Percutaneous mechanical thrombectomy device, fol-

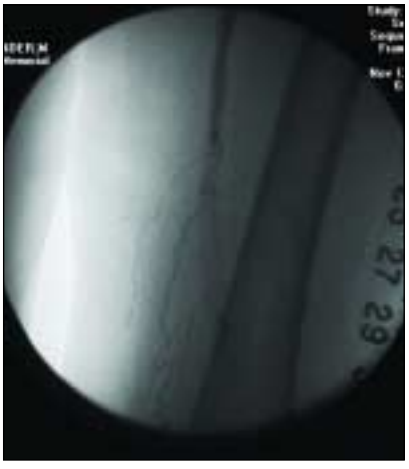

Figure 1. An angiogram of the mid-distal left SFA.

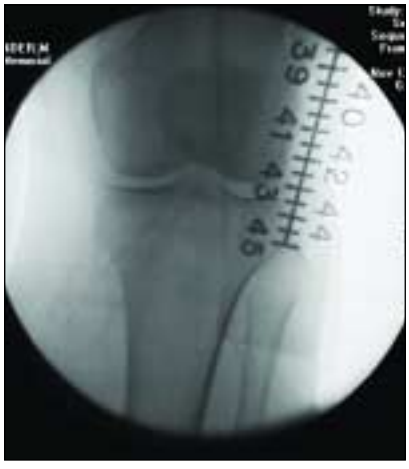

Figure 2. An angiogram depicting the left popliteal and below-the-knee runoff.

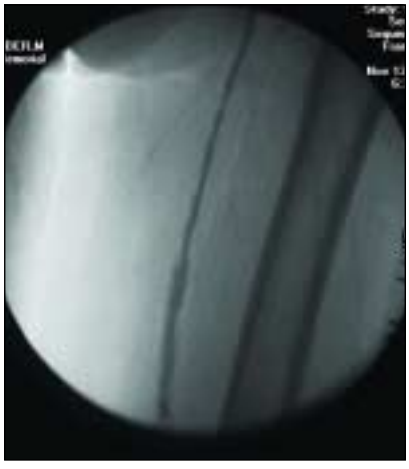

Figure 3. An angiogram of the preprocedural proximal SFA.

lowed by angioplasty and/or stenting
4. Surgical bypass
5. Continued medical therapy (ASA, clopidogrel, cilastozol)
6. Intravascular brachytherapy

COURSE OF ACTION

Given the patient's severe symptomatology and what appeared to be a limb-threatening situation, it was decided to proceed with percutaneous thrombectomy and revascularization of the SFA. Using the crossover technique, a 7-F Arrow sheath (Arrow International Inc., Reading, PA) was placed around the iliac bifurcation. A Terumo wire (Terumo Medical Corporation, Ann Arbor, MI) supported by a 5-F vertebral catheter was maneuvered across the occluded segment and positioned in the popliteal artery (below the knee). After confirming wire position, the vertebral catheter was advanced allowing for the exchange of the initial Terumo wire in favor of a 0.018-inch Roadrunner wire (Cook Incorporated, Bloomington, IN). With the Roadrunner wire in position near the origin of the anterior tibial vessel, the vertebral catheter was removed and a Thrombex PMT (percutaneous mechanical thrombectomy device; Edwards Lifesciences, Irvine, CA) was advanced through the 7-F sheath all the way down the SFA (Figure 4). Pull-back activation with several runs from the popliteal back into the SFA was performed in an attempt to aspirate possible thrombotic material within the area of occlusion (yield, 50 mL).

After successful completion of the "thrombus aspiration," repeat injection via the antegrade subselective sheath revealed significant improvement in flow, both in the SFA and in the popliteal artery and beyond.

With the thromboaspiration procedure completed, the vertebral catheter was placed once again, allowing for the removal of the 0.018-inch Roadrunner wire in favor of a 0.035-inch Rosen exchange wire (Cook Incorporated). With the exchange wire in position, multiple dilatations with a 6-mm X 40-mm Powerflex balloon (Cordis Corporation) were performed. Ultimately, a 6-mm X 80-mm SMART stent was placed in the distal SFA and the popliteal above the knee. A second 6-mm X 80-mm SMART stent was placed proximally in the otherwise unstented segment at the inlet of the SFA, straddling the previously placed stent. Both stents were dilated with a 6-mm X 10-cm Powerflex balloon at high pressure.

At the conclusion of the stent implantation and high-pressure dilatation, repeat injection revealed significant improvement, with less than 20% residual luminal restriction in the previously subtotally occluded segment (Figure 5).

Additionally, because the patient had single-vessel runoff (Figure 6) with a high-grade lesion in the anterior tibial artery, a 0.014-inch Forte exchange wire (Boston Scientific Corporation, Natick, MA) was advanced down the vessel allowing for the placement of a 3-mm X 18-mm coronary CYPHER stent (Cordis Corporation) (Figure 7). The CYPHER balloon-expandable stent was implanted at 14 atm. At the end of the stent implantation, repeat and final angiography revealed significant improvement in the SFA, popliteal, and anterior tibial arteries, with single-vessel runoff to the ankle. Because of the small nature of this vessel and the need for precise placement, balloon-expandable stenting is the preferred method of placement.

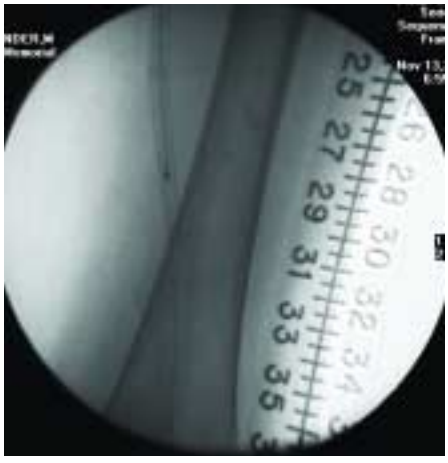

Figure 4. An angiogram of the Thrombex PMT device in the left SFA.

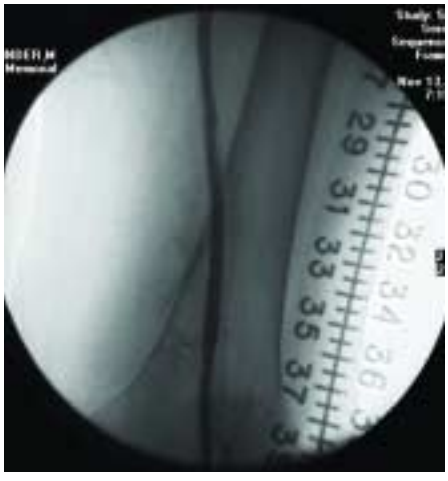

Figure 5. Angiogram of the left SFA after stenting.

FOLLOW-UP

The patient was discharged within 24 hours of the procedure with no complications. She was placed on a regimen of aspirin (162 mg) and clopidogrel (75 mg) daily. At the 3-week follow-up visit, the patient denied any claudication and showed improved distal pulses on the left side (popliteal 2/4 and posterior tibial 1/4; ABI = 0.89). The patient's drug regimen was determined to be aspirin (indefinitely) and clopidogrel (for 1 year as tolerated).

CASE DISCUSSION

The decision to proceed with endovascular intervention rather than an open surgical procedure was based largely on the patient's preference and the anatomical consideration of the marginal landing zone with poor runoff, making long-term patency of a femoropopliteal bypass rather marginal. The patient, however, did not have other significant comorbid conditions to preclude an open procedure.

Once the decision to attempt percutaneous revascularization has been made, the treatment of diffuse in-stent restenosis itself remains a challenge. Although there have been several reports on the benefit of adjunctive therapies to balloon angioplasty, the only technique available under protocol would have been brachytherapy. Unfortunately, at the time of this particular reintervention, all beta and gamma radiation protocols were closed and open-label treatment was unavailable. Therefore, we had to revert to the only available treatment modality, namely POBA (plain old balloon angioplasty), with which a recurrence rate of nearly 50% is expected.

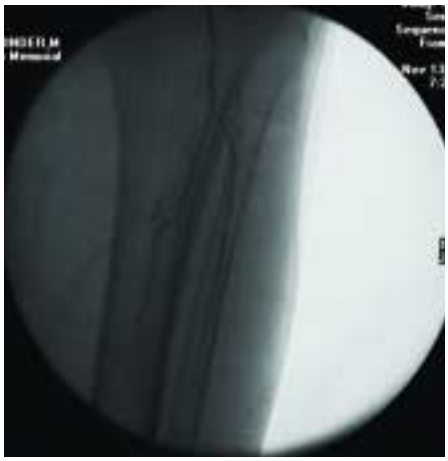

Figure 6. An angiogram of the below-the-knee runoff after placement of the Thrombex PMT device and stenting of the SFA.

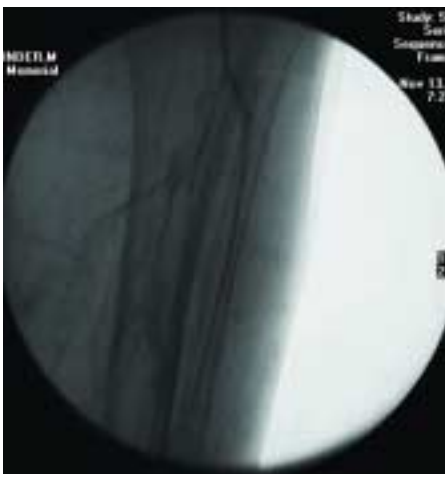

Figure 7. An angiogram of the anterior tibial artery after stenting.

The clinical history in this patient with rapid progression of severe claudication and an angiogram showing total occlusion within the previously stented segment suggest that progressive restenosis may have recently thrombosed. Given the patient's single-vessel runoff and fear of distal embolization, which would lead to catastrophic consequences, we elected to use a rather "handy" and, to date, very effective thrombectomy device called Thrombex PMT. This unique 5-F, active-aspiration catheter was used effectively through the 7-F crossover sheath, allowing for remarkable clean up of the lesion prior to balloon dilatation.

The decisions to use the SMART stent for the SFA and the CYPHER for the tibial artery are mostly based on the fact that drug-eluting stents are not available in larger vessels yet. Despite early experience, long-term data with sirolimus-coated SMART has been somewhat disappointing; clearly, better dose-finding studies are needed to fully assess the potential of these medicated stents on long-term outcomes.

This, however, is not the case with the smaller-diameter CYPHER balloon-expandable stent used below the knee for single-vessel run-off disease. As in coronary diameters, the anterior tibial ought to do very well with this new drug-eluting stent adapted from coronary interventions. Given the importance of this single-vessel runoff, we were compelled to provide this patient with the best chance at long-term patency, which in this critical vessel makes the difference between reperfusion and amputation. ■

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