WHAT WOULD YOU DO?

Left Superficial Femoral Artery Occlusion in a Patient With an Aortobifemoral Graft

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CASE PRESENTATION

A 63-year-old man presents with 4 months of left lower extremity rest pain. The patient has a long-standing history of claudication, and 6 years prior, he underwent bilateral common iliac artery stent implantation. The iliac stents occluded in 2014, and at that time, the patient opted for surgical intervention with an aortobifemoral graft. The left limb of the surgical graft was anastomosed distally to the profunda femoris artery (PFA), with a jump graft from the profunda to the proximal superficial femoral artery (SFA).

Other than the history of peripheral artery disease, the patient's comorbidities included a prior history of smoking, diabetes mellitus, and hypertension. Medications include aspirin 81 mg daily, atorvastatin 40 mg daily, and lisinopril 10 mg daily. On physical examination, 2+ right common femoral and 1+ left common femoral pulses were palpable. There was no palpable left popliteal artery pulse, and there was a faintly palpable left posterior tibial pulse, but the left dorsalis pedis pulse was absent.

Baseline angiography confirmed the prior aorto-bifemoral graft and occluded bilateral common iliac artery stents. The left limb of the aortoprofunda graft was patent, but the prior jump graft segment from the profunda to proximal SFA was occluded. The ongoing left SFA was occluded, with reconstitution in the proximal popliteal artery. The infrapopliteal vessels were notable for single-vessel runoff via the posterior tibial artery (Figures 1 and 2).

Figure 1

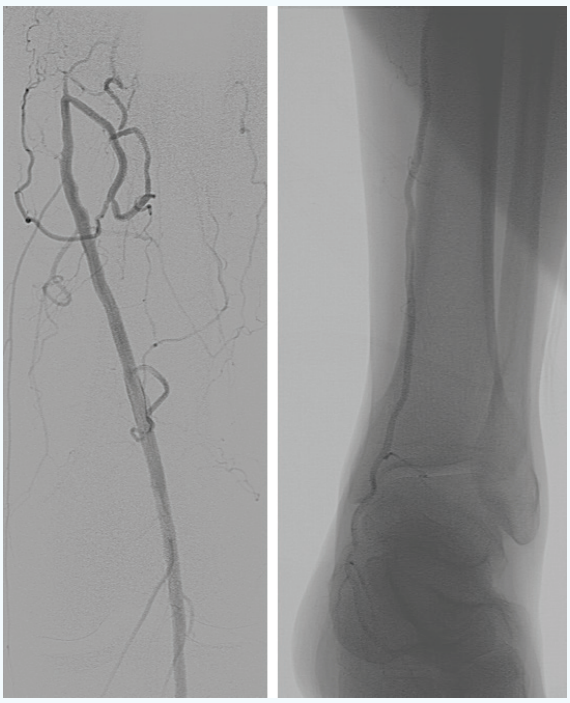

Figure 2

Would you treat this patient with bypass, endovascular therapy, or medical management, and what parts of the initial evaluation would guide this decision?

Dr. Henao: The patient has long-standing debilitating claudication and appears to be on antiplatelet and statin therapy. We do not know if a monitored walking program had been implemented, but hopefully it would have been recommended as part of an optimal medical regimen. Unfortunately, the fact that his ischemia has progressed to rest pain would indicate that intervention is now warranted. The angiographic images are that of a TransAtlantic Inter-Society Consensus (TASC) II D chronic total occlusion (CTO) of the SFA. If we assume a life expectancy of > 2 years and saphenous vein of 3.5 mm, bypass is favored over interventional therapy.[1] Surgically, a redo exposure of the distal left aortofemoral limb would be relatively straightforward, serving as the proximal anastomosis for an above-the-knee bypass that could be tunneled to the generous popliteal target shown, where the entire P1 and P2 segments are widely patent and should yield an effective and durable result, assuming a good venous conduit.

Dr. Parikh: In all cases, optimal medical therapy would be required. Consideration for intensification of antiplatelet therapy will facilitate reduction in major adverse cardiovascular events and major adverse limb events in this patient and could be considered either before or after intervention.

Given that this patient has rest pain, albeit without ulceration, tissue loss, or gangrene, there are several options for revascularization coupled with optimal medical management. Surgical intervention with femoropopliteal bypass could be considered if there were adequate venous conduit, but a reoperative cutdown on the left common femoral artery (CFA) may prove difficult, and the long-term patency would likely be suboptimal if there is a need for prosthetic conduit, given that a venous jump graft may suggest prior vein harvest. As such, an endovascular intervention seems to be a reasonable strategy if it can be accomplished. In this patient, an endovascular approach should be undertaken after appropriate noninvasive evaluation (and vein mapping) and obtaining careful informed consent.

Dr. Sabri: In a patient with rest pain, I would consider revascularization over medical management alone. In planning revascularization, my attention would focus on maintaining patency of the PFA. With the anastomosis of the left limb of the graft to the profunda, I would recommend a surgical bypass to the above-the-knee popliteal artery. An endovascular approach would not only be technically challenging, but long-term patency of such intervention in this anatomy is unknown.

What would be your preferred access approach to endovascular treatment of the occluded left SFA, given that the left limb of the prior surgical graft is anastomosed to the PFA?

Dr. Parikh: The primary strategy could be via a primary retrograde attempt (either distal SFA/proximal popliteal from a supine approach, a tibiopedal approach, or a proximal anterior tibial approach). Alternatively, a transradial approach may be feasible using the new purpose-built transradial sheaths that are 119 cm, although based on the figures, it's not clear that it would be easy to navigate from the PFA to the CFA and then attack the proximal cap of the CTO. One would need to perform a careful Doppler examination to understand the path one might forge from the graft anastomosis back into the CFA bifurcation. A direct antegrade puncture of the previously occluded external iliac artery or the CFA itself may be feasible and provide adequate support for the antegrade CTO crossing and may be required if CART (controlled antegrade and retrograde subintimal tracking) or reverse CART would be needed. Finally, a transcollateral approach from the

PFA collaterals into the distal SFA and back up the SFA toward the CFA could be considered, but support is frequently a challenge in such cases.

Dr. Sabri: If a surgical bypass is not an option, I would start with dual access, specifically antegrade access by puncturing the left limb of the graft at the top of the femoral head and a second retrograde access of the left posterior tibial artery. The retrograde access is necessary because it is unlikely that antegrade access would provide successful recanalization from the hood of the graft into a chronically occluded SFA. Once retrograde access is established, it is likely that sharp recanalization will need to be performed retrograde to gain access in the left limb of the graft. The access wire can then be externalized and any procedure can be performed from the antegrade access sheath. This would provide more options for placing larger devices through an antegrade sheath rather than upsizing the retrograde pedal access.

Dr. Henao: The presence of the aortobifemoral bypass makes an up-and-over approach difficult, reducing deliverability of adjunctive devices and potentially increasing the possibility of complications. An antegrade left femoral approach into the profunda coming from the distal aortoiliac limb is feasible, but it would potentially complicate the maneuver of SFA selective catheterization and definitive treatment, as well as limit pushability of devices, creating an environment that could lead to vessel injury. Looking closely at the angiographic images, a catheter appears to be coming from either the brachial or radial access. Our inventory currently does not support the lengths of devices required for femoropopliteal intervention using this approach, and the distal anastomosis to the PFA is still a complicating factor for pushability. Therefore, the most optimal approach for this scenario, which would allow for straightforward deliverability of most devices for effective treatment of this TASC D lesion, would be a retrograde popliteal access.

To avoid added cumulative radiation exposure in these complex cases, we strongly recommend ultrasound-guided retrograde punctures in lieu of radiographic retrograde access, which is unfortunately popular in many centers worldwide. In addition, it would not be unusual for our group to obtain a secondary retrograde access point at the tibiopedal level. This serves multiple purposes in this scenario: (1) to potentially establish an additional outflow vessel (using the anterior tibial/dorsalis pedis arteries), (2) delivery of a balloon (via a 4-F pedal sheath) for hemostasis after popliteal sheath removal, and (3) deployment of intravascular ultrasound (IVUS) for optimal lesion assessment.

After lesion crossing, what would be your preferred treatment strategy to maximize long-term patency of the left SFA, and what data support this approach?

Dr. Henao: Panaich et al looked at more than 90,000 patients from the Nationwide Inpatient Sample from 2006 to 2011 for the purpose of evaluating IVUS in patients with peripheral artery disease.[2] They found that patients who were evaluated with IVUS had lower rates of postprocedural complications, lower amputation rates, and a nonsignificant increase in hospitalization cost. Our center has adopted this strategy with those benefits in mind, fostering a level of sophistication in vessel sizing, plaque assessment, and wire positioning within the lumen that is simply not possible with angiography alone. In this scenario, we would utilize IVUS to determine the diameter, level of calcification, and position within the true lumen of the vessel to customize the treatment modality. A percutaneous transluminal angioplasty balloon or drug-coated balloon (DCB) will be sized 1:1 to the vessel (external elastic lamina). Zeller et al demonstrated that calcified lesions and long lesions derive the most benefit with atherectomy (91% vs 69% patency in lesions > 10 cm),[3] but this could clearly be hazardous within the subintimal plane, depending on the type of device used. In the majority of cases, our practice has favored rotational atherectomy with aspiration over directional atherectomy for this reason.

After atherectomy, a drug-elution strategy is typically employed in our center. Patency and freedom from target lesion revascularization have been shown to be favorable in numerous reports for drug-eluting stents (DESs) and DCBs.[4] We tend to prefer stenting in longer complex lesions and have used DESs with mixed results in the past. Mimetic woven nitinol stents appear to work more favorably in our patient population.[5] However, in this situation, because of the specific challenges in access, I would favor DCB therapy.

Dr. Parikh: The data for drug delivery continue to be the strongest among competing SFA technologies. DCBs or DESs would likely be preferred after appropriate lesion preparation with PTA with or without debulking. In such cases, I frequently use IVUS to help me determine whether debulking will be beneficial. The access may also dictate what strategy is undertaken (eg, for debulking, tibiopedal access may not allow for the use of a technology such as the Jetstream atherectomy system [Boston Scientific Corporation] because of the

need for 7-F access; conversely, radial access currently only supports use of the Diamondback 360 orbital atherectomy system [Cardiovascular Systems, Inc.]).

Dr. Sabri: I would start with angioplasty followed by angiography to evaluate the location of the crossing into the iliac limb and the relationship to the profunda origin. Given the transition from a graft into an occluded artery, a scaffold will be needed and DCB is unlikely to be sufficient. I would stay away from a covered stent for the fear of compromising the profunda origin. I find interwoven stents to be unreliable to land the trailing end precisely, so I would avoid using them here. I do not believe there is much of a role for bare-metal stents in the SFA anymore, so I would use DESs instead. DESs have high primary patency in native SFA, including TASC C and D lesions, with 1-year patency > 90% and 5-year patency of 66%. It is unclear if these results would translate to stenting into a synthetic graft.

Given the lesion complexity and prior history of multiple revascularization procedures, would you take any additional steps in medical management postintervention to minimize the likelihood of major adverse limb events?

Dr. Sabri: Dual antiplatelet therapy is needed for at least the first 6 months, and I would consider indefinitely given the history of prior stent failure. I would also closely follow the stent with duplex ultrasound, starting with a baseline study at 2 weeks then every 3 months for the first year, focusing on the proximal edge of the stent.

Dr. Henao: Our practice has recently begun recommending low-dose rivaroxaban (2.5 mg twice daily) plus aspirin (100 mg daily) selectively for patients with recurrent arterial occlusive disease and critical limb ischemia. This recommendation is based off of recent COMPASS PAD findings.[6] This patient may be a candidate for this therapy, but only after a discussion of possible bleeding complications and cost. We would also recommend clinical follow-up with ankle-brachial index measurement at 30 days, 1 month, 3 months, 6 months, and yearly, as well as an arterial duplex at 6-month intervals.

Dr. Parikh: I would definitely optimize medical therapy with dual antiplatelet therapy, blood pressure control, statins, and possibly consider additional anticoagulation if otherwise clinically indicated. I don't believe that we have achieved consensus on the role of direct oral anticoagulants or vorapaxar for such patients. Supervised exercise therapy would also certainly be beneficial from a clinical standpoint.

TREATMENT COURSE

Given the access considerations previously discussed, the decision was made to proceed with endovascular intervention via alternative access. I first obtained left radial access and advanced a pigtail catheter to the left limb of the graft in order to selectively visualize left lower extremity blood flow. Under fluoroscopic guidance, I then advanced a micropuncture wire into the retrograde left SFA, followed by a 7-F sheath (Figure 3). I then advanced a NaviCross angled-support catheter (Terumo Interventional Systems) and 0.035-inch straight stiff Glidewire (Terumo Interventional Systems) to the ostium of the left SFA. The wire took a subintimal course; therefore, I reentered the CFA using a 0.018-inch Astato 30 wire (Asahi Intecc) (Figure 4). After reentry,

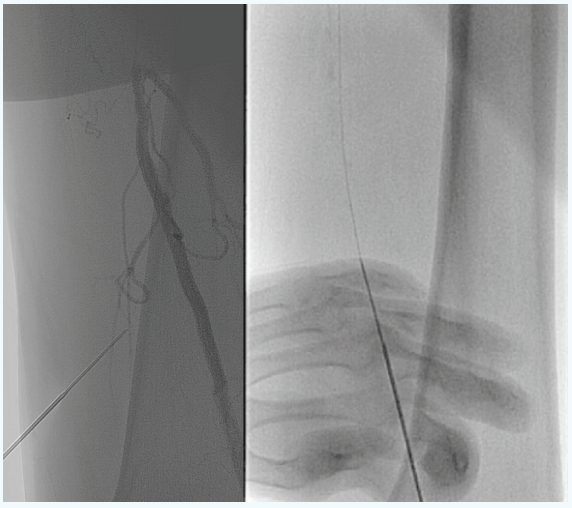

Figure 3

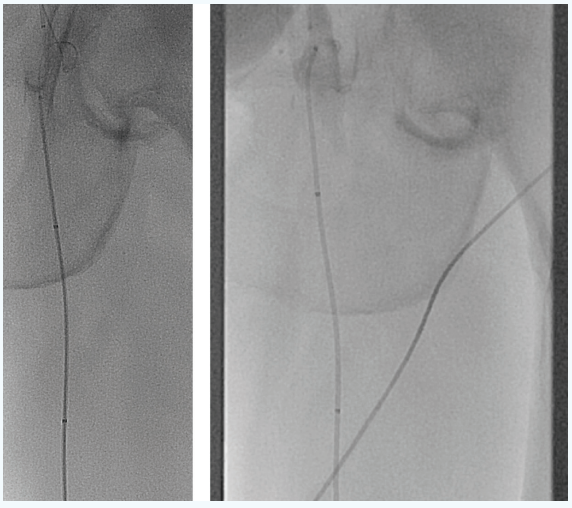

Figure 4

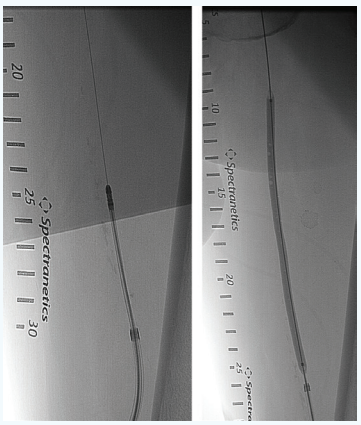

Figure 5

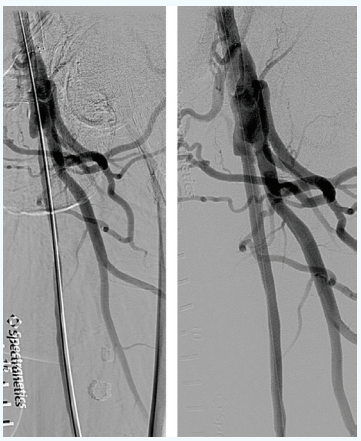

Figure 6

I advanced the NaviCross into the true lumen of the CFA and switched to a 0.014-inch ThruWay wire (Boston Scientific Corporation). Over this wire, I advanced a Jetstream XC atherectomy catheter, with two passes on low speed and one pass on high speed. (Figure 5).

Atherectomy provided significant debulking. I then inflated a 6-mm balloon throughout the SFA. Due to some dissection and recoil, especially near the ostium of the SFA, I placed a 6- X 150-mm Supera nitinol woven stent (Abbott Vascular) via retrograde SFA access from the ostium of the SFA to the mid artery. The final angiogram revealed an excellent angiographic result (Figure 6). For closure, I placed a sphygmomanometer at 20 mm Hg above systolic pressure on the left SFA access site for 10 minutes, with excellent hemostasis.

The patient was admitted to the hospital overnight without event. At the time of discharge, he was prescribed 81 mg of aspirin daily and 2.5 mg of rivaroxaban twice daily, in addition to a high-intensity statin and an angiotensin-converting enzyme inhibitor. At 1 month, a duplex ultrasound demonstrated vessel patency without evidence of restenosis.

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