

Editor's Challenge

A panel of interventional experts weighs in on how they would access and treat a series of challenging access case presentations.

In this Editor's Challenge, I have tried to create a real-life interactive and case-based dialogue between vascular experts from different specialties. Initial case images were provided to the challenge faculty with limited clinical history, and the experts were asked to discuss their approach to the case, with particular emphasis on preferred and secondary routes of access. By nature, because all of these cases represent unique access issues, they are unusually complex scenarios, and all patients had critical limb ischemia; for more straightforward interventions and clinical circumstances, the choice of initial or alternative access is often not as problematic. My hope is that the format of this Editor's Challenge will be provocative and engaging to readers of all levels.



Editor

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CASE 1

Editor's Presentation: Elderly woman with symptomatic common femoral and superficial femoral artery disease

An 89-year-old woman presented with a small ulcer on the plantar surface of her left foot. Her cardiovascular risk factors were hypertension and dyslipidemia. Her femoral pulses were intact, and her distal pulses were only detectable by Doppler. A baseline pelvic and lower extremity arteriogram was obtained (Figure 1A and 1B).

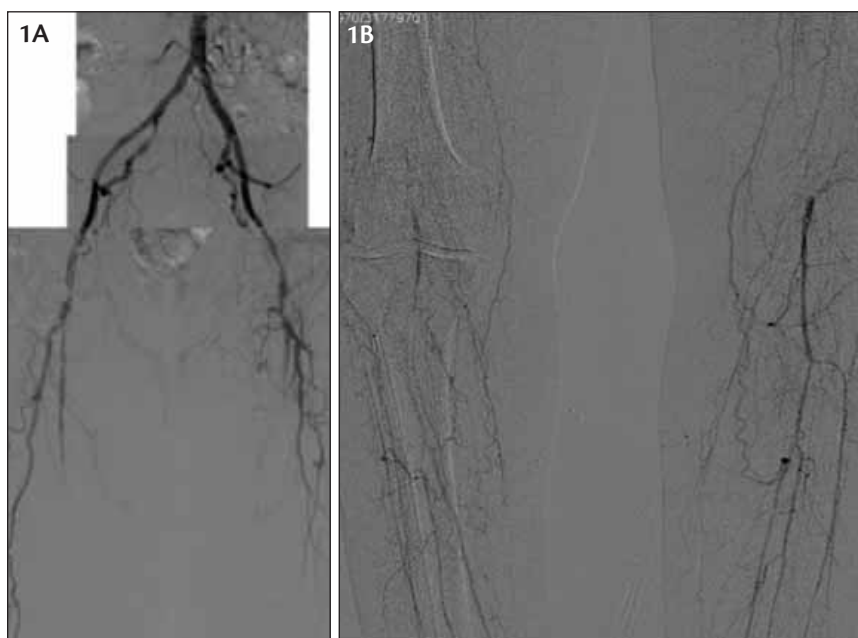


Figure. Case 1 presentation images.

Panel's Suggested Approaches

Dr. Gray: Older patients are best treated with only one arterial access site, if possible. Assuming the right groin was accessed already, I would cross over the bifurcation with the pigtail catheter and exchange for a 6-F sheath. Then, I'd obtain a left anterior oblique arteriogram of the superficial femoral artery (SFA) origin and proceed with antegrade crossing of this SFA occlusion from the contralateral approach. The retrograde popliteal artery approach should be avoided in these patients and in this particular instance, because the occlusion extends down to the top of the patella.

Dr. Wholey: To restore flow in the SFA-popliteal to heal the wound, I might use ultrasound guidance and gain access in the high right common femoral artery (CFA) to avoid distal CFA stenosis. Otherwise, I'd con-

sider brachial access but have better chances of success from the contralateral approach. I would gain access with a 6- to 7-F Destination guiding sheath (Terumo Interventional Systems, Somerset, NJ), up and over the bifurcation, in the left CFA and try a 0.035-inch Glidewire (Terumo Interventional Systems) to recanalize, with the support of a 4-F Glidewire (Terumo Interventional Systems) or Quick-Cross catheter (Spectranetics Corporation, Colorado Springs, CO). If necessary, I would go subintimal and reenter above the knee joint. Once recanalized, I'd perform percutaneous transluminal angioplasty (PTA) of the SFA and popliteal artery

and then place a self-expandable stent in the diseased subintimal segment and postdilate. If the routine wire fails, I would use a dedicated chronic total occlusion device. I would also consider placing an embolic filter (Spider, Covidien, Mansfield, MA) distal to the occlusion upon recanalization.

Dr. Walker: This patient has a left foot ulcer with a long left SFA occlusion with a proximal stump and three-vessel runoff. There is a right CFA stenosis that could result in a sheath being occlusive if access is in or below the lesion. It appears as though there is room to access above the stenosis and still remain below the inguinal ligament. I would access the right CFA using fluoroscopic

guidance with a 4-F sheath. I would then perform an angiography via this sheath to confirm that entry is above the stenosis and nonocclusive. If the sheath is occlusive, then I'd access a brachial artery with a long 4-F sheath and dilate the stenosis using 0.014-inch compatible balloons to ensure that a larger sheath can be placed and not be occlusive.

If the sheath entry was clearly above the stenosis, then I would place a 6-F contralateral sheath and proceed with left SFA intervention. I would attempt to cross the SFA occlusion with a 0.035-inch hydrophilic wire and support catheter, making sure distal wire entry is at or near the point of vessel reconstitution by angiography. I would then dilate and stent the vessel using nitinol self-expanding stents to increase the probability of patency long enough to heal the ulcer. Then, I would use manual compression for closure.

Dr. Burket: Before addressing the angiographic findings in Case 1, it is essential to evaluate the entire status of the patient. Clearly, any intervention in an 89-year-old patient carries with it a higher risk of morbidity than a procedure in a younger individual. For this reason, the operator must be confident that the procedure is indicated. The patient's history suggests critical limb ischemia (CLI), with early tissue loss, which clearly constitutes an indication for intervention. Not shown in the accompanying images are vessels distal to the mid-calf. It would not be surprising to see distal disease with multilevel involvement as a possible explanation for an ischemic ulcer.

There is no straightforward access site in this patient. Brachial artery access would carry a significant bleeding risk. In an elderly patient with hypertension, the brachial artery is often tortuous and prone to spasm and/or injury. Interventional equipment is often too short to reach from the arm to the leg. Left common femoral antegrade access would be challenging due to proximal disease.

My personal preference would be to perform a right common femoral artery puncture just above the SFA/profunda bifurcation. Ultrasound guidance may be helpful to pinpoint the puncture location. A sheath with a radiopaque tip would be mandatory. This would allow much more detailed imaging of the right common femoral artery lesion. In all likelihood, this could be treated with angioplasty to avoid right leg ischemia during left leg intervention. The distal aorta and iliac arteries are healthy enough to allow contralateral sheath placement. At that point, detailed imaging of the left SFA origin could be completed and intervention begun.

Editor's Chosen Method of Treatment

Dr. Rundback: Our typical approach is to puncture the femoral artery contralateral to the side of greatest symptoms unless there is a contraindication not to do so. Access was performed from the right CFA using a modified Seldinger technique, and a catheter and 7-F sheath (Flexor Raabe, Cook Medical, Bloomington, IN) were advanced over the aortic bifurcation for left leg arteriography (Figure 1C). The presence of severe calcific left femoral artery stenosis prevented antegrade puncture on this side (Figure 1C). Via the right femoral puncture, successful angioplasty and stenting of the SFA occlusion and

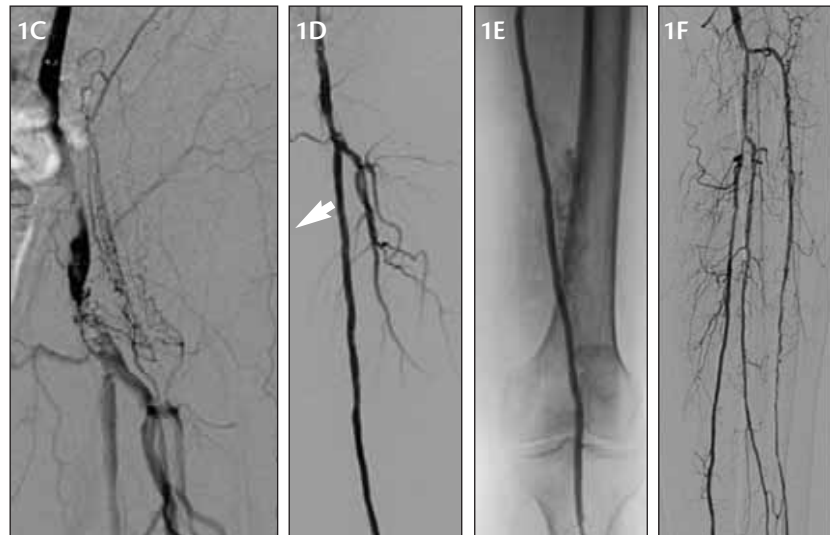


Figure. Case 1 treatment images.

atherectomy and PTA of the CFA stenosis was performed, with an excellent final angiographic result and marked improvement of pedal Doppler signals (Figure 1D through 1F). The patient's ulcer resolved.

Panelist Comments

Dr. Gray: I can't argue with success in this 89-year-old patient whose ulcer healed after revascularization. The interventionist should also consider other treatment alternatives that may be applicable in other similar anatomic situations. A femoropopliteal below-knee bypass is too much surgery for most 89 year olds, but a CFA patch angioplasty may be just enough to revascularize this limb to heal. I would even consider stenting the CFA in this patient to maximize flow to the profunda femoral artery if the SFA lesion could not be traversed and the atherectomy was unsatisfactory. This is preferable over a retrograde approach to recanalize the SFA.

Dr. Walker: A contralateral femoral approach is a comfortable approach for most interventionists. It allows room to work with very proximal SFA occlusions, and it facilitates safe upsizing of sheaths. This was an excellent result in a challenging case.

Dr. Wholey: Good results and a good learning experience. I was interested in which atherectomy device was used. Did you consider using a filter, and if so, which vessel would you try to protect? Probably the SFA. It would be difficult to cover both the SFA and profunda femoral artery (PFA) with such a short distance. For the SFA and popliteal, did you have to go below the knee joint for the disease? I'm curious about which stents were chosen.

CASE 2

Editor's Presentation: Crushing bilateral leg pain

An 81-year-old with multiple medical comorbidities including hypertension, coronary artery disease, former smoking, peripheral vascular disease, and chronic kidney disease presented to the emergency room for severe, progressive bilateral lower extremity pain that was worse on the left side. Trophic changes in both legs are noted without cyanosis or ulceration. The patient had failed previous cross-femoral and axillofemoral bypasses. Markedly diminished capillary refill was observed, especially in the left foot. Femoral signals were heard, with pedal pulses detected by Doppler on the right but very faint on the left. A computed tomographic angiography was ordered (Figure 2A), and bilateral CFA and SFA occlusions were also noted on arterial duplex ultrasound (not shown).



Figure. Case 2 presentation image.

Panel's Suggested Approaches

Dr. Walker: This patient has bilateral external iliac artery (EIA), CFA, and SFA occlusions with a history of failed trans-femoral and failed axillofemoral bypass. There appear to be

patent profunda femoris arteries distally. In this case, I would attempt to establish flow into each of the profunda femoris arteries. There are many challenges in this case: I would consider the femoral approach a poor option, and the EIAs are totally occluded and calcified, posing a significant risk of perforation with intervention, which could have catastrophic consequence.

I would approach this case via a brachial approach only after a duplex exam of the brachial arteries as I have experienced greater success in crossing total iliac occlusions in an antegrade manner, and this approach may allow successful treatment of both iliac arteries in the same setting. Using a micropuncture technique, I'd enter the brachial artery and administer intra-arterial nitroglycerin, calcium channel blockers, and anticoagulants. After this, I'd perform brachial angiography, because a 7-F sheath may be required for emergency placement of a covered stent if there is iliac perforation (the greatest risk of this procedure).

If the brachial artery is large, initially, I'd place a 90-cm, 7-F sheath distally into the left common iliac. If the brachial is small, I'd start with a 5-F, 90-cm sheath (only upsizing as needed for stent placement so as to not be occlusive). I'd choose to first work on the left because it is the most symptomatic. I'd cross the occlusion with a 0.035-inch hydrophilic wire and 5-F support catheter into the profunda where I'd confirm distal position angiographically. I'd be certain to have covered stents in the room on standby. I'd then dilate with a 3- or 4-mm-diameter balloon carefully, monitoring for abdominal pain.

After this, angiography would be performed to look for any evidence of perforation. If there is perforation, then covered stents would be immediately placed. If not, self-expanding stents would be placed and gently postdilated again, monitoring pain and looking for evidence of perforation. If successful and the brachial sheath nonocclusive, then I'd approach the right iliac in the same manner. If the sheath is occlusive, then I'd terminate the procedure, removing the sheath immediately, with plans to approach the right side in the future. The brachial site would be managed with manual compression.

Dr. Wholey: I would use brachial access, or consider right femoral access, and recanalize the right external iliac; with femoral pulses present, the CTA may have overcalled the disease, especially on the right. To recanalize the diseased iliacs, I would probably place self-expandable stents in both the right and left EIAs. Then, I'd cross the left CFA lesion, perform PTA, and place a self-expandable stent, such as the Supera stent (Idev Technologies, Inc., Webster, TX) across the joint. In this case, complexity is high, and chances for recanalization are limited. The patient may benefit from surgery, but with history of cross-femoral and axillofemoral

bypasses, the groins are probably very scarred, and it would not be an easy surgery. This case may also require an alternative means to keep within the vessel, such as the Frontrunner catheter (Cordis Corporation, Bridgewater, NJ) or other devices to try to keep within the lumen.

Dr. Gray: The patient not only has CFA and SFA disease but also EIA disease that needs to be treated. The proximal right CFA could be accessed and the right external iliac occlusion crossed and treated, allowing for intervention on the left leg from the contralateral approach. However, coming from the arm (left brachial to shorten the distance) would allow for sequential intervention on each leg, enabling treatment of the EIA and CFA disease simultaneously with one access site. I would leave the SFA disease alone on the initial procedure, reassess the patient's ischemia, and come back for another session to treat from the groin if needed. Carbon dioxide could be used to minimize the contrast load in this patient with chronic kidney disease.

Dr. Burkett: Case 2 presents a "do-or-die" situation. Previous attempts at surgical revascularization have failed.

The patient's severe pain at rest, associated with markedly decreased pedal pulses, confirms the need to make every effort to complete percutaneous revascularization.

Given the fact that the patient has a palpable right femoral pulse, retrograde access at that site would yield the best chance for improving circulation to both legs with one procedure. I would prefer micropuncture technique for initial access given the extensive amount of disease. Given the degree of occlusive disease and calcification, recanalization of the right iliac arteries will be challenging. Reentry technique can be used if necessary. At that point, a hydrophilic crossover sheath should be placed into the left iliac artery and additional imaging and recanalization performed. The degree of calcification may well interfere with movement of the sheath and interventional equipment, and yet this still appears to be the best overall approach.

Brachial access is unrealistic in this setting, especially if distal leg work is required.

Editor's Chosen Method of Treatment

Dr. Rundback: This was a challenging case. Because the patient had severe ischemic rest pain in both legs, it was felt that it would be necessary to establish the best possible

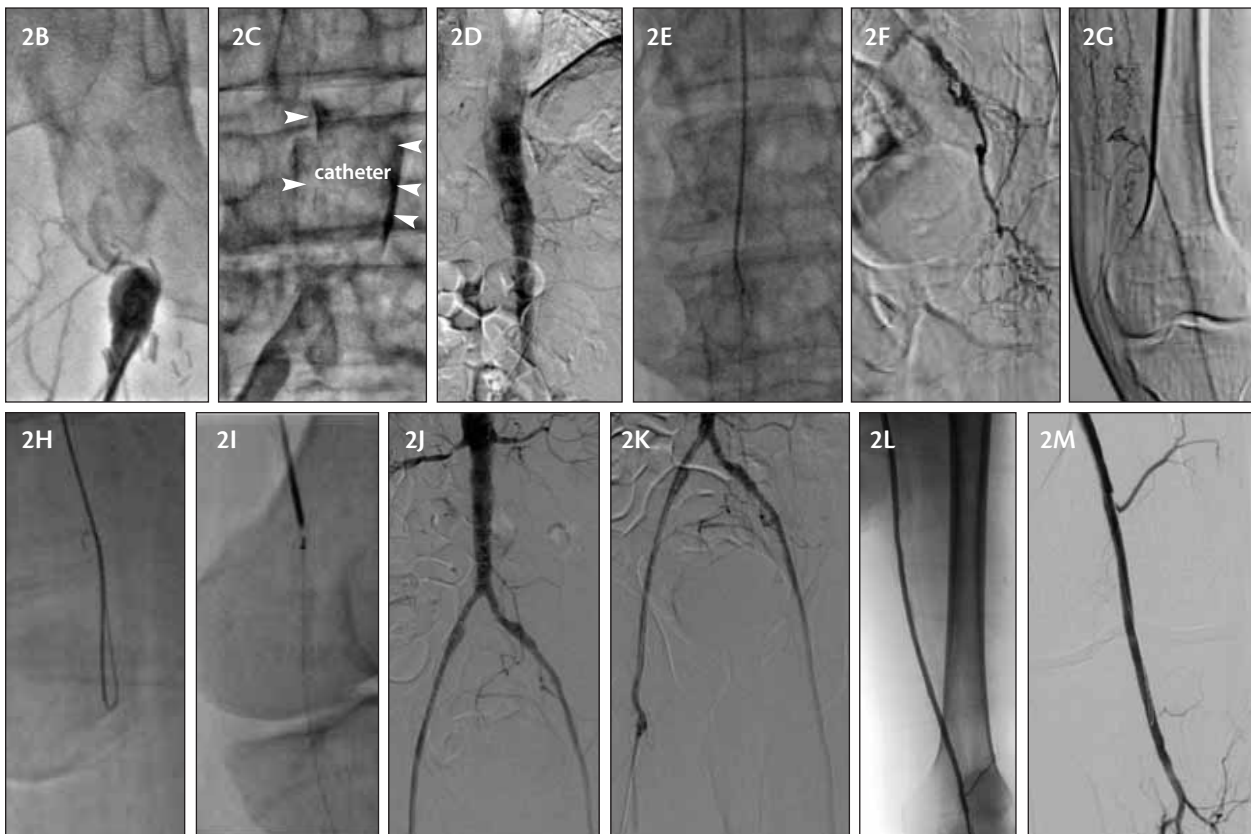


Figure. Case 2 treatment images.

flow to both sides that could be accomplished in a single setting. Bilateral CFA occlusions marked limited femoral access possibilities, although there was a reconstituted PFA segment on the right. Initially, using ultrasound guidance, the right PFA was punctured near the hood of a previous cross-femoral bypass (Figure 2B), with a planned strategy to recanalize the right CFA and EIA occlusions to then allow recanalization of the contralateral left CFA and SFA disease.

However, an intraluminal plane could not be established on the right, and passage of subintimal catheters and wires up to the level of the aorta (as well as several attempts with a reentry catheter) failed to establish wire positioning in the aortic true lumen, with contrast injection staining the subintimal space (Figure 2C). Therefore, a left brachial puncture was performed (at the midhumeral level), and a catheter and wire were negotiated into the aorta from this approach for an abdominal aortogram (Figure 2D) and snaring of a 0.014-inch wire directed using a reentry device from the femoral approach (Figure 2E). Care was used to snare the reentry wire at the level of the aortic bifurcation as visualized by aortoiliac calcification.

The right-sided catheter was then advanced into the true aortic lumen, initial PTA of the right EIA/CFA was per-

formed, and a Glidewire/Glidecath system was successfully used for subintimal recanalization of the left iliac, CFA, and SFA. Distal reentry on the left was again performed with the reentry catheter (Outback, Boston Scientific Corporation, Natick, MA) (Figure 2F through 2I). Completion of the procedure was accomplished with stenting of the left SFA and the popliteal artery, EIA, and CFA (Figure 2J through 2M). Approximately 1 week later, a procedure was performed on the right leg. The patient is currently asymptomatic in both legs.

Panelist Comments

Dr. Gray: Part of the attraction for starting from the arm to treat this patient is to be able to manage the access site after intervention. Coming from above allows treatment throughout the EIA and CFA simultaneously and should be the first consideration. An aortobifemoral bypass was probably considered in the past (before fem-fem and ax-fem bypass), but the patient was probably a prohibitive risk. Another option would be to open the CFA for patch angioplasty but treat the EIA, PFA, and SFA before finishing the repair of the groin. Wire dissections occur, and good visualization and feel are important to potentially avoid and/or treat such complications.

Dr. Burket: The interventionist got a great result and should be proud of his work. I would point out that the brachial access didn't appear to help; they actually got through from right femoral access, then crossed over.

Dr. Walker: There was an excellent result in this case. I think it should be emphasized that whenever one interventionally treats occluded iliac arteries, one must be prepared to deal with the potentially fatal complication of perforation. It has been my experience that retrograde wire passage is typically more difficult. I have experienced that the wires frequently track subintimally into the aorta. When crossing via the antegrade approach, it is important to ensure wire reentry into the common femoral to avoid losing the profunda or SFA.

Dr. Wholey: This was a great case with excellent results. On the initial CTA, the left groin showed an occluded left CFA and SFA. What was the stature of the left PFA? The final image shows the great flow via the stented CFA and SFA, and the PFA is occluded. The teaching point is that stenting across the CFA can cause occlusion of the PFA, but I believe this patient had extensive disease across all three vessels. Having seen the last case, did you consider using atherectomy again? Finally, this case demonstrates a great use of the snare in the aorta to establish good recanalization.

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CASE 3

Editor's Presentation: External iliac artery occlusion

A 64-year-old woman presented with disabling claudication in both legs and new-onset rest pain on the left. She had a history of left SFA stenting, coronary artery bypass grafting, hypertension, dyslipidemia, and noninsulin-dependent diabetes mellitus. Initial aortography (Figure 3A) and proximal runoff (Figure 3B) was performed from the right femoral approach.

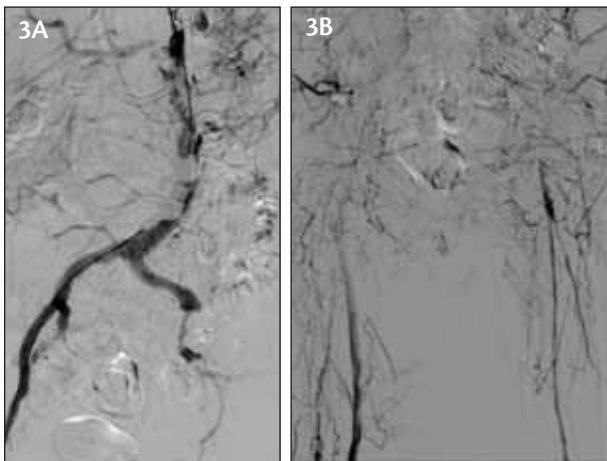


Figure. Case 3 presentation images.

Panel's Suggested Approaches

Dr. Wholey: I would want to recanalize the occluded left external iliac from the small stump to the distal CFA near the bifurcation of the SFA and the PFA. I would access the left femoral artery using ultrasound guidance, as well as gain access from the contralateral right CFA. Similar to Case 2, it is crucial to stay within the lumen of the occluded iliac. I would use a 0.035-inch regular or stiff Glidewire and a 4-F diagnostic catheter. After crossing the occlusion, use of a self-expandable stent, such as the Supera stent, would be required. Because of the complications of stenting across a joint space such as the groin, surgical options should be considered, especially because there is not a threatened limb involved.

Dr. Gray: It is difficult to discern the presence or hemodynamic significance of aortic disease on this film (secondary to the calcification). Assuming that the infrarenal aorta is the main culprit in addition to the left EIA occlusion, I would proceed with aortic intervention from the already accessed right CFA. An 8-F sheath would allow for intravascular ultrasound and PTA/stenting of the aorta

before crossing over the bifurcation to treat the left EIA in a similar fashion.

Dr. Walker: This patient has high-grade distal aortic stenosis and an occluded left EIA with a widely patent right CFA. I would evaluate angiographically if there is significant distal aortic stenosis and, if present, I would approach this via a right retrograde femoral technique, using a 7-F, 25-cm sheath. I would first identify the origins of the renal arteries definitively, then dilate the distal aorta to 8 mm, carefully monitoring for pain (because perforation of the aorta is a possible dangerous consequence). I would then place a 14-mm self-expanding nitinol stent into the distal aorta below the renals and above the aortic bifurcation (because the bifurcation is not involved). If there is evidence of perforation, I would immediately place a covered stent.

After successful treatment of the aortic stenotic lesions, I would exchange for a 45-cm crossover sheath, which would be placed in the left common iliac. Then I would use a 0.035-inch hydrophilic wire and a multipurpose catheter to cross the occluded left EIA into the patent CFA. I would then confirm distal catheter position angiographically. After this, I would dilate the left iliac while carefully monitoring for pain. After the dilation, I would perform angiography, looking for perforation. If perforation is present, I would perform covered stenting; if not, self-expanding nitinol stents would be placed. Groin management postprocedure could use any of the vascular closure devices or manual compression. I would then dilate the SFA stenosis.

Dr. Burkett: This case has begun with right femoral artery access, which is ideal and keeps virtually every therapeutic option open. Both common iliac arteries are widely patent, as is the right external iliac artery. The angle of the aortic bifurcation is obtuse, which means that crossing and applying forward force across this location should be easy.

Very concerning in the patient's history is the fact that rest pain has had a new onset, raising the possibility of recent thrombotic occlusion. From the very start of this case, the operator should be considering the use of distal embolic protection, with filter placement in the adductor canal region. Note that if left femoral retrograde access is chosen, embolic protection cannot be used. There should be a strategy to deal with thrombus, such as aspiration or thrombolysis.

Given the severity of symptoms and the presence of profunda disease, it seems reasonable to treat SFA in-stent restenosis at the same setting. A crossover sheath with its tip placed in the left common femoral artery will allow for whatever treatment strategy is selected.

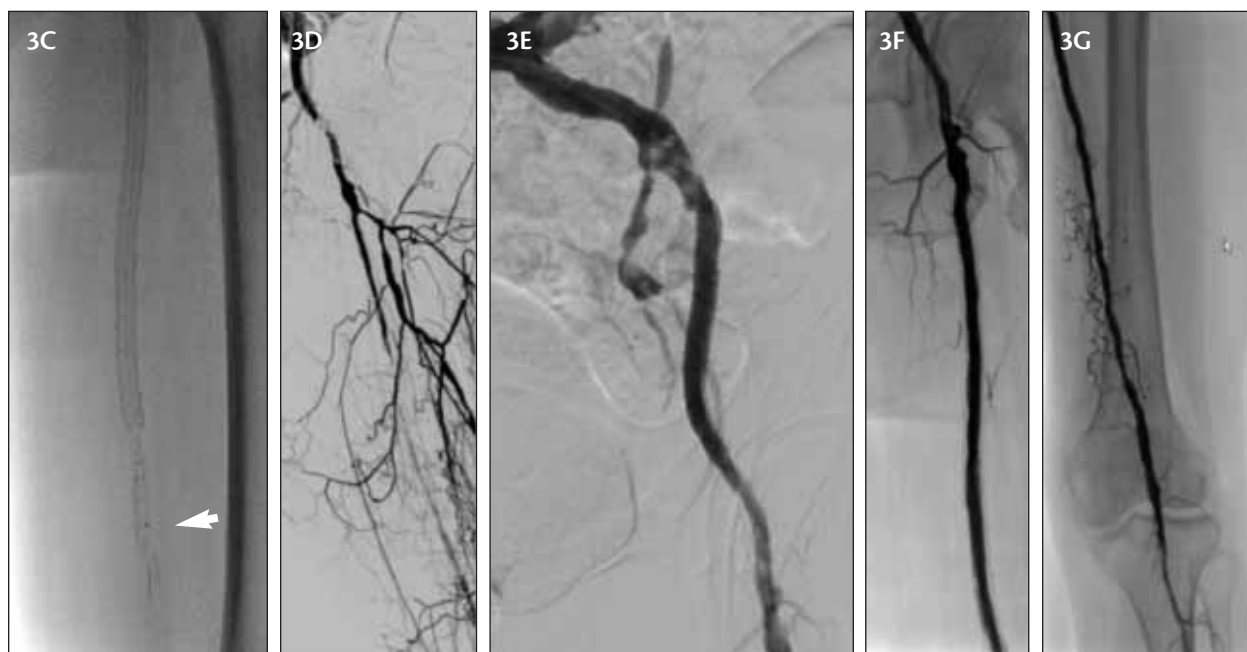


Figure. Case 3 treatment images.

Editor's Chosen Method of Treatment

Dr. Rundback: The nature of the lesion, acuity of the rest pain on the left, and consequent concern for distal embolization prompted us to pursue revascularization from the contralateral femoral side rather than in a retrograde ipsilateral fashion, with the plan being to place a distal filter. A concern for aortic stenosis was not confirmed on subsequent imaging, with the initial appearance of aortic narrowing likely artifactual due to dense mural calcification. The left external iliac and common femoral artery lesions were successfully traversed, and a Spider filter was positioned within the previously stented left SFA (Figure 3C). After revascularization, distal embolic capture was noted (Figure 3D), with flow restored after filter retrieval and iliac stenting (Figures 3E through 3G).

Panelist Comments

Dr. Gray: Despite use of the embolic protection device, the profunda femoral artery was lost. I presume it was embolized but may have been "injured" by treating the CFA/SFA. The history is important to know before intervention on an occlusion. In someone who changes from chronic stable claudication to rest pain, the typical pathobiology is thrombosis on top of fixed disease (stenosis thromboses). Thrombectomy and/or thrombolysis is my preferred initial treatment to remove the clot before treating the underlying lesion. This leads to fewer complications of embolization, loss of runoff, side branches, and lowers restenosis rates (anecdotal thought). I believe catheter-

based therapy trumps other surgical approaches to this anatomic problem.

Dr. Burket: This seems to be the consensus on this case.

Dr. Walker: Excellent final result but there was loss of the profunda femoris. Perhaps initial simultaneous wiring of the SFA and profunda may have protected against this. I think that the use of distal protection was quite appropriate.

Dr. Wholey: The initial angiogram was questionable regarding the aorta. I assumed it was artifacts in the distal portion, but the more I look at the image, the more I am worried about extensive atherosclerotic disease. The right renal appears to have a severe stenosis as well. The aorta may have been a source for the sudden rest pain of the left leg, with atheroemboli/clot on top of chronic iliac disease, resulting in subtotal occlusion. I would have considered thrombolytics versus a surgical approach. I have always been a great proponent for distal protection, but the poor little filter will get overrun by the extent of potential embolic debris, plus you cannot protect the PFA at the same time easily. A hybrid surgical procedure with a cutdown to protect the CFA from emboli may be an option, but often, if the vascular surgeon goes to this much effort, it may be easier and quicker for a bypass graft. This was a good case that we see more frequently with the growing atherosclerotic disease in elderly diabetics.

CASE 4

Editor's Presentation: Calcified femoropopliteal occlusion

An 80-year-old man presented with bilateral rest pain and coldness in his feet at night, worse on the right. He had a history of half block claudication as well. Magnetic resonance angiography demonstrated probable occlusion of the distal SFA on the right and diffuse femoral disease on the left, with patent three-vessel tibial runoff (not shown). The right popliteal artery below the occlusion was also free of significant disease. The patient's medical history included hypertension and a 25-year history of insulin-dependent diabetes mellitus, and his ankle-brachial indices (ABIs) were 0.45 on the right and 0.63 on the left. Angiography at the time of intervention showed a right distal SFA and upper popliteal artery occlusion (Figure 4A).



Figure. Case 4 presentation image.

Panel's Suggested Approaches

Dr. Gray: If the magnetic resonance angiography demonstrated normal CFA anatomy and the proximal left SFA was patent, I would first access the right CFA in an antegrade approach using ultrasound guidance to intervene on the distal right SFA first. Because the patient has such a low ABI, I assume tibial disease is also present, and the antegrade approach facilitates infrapopliteal treatment as well. Considering his diabetes, I would do only one leg at a time to minimize risk of contrast nephropathy and come back for a second procedure from the right groin to address the left SFA from the contralateral approach.

Dr. Walker: This patient has a highly calcified occlusion of the distal right SFA and proximal right popliteal artery with two-vessel runoff to the foot via the peroneal and posterior tibial arteries, with a distal lesion in the posterior tibial artery. The distal popliteal artery is widely patent. I would approach this lesion either via a right common femoral antegrade technique (unless the patient is obese or there is another complicating factor) or left contralateral femoral technique. I would prefer an antegrade femoral approach because there is a greater ability to steer wires and greater support to push devices across the calcified lesions. Because there is no ulceration or gangrene, my

goal would be to open the SFA and popliteal arteries only for symptomatic relief. I would use a 7-F sheath, and I'd approach crossing by using a 0.035-inch hydrophilic wire and a support catheter going subintimally if necessary. If distal reentry is difficult, I'd use a reentry tool to enter near the point of reconstitution rather than more distal reentry. After this, I would perform PTA and then stent with a wire interwoven nitinol stent (not US Food and Drug Administration approved for SFA indication) due to its greater radial force and flexibility, because I would be concerned that other stents may be crushed or may kink in this region with densely calcified lesions. After completion, I'd perform manual compression for closure.

Dr. Wholey: To recanalize a long-segment SFA occlusion in a heavily calcified lesion, I would use antegrade access in the right CFA or, if needed, contralateral left iliac with placement of a 6-F sheath in the CFA for support. Then advance a support catheter to the stump of the SFA and a 0.035-inch Glidewire through the occlusion to the popliteal. After crossing the lesion, I would place an embolic protection filter (Spider) in the popliteal and angioplasty the lesion. Alternatively, if this should fail, I would access the popliteal and approach the lesion in a retrograde direction. Because of the heavy calcifications, you may need reentry devices, such as the Crosser (Bard Peripheral Vascular, Tempe, AZ), Outback, or Frontrunner to cross the occlusion. Once across, there is the heavy calcium burden that may need to be removed with atherectomy devices (if you can be certain of staying within the vessel lumen) and then plan on a self-expandable stent.

Dr. Burkett: The patient presented in Case 4 will require bilateral leg intervention. Given the fact that symptoms and ABI are worse on the right, that leg should be the initial target. The most striking feature on the images associated with this case is the extensive calcification throughout the adductor canal region and popliteal artery. The fact that the SFA is patent proximal to this region, and the behind-knee popliteal is patent indicates that the chance of success is at least 90%.

The optimum access site for this case would be right leg antegrade, which allows for plenty of push against the lesion should that be required. Contralateral retrograde femoral would be acceptable, but the ability to push will be decreased from the opposite side, especially if there is extensive iliac tortuosity and/or calcification. From the onset of the case, the operator should have a strategy in mind for dealing with extensive calcification, and choose a sheath size that will accommodate necessary equipment. This is a case in which simple balloon angioplasty would be predicted to fail, and the use of a simple nitinol stent

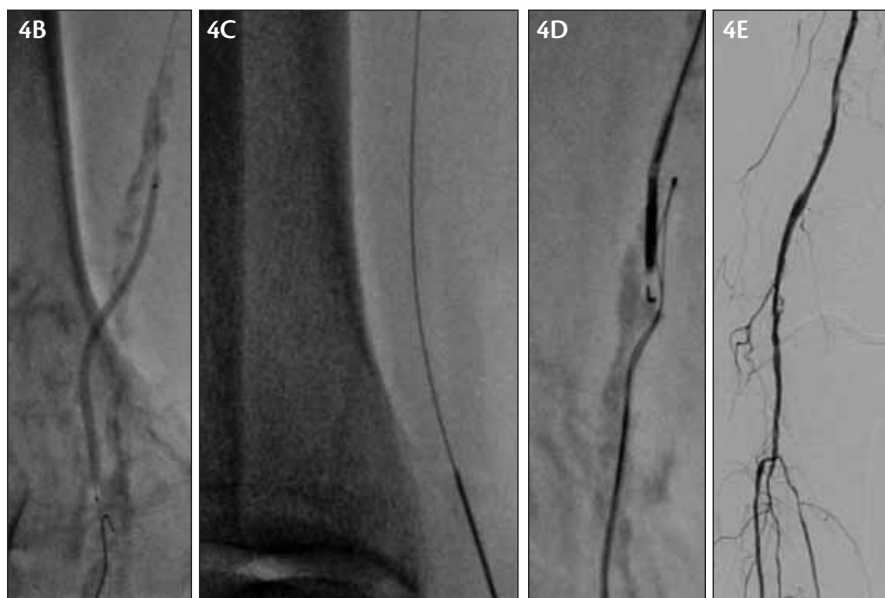


Figure. Case 4 treatment images.

will likely leave an unacceptable residual stenosis. Better options include using a device that allows crossing in the true lumen, followed by an ablative strategy such as atherectomy, or using the more supportive Supera woven nitinol stent (Idev Technologies). Initial sheath size should be selected based on what the operator chooses as the largest subsequent device.

Given the current array of interventional equipment available, including reentry devices, the odds are good that the distal popliteal true lumen can be entered from above. Should antegrade efforts fail, popliteal access would be the best “plan B,” superior to tibial access. It would allow for greater push, larger equipment size, and probably greater overall safety.

Editor's Chosen Method of Treatment

Dr. Rundback: An initial attempt at recanalization of the heavily calcified popliteal occlusion was performed without success via an antegrade left femoral puncture, with suboptimal positioning of the catheters in the subintimal space for reentry (Figure 4B). Subsequently, using fluoroscopic guidance and targeting arterial calcification, retrograde puncture of the posterior tibial artery was performed just above the ankle. Retrograde intraluminal (distal) and subintimal (popliteal) recanalization was accomplished via a 4-F posterior tibial sheath, with meeting of the antegrade and retrograde catheters in the mid-popliteal artery (Figure 4C). Reentry was then performed from the femoral access into a snare (En Snare, Merit Medical Systems, Inc., South Jordan, UT) positioned from the tibial approach (Figure 4D). Once through-and-

through access was achieved, revascularization was completed with scoring balloon angioplasty of the popliteal artery using a 5-mm balloon (Bard Peripheral Vascular) (Figure 4E).

Panelist Comments

Dr. Gray: These kinds of calcific atherosclerotic occlusions are tough to cross, open, and keep open. After stenting, the recurrence rate is substantial, and I would have a low threshold for stent grafting with anticoagulation to prevent thrombosis (more common with smaller grafts). The pedal access site should always be imaged after hemostasis to screen for injury that is not

uncommon with tibial puncture. Bypass surgery should be a strong consideration in these patients with “acceptable risk” and autologous vein.

Dr. Burket: Although the final result looks very good, I still would prefer popliteal access over placing a 4-F sheath into a tibial vessel.

Dr. Walker: Densely calcified arterial occlusions are challenging. They are difficult to cross and difficult to treat. Wire crossing is usually subintimal limiting the utility of atherectomy devices to modify plaque. Stents are frequently crushed in these areas, and there are higher rates of stent fracture and occlusion. Even balloon angioplasty is associated with balloon rupture. Newer stent designs are being evaluated for these lesions. The retrograde tibial approach utilized in this case can allow successful wire passage when antegrade attempts fail. It is safe when the operator follows meticulous technique and avoids being obstructive with catheters. Typically, one crosses via this approach then delivers therapy via the antegrade approach.

Dr. Wholey: This case is a good representation of the difficult popliteal cases that we can encounter: not only is it a long occlusion, but it is heavily calcified and a segment of the leg hostile for stent placement. This case also shows nice results with the snare. A simple approach with the cutting balloon showed good results, but long term, the patient may have a high restenosis rate. He will need frequent follow-up and subsequent treatment. I am curious how his ABI was after the procedure. ■