WHAT WOULD YOU DO?

Chronic Swelling, Pain, and Ulceration in the Left Lower Extremity

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CASE PRESENTATION

A 54-year-old man with a history of traumatic brain injury in 1981 from a motor vehicle accident developed extensive left lower extremity deep vein thrombosis (DVT) and was anticoagulated for a "short period of time" following his accident. Seven years ago, he underwent ablation of the great saphenous vein (GSV) to treat chronic swelling and pain in the left lower extremity, and he developed a non-healing wound, which has progressed over time. He also has significant weight gain from decreased activity and is treated in a wound care center and compliant with daily compression. His leg weeps fluid daily. He is mentally disabled from the head injury and needs constant care but is ambulatory and active despite his frontal lobe damage.

Medical history also includes seizures and a ventriculoperitoneal shunt. Medications include lamotrigine, donepezil, furosemide, lovastatin, topiramate, baby aspirin, and vitamins. He has been on and off antibiotics.

Physical examination shows 2+ edema and excoriation in the left lower extremity and ulcerated skin with erythema over a large area of the medial malleolus calf. There are 2+ dorsalis pedis and posterior tibial pulses. The left ankle, calf, and thigh are 4 to 5 cm larger than the right (Figure 1).

Figure 1. Photograph of the patient's leg.

What imaging would you obtain to evaluate this patient, and what questions are you trying to answer with this imaging?

Dr. Garcia: I would start with venous Doppler imaging of the leg to assess the extent of the DVT, the occlusive nature, and whether it extends below the popliteal to help determine the site of entry (popliteal vs posterior tibial/anterior tibial), as well as status of the ablated GSV. The final goal is to reestablish unimpeded, direct in-line flow from the ankle to the right atrium. If the common femoral vein (CFV) is involved or has poor waveform or

if there are pelvic or abdominal wall superficial varicosities on examination, then I would perform CT venography (CTV) to evaluate the central (including the inferior vena cava [IVC]) venous system. I have found that nonhealing venous wounds are often accompanied by central venous issues.

Dr. Hofmann: I would request a CTV from the diaphragm to the toes to get a comprehensive view of his deep and superficial system, in particular the status of his iliac veins and IVC.

Dr. Steadman: I would obtain a CTV of the pelvis and lower extremities followed by insufficiency duplex ultrasound. The pelvic CTV assesses for venous outflow obstruction, including left iliac vein and/or IVC scarring as well as May-Thurner compression of the left common iliac vein (CIV). I would then obtain a lower extremity CTV to map out enlarged superficial truncal veins and/or perforators that supply the varicosities in the lower extremity, particularly in and around the ulceration site. I also look for chronic scarring in the deep veins. This information is relayed to the vascular technician to guide their assessment for pathologic reflux and deep venous scarring. I use this imaging combination in patients with venous ulcers, patients with prior superficial venous intervention, and history of DVT with significant post-thrombotic syndrome (PTS).

CASE CONTINUED

Left lower extremity ultrasound for DVT and superficial reflux study demonstrate changes of chronic DVT in the left calf, the popliteal and femoral veins, and CFV. The vessels are patent and recanalized. The GSV is patent and refluxing for > 3 seconds (Figures 2–5).

CTV of the pelvis (protocol was not followed, so non-contrast CT was obtained) shows that the veins were mildly misshapen but fairly normal in caliber. There is subtle calcification centrally in the external iliac vein (EIV) and CFV (Figure 6).

Figure 2. Ultrasound image of the proximal femoral vein and profunda femorus demonstrating scarring.

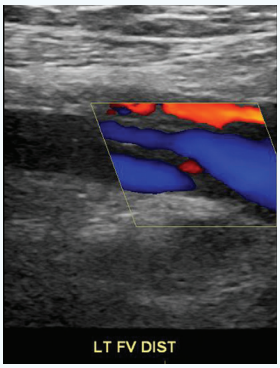

Figure 3. Ultrasound image of the distal femoral vein showing a web.

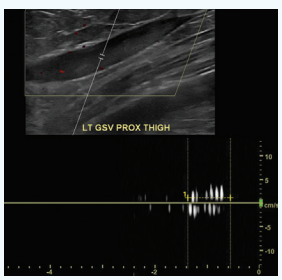

Figure 4. Ultrasound image of the GSV in the thigh showing reflux.

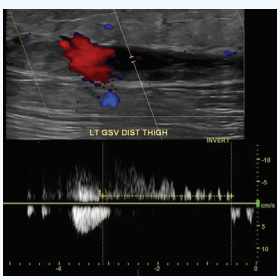

Figure 5. Ultrasound image of the GSV in the calf showing > 3 seconds of reflux and enlargement.

Figure 6. CTV image of the EIV showing subtle internal calcification but good caliber.

What would you do next? Would you have a sequential plan, and if so, what order would you consider for planned interventions? Would the patient's impulsive cognitive deficits play a role in influencing this decision?

Dr. Steadman: I would first perform a venography to assess the chronic scarring in the deep venous system with plans to perform angioplasty and stent anything in the iliac veins down to the lesser trochanter. Prolonged angioplasty would be performed from the lesser trochanter down to the popliteal vein and possibly the tibioperoneal and upper posterior tibial veins. The venogram is also beneficial to determine if the GSV is a significant collateral venous drainage pathway, especially considering

the ulcer formed after prior GSV ablation. If the GSV is not a significant collateral pathway, then I would ablate it coupled with foam sclerotherapy. I would use general anesthesia for the venography, which I use for almost all patients, and conscious sedation for the endovenous laser treatment and foam sclerotherapy given the patient's cognitive deficits. Ideally, if the ultrasound shows a large, accessible posterior tibial vein, then I will perform all procedures supine in one sitting using general anesthesia. While the patient is still under anesthesia, I will aggressively debride the ulcer, followed by appropriate wound dressing as well as compression wrap or an Unna boot. If the ulcer is particularly exudative and/or possibly infected, then I would place a wound vacuum after culture. The patient would then be admitted to internal medicine for antibiotics and wound vacuum treatment.

Dr. Hofmann: I would call the radiologist to ask why the CTV protocol wasn't followed and ensure it didn't occur with another patient. Given the calcification in the EIV, I am highly suspicious the patient will need iliac vein stenting. Depending on the caudal extent of disease, I would puncture either the posterior tibial vein, the short saphenous vein, or the popliteal vein and perform venography. If I didn't obtain a high-quality CTV, I would also likely use intravascular ultrasound (IVUS). Given this patient's cognitive deficits, I would do this while the patient is under general anesthesia.

Dr. Garcia: Although the CT is without contrast, the calcification is suggestive of disease. I would attempt to perform a CTV to better assess anatomy, as I like to know as much as possible before intervening. Nonetheless, after the CTV, the plan would be to obtain a venogram with the intent of treating at that time. Based on the venous Doppler image, I would place the patient in the prone position, access the posterior tibial vein and get a full leg venography, with the popliteal fossa prepped for IVUS use. Despite the patient's injury and resultant deficits, I think that it is possible to improve his quality of life while allowing his wounds to heal, prevent the ulcers from recurring, limit the progression of his chronic venous disease, and even allow the patient to become more active. My initial office evaluation would include a thorough discussion with the patient and his family as to the risks and benefits of the procedure and ensure their complete understanding of the bleeding risks. Because his injury is so remote, I would not have any issue using the ACCESS PTS protocol of low-dose tissue plasminogen activator and Ekos therapy (Ekos Corporation, a BTG International group company) if needed.

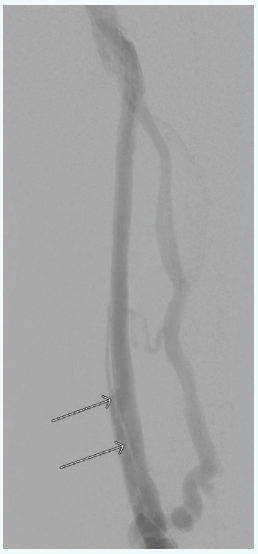

Figure 7. Prestent femoral venogram.

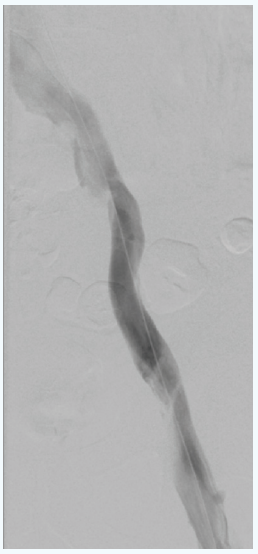

Figure 8. Prestent pelvic venogram.

CASE CONTINUED

The venogram of the leg shows webs in the femoral vein and narrowing of the popliteal vein, with collateral filling of the profunda femorus vein (Figure 7). The venogram of the pelvis shows misshapen but patent iliac veins with mild lucency of the CIV and mild reflux into the internal iliac vein (Figure 8).

What would you do next?

Dr. Garcia: On therapeutic enoxaparin, I would dilate from the posterior tibial vein through the iliacs (with secondary access at the popliteal vein) with appropriate-sized balloons to break the webs/synechiae and perform IVUS from the popliteal vein through the iliac vein to determine residual luminal abnormalities (webs/synechiae), if iliofemoral stenting is needed, and if so, the exact location and sizes. I measure both the vein diameter as well as area, both pre- and postintervention. Once treatment is completed, I repeat the full leg venography and look at flow—how brisk it is and the time for contrast washout. I find that the comparison of the initial to postwashout time is very indicative of how the patient will do and potential long-term vessel patency.

Dr. Steadman: I would perform prolonged angioplasty from the CIV to the popliteal vein. The CIV angioplasty would likely identify a suspected May-Thurner compression, which would be stented. Angioplasty would also identify the significant stenosis or stenoses that are causing collateral filling of the profunda femoral vein. If

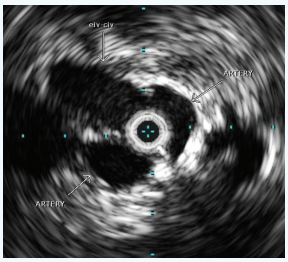

Figure 9. IVUS showing a web in the CFV/EIV junction.

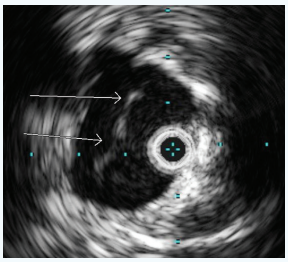

Figure 10. IVUS showing a misshapen EIV.

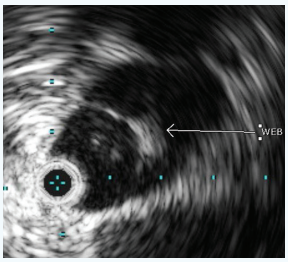

Figure 11. IVUS compression of the EIV/CIV junction as it passes between the internal and external iliac arteries.

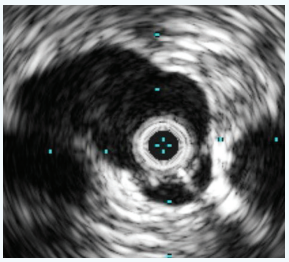

Figure 12. IVUS with web in the CIV.

stenoses were questionable and/or flow did not improve after angioplasty, I would use IVUS to identify stenotic areas and/or regions of significant webbing to target with additional angioplasty or stenting.

Dr. Hofmann: I would also plan on venoplasty of the popliteal and femoral vein and stent the iliac veins. It is hard to tell based on the images, but if needed, I would stent down to the level of the lesser trochanter to ensure robust in-line flow.

CASE CONTINUED

IVUS shows webs and bands of synechiae throughout the CIV, EIV, and proximal CFV above the GSV. The vein is large in external caliber (16 mm except in an area of 50% narrowing). Segments of the vein are tented and misshapen (Figures 9–12).

Approach of the Moderator

My philosophy and approach to these patients is consistent. Ulcers usually have a deep venous obstruction of some nature. Obesity and congestive heart failure can be a form of physiologic "obstruction." I believe that chronic DVT should be addressed first with recanalization before treatment of the superficial system. This is a case in point of a patient whose GSV was ablated and he worsened. It is difficult to get superficial reflux severe enough to overwhelm the deep system to the point of ulceration in a patient with a patent deep venous system. Therefore, I obtain a DVT ultrasound, including longitudinal grayscale images of the vein, and a CTV on all ulcer patients.

I performed a left lower extremity venography with prolonged balloon angioplasty of the common femoral, femoral, and popliteal veins. This requires angioplasty for 3 to 5 minutes with high-pressure balloons and, therefore, general anesthesia, which would have been necessary in any event in this patient. Given the calcifications in the pelvis seen on CTV, this patient also needs evaluation with IVUS. Once deformity, webs, and narrowing are identified, stenting is indicated, especially in ulcer patients. I choose to stent to match the vein size and not oversize, as tenting of the vein distally causes spasm and turbulent flow. The entire webbed segment needs to be stented, so in this patient, this means from CIV to CFV.

Following such an intervention, what would your anticoagulation/clinical management regimen be?

Dr. Hofmann: I would anticoagulate with enoxaparin 1 mg/kg twice daily for a minimum of 1 month, preferably 3 to 6 months, with a goal peak (4 hours after dose) anti-Xa level of 0.7 to 1 IU/mL. I would then transition to an oral anti-Xa agent with the same therapeutic goal.

Dr. Garcia: Everyone is started on weight-based (twice daily) enoxaparin the day prior to the procedure, and this is continued for 1 month postprocedure. Patients are seen in the office at 1 month with follow-up venous Doppler, and then they are transitioned to oral anticoagulation (novel anticoagulants). I use enoxaparin because I believe it is the best anticoagulant with anti-inflammatory properties that give the best result. All patients are discharged with my "ABC" rules: activity, blood thinner, and compression.

Dr. Steadman: I would use enoxaparin with bridging to one of the newer oral anticoagulants for at least 6 months. Patients return to the clinic for duplex ultrasound at 1, 3, and 6 months to assess for ulcer, leg swelling resolution, and deep vein patency.

CASE CONTINUED

The final result is improved flow in the femoral and popliteal veins and widely patent stents in the pelvis with a few areas of subtle lack of complete wall apposition (Figures 13 and 14). The patient is placed

Figure 13. Poststent pelvic venogram showing initial stenting of the CIV with a 16-mm Wallstent (Boston Scientific Corporation).

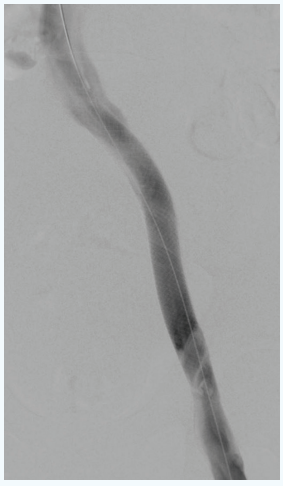

Figure 14. Second poststent venogram showing an overlapping 16-mm Wallstent.

on enoxaparin 1 mg/kg subcutaneously twice daily for 1 month, aspirin 81 mg, and compression is applied. He is seen in clinic at 3 weeks with follow-up ultrasound and clinical evaluation. He has experienced resolution of pain and significant interval healing of wounds. His mother reports only one episode of weeping from wounds. The patient has lost 23 lb due to a combination of edema reduction and ability to return to a rigorous gym routine. There is still significant edema in the calf, but it is softer. Deep veins are patent, and saphenous reflux and numerous varices around the wound persist.

What would you do next?

Dr. Steadman: If the ulcer has healed with no residual symptoms at 6 months, I would discharge the patient from the clinic with strict instructions to return to my clinic for recurrent ulcer, leg pain, or swelling. In this case, I recommend aspirin 81 mg for life. If a patient meets criteria for life-long anticoagulation, I will recommend anticoagulation continuation.

Dr. Garcia: His residual calf swelling could be a result of either reflux (deep, superficial, or both), chronic venous changes, or both. I have become an advocate for posterior tibial access, as I have found the best results for complete lower extremity improvement (to ankle) are when the popliteal and tibials are treated as well. If in 3 to 6 months the signs and symptoms persist after treating the popliteal and tibial veins, then I would ablate the GSV if significant reflux is still demonstrated.

Dr. Hofmann: Given that this was initially a provoked DVT (motor vehicle accident in 1981), if at 1 year he had no open wounds and a CTV showed widely patent stents with good in-flow, I would consider trying to reduce his anticoagulation dosage from a therapeutic dose to a prophylactic dose. Then, I may consider taking him off all anticoagulation, except for a daily 81 mg of aspirin.

CASE SUMMARY

The patient is scheduled for ablation of the saphenous vein and foam sclerotherapy to be performed while on anticoagulation. ■

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