The Progression of Deep Venous Interventions: What's Next for Physicians and Patients

Tejas Shah, MD, shares his view on the evolving landscape of vascular care and talks about how his practice addresses venous disease through myriad approaches.

Tejas Shah, MD
Program Director, Vascular Surgery
Ascension Illinois
Chicago, Illinois
Disclosures: Paid consultant to Inari Medical.

What does your current venous practice look like?

My current venous practice incorporates the entire range of venous disease, including the management of acute and chronic deep vein thrombosis (DVT), May-Thurner syndrome, deep venous occlusions secondary to dialysis access, and upper extremity deep venous treatment including Paget-Schroetter syndrome. In addition to deep venous work, I also perform a variety of superficial venous treatment strategies, including endovenous thermal ablation, sclerotherapy, microphlebectomy, and treatment of venous malformations.

What impact has the recent rise in venous interventions had on vascular surgery?

I believe that as technology has shifted, we are able to offer interventions to a greater number of patients. In the past, the management of patients with complex or long-standing venous disease was challenged by our limited treatment strategies. This is particularly true for the chronic deep venous space. Many vascular surgeons will recall the difficulties of performing a Palma procedure for chronic iliac vein occlusions; however, with the advent of several endovascular technological advances, we are now able to offer more effective treatments in a minimally invasive fashion.

What has been your experience with the ClotTriever® System (Inari Medical)?

The ClotTriever device has changed the way we view and treat acute and subacute DVTs. For many vascular specialists, it is akin to performing Fogarty thrombectomy in the arterial space. By using the ClotTriever device, extraction of acute and subacute clot from venous vessel walls has resulted in restoring venous luminal flow and improving the functionality of deep venous valves.

Symptomatically, patients report improvement in their edema and pain, as well as long-term benefits including reduced postthrombotic syndrome (PTS).[1] ClotTriever has been something our organization has been able to train on and integrate into practice effectively. Additionally, the use of ClotTriever reduces the need for thrombolytics and long hospital stays, including days spent in the intensive care unit (ICU).[2] Finally, there is no additional equipment required with a ClotTriever device, which minimizes the need for storage of additional supplies.

How does ClotTriever differ from other modes of intervention for DVT?

ClotTriever has revolutionized the way we view and treat acute and subacute DVT. Through various in vivo studies, we have learned that despite the acute presentation of the patient, deep venous clot quickly evolves from the soft, currant jelly–appearance that is rich in fibrin to a rubberier, fibrous, collagen-rich substance.[3,4] Both the ClotTriever and ClotTriever BOLD devices offer wall-to-wall thrombectomy for the removal of wall-adherent clot from the vascular system. All this is captured in the collection basket that allows for a quick removal of clot burden.

Use of ClotTriever has decreased the need for thrombolytics, shortened procedural times, and decreased hospital lengths of stay.[2] Additionally, patients no longer

Case Example: VenaCore Device to Address Challenging Venous Occlusion

By Tejas Shah, MD

PATIENT PRESENTATION

A man in his mid-70s presented with significant swelling and pain of the left leg that he recalled starting about 3 months before presentation to our vascular clinic. Prior to vascular evaluation, the patient was recommended compression, elevation, and anticoagulation. Duplex ultrasound was performed, revealing nonacute thrombus from the left common femoral vein (CFV) down to the distal popliteal vein.

PROCEDURAL OVERVIEW

The patient was prone after administration of general anesthesia. Access of the distal left popliteal vein was obtained via micropuncture, and systemic heparin was administered. Venography was performed revealing acute-to-chronic thrombus occlusions from the popliteal vein proximally to the CFV with significant collateralization (Figure 1A and 1B). A stiff straight Glidewire (Terumo Interventional Systems) and 0.035-inch TrailBlazer support catheter (Medtronic) were used to cross the entirety of the lesion. The Glidewire was ultimately exchanged for an Amplatz Super Stiff (Boston Scientific Corporation) wire. A 16-F ClotTriever sheath was then placed into the popliteal access.

Initially, a ClotTriever Bold device was selected, and four passes were performed, rotating the device 90˚ with each pass. Repeat venography was performed, revealing significant residual venous occlusion. As such, we elected to utilize the VenaCore device to perform more aggressive thrombectomy to address the challenging venous occlusion. The VenaCore device was dialed to the precise size of the vessel, and brisk quarter turns were performed while brushing the vessel back and forth with the VenaCore device. This resulted in significant separation of the challenging occlusive material from the vessel wall and ultimate removal of the existing thrombus.

The ClotTriever device was then deployed two additional times to remove all remaining thrombus that had been separated from the vessel wall (Figure 1C). Completion venography revealed restoration of the venous system with brisk flow from the popliteal vein to the iliac venous system (Figure 1D-1F). Total procedure time was 59 minutes. The patient was discharged home that evening and resumed anticoagulation.

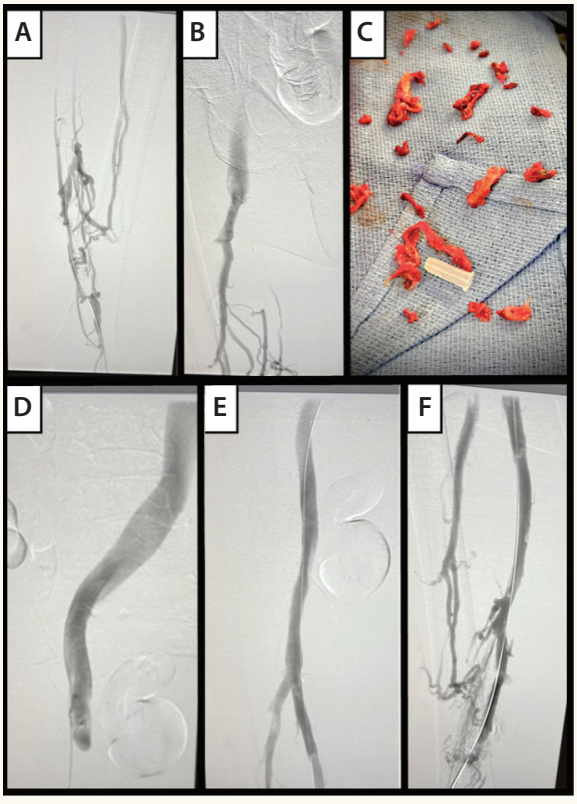

Figure 1. Initial venograms (A, B). Extracted thrombus (C). Completion venograms (D-F).

CONCLUSION

At 2-week follow-up, the patient reported complete resolution of pain and swelling. Ultrasound revealed patency from the CFV down to the popliteal venous system with improved respiratory phasicity and appropriate response to Valsalva.

require an expensive ICU stay, and the need for repeat procedures during the same hospitalization has diminished. ClotTriever can also be used in conjunction with the high-power suction properties of FlowTriever® (Inari Medical), which can help remove significant soft thrombus and clots that may be trapped within thrombosed inferior vena cava filters.

VenaCore™ (Inari Medical) is designed to address challenging venous occlusions. What has been your experience with that device?

The addition of the VenaCore thrombectomy catheter has completed the family of devices that are required to tackle thrombus of any age. The most challenging patients are those who have been suffering from long-standing

occlusions associated with a remote DVT. The VenaCore device is akin to both an endovascular Freer elevator that may be used during an open endarterectomy and an atherectomy device, featuring notched leading edges that engage, separate, and ultimately remove material. In addition, the VenaCore device engages material in a bidirectional fashion while turning the device a quarter turn at a time.

An added feature of the VenaCore device is its precise sizing dial that allows the interventionalist to treat vessels from 6 to 16 mm. I have been impressed with the results after intervening with the VenaCore device because I have been able to remove venous occlusions plastered by prior DVT events. The most impressive characteristic is the ability to remove challenging venous occlusions either as a single piece or in several small pieces. I often use the VenaCore device in conjunction with the ClotTriever device to remove separated nonacute material off the vessel walls. Moreover, in patients with long-standing occlusions who may also have residual thrombus or scarring in the inflow vessels, the use of VenaCore can potentially improve inflow and maintain stent patency.

How does your technique with VenaCore optimize both vessel patency and patient outcomes?

When using VenaCore, remember the clinical goal is luminal gain and improved patency, not thrombus removal, although some cases yield a large amount of material removed. In my experience, optimal results start with preprocedural imaging, especially intravascular ultrasound (IVUS), to identify chronic obstructions.

After gaining access, I advance VenaCore under fluoroscopy until the tip passes the identified occlusion. A scrub-and-quarter-turn technique has proven both effective and safe.

VenaCore stands out for its ability to provide luminal gain, improve vessel patency, and remove fibrotic material that otherwise would be left untreated. Paired with posttreatment imaging, including repeat IVUS, it gives me confidence that I'm improving clinical outcomes and meaningfully enhancing the patient's quality of life.

What do you think the future holds for advanced venous disease interventions?

The future for the treatment of advanced venous disease is bright with a host of new tools that are designed to eliminate thrombus of virtually any age. This can now be done safely, effectively, and through minimally invasive mechanisms to help restore the original venous structures and provide much-needed relief from the scourge of PTS and the associated long-term consequences. We can now help an entire population of patients for whom we previously had minimal effective treatment strategies.

How can physicians best identify and work with their referring providers to ensure that they get an evaluation from an interventionalist?

Recognition of the disease is the key. For many patients with venous symptoms and a history of DVT, advanced venous occlusions may be present. Previously, we didn't have a viable treatment, so we didn't have a strategy; however, now there are minimally invasive intervention options that are increasingly effective. Educating our medical colleagues, whether that be hospitalists, primary care physicians, hematologists, or wound care specialists, is vital as it is a barrier for the referral process. Understanding that this space is real, treatment is real, and that meaningful improvement in patients' condition is real and essential. This will be a multifaceted approach similar to the carotid space. ■

1. Kahn SR. The post-thrombotic syndrome. Hematology Am Soc Hematol Educ Program. 2016;2016:413-418. doi: 10.1182/asheducation-2016.1.413
2. Dexter D, Kado H, Shaikh A, et al. Safety and effectiveness of mechanical thrombectomy from the fully enrolled multicenter, prospective CLOUT registry. J Soc Cardiovasc Angiogr Interv. 2023;2:100585. doi: 10.1016/j.jscai.2023.100585
3. Silver MJ, Kawakami R, Jolly MA, et al. Histopathologic analysis of extracted thrombi from deep venous thrombosis and pulmonary embolism: mechanisms and timing. Catheter Cardiovasc Interv. 2021;97:1422-1429. doi: 10.1002/ccd.29500
4. Czaplicki C, Albadawi H, Partovi S, et al. Can thrombus age guide thrombolytic therapy? Cardiovasc Diagn Ther. 2017;7(suppl 3):S186-S196. doi: 10.21037/cdt.2017.11.05

DISCLAIMER: Tejas Shah is a paid consultant of Inari Medical. He is sharing his views, opinions, and experience with Inari Medical devices. His opinions and experiences using these devices may not represent every experience or outcome with the devices. The information is not a promise or guarantee by Inari Medical regarding a particular treatment, therapy, medication, device, diagnosis, action, recommendation, strategy, or outcome with either the product or the information contained in these materials.