

CASE REPORT

Single-Session Endovascular Treatment of Acute Iliofemoral DVT

Pharmacomechanical thrombectomy and venous stenting in a patient with phlegmasia secondary to extensive iliofemoral venous thrombosis.

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A 39-year-old woman presented to the emergency department with sudden onset of severe left leg swelling and pain. The patient reported some less severe groin and lower back pain over the preceding few days. A sudden deterioration with evolving phlegmasia, significant skin discoloration, and some mottling were observed in the last 24 hours. In addition, she had pronounced shortness of breath but was hemodynamically stable.

There was no previous history of lower limb deep vein thrombosis (DVT); however, there was a significant family history of thrombosis, and the patient had previously suffered a cerebral venous thrombosis. She was not known to our hematology service and was not on anticoagulation therapy at the time of presentation.

Initial ultrasound imaging demonstrated extensive acute venous thrombus extending from the common femoral vein to the popliteal vein with patent below-the-knee veins. Indirect CT venography confirmed acute descending thrombosis extending from the proximal common iliac vein (CIV) with a tight May-Thurner compression and also venous compression by the left internal iliac artery. The CT pulmonary angiogram showed large bilateral main pulmonary artery emboli with no evidence of right heart strain and a right ventricular/left ventricular ratio < 0.9 .

TREATMENT OPTIONS

Due to the severity of symptoms, conservative management with anticoagulation was not considered to be a viable option. Catheter-directed thrombolysis was discussed, but the acuity and severity of the symptoms meant rapid restoration of flow was required. There was some initial reticence to perform pharmacomechanical thrombectomy given the large-volume pulmonary emboli. However, given the absence of right heart strain, we believed it was safe to proceed, albeit with the placement of a temporary inferior vena cava (IVC) filter. We do not typically place IVC filters prior to treating DVTs and usually adhere to the theory that the venous com-

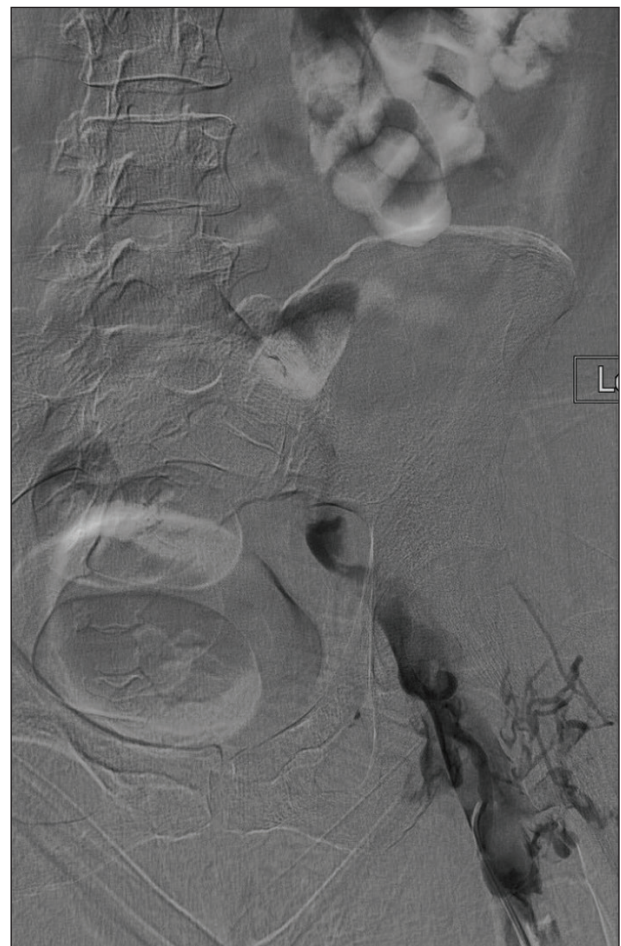


Figure 1. Preintervention venogram demonstrating extensive iliofemoral thrombus and absent flow.

pression point effectively acts as a filter. However, in this case, the sheer volume of pulmonary emboli led our decision to place a filter prior to treatment.

COURSE OF TREATMENT

The procedure was performed in the interventional radiology suite under local anesthetic with conscious

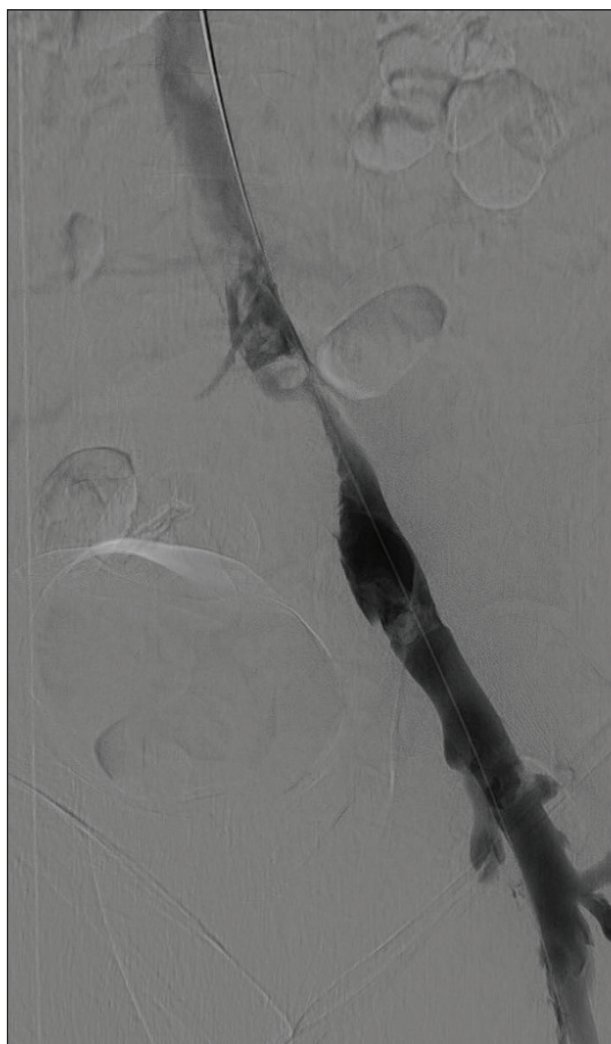


Figure 2. Post-AngioJet venogram demonstrating clearance of a majority of the acute thrombus and the underlying tight CIV stenosis.

sedation. A right internal jugular puncture was used, and an IVC filter was inserted in the infrarenal IVC. The patient was then repositioned prone, and under ultrasound guidance, the popliteal vein was punctured, and a 10-F vascular sheath was inserted. Venography confirmed extensive acute thrombus of the popliteal, femoral, and iliac veins (Figure 1). The occlusion was crossed easily using a catheter and hydrophilic guidewire. Intravascular ultrasound (IVUS) was performed to delineate the extent and volume of the thrombus.

An AngioJet™ ZelanteDVT™ catheter (Boston Scientific Corporation) was inserted, and lytic was instilled using the Power Pulse™ mode throughout the thrombosed segment. The Power Pulse mode drives the lytic deep into the clot, and the device is rotated during delivery to ensure uniform distribution throughout the thrombus.

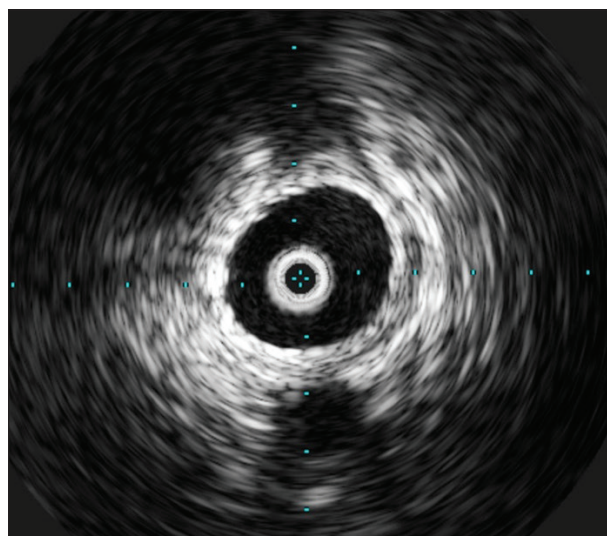


Figure 3. IVUS image of the Vici stent demonstrating complete expansion and circular stent morphology.

For lytic delivery, we dilute 20 mg of alteplase in 100 mL of normal saline. Following administration of the lytic, it is important to pause for at least 15 minutes to allow the lytic to act effectively. The AngioJet was then switched to thrombectomy mode, and the catheter passed slowly through the thrombosed segment to ensure maximal clot clearance. A number of passes through the thrombus were performed with a total run time of 260 seconds.

Venography confirmed excellent clot clearance, with a residual stenotic segment of CIV (Figure 2). IVUS, which has been shown to be more accurate than venography in assessing venous stenosis,¹ was used to identify the compression points, delineate the landing zones, and correctly size the vessel prior to stent selection and placement. Predilatation of the stenotic segment was performed using a 16-mm high-pressure noncompliant balloon. A 16- X 90-mm-diameter Vici Venous Stent® (Veniti, Inc.) was inserted and postdilated following deployment; IVUS was performed to confirm uniform expansion and position (Figure 3). Completion IVUS demonstrated a focal thrombus at the stent inflow that could potentially have jeopardized patency. This was easily treated with another short burst of thrombectomy from the AngioJet. Completion venography demonstrated rapid venous flow (Figure 4). Hemostasis was achieved with manual compression. We planned to remove the filter immediately postprocedure, but the cavogram showed a moderate amount of thrombus within the filter, and retrieval was deferred for 6 weeks.

RESULTS

The patient's symptoms improved rapidly, and our standard posttreatment protocol began. She was



Figure 4. Completion venography demonstrating resolution of thrombus, a uniformly expanded stent, and rapid flow with no collateral filling.

started on split treatment dose low-molecular-weight heparin for 2 weeks, with the first dose given 2 hours postprocedure. A duplex ultrasound performed on day 1 confirmed stent patency. A second ultrasound was performed at 2 weeks and showed a widely patent stent with good flow; the patient was then transitioned to warfarin. At 6 months, the patient was converted to a direct oral anticoagulant, which will be continued indefinitely, given the multiple episodes of venous thrombosis.

The filter was easily removed 6 weeks after the procedure with complete resolution of the thrombosis. At 1-year follow-up, the stents were patent with no in-stent stenosis, and the patient remained symptom free (Villalta score < 5).

DISCUSSION

Acute iliofemoral DVT is a potentially life-changing event, and severe cases with phlegmasia can be limb

threatening. The long-term sequelae and high incidence of postthrombotic change are now well recognized. Almost half of patients with an iliofemoral DVT will develop a degree of postthrombotic syndrome (PTS), and up to 10% will develop severe PTS with ulceration and skin changes.² In cases such as ours with a potentially threatened limb, rapid restoration of flow is vital. Prevention of PTS relies on thrombus removal and restoration of flow to prevent vessel and valvular damage, which ultimately leads to venous hypertension and PTS.

One of the most common problems with delivering catheter-directed lysis treatment is the availability and cost of high dependency beds for the period of lytic treatment. For this reason, therapies that enable effective “single-session” thrombus removal are attractive. Additionally, avoiding patient exposure to lysis infusions reduces bleeding risk. The AngioJet device utilizes rheolytic technology with high-pressure jets disrupting thrombus and creating a vacuum behind that entrails thrombus into the in-flow window. The Zelante catheter is specifically designed for treatment of large-vessel veins with a single large in-flow window for torqueable and directional thrombectomy, combined with a more powerful jet. In our experience, this significantly increases the rate and volume of thrombus clearance.

Maintaining venous patency after venous intervention is key to achieving good long-term results when treating DVT. In the majority of cases, this requires treating any underlying stenosis with a dedicated venous stent. A venous stent must have sufficient crush resistance and radial force to maintain luminal shape, in combination with flexibility to accommodate movement in the pelvis and groin. Early data have suggested that attaining a circular lumen may have more impact on clinical outcomes than area change.³ The Vici stent is a closed-cell nitinol stent that provides uniform end-to-end strength balanced with flexibility. Preliminary data from the VIRTUS clinical trial investigating the use of the Vici stent in the treatment of chronic venous outflow obstruction have confirmed excellent technical results: 0% mean residual stenosis; primary, assisted primary, and secondary patency of 93%, 96%, and 100%, respectively.⁴

The recently published ATTRACT trial, and its headline finding of no significant difference in the presence of PTS between patients treated with catheter-directed therapies and those receiving standard anticoagulation,⁵ has inevitably led some to question whether this will affect contemporary DVT treatment practices. However, the limitations of the trial must be considered when interpreting the findings. The use of a binary endpoint of PTS or no PTS, the inclusion of patients with femoropopliteal thrombosis, the low incidence of stenting, and absence of a standardized postprocedure follow-up

are significant weaknesses and do not reflect current best practice. As our understanding of venous disease has evolved, we now know that by selecting the correct patient for intervention (descending iliofemoral DVT, thrombus age < 14 days, and patients with low bleeding risk), effectively clearing the clot, addressing any underlying venous stenosis, and adopting a rigorous post-procedure anticoagulation and ultrasound surveillance protocol, we are able to achieve excellent results for our patients. ■

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