

Pharmacomechanical Thrombolysis of Symptomatic Deep Vein Thrombosis

► Interventional radiologists at Penn Medicine are performing pharmacomechanical thrombolysis in conjunction with catheter-directed thrombolytic therapy to manage symptomatic acute and subacute deep vein thrombosis (DVT). The goal of the therapy is to remove the majority of the clot burden with significantly less thrombolytic medication than conventional catheter-directed thrombolysis alone, thereby decreasing the risk of bleeding and more importantly, helping to minimize damage to the veins that can subsequently lead to life-long complications known as post-thrombotic syndrome (PTS).

The etiologies for DVT include several prothrombotic factors such as recent surgery, cancer, trauma, prolonged periods of inactivity (i.e., air travel), central venous catheters, hormone therapy, genetic hypercoagulable syndromes, and superficial thrombophlebitis. DVTs generally begin as occlusive clots at the valve cusps in the veins of the calf. Half will resolve spontaneously, but about 25% of symptomatic DVT will progress by extension into the proximal (iliofemoral) veins. In addition to causing symptoms of pain and swelling, the presence of iliofemoral DVT accounts for the highest risk of recurrent DVT and more importantly, the highest risk of pulmonary embolism.

Of patients with symptomatic iliofemoral DVT, 25-60% will go on to develop (PTS), a condition caused by damage to valves in the deep veins. PTS is characterized by chronic lower extremity swelling, pain, skin changes, and venous ulceration secondary to chronic venous hypertension.

The standard of care for acute and subacute DVT is anticoagulation, a therapy that prompts endogenous clot lysis and prevents further clot formation and propagation. However, anticoagulation works slowly and studies suggest that fewer than 50% of iliofemoral DVT will dissolve completely within six months. Unfortunately, valvular damage can occur during this timeframe.

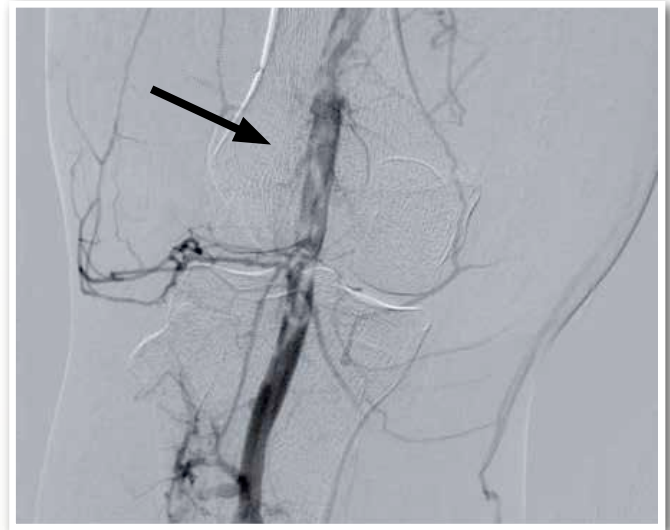
To hasten the resolution of DVT and preempt PTS, interventional radiologists at Penn Medicine are performing pharmacomechanical thrombolysis in combination with catheter-directed thrombolysis. Pharmacomechanical thrombolysis involves infusing a small amount of potent thrombolytic directly into the clot, fragmenting the clot, and then suctioning the clot fragments from the vein. This technique allows for a 40-50% reduction in thrombolytic dose, greatly diminishing the risk of bleeding that may be associated with thrombolytic therapy.

CASE STUDY

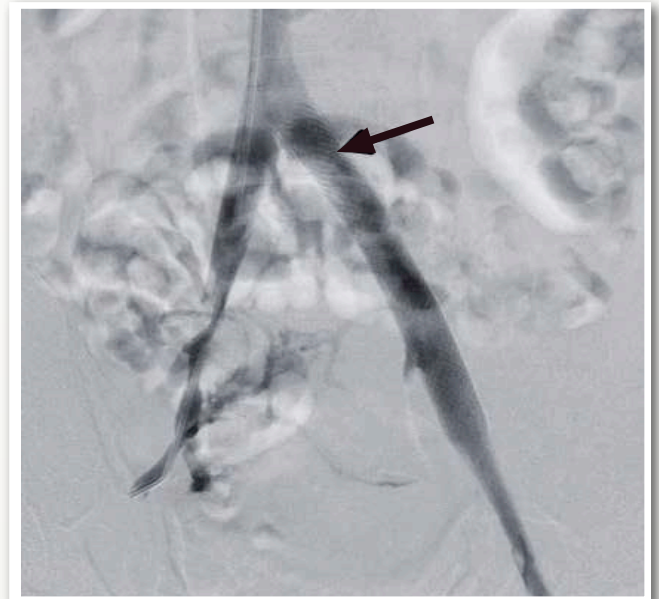
Ms. G, a 44-year-old woman, presented to the Penn Medicine Trauma Center with pain and swelling of her entire lower left leg. She reported having had severe cramping in the leg for two days previously, but that the pain had been relieved by NSAIDs. With the exception of oral contraceptive use for the past year, her medical history was unremarkable.

At Penn, a Doppler ultrasound and CT identified extensive thrombus in the left popliteal, femoral, and iliac veins extending to the inferior vena cava (Fig. 1). No evidence of pulmonary embolism was found, however. Ms. G was started on IV heparin and transferred to the inpatient medical service.

Penn Interventional Radiologists were consulted to discuss treatment options. After learning about standard of care treatment and more aggressive treatment options, Mrs. G opted for pharmacomechanical thrombolysis versus conservative standard of care with



► **Figure 1:** Venogram of a deep vein thrombosis (arrow) extending from the left popliteal vein to the inferior vena cava.



► **Figure 2:** Final venogram, showing no evidence of thrombus. The left common iliac vein has been stented in the setting of May Thurner syndrome, resulting in excellent venous outflow.

anticoagulation and compression stockings. The following morning, she went to the Interventional Radiology suite, where she was placed under conscious sedation in the prone position, and venous access was obtained near the ankle in the left posterior tibial vein. Given the extent and acuity of the clot burden, pharmacomechanical thrombolysis alone was performed resulting in removal of the majority of the thrombus.

During the procedure, a high grade stenosis of the left common iliac vein was identified as the culprit lesion, suggesting a diagnosis of May Thurner syndrome, an often underdiagnosed and overlooked cause of extensive left iliofemoral DVT. May Thurner, which is more commonly seen in women, is due to compression of the left common iliac vein by the overlying right common iliac artery and the spine posteriorly.

May Thurner is managed with angioplasty and stenting to treat the underlying mechanical compression and prevent recurrent DVT. Because patients with the syndrome receive anticoagulation therapy for only 3-6 months (vs. potentially lifelong treatment for acute unprovoked DVT), accurate diagnosis of May Thurner is of critical importance.

Angioplasty of the left common iliac vein was performed for Ms. G, resulting in improvement, but continuing compression of the vessel. To resolve this issue, a stent was placed to buttress the left common iliac vein resulting in excellent venous outflow (Fig. 2). Ms. G remained in the hospital overnight for observation and was released to home the next day. She has since made a full recovery.

FACULTY TEAM

The specialists with the Interventional Radiology Division at Penn Medicine offer the diagnosis and treatment of a variety of diseases using minimally invasive techniques. In addition to dedicated IR suites, the Division has an active outpatient clinic, admitting and consulting services.

Performing Pharmacomechanical Thrombolysis for DVT at Penn Medicine

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