

## Management of Chronic Deep Vein Thrombosis and Post Thrombotic Syndrome

► Interventional radiologists at Penn Medicine are performing deep vein recanalization to treat post-thrombotic syndrome (PTS) following deep vein thrombosis (DVT) with extremely high success rates (92%-95%). Deep vein recanalization offers the potential for vein restoration and symptomatic relief of massive leg swelling and pain, and reduces the risk of recurrent blood clots even among patients considered “untreatable” as a result of long-term PTS.

By comparison to distal DVT (below the knee), patients with proximal DVT (extending into the thigh and/or pelvis or abdomen) have a greater than 50% chance of developing PTS. For those patients with inferior vena cava (IVC) filters, there is up to a 20% risk of developing complete blockage of the IVC if the filter is not removed when it is no longer needed.

Deep venous recanalization is a complex, yet minimally invasive procedure that involves threading a small wire (1 mm in diameter) and a catheter from the ankle through the blocked veins. A balloon is advanced over the wire and inflated to open the vein (a technique or procedure known as angioplasty) and break up scar tissue that is preventing the vein wall from staying open. Once the scar tissue is broken, the previously blocked vein remains open enabling blood to drain from the legs and lower body back to the heart. For veins in the abdomen and pelvis, stents are placed to keep the veins open. In individuals whose PTS is related to an IVC filter, removal of the IVC filter with endobronchial forceps, a technique pioneered at Penn Medicine, is performed.

Chronic venous disease is a condition that requires a comprehensive multi-disciplinary approach. Procedures such as endovenous laser treatment (EVLIT) and sclerotherapy are also performed at Penn Medicine to treat painful varicose veins, skin discoloration, and venous ulcers. Our team works closely with hematologists, lymphedema specialists and wound care experts to offer the most advanced care. A hallmark of the program is providing education to patients so that they can better understand chronic venous disease.



► **Figure 1:** Diagnostic venogram demonstrating complete obstruction and scarring of the IVC and iliac veins.



► **Figure 2:** The same patient after deep venous recanalization with stenting (ie reconstruction) of the deep veins in the abdomen and pelvis.

Before DVT Treatment



1 month after DVT Treatment



► **Figure 3:** Patient with severe PTS after DVT involving an embedded IVC filter. The same patient 1 month later after removal of the IVC filter and deep venous recanalization of the deep veins of the abdomen, pelvis, and legs.

### CASE STUDY

Mr. J was referred to Penn Interventional Radiology for severe disabling PTS. Several years before, Mr. J presented to another hospital with shortness of breath and leg swelling and was found to have an extensive DVT in the right leg with a pulmonary embolism. He was placed on blood thinners and had an IVC filter placed. Months later, he developed massive swelling and pain in both legs that required him to go on disability and use a wheelchair. In the following months, he saw several specialists, who told him nothing further could be done to improve his quality of life.

At Penn Interventional Radiology, an examination of Mr. J’s legs found significant edema, abdominal varicosities, and skin discoloration. Massive swelling prevented Mr. J from wearing pants or shoes, and he was unable to stand for more than 5 minutes without severe pain and shortness of breath. A CT scan showed that the IVC and iliac veins in the abdomen and pelvis were completely blocked and had scarred down to one-tenth of the original size (Figure 1). The blockage extended up to the IVC filter, which was embedded in the IVC wall.

With an expert team of anesthesiologists and nurses, Penn IR physicians removed the IVC filter using endobronchial forceps. Through 3 small skin punctures, the chronically blocked IVC and iliac veins were opened and reconstructed with stents while the chronic scar tissue in the femoral and popliteal veins in the legs was broken up with balloon angioplasty (Figure 2). After the procedure, Mr. J was placed on anticoagulation, an exercise regimen, and provided compression stockings. At 1 month follow-up, he had lost more than 30 lbs, had significant improvement in pain and swelling (Figure 3), resolution of shortness of breath, and was able to return to work and regain his quality of life. Four years later, he continues to do very well.

## FACULTY TEAM

Patients travel from around to world to Penn Interventional Radiology to be treated for venous disease. In addition to advanced diagnostics and innovative minimally invasive procedures, the Division offers dedicated IR suites, an active outpatient clinic and admitting and consulting services.

### ► Managing Chronic Deep Vein Thrombosis and Post Thrombotic Syndrome at Penn Medicine

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