

# Deep Vein Thrombosis (DVT)

**Deep Vein Thrombosis (DVT)** is the formation of a blood clot, known as a thrombus, in the deep leg vein. It is a very serious condition that can cause permanent damage to the leg, known as post-thrombotic syndrome, or a life-threatening pulmonary embolism. In the United States alone, 600,000 new cases are diagnosed each year. One in every 100 people who develops DVT dies. Recently, it has been referred to as "Economy Class Syndrome" due to the occurrence after sitting on long flights.

The deep veins that lie near the center of the leg are surrounded by powerful muscles that contract and force deoxygenated blood back to the lungs and heart. One-way valves prevent the back-flow of blood between the contractions. (Blood is squeezed up the leg against gravity and the valves prevent it from flowing back to our feet.) When the circulation of the blood slows down due to illness, injury or inactivity, blood can accumulate or "pool" which provides an ideal setting for clot formation.

## Risk Factors

- Previous DVT or family history of DVT
- Immobility, such as bed rest or sitting for long periods of time
- Recent surgery
- Above the age of 40
- Hormone therapy or oral contraceptives
- Pregnancy or post-partum
- Previous or current cancer
- Limb trauma and/or orthopedic procedures
- Coagulation abnormalities
- Obesity

## May Thurner Syndrome

Deep Vein Thrombosis may be caused by a rare, yet readily treatable condition called May Thurner Syndrome. This disorder results from compression of the left iliac vein by right iliac artery. This may lead to blood clots, vein narrowing and scarring, resulting in painful leg swelling. The interventional radiologist can open up the blockage with a metallic stent. This will allow the blood to flow normally again and usually results in dramatic improvement in the leg pain and swelling. Treatments as this are quick, safe, effective and without scar. This may be performed with just intravenous sedation, with minimal risk to the patient.

## **Symptoms of May Thurner Syndrome**

- Discoloration of the legs
- Calf or leg pain or tenderness
- Swelling of the leg or lower limb
- Warm skin
- Surface veins become more visible
- Leg fatigue

## **Post-Thrombotic Syndrome**

Post-thrombotic syndrome is an under-recognized, but relatively common sequela, or aftereffect, of having DVT if treated with blood thinners (anticoagulation) alone, because the clot remains in the leg. Contrary to popular belief, anticoagulants do not actively dissolve the clot, they just prevent new clots from forming. The body will eventually dissolve a clot, but often the vein becomes damaged in the meantime. A significant proportion of these patients develop permanent irreversible damage in the affected leg veins and their valves, resulting in abnormal pooling of blood in the leg, chronic leg pain, fatigue, swelling, and, in extreme cases, severe skin ulcers. While this use to be considered an unusual, long-term sequela, it actually occurs frequently, in as many as 60-70 percent of people, and can develop within two months of developing DVT. There is increasing evidence that clot removal via interventional catheter-directed thrombolysis in selected cases of DVT can improve quality of life and prevent the debilitating sequela of post-thrombotic syndrome.

## **Pulmonary Embolism**

Left untreated, a deep vein thrombosis (DVT) can break off and travel in the circulation, getting trapped in the lung, where it blocks the oxygen supply, causing heart failure. This is known as a pulmonary embolism, which can be fatal. With early treatment, people with DVT can reduce their chances of developing a life threatening pulmonary embolism to less than one percent. Blood thinners like heparin and coumadin are effective in preventing further clotting and can prevent a pulmonary embolism from occurring.

- It is estimated that each year more than 600,000 patients suffer a pulmonary embolism.
- PE causes or contributes to up to 200,000 deaths annually in the United States.
- One in every 100 patients who develop DVT die due to pulmonary embolism.
- A majority of pulmonary embolism are caused by DVT.
- If pulmonary embolism can be diagnosed and appropriate therapy started, the mortality can be reduced from approximately 30 percent to less than ten percent.

## **Symptoms of Pulmonary Embolism**

The symptoms are frequently nonspecific and can mimic many other cardiopulmonary events.

- Shortness of breath
- Rapid pulse
- Sweating
- Sharp chest pain
- Bloody sputum (coughing up blood)
- Fainting

## **Deep Vein Thrombosis Treatments**

Early treatment with blood thinners is important to prevent a life-threatening Pulmonary Embolism but does not treat the existing clot.

### **Blood Thinners**

Early in treatment, blood thinners are given to keep the clot from growing or breaking off and traveling to the lung and causing a life-threatening pulmonary embolism by blocking the oxygen supply causing heart failure. Contrary to popular belief, blood thinners (anticoagulants) do not actively dissolve the clot, but instead prevents new clots from forming. Over time, the body will dissolve the clot, but often the vein becomes damaged in the meantime. To prevent permanent leg damage, patients can get catheter-directed thrombolysis treatment.

**Seek a second opinion from an Interventional Radiologist if leg pain continues beyond seven days.**

It is important for DVT patients to be evaluated by an interventional radiologist to determine if catheter-directed thrombolysis is needed to remove the clot. This treatment is highly effective when performed within 10 days after symptoms begin.

### **Catheter-Directed Thrombolysis (Clot-Busting) Treatment**

Catheter-directed thrombolysis is performed under imaging guidance by interventional radiologists. This procedure, performed in a hospital's interventional radiology suite, is designed to rapidly break up the clot, restore blood flow within the vein, and potentially preserve valve function to minimize the risk of post-thrombotic syndrome. The interventional radiologist inserts a catheter into the popliteal (located behind the knee) or other leg vein and threads it into the vein containing the clot using imaging guidance.

The catheter tip is placed into the clot and a "clot busting" drug is infused directly to the thrombus (clot). The fresher the clot, the faster it dissolves ? one to two days. Any narrowing in the vein that might lead to future clot formation can be identified by venography, an imaging study of the veins, and treated by the interventional radiologist with a balloon angioplasty or stent placement.

In patients in whom this is not appropriate and blood thinners are not medically appropriate, an interventional radiologist can insert a vena cava filter, a small device that functions like a catcher's mitt to capture blood clots but allow normal liquid blood to pass.

### **Efficacy**

Clinical resolution of pain and swelling and restoration of blood flow in the vein is greater than 85 percent with the catheter-directed technique.

### **Thrombectomy ? AngioJet Mechanical**

Thrombectomy also targets the clot (thrombus) directly, but this procedure's purpose is to remove the clot from the body. Thrombectomy is also a catheter-directed procedure using fluoroscopy "real-time" guidance, which is performed in a hospital's interventional radiology suite. This technique utilizes a thin, flexible catheter which is inserted directly into the thrombus (clot). A high-speed water jet is then used to create a vacuum effect and pull the thrombus into the catheter where it is broken into tiny pieces. The fragments are then propelled through the catheter and out of the body. This quickly restores blood flow, resolves symptoms and removes the clot from the body.

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