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# Recent Advances in the Prevention of Deep Vein Thrombosis (DVT) Following Surgery

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An example of venous thrombosis is the formation of an arterial blood clot (thrombus). Swelling and discomfort are common side effects when a blood clot forms in a vein. When deep vein thrombosis develops in the lower legs, thighs, or pelvis, it is most frequent. One of the most common causes of deep vein thrombosis (DVT) is excessive exercise. The most frequent kind of venous thrombosis is DVT in the leg. A clot, on the other hand, might develop anywhere in the veins. An embolus occurs when a piece of a blood clot that has formed in the vein separates from the place where it developed and travels through the veins. A pulmonary embolism (PE) occurs when the embolus becomes lodged in the lung, and it is a life-threatening illness that accounts for more than 50,000 fatalities annually in the United States. PE is almost often the result of a DVT fragment becoming caught in the lungs. It is important to note that the word "thromboembolism" refers to both DVT and PE.

When a blood clot develops in one of the body's deep veins, known as deep vein thrombosis (DVT), it is known as DVT. Damage to a vein or a decrease in blood flow inside a vein may both result in this condition. Two of the most prevalent risk factors for having a DVT are a lower-body injury or surgery involving the hips or legs.

A DVT may be life-threatening. It's possible for a blood clot to break away and move through the circulation, preventing oxygen-rich blood from reaching the lungs. Pulmonary embolism is an uncommon but potentially deadly condition. Even though a blood clot does not dislodge, the valves in the vein may be permanently damaged. Pain, swelling, and leg sores may result from long-term damage caused by this injury. It is via arteries that oxygen-rich blood from the heart is transported throughout your whole body and to every cell. Oxygen-depleted blood is returned to the heart through veins. In the human body, there are two kinds of veins:

- Superficial veins that are loacated just below the surface of the skin
- Deep veins that are located in depth within the muscles

DVT symptoms include leg discomfort, redness, swelling, edoema, warmth, and soreness on one side of the body. Dyspnea, chest discomfort, hemoptysis, syncope, tachycardia, and hypotension are all possible symptoms of pulmonary embolism.

**Complications of DVT**

**1. Pulmonary Embolism**

Uncontrolled bleeding in the veins may lead to an embolism, which can be fatal if the clot enters the lungs. This may occur immediately after the blood clot is formed, or it may occur many days later. It is possible that the blood clot will obstruct blood flow to the heart and lungs if it gets that far into the body. Pulmonary embolisms are life-threatening and may result in death if left untreated.

**2. Post-thrombotic Syndrome**

Post-thrombotic syndrome (PTS) is a disorder that affects certain persons who have had a deep vein thrombosis. Impairment to the veins causes higher blood pressure or venous hypertension in the veins, which culminates in post thrombotic syndrome. As a result of the increased pressure, vein valves might be damaged. In rare cases, this might result in permanent damage to the area. Patients with post-thrombotic syndrome may suffer from symptoms such as discomfort, swelling, skin changes, and leg sores, all of which may have a negative influence on their quality of life.

Blood clots are more likely to form when the flow of blood in the deep veins is disrupted by a variety of circumstances. Among them are:

- Increase in age
- Family or personal history of pulmonary embolism or DVT
- Cancer
- The presence of a venous disorder, such as varicose veins
- Smoking habits

- using oral contraceptives or synthetic hormones
- Pregnancy
- Being obese or overweight
- Having a blood clotting issue as a genetic trait

For example, undergoing significant surgery on the knee, hip and lower leg might impair clotting and blood flow. Hypercoagulation, steady blood flow, and injury to the veins are the main causes of blood clots in orthopaedic conditions.

**3. Blood flowing slowly through Veins (Stasis)**

Vein walls have a smooth surface. As a result, the natural anticoagulant agents in the blood are able to work more effectively to prevent blood clotting. Blood clots are more likely to form when it is restricted and does not combine with anticoagulants. One should check for DVT symptoms if they are on long-term bed rest, are immobilised in casts or braces, or cannot move for lengthy periods of time.

**4. Hypercoagulation**

Around non-venous material, the blood thickens or coagulates. Surgery may cause blood to coagulate when tissue debris, collagen, or fat are discharged into the bloodstream. It is also possible that during total hip replacement, the body may produce chemical molecules called antigens into the blood stream in preparation for the prosthesis. These antigens may potentially lead to the production of blood clots.

**5. Damaging the Vein Walls**

Soft tissues like ligaments, muscles, and tendons must be moved or retracted by the surgeon in order to access the surgical site. Certain naturally occurring chemicals that aid in blood coagulation may be released as a result in rare situations.

**Preventive Treatment**

**1. Catheter- directed thrombolysis**

By removing blood clots that have formed in blood arteries, catheter-directed thrombolysis helps maintain healthy blood flow and prevents organ and tissue damage. Coagulation occurs when blood is unable to flow freely through the body's vessels, resulting in the formation of gels or clumps of blood. Blood clots may cause tissue and organ damage by obstructing blood flow to particular sections of the body. Two of the most common ways a blood clot may produce obstructions are thrombosis and embolization. In order for a blood clot to develop inside a blood artery, it must expand until it fully or partly restricts blood flow. Thrombosis occurs when this happens. When blood clots detach from one location, migrate downstream, and lodge in a new location, embolization occurs, resulting in vascular obstruction downstream. The loss of an organ or an extremity due to thrombosis or embolization may be life-threatening if it is left untreated. To dissolve a blood clot, catheter-directed thrombolysis employs x-ray imaging to deliver medicine or a medical device to the clot's location.

**2. Inferior Vena Cava Filter**

Radiologists employ imaging guidance to insert an inferior cava (IVC) filter, a major vein in the abdomen that returns blood to the heart from the lower torso, during an inferior vena cava filter installation surgery. With an IVC filter, big clot pieces can be prevented from going through the veins to the lungs and heart, where they might cause serious consequences such as breathing problems or fatality.

Permanently implanted IVC filters were once the sole option for filtering the IVC. When it comes to newer filters known as optionally retrievable filters, they may either be kept in place permanently or they can be removed at a later date. Ideally, this should be done within six months after installation by the physician or interventional radiologist who placed the IVC filter. The long-term danger of filter breakage or recurrence of DVT is eliminated by removing an IVC filter. It does not, however, treat the root cause of DVT. It is up to the surgeon to decide whether blood thinners are still required. As long as there is the possibility of blood clots entering the lung and as long as the blood thinners cannot be used, it is not necessary to remove all retrievable IVC filters. However, many of these filters may be removed even if they have been in place for many years.

**3. Compression Stockings**

There is no difference between using graded compression stockings after acute proximal DVT and either using a placebo or not using any stockings in terms of post thrombotic syndrome. Acute or persistent problems like swelling and pain may warrant the use of compression stockings, but only as a temporary fix.

**4. Isolated Distal DVT**

In patients with a low risk of thrombus extension to the proximal veins, the American College of Chest Physicians' 2016 recommendations recommend ultrasonography monitoring over anticoagulation for isolated distal DVT.

**5. Surgical Thrombus Removal**

It's not clear whether surgical excision of DVT is beneficial. There are many who argue that only patients who are at imminent risk of venous gangrene, while receiving adequate anticoagulation, should be considered for venous thrombectomy, regardless of the availability of catheter-directed thrombolysis or iliofemoral deep vein thrombosis (DVT).

**6. Anticoagulation**

Blood thinning is a common term used to describe anticoagulation. Anticoagulants are medicines that function in this manner. However, they have no effect on the blood's ability to thin. To prevent blood clots from forming, they modify the blood's chemical composition. The clot is not dislodged by anticoagulants. Anticoagulation stops a deep vein thrombosis (DVT) from enlarging and from producing new clots. Once the clot is broken up, the body's natural healing systems may start to work. DVT patients often need anticoagulant therapy for a period of three months or more. Many alternatives that are available are:

- Warfarin
- There are newer anticoagulant drugs such as rivaroxabanes, apixabanes, edoxabans and dabigatran. One doesn't need to keep track of the blood coagulation by having frequent blood tests. Contrary to warfarin, they are more benficial
- Low molecular weight heparin (LMWH) injections.

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