Deep Vein Thrombosis: Prevention – an Overview

Description/Etiology

Deep vein thrombosis (DVT) is the development of one or more thrombi (i.e., blood clots) in the deep veins of the pelvis or extremities. A lower extremity is usually involved, but occasionally DVT originates in an upper extremity. The thrombus can obstruct venous flow, elicit a local inflammatory response, lead to damage of valves of the deep veins, and embolize (i.e., become dislodged and travel through the bloodstream) and lodge in the brain, heart, or lung. DVT can lead to pulmonary embolism (PE), a potentially fatal condition. DVT and PE—manifestations of the same disease process, called venous thromboembolism (VTE)—are among the most common causes of preventable death in hospitalized patients. Other potential complications of DVT include post-thrombotic syndrome (PTS), chronic venous insufficiency, venous ulcerations, and phlegmasia cerulean dolens (i.e., a swollen, blue, painful leg). For additional information on DVT and PE, see Quick Lesson About ... Pulmonary Embolism: an Overview, and the series of related Evidence-Based Care Sheets and Quick Lessons.

The etiology of DVT is typically multifactorial. Conditions that produce stasis, intimal (i.e., inner) vessel wall damage, and/or hypercoagulability can lead to the formation of DVT; these conditions include increased age, trauma, surgery, obesity, certain drugs, varicose veins, chronic medical conditions, atrial fibrillation, and inherited and acquired hypercoagulable states (for more information, see Risk Factors, below).

DVT prevention strategies include early ambulation after surgery, use of graduated compression stockings and/or intermittent pneumatic compression (for more information, see Food for Thought, below), and prophylactic anticoagulant therapy. A filter can be placed within the inferior vena cava to prevent PE if anticoagulation therapy is contraindicated.

Facts and Figures

DVT is a common medical condition, affecting > 80/100,000 persons in the United States each year and 5% of people during their lifetime. An estimated 600,000 people are hospitalized for DVT in the U.S. annually. Individuals older than 40 years of age are usually affected. Males have a slightly higher risk of developing DVT than females. Blacks and Whites have a 2.5–4 times higher risk of developing DVT than Asians and Hispanics. The incidence of DVT is increased 4-fold in older adults compared to younger people. Without anticoagulant prophylaxis, 15–30% of patients develop DVT after undergoing total knee or hip replacement surgery. Thromboprophylaxis with low molecular weight heparin (LMWH) reduces the risk of DVT by 82% in patients who undergo arthroscopic knee surgery (Sun et al., 2014).

Risk Factors

Risk factors for development of DVT include immobilization, age > 60 years, malignancy (especially pancreatic, liver, and ovarian cancer; for more information, see Quick Lesson About ... Thromboembolism, Venous, and Cancer), cancer treatment, trauma, obesity (i.e., body mass index [BMI] > 30), recent major surgery, pregnancy and puerperium (for more information, see Quick Lesson About ... Thromboembolism, Venous, in Pregnancy), oral contraceptives, hormone replacement therapy, heart or respiratory failure, smoking, central venous catheterization, previous DVT, hyperviscosity (e.g., in patients who have sickle cell disease or polycythemia), and thrombophilias that are acquired (e.g., antiphospholipid...
syndrome, hyperhomocysteinemia) and inherited (e.g., factor V Leiden, antithrombin deficiency).

**Signs and Symptoms/Clinical Presentation**

Many cases of DVT are asymptomatic and are only diagnosed after PE develops. Symptomatic patients complain of limb pain, tenderness, and edema and can have warm skin, erythema, and an elevated temperature > 100.4 °F (> 38 °C). A positive Homans’ sign (i.e., pain on forced dorsiflexion of the foot when the leg is raised) may be present, although this is not a consistent indicator of DVT. The lower extremities can become cyanotic and edematous if the DVT involves the inferior vena cava. Pain, tenderness, and edema can develop in the face, neck, back, and upper extremities if the DVT involves the superior vena cava. Clinical manifestations of PTS include persistent pain and swelling of the involved limb that worsens by walking or standing.

**Assessment**

› **Patient History**
  • Review medical history for risk factors; history of DVT increases the risk of recurrence

› **Physical Findings of Particular Interest**
  • For details, see *Signs and Symptoms/Clinical Presentation*, above. (For additional information on assessment, see *Quick Lesson About ... Deep Vein Thrombosis* )

**Treatment Goals**

› **Maintain Optimal Venous Status and Reduce Risk for Deep Vein Thrombosis**
  • Monitor vital signs, assess all physiologic systems (especially cutaneous, respiratory, and circulatory), and monitor laboratory/diagnostic study results; closely monitor for the development of DVT and immediately report signs and symptoms of abnormalities
  – Provide postsurgical care and/or prescribed treatment for any underlying condition that increases risk of developing DVT
  • Assess fall risk and maintain patient safety (e.g., airway, circulation, and prevention of injury)
  • Apply graduated compression stockings or intermittent pneumatic compression, as ordered for prevention of DVT
  • Reposition regularly and ambulate postoperatively as soon as possible; encourage regular leg movement to increase venous flow and activate calf muscles (e.g., rotate and flex feet, bend knees, contract muscles)
  • Request referral to physical therapy, if appropriate, for evaluation and formulation of an individualized exercise regimen
  • Administer unfractionated heparin for prophylaxis or as acute anticoagulation treatment if DVT develops, followed by warfarin for maintenance, as prescribed
  – LMWH (e.g., enoxaparin or fondaparinux) is also commonly ordered as effective prophylaxis or as initial acute treatment
  • For patients receiving anticoagulation therapy, use foam swabs or soft-bristled toothbrushes for oral care and; if oxygen is ordered, humidify supplemental oxygen source in order to prevent nosebleed

› **Promote Emotional Well-Being and Educate**
  • Assess patient/family anxiety level and coping ability; provide emotional support, educate, and encourage discussion about DVT etiology, risk factors, potential complications, prevention strategies, treatment risks and benefits, early ambulation, participation in rehabilitation, and individualized prognosis

**Food for Thought**

› The American College of Chest Physicians recommends mechanical prophylaxis with graduated compression stockings or intermittent pneumatic compression for patients at risk for VTE and at high risk of bleeding. In contrast, the American College of Physicians recommends against the use of graduated compression stockings because they have not been shown to prevent VTE or reduce mortality and can result in lower extremity skin damage; they suggest that intermittent pneumatic compression can be considered in patients for whom heparin is contraindicated

› Limitations of existing anticoagulants—including the need for daily subcutaneous injection of low molecular weight heparin and laboratory monitoring for patients treated with warfarin—have led to the development of new oral anticoagulants (e.g., factor Xa inhibitors)
  • Investigators who conducted a meta-analysis of 7 studies including 24,385 patients calculated that, compared to enoxaparin, the oral factor Xa inhibitors rivaroxaban and apixaban are associated with a 54% of reduction in risk of DVT following total hip or knee replacement surgery (Russell et al., 2013)
  • Missed doses of medication are common during hospitalization. Investigators who studied 202 trauma and general surgery patients admitted to a level I trauma center found that 58.9% missed at least one dose of enoxaparin and that the incidence
of DVT was 23.5% in patients who missed at least one dose, compared with 4.8% in patients who did not miss any doses (Louis et al., 2014)

Anticoagulant therapy appears to be underused in pediatric patients at risk for DVT. Researchers in a multinational study of 2,484 critically ill children found that just 34.7% of those with indications for pharmacologic thromboprophylaxis were receiving aspirin, LMWH, or unfractionated heparin (Faustino et al., 2014)

Red Flags

› Closely monitor patients treated with anticoagulants; consult a drug information resource for a complete listing of contraindications and potential adverse effects and complications

› Monitor for venous gangrene, a rare complication of DVT

What Do I Need to Tell the Patient/Patient’s Family?

› Educate about and emphasize the importance of

• changing modifiable risk factors associated with DVT, including oral contraceptive or HRT use, cigarette smoking, sedentary lifestyle, and obesity
• regular movement and avoiding prolonged sitting or standing in one position
• frequent ambulation and flexing/bending when traveling longer than 4 hours
• knowing the signs and symptoms of DVT, as well as the potential for development of PE and its clinical presentation (e.g., sudden onset of dyspnea, tachypnea, pleuritic chest pain)
• seeking immediate medical attention for new or worsening signs and symptoms
• strict adherence to the prescribed anticoagulation regimen, including taking the medication at the same time each day, testing clotting time regularly, and avoiding activities that can cause bleeding or bruising
• knowing the effects of anticoagulation therapy, the necessity of monitoring for signs and symptoms of bleeding (e.g., headache, unusual bruising, back pain, joint pain or swelling), and when to seek medical attention

References


