

Venous thromboembolism: An overview

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Editor's Note: This article was submitted and accepted for the recent special issue on venous disease but was inadvertently omitted from the issue.

Venous thromboembolism (VTE) is a disease that includes both deep vein thrombosis (DVT) and pulmonary embolism (PE). It is a common, lethal disorder that affects both hospitalized and nonhospitalized patients. PE and DVT are 2 clinical presentations of VTE and share the same predisposing factors. In most cases, PE is a consequence of DVT. This article discusses the predisposing factors, prevalence, and individuals who are at risk of developing this often life-threatening disease. (J Vasc Nurs 2015;33:95-99)

WHAT IS VENOUS THROMBOEMBOLISM?

Venous thromboembolism (VTE) is a disease that includes both deep vein thrombosis (DVT) and pulmonary embolism (PE). It is a common, lethal disorder that affects both hospitalized and nonhospitalized patients. It can reoccur frequently, and unfortunately is often overlooked. It may result in long-term complications including chronic thromboembolic pulmonary hypertension and post-thrombotic syndrome.

PE and DVT are 2 clinical presentations of VTE and share the same predisposing factors. In most cases, PE is a consequence of DVT. Among patients with a proximal DVT, about 50% have an associated asymptomatic PE noted with a lung scan.¹ In about 70% of patients with a PE, a DVT can be found in the lower extremity.^{2,3}

DVT

The lower extremities are the most common site for a DVT, but other affected locations may include the upper extremities, the mesenteric and pelvic veins, as well as the cerebral veins. A proximal lower extremity DVT (defined as occurring in the popliteal vein and above) is linked to an estimated 50% risk of PE if not treated; approximately 20%-25% of calf vein thrombus propagate (in the absence of treatment) to involve the popliteal vein or above (Figure 1). Approximately 10% of all DVT cases involve the upper extremities. Complications are more common after a DVT in the upper extremities than in the lower. PE occurs between 6% and 10% of cases after a DVT in an upper extremity and in 15%-32% of cases after DVT in a lower extremity.⁴

PE

PE resulting from lower extremity DVT have the potential to lead to a number of physiologic changes secondary to obstruction

of the pulmonary arteries (Figure 2). These changes include increased respiratory rate and hyperventilation, impairment of gas exchange owing to impaired perfusion, intrapulmonary shunting leading to hypoxemia, atelectasis, and vasoconstriction resulting from the release of inflammatory mediators (serotonin and thromboxane). In hemodynamically challenged patients, acutely elevated pulmonary vascular resistance results in decreased right ventricular output and hypotension. In the body's attempt to overcome the obstructing thrombus and maintain pulmonary perfusion, the right ventricle must generate systolic pressures of >50 mmHg and mean pulmonary artery pressures of >40 mmHg.⁵

Right heart failure and cardiac collapse may develop because a normal right ventricle is unable to generate these types of pressures. Additionally, increased right ventricular wall tension can lead to decreased right coronary artery flow and ischemia. A patient with coexisting coronary artery disease and underlying cardiopulmonary disease are noted to be at an increased risk for cardiopulmonary collapse from PE.⁶

PE is a relatively common cardiovascular emergency. However, with an occlusion of the pulmonary artery it may lead to acute life-threatening but potentially reversible right ventricular failure. PE is a difficult diagnosis that may be missed because of its nonspecific clinical presentation. Early diagnosis is fundamental, because immediate treatment is highly effective. Depending on the clinical presentation, initial therapy is primarily aimed either at life-saving restoration of flow through occluded pulmonary arteries or at the prevention of potentially fatal early recurrences. Both initial treatment and the long-term anticoagulation that is required for secondary prevention must be justified in each patient by diagnostic testing.⁷

PREVALENCE

VTE is the third most common cardiovascular illness after acute coronary syndrome and stroke.⁸ The exact incidence of VTE is unknown; it is believed that there are approximately 1 million cases in the United States each year, many of which represent recurrent disease.⁹ Nearly two-thirds of all VTE events result from hospitalization and approximately 300,000 of these patients die.¹⁰

PE is the third most common cause of hospital-related death and is also the most common preventable cause of hospital-related death.^{11,12} Most hospitalized patients have ≥ 1 risk factors for VTE (<http://www.clevelandclinicmeded.com/medicalpubs/diseaseman>

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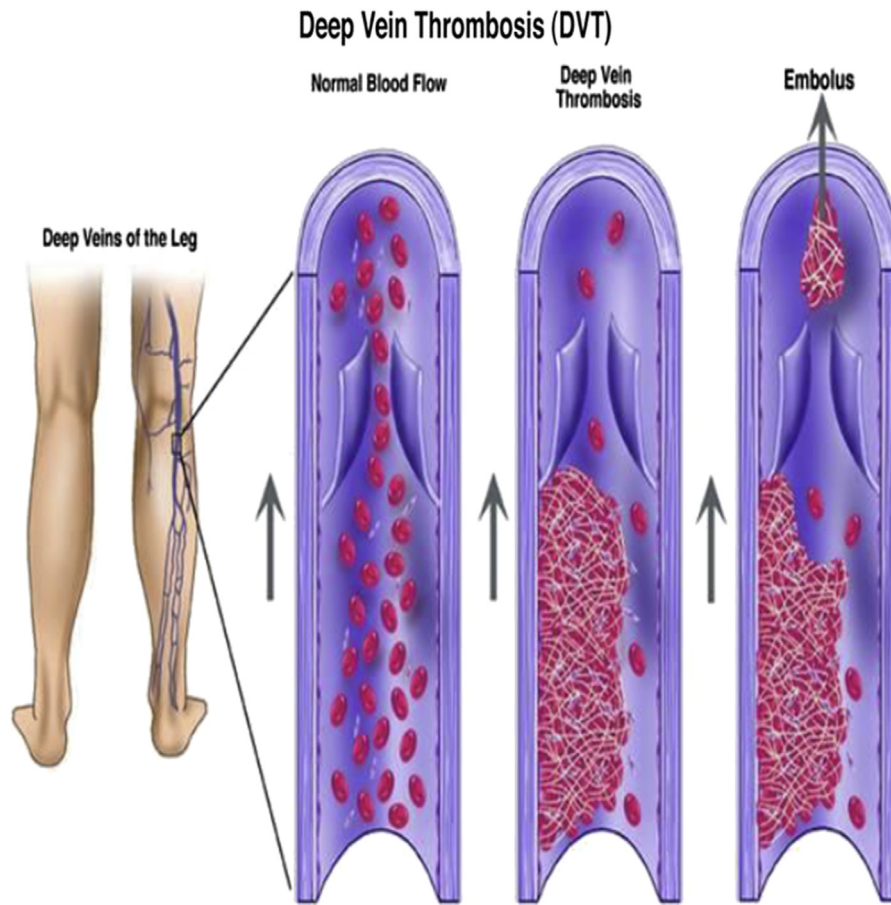


Figure 1. Deep Vein Thrombosis (DVT).

agement/cardiology/venous-thromboembolism/, Table 1). Among hospitalized patients with acute medical illness, infection, age >75, cancer, and a history of VTE are most associated with an increased VTE risk.¹³

There are some long-established and well-known cardiovascular risk factors for VTE, which include hypertension, diabetes mellitus, cigarette smoking, and high cholesterol levels, which have also been linked to acute PE and VTE in general.¹⁴ Genetic risk factors for VTE include factor V Leiden, prothrombin gene mutation G20210 A, protein C and S deficiency, and antithrombin deficiency.

UNITED STATES STATISTICS

The incidence of PE in the United States is estimated to be 1 case per 1,000 people per year.¹⁵ Studies from 2008 suggest that the increasing use of CT for assessing patients with possible PE has led to an increase in the reported incidence of PE.^{16,17}

From 1979 to 1998, the age-adjusted death rate for PE in the United States decreased from 191 to 94 deaths per million population.¹⁵ Regional studies covering the years after 1998 found either a slight decrease in the incidence of mortality or no change in the frequency.^{16,17}

PE is present in 60%-80% of patients with DVT, even though more than one-half of these patients are asymptomatic.

PE is the third most common cause of death in hospitalized patients, with $\geq 650,000$ cases occurring annually. Autopsy studies have shown that approximately 60% of patients who have died in the hospital had PE, with the diagnosis having been missed in $\geq 70\%$ of the cases. Prospective studies have demonstrated DVT in 10%-13% of all medical patients placed on bed rest for 1 week, 29%-33% of all patients in medical intensive care units, 20%-26% of patients with pulmonary diseases who are given bed rest for ≥ 3 days, 27%-33% of patients admitted to a critical care unit after a myocardial infarction, and 48% of patients who are asymptomatic after a coronary artery bypass graft.¹⁸

A challenge in understanding the real disease has been that autopsy studies have found an equal number of patients diagnosed with PE at autopsy were initially diagnosed by clinicians.^{19,20} This has led to estimates of between 650,000 and 900,000 fatal and nonfatal venous thromboembolic events occurring in the United States annually. The incidence of VTE has not changed significantly over the last 25 years.¹⁹ Capturing the true incidence going forward will be challenging because of the decreasing rate of autopsy. In a longitudinal, 25-year prospective study from 1966 to 1990, autopsy rates dropped from 55% to 30% over the study period.¹⁹ Current trends suggest a continued decrease.

In addition to the poor patient outcomes from VTE, the economic cost of this problem is significant and burdensome to the

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