VENOUS THROMBOEMBOLISM

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Table of Contents

Introduction ........................................ 2
Pathogenesis ....................................... 2
Diagnosis ........................................... 2
Initial Treatment Options ........................ 3
Long-term Therapy ................................. 4
Hypercoagulable States ............................ 6
Superficial VTE ..................................... 8
New Anticoagulants and Treatment of VTE ....... 8
Travel and the Risk of VTE ....................... 10
Conclusion .......................................... 11
Board Review Questions ......................... 11
References ......................................... 11
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INTRODUCTION

Venous thromboembolism (VTE) and its associated complications account for significant morbidity and mortality. Each year between 100 and 180 persons per 100,000 develop a VTE in the Western countries. The majority of VTEs are classified as either pulmonary embolism (PE), which accounts for one third of the events, or deep vein thrombosis (DVT), which is responsible for the remaining two thirds. Between 20% and 30% of patients diagnosed with thrombotic events will die within the first month after diagnosis.1 PE is a common consequence of DVT; 40% of patients who are diagnosed with a DVT will be subsequently found to have a PE upon further imaging. The high rate of association is also seen in those who present with a PE, 70% of whom will also be found to have a concomitant DVT.2,3

The main demographic factor that appears to be associated with development of a VTE is age. It is rare for children to suffer a thrombotic event, whereas older persons have a risk of 450 to 600 events per 100,000 persons.1 The highest incidence occurs in African Americans, with Asians having the lowest incidence. Other factors that appear to be linked to increased risk of VTE include obesity, smoking, long air travel, and hormonal therapy.

PATHOGENESIS

Abnormalities in both coagulation factors and the vascular bed are at the core of the pathogenesis of VTE. The multifaceted etiology of thrombosis was first described in 1856 by Virchow, who defined a triad of defects in vessel wall, platelets, and coagulation proteins.4 Usually the vessel wall is lined with endothelial cells that provide a nonthrombotic surface and limit platelet aggregation through release of prostacyclins and nitric oxide. When the endothelial lining becomes compromised, the homeostatic surveillance system is disturbed and platelet activation and the coagulation system are initiated. Tissue factor exposure in the damaged area of the vessel leads to activation of the coagulation cascade. Collagen that is present in the area of the wound is also exposed and can activate platelets, which provide the phospholipid surface upon which the coagulation cascade occurs. Platelets initially tether to the exposed collagen through binding of glycoprotein Ib-V-IX in association with von Willebrand factor. The thrombus is initiated as more platelets are recruited to exposed collagen of the injured endothelium through aggregation in response to the binding of glycoprotein IIIa/IIIb with fibrinogen. This process is self-perpetuating as these activated platelets release additional proteins such as adenosine diphosphate, serotonin, and thromboxane A2, all of which fuel the recruitment and activation of additional platelets.

DIAGNOSIS

The key to decreasing the morbidity and mortality associated with VTE is timely diagnosis and early initiation of therapy. Various imaging modalities can be employed to support a diagnosis of VTE and are used based on clinical suspicion arising from the presence of signs and symptoms. DVT is usually associated with pain in the calf or thigh, unilateral swelling, tenderness, and redness. PE can present as chest pain, shortness of breath, syncope, hemoptysis, and/or cardiac palpitations.

Clinical decision rules based on signs, symptoms, and risk factors have been developed to estimate the pretest probability of PE or DVT and to help determine which patients warrant further testing. These clinical decision rules include the Wells criteria, which address both DVT and PE, as well as the Geneva score, which is focused on identifying patients likely to have a PE.5 The Wells rule uses 7 assessment variables to determine a patient’s probability of having a PE (Table 1). Patients receiving a score of 4 or greater have a 28% to 52% risk of PE.5 The Geneva criteria are based on the Wells criteria, with slight modifications for clinical assessment.6,7 Both rules can be easily applied to assess the overall risk of PE. Patients who score high are evaluated by imaging modalities, while those with lower scores should be considered for further stratification based on D-dimer testing. The goal of clinical assessment is to identify