

Emergency Case

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Deep vein thrombosis

QUESTIONS

A traveling businessman came to the emergency department from the squash court complaining of a sore, swollen calf. What clinical criteria are useful for diagnosing deep vein thrombosis (DVT)? What objective tests are helpful? Does a DVT patient require admission?

ANSWER

Deep vein thrombosis is feared for its potentially fatal complication, pulmonary thromboembolism (PE), the leading cause of preventable mortality among patients in hospital.¹ Deep vein thrombosis affects both healthy people and many patients in hospital. Incidence of DVT is unknown because it is hard to diagnose and because most DVT is silent.

Pathophysiology

Venous thrombosis is triggered by damage to vessels, stasis of blood flow, and increased coagulability, factors classically known as Virchow's triad. One or more of these factors comes into play with advancing age, cancer, surgery, immobilization, fractures, the puerperium, paralysis, oral contraceptive and estrogen use, antiphospholipid syndrome, and inherited thrombophilia. Inherited thrombophilic conditions include deficiencies of antithrombin, protein C or protein S; factor V Leiden; hyperhomocysteinemia; and other rare conditions. About 40% to 60% of patients having a first episode of DVT have inherited thrombophilic abnormalities.²

The veins involved in DVT are lower limb (~85%); pelvic (~10%); and upper limb, shoulder, and cephalic (~5%). Whether calf vein thrombi cause clinically important PE is a matter of debate. Calf vein thrombi become dangerous if they propagate proximally,

which occurs in about 20% of cases.³ Superficial thrombophlebitis not related to varicose veins or obvious etiology (eg, an intravenous catheter) has about a 40% risk of associated DVT.¹

Clinical features

A typical patient raising concern for DVT presents with a tender, warm, swollen calf with a positive Homans' sign. The advent of venography in the 1970s demonstrated that diagnosing DVT based on clinical findings alone is less accurate than a coin toss.⁴ The signs described are equally likely due to injury, ruptured Baker's cyst, cellulitis, tendonitis, stress fracture, or other causes. Less than half the patients eventually proven to have DVT have symptoms or signs of it.⁴ It is essential to be aware of the risk factors for DVT and to be vigilant with patients who have them.

Diagnosis

Diagnosis of DVT clearly requires objective testing, and ultrasonography (US) is now the test of choice.² Venography remains the reference standard, but it is invasive and associated with complications including risk of contrast reactions and venous thrombosis. For detecting thigh DVT (popliteal vein to inguinal ligament), US is more than 96% sensitive.²

When DVT is suspected and initial US results are negative, the current recommendation is to withhold anticoagulation therapy and repeat US in 7 days (if symptoms persist and an alternative diagnosis is not apparent).² This is a relatively costly plan, and few patients with initial negative results on US are subsequently found to have thigh DVT (~2%), presumably on the basis of extension from calf veins.³ Ultrasonography is poor at detecting calf vein thrombosis (~50% sensitivity)³ and DVT above the inguinal ligament.

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Table 1. Clinical criteria for probability of deep vein thrombosis

MAJOR CRITERIA

- Active cancer
- Paralysis, paresis, or recent plaster immobilization of a leg
- Recent bed rest for >3 days, major surgery within 4 weeks, or both
- Localized tenderness along the deep venous system of the leg
- Swelling of thigh and calf (measured)
- Swelling of calf to 3 m larger than asymptomatic calf (measured 10 cm below tibial tuberosity)
- History of deep vein thrombosis in two or more first-degree relatives

MINOR CRITERIA

- Trauma to the symptomatic leg in the previous 60 days
- Pitting edema of the symptomatic leg only
- Dilated superficial veins in symptomatic leg only (nonvaricose)
- Hospitalization within previous 6 months
- Erythema of symptomatic leg

PROBABILITY OF DVT

HIGH

- Three or more major criteria and no alternative diagnosis
- Two or more major criteria and two or more minor criteria and no alternative diagnosis

LOW

- One major criterion, two or more minor criteria, and an alternative diagnosis
- One major criterion, one or more minor criteria, and no alternative diagnosis
- No major criteria, three or more minor criteria, and an alternative diagnosis
- No major criteria, two or more minor criteria, and no alternative diagnosis

INTERMEDIATE

- All other combinations

Adapted from Wells et al.⁵

Venography remains useful as a second-line test in cases where US gives equivocal results or is technically unreliable (eg, for obese patients or for very large legs).

Magnetic resonance imaging is very sensitive for detecting DVT, including calf DVT,¹ but cost and availability limit its use. It is the diagnostic test of choice for suspected iliac vein or inferior vena cava thrombosis and is more accurate than US during late pregnancy.¹

To help physicians make a more definitive diagnosis during the first visit and thus reduce morbidity and cost, a standard clinical model of probability for DVT has been devised using historic and physical features (Table 1⁵). A low probability combined with normal US results excludes DVT with almost 95% accuracy.²

D-dimer, a fibrin degradation product, can be assayed to detect DVT. This test is not accurate enough at this time to be reliable.¹ It would be very useful to have a test that could reliably screen for intravenous thrombosis. Currently accepted strategies for diagnosing DVT are shown in Figure 1².

When DVT is suspected or diagnosed, it is prudent to assess whether PE has already occurred. With thigh DVT, 60% to 80% of patients will have PE at some point, and the PE will be asymptomatic in about half of them.¹

Treatment

The advent of low molecular weight heparin (LMWH) has simplified treatment for DVT because LMWH has a predictable anticoagulating effect when given subcutaneously by weight-based dosing. Prothrombin time does not need to be monitored. Compared with in-hospital treatment with intravenous unfractionated heparin, outpatient unmonitored treatment with LMWH has been shown to be at least as effective, to have a lower risk of serious hemorrhage and a lower mortality rate, and to have a significantly lower risk of heparin-induced thrombocytopenia.² (Various LMWHs have varying properties; study results using one do not apply to others.)

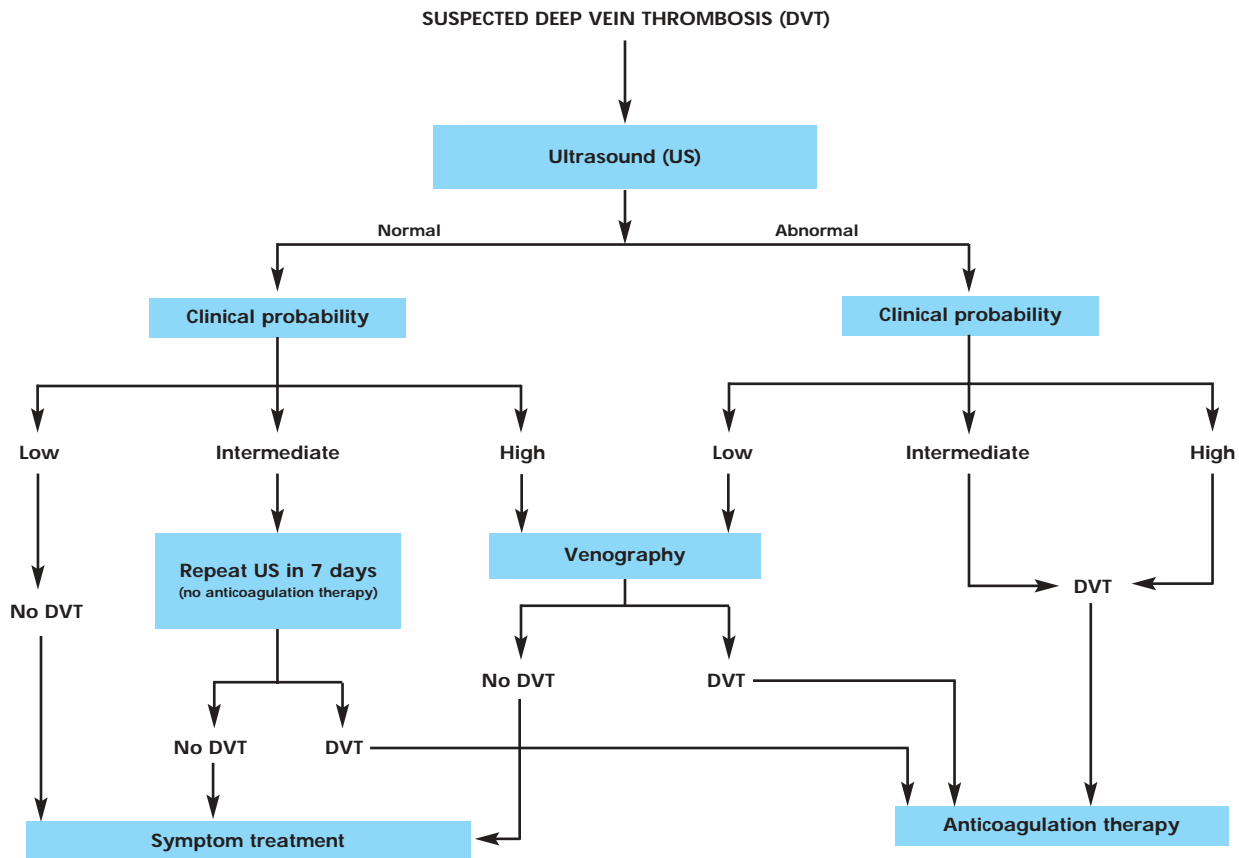
Admission or discharge decisions involve consideration of comorbidities, presence of PE, risk of bleeding, and other factors. In most cases, the issue can be addressed by the simple maxim, "If the patient can walk in to the emergency department, he or she can walk out."

Oral anticoagulant and LMWH are begun on day 1 and LMWH is continued for 5 to 10 days until a patient's international normalized ratio reaches 2.0 to 3.0.² Optimum duration of anticoagulation is unclear.

Studies have identified groups at risk and have developed the following recommendations²:

- for postoperative patients with no other risk factors, 6 weeks to 3 months;

Figure 1. Diagnostic and management strategies for deep vein thrombosis



Adapted from Lensing et al.²

- for most patients with a first episode of DVT, including those with genetic thrombophilic abnormalities, 3 to 6 months
- for patients with persistent risk factors (eg, cancer) or recurrent thromboembolic events, 6 to 12 months or lifelong in rare cases.

Superficial phlebitis and calf vein DVT, by most accounts, can be safely treated with nonsteroidal anti-inflammatory drugs and activity.¹ Compression stockings are of proven benefit for DVT.

Studies have identified inpatient groups at high risk for DVT, and preventive measures are being instituted. The best treatment for DVT for healthy people is prevention.

estimate the probability of DVT. Ultrasound is currently the diagnostic test of choice. Many DVT patients can be treated at home with LMWH. ❖

References

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ANSWERS

Deep vein thrombosis cannot be diagnosed with clinical criteria, although history and clinical findings can help