Diagnosis of DVT with D-dimer testing and the Wells score

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Venous thromboembolism refers to a spectrum of disease that includes both pulmonary embolus and deep-venous thrombosis (DVT).

More than 250,000 people in the United States are diagnosed annually with venous thromboembolic disease; an estimated equal number of cases goes undiagnosed [1].

Clinicians and official guidelines take a variety of diagnostic approaches toward patients with a suspected DVT. Historically, clinicians have used compression ultrasound and impedance plethysmographyin the outpatient setting to diagnose clinically suspected DVT.

More recently, the D-dimer assay has expanded diagnostic options. Nevertheless, D-dimer interpretation can be limited by the test's low specificity and the necessity of knowing the pretest probability of disease to properly use the results.

Utility of D-dimer testing

The sensitivity of the D-dimer test also varies with the assay used. One meta-analysis of 12 studies compared a highly sensitive ELISA D-dimer assay with a less sensitive (and less expensive) SimpliRED D-dimer assay.

In studies using the highly sensitive ELISA assay, for patients with negative D-dimer results and low or intermediate pretest probability of disease, the 3-month incidence of DVT was 0.5%.

However, using the SimpliRED assay, the 3-month incidence of DVT with a negative D-dimer results and low pretest probability was 0.5% but the incidence was 3.5% with a negative D-dimer and an intermediate pretest probability.

This meta-analysis suggests that the SimpliRED assay misses some DVTs in patients with intermediate pretest probabilities of the disease [2].

New evidence concerning the utility of D-dimer testing for DVT comes from a meta-analysis funded by the United Kingdom National Health Service Health Technology Assessment R&D Program [3].

The authors compared the accuracy and cost effectiveness of various algorithms for diagnosing DVT, with the goal of identifying a practical, cost-effective strategy.

They included 14 studies of algorithms for the diagnosis of suspected DVT that combined Wells scoring (a risking system that formalizes assessment of the pretest probability, see TABLE 1), D-dimer, ultrasound, or venography.

Researchers followed patients with negative results for at least 3 months. They developed a decision analysis model to compare these algorithms in a hypothetical cohort of 1,000 outpatients with suspected DVT

Applying estimates of the sensitivity and specificity of each algorithm to the population, they determined the proportions of patients with and without DVT who would receive treatment, which patients would suffer events relating to DVT or treatment, and estimated lifetime health outcomes (quality-adjusted life years [QALYs]) and costs.

Two effective algorithms

Two algorithms maximized cost effectiveness (TABLE 2). For both protocols, patients could have been safely sent home when there was a low to intermediate risk Wells score and a normal D-dimer. Both protocols also call for an ultrasound if either the D-dimer or the Wells score is elevated.

Protocol I was the least expensive (£10,000 per QALY), whereas protocol II had the maximum net benefit to the entire healthcare system (while costing £20,000–£30,000 per QALY).

Importantly, protocols that relied on ultrasound for all patients were not cost effective (costing >£40,000 per QALY). A key weakness of this study was that the authors did not include algorithms that involved plethysmography.

The authors also stressed that their results are most applicable to outpatients with a suspected first DVT, and not to inpatients, patients with suspected recurrent DVT, pregnant patients, or intravenous drug abusers [1].

The Wells score
1 point each for:
• Active cancer • Paralysis, paresis, recent plaster immobilization of lower limb • Recently bedridden for >3 days or major surgery during past 4 weeks • Localized tenderness along distribution of deep venous system • Entire leg swollen • Calf swelling >3 cm compared to asymptomatic leg • Pitting edema • Collateral superficial veins
-2 points for:
• Alternative diagnosis as likely or more likely than that of DVT
Interpretation: ≥3 points=High probability of DVT 1–2 points=Intermediate probability of DVT 0–1 points=Low probability of DVT DVT=deep-venous thrombosis.

TABLE 1

Two protocols for DVT diagnosis
I. Obtain Wells score first
A. Wells score is low or intermediate—check D-dimer 1. D-dimer is normal—send home 2. D-dimer is elevated—obtain ultrasound B. Wells score is high—obtain ultrasound 1. Ultrasound is positive—treat 2. Ultrasound is negative—obtain D-dimer a. D-dimer is low—send home b. D-dimer is elevated—repeat ultrasound 1 week
II . Obtain D-dimer first
A. D-dimer is elevated—obtain ultrasound 1. Ultrasound is positive—treat 2. Ultrasound is negative—repeat ultrasound 1 week B. D-dimer is normal—do Wells Score 1. Wells score is low or indeterminate—send home 2. Wells score is high—obtain ultrasound a. Ultrasound is positive—treat b. Ultrasound is negative—repeat ultrasound 1 week
DVT=deep-venous thrombosis.

TABLE 2

Summary

In summary, the data suggest that when patients present in a clinic setting with a suspected first DVT, high-sensitivity D-dimer testing should be combined with Wells scoring to determine which patients need ultrasound imaging and which may be reassured with no further intervention.

References

1. Tapson V, Carroll B, Davidson B, *et al*; for the American Thoracic Society. The diagnostic approach to acute venous thromboembolism: clinical practice guideline. Am J Respir Crit Care Med 1999; 160:1043–1066. [LOE 5].

2. Fancher TL, White RH, Kravitz RL. Combined use of rapid D-dimer testing and estimation of clinical probability in the diagnosis of deep vein thrombosis: systematic review. BMJ 2004; 329:821–828. [LOE 1a].

3. Goodacre S, Stevenson M, Wailoo A, Sampson F, Sutton AJ, Thomas S. How should we diagnose suspected deep-vein thrombosis? Q J Med 2006; 99:377– 388. [LOE 1a]