

most emergency departments for the management of severe acute asthma in children.

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■ D-DIMER TESTING IN SUSPECTED DVT

Bernardi F, Prandoni P, Lensing AWA, et al. D-dimer testing as an adjunct to ultrasonography in patients with clinically suspected deep vein thrombosis: prospective cohort study. *BMJ* 1998; 317:1037-40.

Clinical question Is it safe to withhold anticoagulation from patients with clinically suspected deep vein thrombosis (DVT) who have both normal D-dimer levels and normal venous ultrasonography results?

Background Current evidence suggests that patients with clinically suspected DVT and a normal venous ultrasound result should have a repeat ultrasound examination at 1 week to safely exclude DVT and continue without anticoagulation. Less than 2% of patients, however, will have evidence of DVT on the repeat examination. Recently developed tests for plasma levels of D-dimer, a fibrin degradation product, have shown high sensitivity and moderate specificity in diagnosing clinically suspected DVT. Highly sensitive tests are generally helpful in ruling out the presence of disease. This study examines the effectiveness of D-dimer testing in ruling out DVT after an initially normal venous ultrasound result.

Population studied This study included 946 adult outpatients with a suspected first episode of DVT. Patients were excluded who were taking anticoagulants for more than 48 hours, had symptoms of pulmonary embolism (PE), were pregnant, or who were unavailable for follow-up. The mean age was 59 years and the mean interval between onset of symptoms and testing was 8 days.

Study design and validity This was a prospective cohort study with a 3-month follow-up period. All patients had venous ultrasonography of the proximal veins. Patients with an abnormal ultrasound result received anticoagulation therapy. A rapid plasma D-dimer test (enzyme-linked

immunosorbent assay) was performed on all patients with a normal ultrasound result. Patients with a normal D-dimer test result did not receive anticoagulation therapy and were not retested with ultrasonography. Those with abnormal D-dimer levels had a repeat ultrasound in 1 week. Anticoagulation was withheld if both ultrasound results were normal. At follow-up, all patients were interviewed; diagnostic testing was performed when thromboembolic complications were suspected. Only 2 patients were lost to follow-up, which is important in this type of study.

Outcomes measured The primary outcome was the rate of thromboembolic complications defined as the occurrence of PE before repeat ultrasonography and the occurrence of PE or DVT during the 3 months of follow-up.

Results The prevalence of DVT in the initial population was 27.5%. Of the 686 patients with a normal ultrasound result, 88 had an abnormal D-dimer result requiring repeat ultrasonography. Five patients had evidence of DVT at repeat testing and received anticoagulation therapy. Only 1 of the 598 patients with normal D-dimer levels and normal ultrasound results developed DVT during the 3-month follow-up period. The rate of thromboembolic complications was 0.4% (95% confidence interval, 0.0 - 0.9) in the group of patients not treated with anticoagulants. This rate of complications is at least as low as previously published rates in studies using repeat ultrasonography. The negative predictive value (NPV) is the chance that a patient with a negative test result does not have DVT. In this study the NPV for the initial ultrasonogram was 98.8%; adding a normal D-dimer test result increased the NPV to 99.8%.

Recommendations for clinical practice Repeat ultrasound testing is not indicated in patients whose initial ultrasonography and D-dimer test results are normal. These patients can be safely followed without anticoagulation. Those patients with abnormal D-dimer test results have a 5.7% chance of having DVT and should have a repeat ultrasound examination at 1 week before the decision to continue withholding anticoagulation. While an economic analysis was not performed, fewer repeat ultrasound examinations should decrease costs while increasing convenience for patients. D-dimer testing is a useful adjunct to venous ultrasound and can be substituted for repeat ultrasound testing in excluding DVT.

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