Compression ultrasonography had limited value for detecting pulmonary embolism


Objective
To determine the accuracy and clinical utility of compression ultrasonography (CU) of leg veins in the diagnosis of pulmonary embolism (PE).

Design
Blinded comparison of the diagnostic accuracy of CU with the conjoint diagnostic standards, perfusion lung scanning or pulmonary angiography.

Setting
A teaching hospital in the Netherlands.

Patients
357 patients suspected of having PE who were $\geq$ 18 years of age.

Description of test and diagnostic standards
B-mode gray-scale CU was done by an independent investigator who scanned the common femoral, popliteal, and distal popliteal veins. CU results were considered abnormal if a venous segment could not be completely compressed. Results were not forwarded to the referring physician. Perfusion lung scanning was done with 6 views. PE was excluded if the scan was normal and was proven by a high-probability scan. Selective pulmonary angiography was done on patients who had a nondiagnostic lung scan. Angiograms were classified by using standard definitions.

Main outcome measures
Sensitivity and specificity of CU.

Main results
178 patients had PE excluded, and 149 patients had PE confirmed. Sensitivity, specificity, and likelihood ratios for positive and negative CU test results are listed in the Table. 155 patients initially had a nondiagnostic lung scan, and no angiogram was obtained for 30 of these patients. Of these 30 patients, 4 (13%) had abnormal results on CU. When CU was done only in patients with a nondiagnostic lung scan, 9% of angiograms were prevented but 26% of patients who had an abnormal CU result were unnecessarily treated.

Conclusions
Compression ultrasonography had low sensitivity but was highly specific in detecting pulmonary embolism. Ultrasonography may improve diagnostic efficiency but as many as 26% of patients with an abnormal result on ultrasonography may be unnecessarily treated.

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<th>Test features for the diagnosis of pulmonary embolism*</th>
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*+LR = likelihood ratio for presence of disease if the test is positive; -LR = likelihood ratio if the test is negative. LRs calculated from data in article. CI defined in Glossary.

Ventilation-perfusion lung scanning is a standard diagnostic test for PE. A normal or high-probability lung scan is usually adequate for diagnostic purposes (1). Unfortunately, as many as 70% of lung scans are assigned a low-to-intermediate probability, whereas the incidence of PE may be as high as 70%, thereby necessitating additional diagnostic tests. Because most PEs arise in veins in the legs, CU is often recommended. The low sensitivity of CU for PE found in the study by Turkstra and colleagues is consistent with the results of previous studies that showed a low sensitivity of CU for deep venous thrombosis in asymptomatic patients (2, 3). Because of the low sensitivity of CU and the consequences of an untreated embolus, CU alone cannot be recommended to rule out a diagnosis of PE.

The authors noted a reduction in the number of lung scans required if CU was done first, but they did not calculate the number of nondiagnostic CU results also done. Doing CU after lung scanning may avoid a few pulmonary angiograms but, again, with a substantial number of nondiagnostic CU results. 43% of patients had nondiagnostic lung scans that required further evaluation. Of the 33 patients who had PE on angiography, only 8 had deep venous thrombosis on CU. Therefore, CU added useful diagnostic information in only 6% of patients with nondiagnostic lung scans.

The investigators did not include an assessment of clinical pretest probability, as in the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) report (1). Inclusion of this information could have altered the number of patients at increased likelihood for PE and changed the clinical utility of CU.

In conclusion, most patients with normal-or high-probability lung scans do not require additional investigations. A positive CU result in a patient with a nondiagnostic scan supports the use of anticoagulant therapy; however, this occurrence is rare, and most patients with nondiagnostic scans will require further testing.

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References
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