ORIGINAL ARTICLE

Diagnosis of Pulmonary Embolism with D-Dimer Adjusted to Clinical Probability

Clive Kearon, M.B., Ph.D., Kerstin de Wit, M.B., Sameer Parpia, Ph.D., Sam Schulman, M.D., Ph.D., Marc Afilalo, M.D., Andrew Hirsch, M.D., Frederick A. Spencer, M.D., Sangita Sharma, M.D., Frédérick D'Aragon, M.D., Jean-François Deshaies, M.D., Gregoire Le Gal, M.D., Ph.D., Alejandro Lazo-Langner, M.D., Cynthia Wu, M.D., Lisa Rudd-Scott, R.N., Shannon M. Bates, M.D., and Jim A. Julian, M.Math., for the PEGeD Study Investigators*

ABSTRACT

Retrospective analyses suggest that pulmonary embolism is ruled out by a p-dimer level of less than 1000 ng per milliliter in patients with a low clinical pretest probability (C-PTP) and by a p-dimer level of less than 500 ng per milliliter in patients with a moderate C-PTP.

METHODS

We performed a prospective study in which pulmonary embolism was considered to be ruled out without further testing in outpatients with a low C-PTP and a p-dimer level of less than 1000 ng per milliliter or with a moderate C-PTP and a p-dimer level of less than 500 ng per milliliter. All other patients underwent chest imaging (usually computed tomographic pulmonary angiography). If pulmonary embolism was not diagnosed, patients did not receive anticoagulant therapy. All patients were followed for 3 months to detect venous thromboembolism.

RESULTS

A total of 2017 patients were envolled and evaluated, of whom 7.4% had pulmonary embolism on initial diagnostic testing. Of the 1325 patients who had a low C-PTP (1285 patients) or moderate C-PTP (40 patients) and a negative p-dimer test (i.e., <1000 or <500 ng per millilites, respectively), none had venous thromboembolism during follow-up (95% confidence interval [CI], 0.00 to 0.29%). These included 315 patients who had a low C-PTP and a p-dimer level of 500 to 999 ng per milliliter (95% CI, 0.00 to 1.20%). Of all 1863 patients who did not receive a diagnosis of pulmonary embolism initially and did not receive anticoagulant therapy, 1 patient (0.05%; 95% CI, 0.01 to 0.30) had venous thromboembolism. Our diagnostic strategy resulted in the use of chest imaging in 34.3% of patients, whereas a strategy in which pulmonary embolism is considered to be ruled out with a low C-PTP and a p-dimer level of less than 500 ng per milliliter would result in the use of chest imaging in 51.9% (difference, -17.6 percentage points; 95% CI, -19.2 to -15.9).

CONCLUSIONS

A combination of a low C-PTP and a p-dimer level of less than 1000 ng per milliliter identified a group of patients at low risk for pulmonary embolism during follow-up. (Funded by the Canadian Institutes of Health Research and others; PEGeD ClinicalTrials.gov number, NCT02483442.)

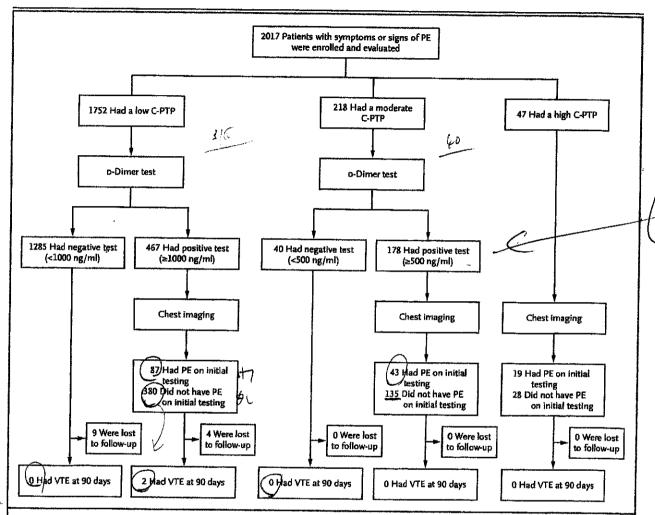


Figure 1. Patient Enrollment, Results of Initial Diagnostic Testing, and Cases of Venous Thromboembolism (VTE) during Follow-up.

A patient's clinical pretest probability (C-PTP) of pulmonary embolism (PE) was assessed with the use of the Wells score (range, 0 to 12.5, with higher scores indicating a higher probability of PE). A low C-PTP was defined as a Wells score of 0 to 4.0, a moderate C-PTP as a Wells score of 4.5 to 6.0, and a high C-PTP as a Wells score of 6.5 or higher. A total of 2 patients who had PE on initial testing did not receive anticoagulant therapy: 1 had a moderate C-PTP, and 1 had a high C-PTP (both had thrombocytopenia). A total of 5 patients who did not have PE on initial testing received anticoagulant therapy: 2 had a low C-PTP (1 had chronic PE and 1 underwent nondiagnostic computed tomographic [CT] pulmonary angiography and declined ventilation—perfusion scanning), 2 had a moderate C-PTP (1 had leg deep-vein thrombosis [DVT] with negative findings on CT pulmonary angiography, and 1 had arm DVT with negative findings on CT pulmonary angiography), and 1 had a high C-PTP (untreated leg DVT 5 months previously [prescription was lost] and negative findings on CT pulmonary angiography). Of the 4 patients with a low C-PTP and a positive p-dimer test who were lost to follow-up, none had PE on initial testing. In the entire study population, 2 patients (both with a low C-PTP and a positive p-dimer test) had VTE during follow-up: a DVT occurred in a patient who did not have PE on initial testing (negative CT and no anticoagulant therapy), and a recurrent PE occurred in a patient who had PE on initial testing (positive CT and anticoagulant therapy).

短状・所見
DVTの臨床所見(下肢の腫脹と圧痛) 3
肺塞栓以外の診断の可能性が低い 3
心拍数>100回/分 1.5
1か月以内の手術または安静 1.5
DVTや肺塞栓の既往 1.5
喀血 1
半年以内の悪性腫瘍 1