

Evidence Discussion (CH 25.1)

CH 25.1. Pulmonary embolism evidence summary

Symptoms and signs of pulmonary embolus (PE) are nonspecific and common; therefore, knowing whom to test for PE is challenging.(1) In North America, PE is diagnosed in only 5% of people tested for it.(2) Chest x-ray (CR) is nonspecific but may rule out other causes of dyspnea and chest pain.(3) Avoiding the overuse of imaging tests is important, given the potential harms of radiation exposure, high costs and complications. The pretest clinical probability has an important effect on the predictive value of CT pulmonary angiography (CTPA).(2) Determining the clinical pretest probability of PE depends on clinical judgment, which lacks standardization and is subjective, or prediction rules.(2,4) Kahn et al recommend diagnostic imaging in those with a likelihood of PE greater than or equal to 15%, based on the “implicit sense” of the clinician, and either a structured clinical probability score (Wells, Revised or Simplified Geneva score) or a D-dimer above a pre-specified threshold.(1) Other experts recommend that imaging be done in those with a high pretest probability based on empirical clinical judgment or a prediction rule and in those with a low/ intermediate pretest probability and a positive D-dimer.(2,3) Imaging can be avoided in people with both a structured clinical probability score at or below the given cutoff and a D-dimer below the given cutoff value.(1) Imaging is likewise not appropriate in those with a low/intermediate pretest probability based on clinical judgement and a normal D-dimer.(2,3)

CTPA is highly sensitive and specific and is the imaging method of choice for suspected PE.(1,2,3,4) It may also demonstrate other potential causes of the presenting symptoms. CTPA is a CT angiogram with intravenous (IV) contrast. The timing of the scan is tailored so that contrast enhances the pulmonary arterial system to identify potential filling defects. CT with contrast is usually not appropriate. According to the American College of Radiology, when IV contrast is given during CT acquisition for suspected PE, the study should be performed as a CTPA.(3)

Planar V/Q may preferentially be used in outpatients with a low clinical probability of PE and normal CR, in young (especially female) patients, pregnant women and patients with a history of contrast allergy or renal failure.(2) The proportion of diagnostic V/Q scans is higher in patients with a normal CXR. A normal V/Q scan has a high negative predictive value, but there is a high proportion of non-diagnostic scans and it cannot provide alternative diagnoses.(3) Abnormal regional lung perfusion may suggest PE but is not specific and requires correlation with ventilation studies or other imaging. Investigators have studied single-photon emission CT (SPECT) to improve the sensitivity and specificity of V/Q scans. Kahn et al state that V/Q SPECT is a low radiation option to minimize lung and breast tissue irradiation in younger patients.(1) Some authors believe that V/Q SPECT should be the preferred study in the evaluation of suspected PE.(5) However, large scale prospective trials are needed to validate SPECT techniques before its widespread incorporation into diagnostic algorithms.(2,6)

A normal perfusion scan and a negative CTPA appear equally safe for ruling out PE in pregnancy.(2) There is debate regarding which is the first test of choice. CTPA is more expensive and exposes the pregnant woman to more radiation than the fetus; V/Q scans have low radiation and no contrast-related side effects.(7) A compression duplex ultrasound of the lower extremity should be performed if there are symptoms/signs of a DVT. If a DVT is diagnosed, anticoagulation can be administered without further

imaging. A CXR is usually appropriate. An alternative diagnosis may be found, and it can inform the choice between CTPA and a V/Q scan as the next test when there is no clinical evidence of a DVT.(3) If there is no DVT and a CXR is normal, CTPA or a perfusion scan is appropriate. If the perfusion scan is normal, a ventilation scan may not be needed. If the CXR is abnormal, alternative causes have been considered and PE is still suspected, CTPA should be done.(2)

Acute PE is treated for at least 3 months with anticoagulation. Whether anticoagulation is stopped after 3 months or continued indefinitely depends on whether the reduced risk of recurrent venous thromboembolism (VTE) outweighs the increased risk of bleeding.(2) The risk of recurrent VTE after stopping anticoagulation is related to the risk factor category for the index PE/VTE event. There are many genetic and acquired risk factors for VTE associated with a low, intermediate or high risk of recurrence.(2,4)

Patency of the pulmonary arterial bed is restored in the majority of people within the first few months, and no routine CTPA imaging is needed.(2) Konstantinides et al recommend a transthoracic echocardiogram in those with dyspnea or functional limitation at follow up. If the probability of pulmonary hypertension is felt to be high, planar V/Q is considered the first line imaging test for suspected chronic thromboembolic pulmonary hypertension (CTEPH). CTPA should not be used as a stand alone test to rule out CTEPH. The diagnosis is based upon measurements made during right heart catheterization and mismatched perfusion defects on V/Q scan more than 3 months after an acute PE.(2)

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