Suspected acute pulmonary embolism

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Clinical history, physical examination, ECG, D-dimer, CXR
(please see Remarks 1)

CTPA

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Diagnosis of PE confirmed

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Treatment

V/Q scan
(please see Remarks 5)

- Can be considered for young patients (with normal CXR)
- Can be considered as an alternative for patients with renal impairment or absolute contraindication to iodinated IV contrast injection
- Can be considered in pregnant women with suspected PE, provided normal recent CXR
- Please note the choice of CTPA and V/Q scan for pregnant women remains controversial

REMARKS

1   General

1.1   Diagnosis of pulmonary embolism (PE) based on clinical symptoms and signs can be difficult, as chest pain, shortness of breath and tachycardia are non-specific.

1.2   To diagnose or to exclude PE, it would be helpful to use an agreed protocol combining clinical features, pretest probability and results of D-dimer assay in order to utilize imaging appropriately, such as Wells' criteria for PE.

1.3   Wells' Prediction Rule for Diagnosing PE: Clinical Evaluation Table for Predicting Pretest Probability of PE
- Symptoms of deep vein thrombosis (DVT): 3 points
- No alternative diagnosis: 3 points
- Heart rate >100 bpm: 1.5 points
- Recent immobilization or surgery: 1.5 points
- Previous DVT or PE: 1.5 points
- Haemoptysis: 1 point
- Malignancy: 1 point

1.4   The followings may be considered by referring clinicians as determinants of work-up for PE:

1.4.1   Clinical probability of PE: low 0-1 point; intermediate 2-6 points; high >/= 7 points.

1.4.1.1   If the patient is at LOW RISK, clinicians should use the eight Pulmonary Embolism Rule-Out Criteria (PERC); if a patient meets all eight criteria, the risks of testing are greater than the risk for embolism, and no testing is needed.

1.4.1.2   For patients at INTERMEDIATE RISK, or for those at low risk who do not meet all of the rule-out criteria, use a high-sensitivity plasma D-dimer test as the initial test.

1.4.1.3   Patients at HIGH RISK should skip the D-dimer test and proceed to CT pulmonary angiography, because a negative D-dimer test does not eliminate the need for imaging in these patients.

1.4.2   Alternatively, a two-tier model can be used, if score </=4, D-dimer evaluation is needed first.

2   Plain radiograph

2.1   Chest x-ray (CXR) is non-specific for PE.

2.2   Normal or abnormal CXR cannot exclude presence of PE.

2.3   There are no specific findings on CXR which are sufficient to confirm PE.

2.4   CXR is useful to exclude other causes of acute chest pain.

2.5   A recent CXR is required to allow accurate interpretation of abnormal radionuclide ventilation / perfusion scintigraphy (V/Q scan).

3   Computed tomography pulmonary angiogram (CTPA)

3.1   CTPA is the current standard of care and primary imaging modality for detecting PE.

3.2   CTPA is highly sensitive and specific.

3.3   There are fewer non-diagnostic studies of CTPA than that of V/Q scan.

3.4   CTPA can identify features of right ventricular dysfunction which indicates poor prognosis of PE.

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4 US

4.1 Doppler US of lower extremity veins is useful as there is high association of DVT with PE.

4.2 Presence of DVT does not indicate the presence (or absence) of PE, but may increase (or decrease) its likelihood.

4.3 In pregnant women with suspected PE and clinical features suggestive of DVT, compression Doppler US of the symptomatic leg veins should be the initial investigation.

4.4 Transthoracic echocardiogram (TTE) or transoesophageal echocardiogram (TOE) are generally not indicated for the diagnosis of acute PE, but are useful in the assessment of right ventricular morphology and function.

5 Ventilation / Perfusion scintigraphy (V/Q scan)

5.1 Overall decreasing role in evaluation of suspected PE as compared to CTPA.

5.2 Scan findings classified by the modified Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) II criteria are reported as "PE present" (high probability), "PE absent" (very low probability or normal), or "not diagnostic" (all other findings).

5.3 A normal perfusion scan can obviate the need of ventilation scan, further reducing the dose.

5.4 V/Q scan can be an alternative to CTPA in patients without pre-existing pulmonary disease and with normal CXR.

5.5 V/Q scan delivers lower radiation dose to the breasts and lower overall maternal radiation dose when compared with CTPA.

5.6 V/Q scan can be considered as the first choice of assessment for suspected PE in young patients, particularly during pregnancy (provided normal CXR) and in patients with renal impairment.

5.7 Use of single photon emission computed tomography (SPECT) may decrease the rate of non-diagnostic test and improves the diagnostic performance.

5.8 V/Q scan is the most sensitive test for chronic pulmonary embolism.

5.9 The use of CTPA or V/Q scan in pregnant patients remains a matter of debate.

5.10 Not every hospital provides nuclear medicine clinical services. CT is available in most hospitals.

6 MRI

6.1 MRI and magnetic resonance angiogram (MRA) are not generally advocated.

7 Catheter-directed angiography of pulmonary arteries

7.1 Conventional catheter angiography of pulmonary arteries is generally not necessary for the diagnosis of PE.

7.2 Useful if intervention such as thrombectomy or thrombolysis is needed.

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