

Pulmonary Embolus (PE)

Definition of pulmonary embolus/embolism (PE)

- Embolus (usually from a thrombus in the deep veins of the leg or pelvis) which lodges in the pulmonary arteries

Epidemiology of pulmonary embolism (PE)

- 1 per 1000 people per year
- Commoner in older people
- 20% higher in black people, 30% lower in Asian
- 25% unprovoked, 50% temporary risk factors, 25% have underlying malignancy

Risk factors for pulmonary embolus (PE)

- Previous VTE
- Patient
 - Age > 60
 - Obesity
- Situation
 - Immobility
 - Prolonged travel
- Condition
 - Acute medical illness
 - Surgery – especially lower limb orthopaedic surgery
 - Malignancy
 - Thrombophilia
 - Pregnancy
 - OCP/HRT

Presentations of pulmonary embolism (PE)

- **Non-massive PE**
 - Pain (pleuritic)
 - SOB
 - Tachypnoeic – 85%
 - Fever – 40%
 - Tachycardia – 30%
 - Localised pleural rub and/or coarse crackles
 - Haemoptysis (may be delayed up to 3 or more days)
- **Massive PE**
 - Central chest pain
 - Collapse
 - Haemodynamic compromise
 - AF
 - Raised JVP with prominent a-wave (contraction of distended atria)
 - Failure: RV heave, gallop rhythm, widely split second heart sound

Differential diagnosis of pulmonary embolism (PE)

- Acute coronary syndromes (ACS)

- Pneumothorax
- Pneumonia
- Aortic dissection
- Cardiac tamponade

Well's score in pulmonary embolism (PE)

- Use Well's score to assess probability of PE (see below)
- Low or Medium probability: do a D-Dimer. If negative, look for another cause of symptoms.
- High probability: do a CTPA/VQ scan

Factor	Points
Clinically suspected DVT	3
Alternative diagnosis less likely than PE	3
Tachycardia	1.5
Immobilisation/surgery in previous four weeks	1.5
History of DVT or PE	1.5
Haemoptysis	1
Malignancy (treatment in preceding 6 months or palliative stage)	1

Interpretation of the Well's score in pulmonary embolism (PE)

- 0-4 = PE unlikely
- > 4 = PE likely

Investigation of pulmonary embolism (PE):

- ABG
- Bloods
 - Including D-dimer (depending on Well's score) clotting and troponin
- CXR
 - May show wedge infarction
 - Atelectasis (due to collapse of non-perfused alveoli, which then don't make surfactant)
 - Pleural effusion
 - Rule out consolidation
- ECG
 - Right ventricular strain
 - ST depression and T-wave inversion in right-sided chest leads, V1-V3 (also limb leads I, II and AvF potentially)
 - Classic S1 Q3 T3 pattern, which is rare.
- CTPA
 - Positive predictive value 96% with high Wells score
 - 92% with moderate Wells score
 - 58% with low Wells (BMJ 2013).
 - Also varies with size of PE (PPV 97% with main or lobular, 68% with segmental, 25% with subsegmental)
- V/Q can be done if poor renal function, young age or pregnant
 - Needs a normal CXR beforehand
 - Can rule out PE if normal
- USS to look for pelvis/femoral vein clots
- Echoardiography
 - May show dilated RV or clot in RV outflow tract

- MRA can also be done if CT contraindicated (e.g. due to contrast)
- Further investigations if PE
 - If over 40 years old: PSA in men, mammography in women to look for underlying malignancy (as well as full history to looking for underlying malignancy)
 - Consider CT CAP and colonoscopy if any suspicion

Staging of pulmonary embolus (PE)

- Massive: Embolus in the RV outflow tract
- Non-Massive: Embolus in a terminal vessel

Initial management of pulmonary embolism (PE)

- ABCDE
 - Oxygen
 - IV access
 - Bloods
 - ECG and CXR
- Analgesia
- Thrombolysis if haemodynamic compromise
 - Usually alteplase
 - Dosage in (peri)/arrest situation is different to that in hypotension – see local guidelines
- Anticoagulation
 - Fondaparineux (10a inhibitor) or treatment dose heparin (UFH or LMWH) depending on local guidelines

Further management of pulmonary embolism (PE)

- Oral anticoagulation
 - Warfarin or Rivaroxaban
 - Continue LMWH if malignancy or pregnant
- IVC Filter
 - Consider in patients who cannot have anti-coagulation treatment or who develop new PEs despite conventional treatment
 - Not a long term solution.
- Embolectomy

Complications of pulmonary embolism (PE)

- Post-thrombotic syndrome
- Recurrence
- Chronic thromboembolic pulmonary hypertension
- Right heart failure

Prognosis of pulmonary embolism (PE)

- 30% overall mortality but very dependent on severity

Common questions concerning PE

What are the risk factors for pulmonary embolus (PE)?

- Previous VTE
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- Condition
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 - Malignancy
 - Thrombophilia
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What is the Well's score in pulmonary embolism (PE)

- The Well's score assesses the probability of PE with given presentations.
- The score it gives defines probability of PE
- This then dictates further investigations.

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- 0-4: PE unlikely
 - Do a D-Dimer – if negative, look for other causes of symptoms
- > 4 = PE likely
 - Do a CTPA or V/Q scan

What are the chances of PE in malignancy?

- If patient over 40 then there is a 10-25% chance of malignancy
 - Therefore ensure thorough history, examination, CXR and bloods
 - Organise CT abdo/pelvis plus PSA in men, mammography in women

What potential strategies are there for patients who develop PE despite adequate anti-coagulation?

- Increase INR target to 3-4
- Switch to LMWH
- IVC filter

Who should have thrombophilia testing?

- Do not offer to patients who are continuing on anti-coagulation treatment: only in patients whom there is a plan to stop anti-coagulation
- Consider testing for anti-phospholipid in patients with unprovoked PE
- Consider testing for hereditary thrombophilia in patient with unprovoked PE with first degree relatives who have a history of VTE
- See haematology pages for further details

Is there any evidence for thrombolysis in stable patients who have evidence of right ventricular

dysfunction?

- Solid evidence of the benefit of this is still lacking
- However some centres have started to do it as it appears that the risks of thrombolysis may not be as great as previously thought