بسم الله الرحمن الرحيم

Pulmonary Thromboembolism: Clinical Assessment

By

Essam Mahfouz, MD

Professor of Cardiology Mansoura University

Introduction

- Pulmonary embolism (PE) is a major international health problem.

- The diagnosis is often difficult to obtain and is frequently missed.

- Mortality in untreated PE is approx. **30%,** but with adequate treatment , it can be reduced to **2-8%.**

- The prevalence of PE at autopsy (**12-15%**) in hospitalized patient has not changed over the last 3 decades.

Classification

For clinical purposes PE can be classified into two main groups: massive and non-massive.

- *Massive PE* consists of shock and/or hypotension (defined as a systolic blood pressure <90 mmHg or a pressure drop of 40 mmHg for >15 min if not caused by new-onset arrhythmia, hypovolemia or sepsis).

- Otherwise *non-massive PE* can be diagnosed.

- A subgroup of patients with non-massive PE may be identified by echocardiographic signs of right ventricular hypokinesis. This subgroup is called *submassive*, because there is growing evidence that the prognosis of this patient group may be different from those with non-massive PE and normal right ventricular function.

Diagnosis of PE

- PE has a wide range of clinical presentation.
- A reasonable clinical suspicion is required to avoid missing the diagnosis of PE.
- First line diagnostic tests, such as ECG, chest X-ray and blood-gas analysis are indicated to assess clinical probability of PE and general condition of the patient.

Diagnosis of PE

- Clinical evaluation is accurate to discriminate a subgroup of patients with a low likelihood of PE.
- Clinical probability may be estimated empirically or explicitly by a prediction rule.
- Patients with a low clinical probability of PE, no lower limb deep vein thrombosis and a nondiagnostic lung scan have a very low risk of PE.

Risk factors of VTE

- Age >40 yr
- Long-haul air travel
- History of venous thromboembolism
- Surgery requiring >30 min of anesthesia
- Prolonged immobilization
- Cerebrovascular accident
- Congestive heart failure
- Cancer
- Fracture of pelvis, femur, or tibia

Risk factors of VTE

- **Obesity**
- **Pregnancy or recent delivery**
- **Estrogen therapy**
- **Inflammatory bowel disease**
- **Genetic or acquired thrombophilia**
  - Factor V Leiden
  - Antithrombin III deficiency
  - Protein C deficiency
  - Protein S deficiency
  - Prothrombin G20210A mutation
  - Anticardiolipin antibody syndrome
  - Lupus anticoagulant

Symptoms of PE

	PE	No PE
Dyspnea	80 %	59 %
Chest pain pleuritic	52 %	43 %
Chest pain substernal	12 %	8 %
Cough	20 %	25 %
Hemoptysis	11 %	7 %
Syncope	19 %	11 %

Signs of PE

	PE	No PE
achypnoea (20/min)	70%	68%
achycardia (> 100/min)	26 %	23 %
gns of DVT	15 %	10 %
ever > 38.5	7 %	17 %
anosis	11 %	9 %

Routine Investigation

	PE	No PE
Chest X-ray		
Atelectasis or infiltrate	49%	45%
Pleural effusion	46%	33%
Pleural-based opacity (infarction)	23%	10%
Elevated diaphragm	36%	25%
Increased pulmonary vascularity	36%	6%
Amputation of hilar artery*	36%	1%
Hypoxemia	75%	81%

Diagnostic Prediction

Wells et. al.:

➤ **7Clinical Data**

- **DVT** **(3·0 points)**
- **Alternative diagnosis is less likely than PE** **(3·0 points)**
- **Heart rate above 100/min** **(1·5 points)**
- **Immobilisation or surgery in the previous 4 w** **(1·5 points)**
- **Previous DVT or PE** **(1·5 points)**
- **Haemoptysis** **(1 point)**
- **Cancer, being treated currently or**
within the previous 6 months or palliative **(1 point)**

➤ **Clinical Probability:**

- **Low** **< 2**
- **Intermediate** **2-6**

<u>Diagnostic Prediction</u>

British Thoracic Society

A standard assessment of pre-test clinical probability might include the following.

➢ A. The patient has clinical features compatible with PE (raised respiratory rate, which may be accompanied by haemoptysis, pleuritic chest pain, or both)

➢ Plus two other factors:

1. The absence of another reasonable clinical explanation
2. The presence of a major risk factor

➢ Assessment

- A. PLUS 1. AND 2.: high pre-test clinical probability
- A. PLUS 1. OR 2.: intermediate pre-test clinical probability

Modified pretest probability for DVT

Clinical feature	Score
Tenderness along entire deep vein system	1
Swelling of the entire leg	1
Greater than 3 cm difference in calf circumference	1
Pitting oedema	1
Collateral superficial veins	1
Risk factors present:	
Active cancer	1
Prolonged immobility or paralysis	1
Recent surgery or major medical illness	1
Alternative diagnosis likely (ruptured Baker's cyst in rheumatoid arthritis, superficial thrombophlebitis, or infective cellulitis)	-2

Natural History of VTE 1

Most cases of deep vein thrombosis (DVT) (about **90%**) start in the calf

Isolated DVT of the calf rarely causes :

➢**Leg symptoms (80% of the cases of symptomatic DVT involve the proximal veins)**

➢**Clinically important pulmonary embolism.**

About **1/4** of untreated cases of DVT in the calf will extend to involve the proximal veins and do so within a week of

Natural History of VTE 2

Most patients with symptomatic proximal DVT and without chest symptoms have lung scan evidence of pulmonary embolism (about **40%** have "high-probability" lung scans). These abnormalities are often misdiagnosed as new pulmonary embolism during treatment.

Natural History of VTE 3

About **75%** of all patients who are diagnosed with PE have DVT; about **2/3** of these cases involve the proximal veins

➤ Patients with less extensive PE are less likely to have proximal DVT

➤ Up to **25%** of patients with symptomatic PE have clinical evidence of DVT.

Without treatment, about **1/2** of patients with symptomatic proximal DVT or PE are expected to have recurrent VTE within 3

Natural History of VTE 4

After PE, as compared with DVT, at least within the first 3 months, a high proportion of recurrent episodes of VTE are fatal PE (case fatality rate over 2-fold higher)

10% of symptomatic PE cases are estimated to be fatal within an hour of first symptoms:
➤ 5%–10% of patients with PE have shock

Natural History of VTE 5

➢ About **50%** of patients who are diagnosed with PE have echocardiographic evidence of RV dysfunction at presentation, a finding that is associated with an elevated short-term mortality.

With treatment of PE, about **50%** resolution of perfusion defects is expected after 2–4 weeks. Eventually, complete resolution of PE embolism is expected to occur in about **2/3** of

Natural History & Prognosis

mmary

Mortality in untreated PE is **25-30%**

Untreated VTE has a high risk of (fatal or non-fatal) recurrence.

Anticoagulant therapy reduces the mortality in patients with PE by **75%.**

The prognosis of treated, non-massive VTE is mainly dependent on co-existing illnesses, such s malignancy or CV diseases

<u>*Take home message*</u>

PE is a common medical emergency that faces nearly all medical specialties

The diagnosis is often difficult and frequently missed

Mortality of untreated PE about 30% that can be reduced to 2-8 % with adequate treatment

So, use of clinical prediction rules and diagnostic algorithms is mandatory to avoid this fatal clinical emergency especially in