

Case Conference

Presenter : R2周光緯
Supervisor : F 王德皓
2011.07.06

Discussion

Acute Pulmonary Embolism -- Diagnosis

2/52

Symptoms and Signs

Symptom	Frequency
Dyspnea	73 percent
Pleuritic chest pain	66 percent
Cough	37 percent
Hemoptysis	13 percent
Sign	
Tachypnea	70 percent
Rales	51 percent
Tachycardia	30 percent
Fourth heart sound	24 percent
Accentuated pulmonic component of second heart sound	23 percent
Circulatory collapse	8 percent

3/52

Diagnostic Tests

- Laboratory
 - Arterial blood gas
 - Brain natriuretic peptide
 - Troponin
 - D-dimer
- EKG
- Chest radiography
- V/Q scan
- Ultrasound
- Angiography
- Spiral CT
- MR angiography
- Echocardiography

4/52

Laboratory

- Routine laboratory findings are nonspecific
- WBC ↑ , ESR ↑ , GOT ↑ , LDH ↑
- ABG :
 - Hypoxemia
 - Hypocapnia
 - Respiratory alkalosis
- BNP : may elevated but poor specificity (60~62%)

5/52

A-a gradient

- $PAO_2 = (FiO_2 * (760 - 47)) - (PaCO_2 / 0.8)$
- A-a gradient = $PAO_2 - PaO_2$
- Respiratory quotient : 0.8 at sea level
- Normal range adjust by age :
Age (years) / 4 + 4

6/52

Initial ABG

- Under O₂ mask 10 L/min (FiO₂ 60%)

PH=7.448
PCO₂=22.9 mmHg
PO₂=76 mmHg
BE=-8 mmol/L
HCO₃=15.9 mmol/L
TCO₂=17 mmol/L
SO₂=96 %

A-a gradient = 325

7/52

Tronponin

- Elevated in 30 to 50 percent of patients who have a moderate to large pulmonary embolism
- Resolve within 40 hours
- Not useful for diagnosis, but are associated with **adverse outcomes**

8/52

D-Dimer

- good sensitivity (~95%) and negative predictive value
- poor specificity and positive predictive value
- D-dimer level <500 ng/mL by quantitative ELISA is sufficient to exclude PE

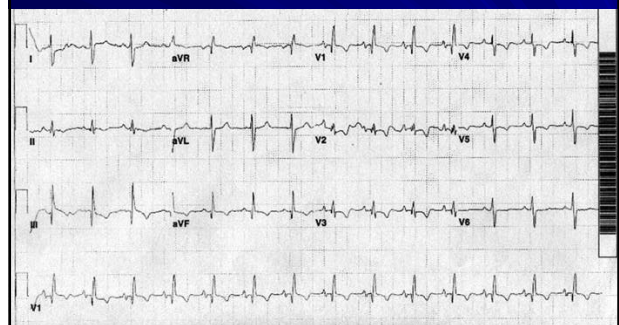
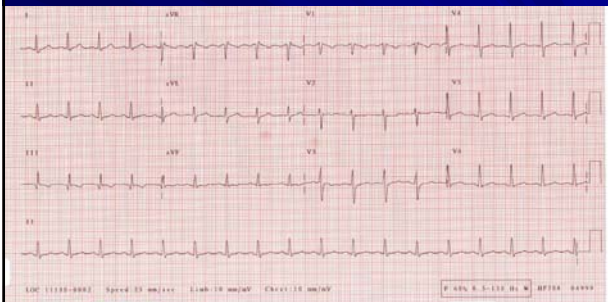
9/52

EKG

- Suggestive findings :
 - S1Q3T3 pattern
 - RV strain
 - New incomplete RBBB
- Common in **massive** acute PE and cor pulmonale
- Poor prognosis :
 - Atrial arrhythmias
 - RBBB
 - Inferior Q-waves
 - Precordial T-wave inversion and ST changes

10/52

Example



CXR

- Non-specific
- Atelectasis
- Pleural effusion
-
- Only 12 percent of the chest radiographs in patients with PE were interpreted as normal

13/52

V/Q scan

- A normal V/Q scan virtually excluded PE

Scan Category	Clinical probability of emboli		
	High	Intermediate	Low
High	95	86	56
Intermediate	66	28	15
Low	40	15	4
Normal or near normal	0	6	2

14/52

Ultrasound

- Lower extremity venous ultrasound
- To detect venous thrombosis
- Operator-dependent

15/52

Pulmonary Angiography

- Definitive diagnosis (**gold standard**)
- A filling defect or abrupt cutoff of a small vessel is indicative of an embolus
- A negative pulmonary angiogram excludes clinically relevant PE

16/52

CT Scan

Advantages	Limitations
Specificity	Reader expertise required
Availability	Expense
Safety	Not portable
Relative rapidity of procedure	Need contrast bolus comparable to angiogram
Diagnosis of other disease entities	Poor visualization of certain regions
Retrospective reconstructions	Contraindications
Advancing technology	Renal insufficiency
	Contrast allergy

- 83 percent of patients with PE had a positive CT-PA (ie, sensitivity)
- 96 percent of patients without PE had a negative CT-PA (ie, specificity)

17/52

MR angiography

- Limitations :
 - Respiratory and cardiac motion artifact
 - Suboptimal resolution
 - Complicated blood flow patterns
 - Magnetic susceptibility effects from the adjacent air-containing lung

18/52

Echocardiography

- Only 30-40 % abnormal findings
 - Increased right ventricular (RV) size
 - Decreased RV function
 - Tricuspid regurgitation
- Additional findings that suggests PE :
 - RV thrombus
 - Regional wall motion abnormalities that spare the right ventricular apex ("McConnell's sign")

19/52

Decision Making

- Pending where your are and what you got !
 - CT experienced institutions
 - CT inexperienced institutions
 - Low risk outpatient populations

20/52

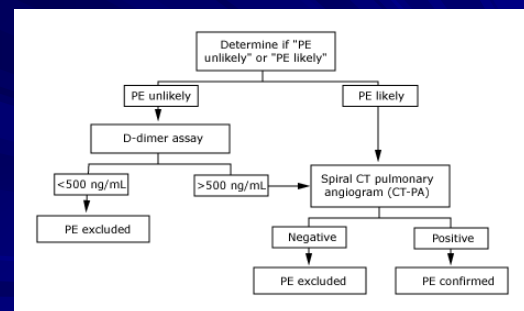
Modified Well's Criteria

Probability	Score
Clinical symptoms of DVT (leg swelling, pain with palpation)	3.0
Other diagnosis less likely than pulmonary embolism	3.0
Heart rate >100	1.5
Immobilization (≥3 days) or Surgery in the previous four weeks	1.5
Previous DVT/PE	1.5
Hemoptysis	1.0
Malignancy	1.0

- PE is unlikely (score ≤4) or likely (score >4)

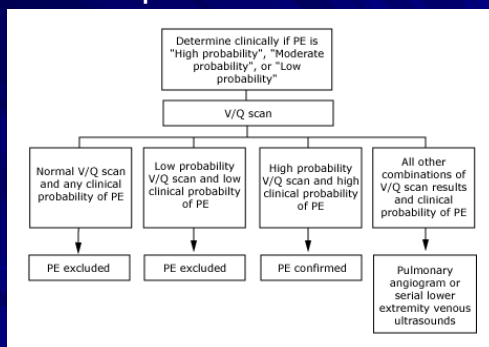
21/52

CT experienced institutions



22/52

CT inexperienced institutions



23/52

Low risk outpatient populations

- Pulmonary embolism rule-out criteria (PERC)
 - Age < 50 years
 - Heart rate < 100 bpm
 - SpO2 > 95 %
 - No hemoptysis
 - No estrogen use
 - No prior DVT or PE
 - No unilateral leg swelling
 - No surgery or trauma requiring hospitalization within the past 4 weeks

24/52

**Thanks for your
listening !**

