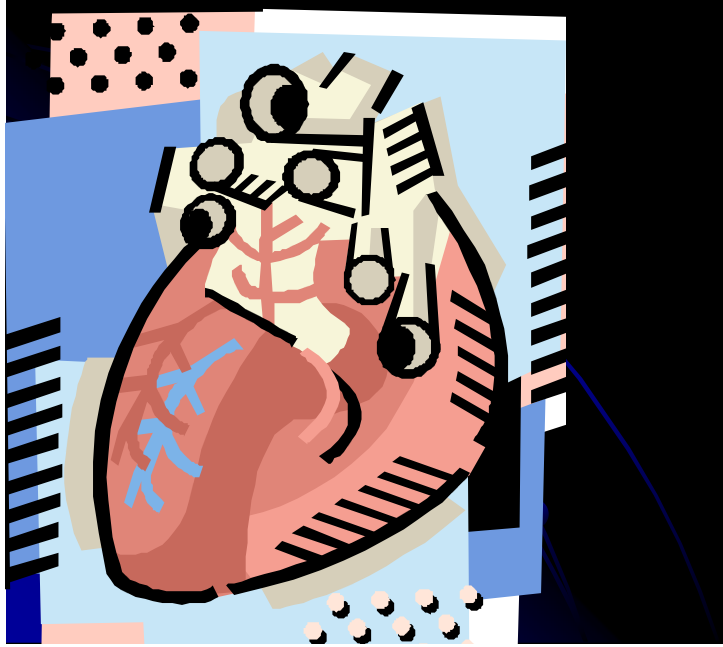
MDCT of the chest:
Pulmonary embolism and acute aortic disease



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大綱

- MDCT 在急診胸痛病人扮演角色
- MDCT : imaging of pulmonary embolism
- MDCT: imaging of aortic dissection
- MDCT: imaging of the heart
  - non-ECG gated CT imaging
  - ECG-gated cardiac CTA
- Update from 64-slice CT to 320-slice CTA

- 至少一半以上急診胸痛病患是沒有心臟方面疾病
- Triple rule-out CT 可以快速找出病因.
- Chest pain:

  Stable angina

  Pulmonary embolism (PE)

  Aortic dissection.

  Acute coronary syndrom

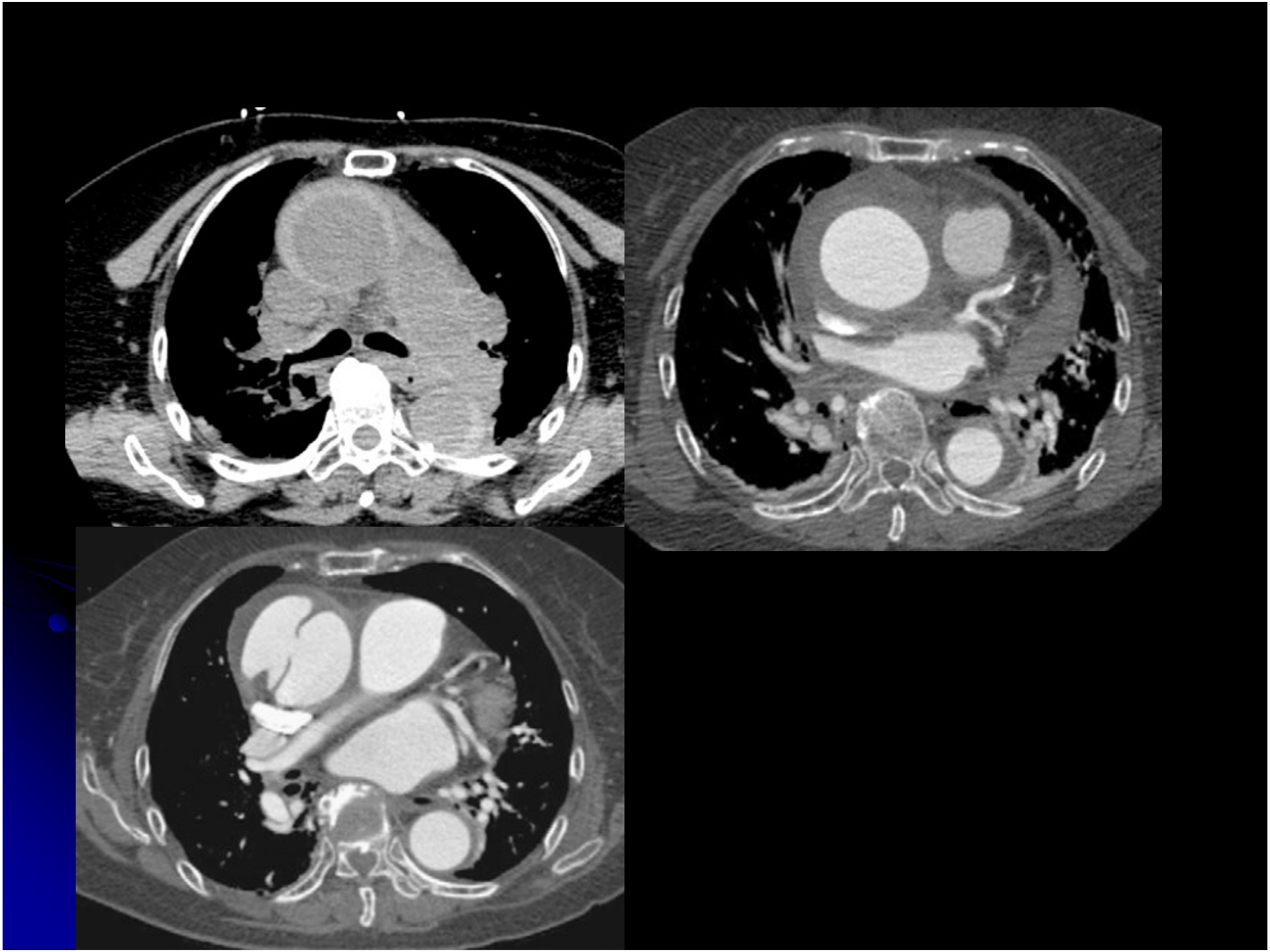
    transmural myocardial infarction (MI)

    subendocardial MI

    unstable angina

Acute aortic dissection

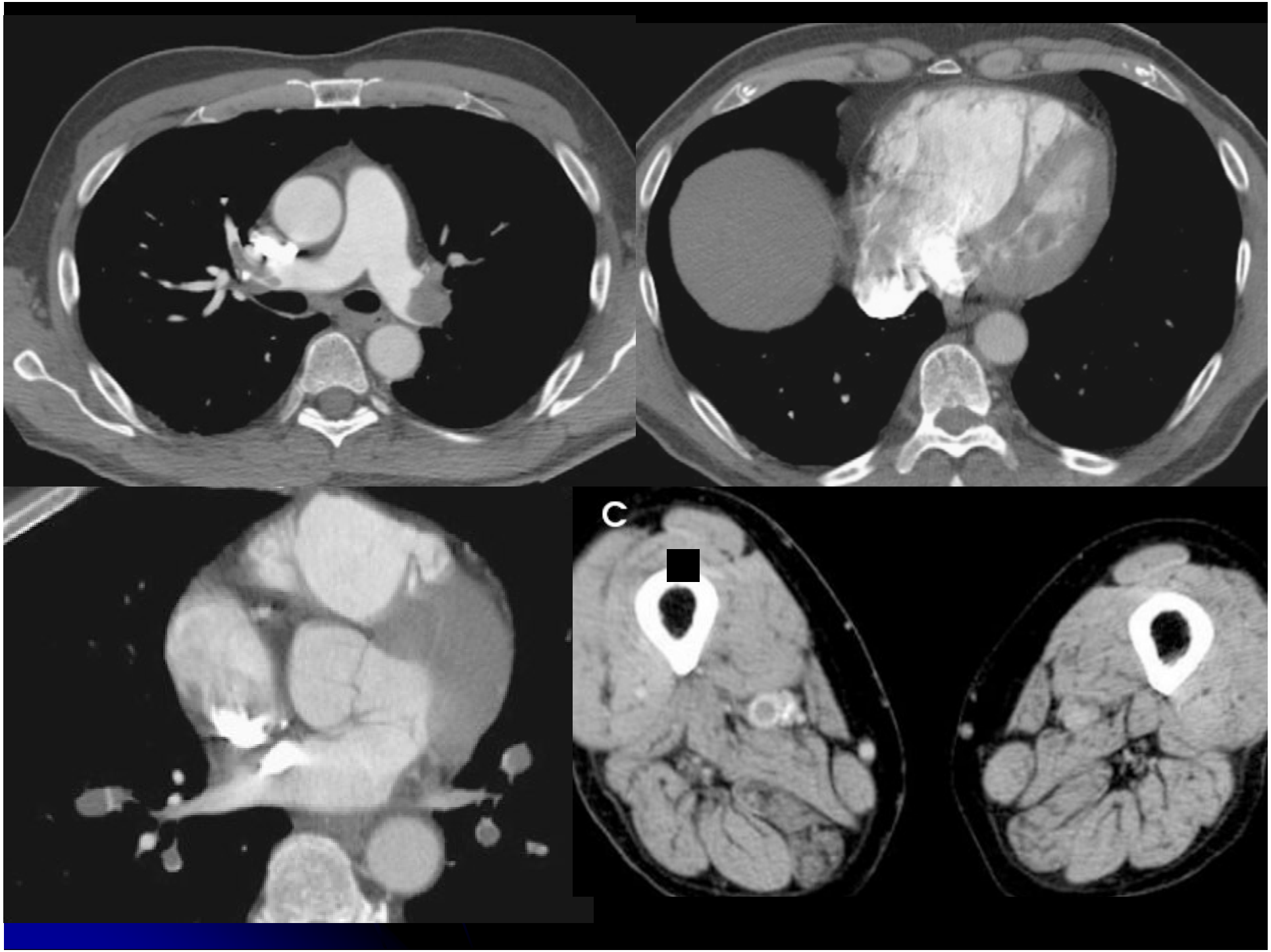
- tearing aortic pain with immediate onset, unequal extremity pulses or blood pressures, and mediastinal widening on chest radiograph.
- 4%–7% of patients with aortic dissection may have none of these findings
- CT identified 99% acute aortic disorders, including dissection, intramural hematoma, penetrating aortic ulcer, new or enlarging aneurysm, or acute aortic rupture.
  Radiology. 2006;238:841–852.



Pulmonary embolism

- Clinical scoring systems such as the Wells and Geneva scores can be used to risk stratify patients suspected of having PE, but they are insufficient to exclude the diagnosis alone.
- Diagnostic imaging strategies include ventilation-perfusion scanning, lower extremity sonography, CT pulmonary angiography (CTPA), and conventional pulmonary angiography (CPA).
- Among these methods, CTPA has become the first line tool for evaluation of PE in the acute setting.

- 4-slice CTPA with CPA in 93 patients, the sensitivity and specificity of CTPA were 100% and 89%, respectively. *Radiology. 2004;233:806–15.*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Acute coronary syndrome

- ACS encompasses a spectrum of presentations ranging from unstable angina to acute MI.

- 診斷ACS: clinical history, electrocardiogram (ECG), and cardiac enzymes.
- 大多數胸痛病患 normal ECG and cardiac enzymes. 主要都在觀察病情變化, 僅15%是真正ACS.
- 2~5% 真的ACS沒診斷出來
- 因此需要更快速而且精準的檢查

第一類

- 很明顯是 ACS.

  The ECG is abnormal

  The cardiac biomarkers are elevated, clinical history → high risk for coronary artery disease.

- This group of patients is typically sent directly to the cardiac catheterization laboratory.

第二類

- have minimal risk for coronary artery disease and a reasonable explanation for the chest pain

  例如: musculoskeletal injury

- 這類病患可以 discharged home without further work-up.

第三類
佔50%左右

- equivocal findings on the chest pain work-up.

- 一開始的時候
- The history may be atypical,
- the ECG nonspecific or normal,
- the cardiac biomarkers may be normal,

- In this large group of patients, noninvasive imaging may be useful for clarifying the diagnosis.

影像檢查

- Radionuclide myocardial perfusion imaging

  high negative predictive value (99%) for ACS.

  通常僅在正常時間內服務

  對其他胸痛原因無法釐清
- echocardiography.

  急診available

  sensitivity for ACS is good (90%)

  specificity is comparatively poor (53% for MI, 78% for ischemia).

  主要看wall motion abnormality, 無法區分新舊
- Magnetic resonance imaging (MRI)
- multidetector cardiac CT.

- Radionuclide myocardial perfusion imaging
- echocardiography.
- Magnetic resonance imaging (MRI)

  ability to evaluate myocardial perfusion, function, and viability.
- contrastenhanced, resting cardiac MRI had a sensitivity of 84% and a specificity of 85% for the diagnosis of ACS.
- 缺點: 轉運, 檢查時間長, and the incompatibility of MRI with pacemakers, implantable cardioverter-defibrillators, and other metallic devices.
- Multidetector cardiac CT.

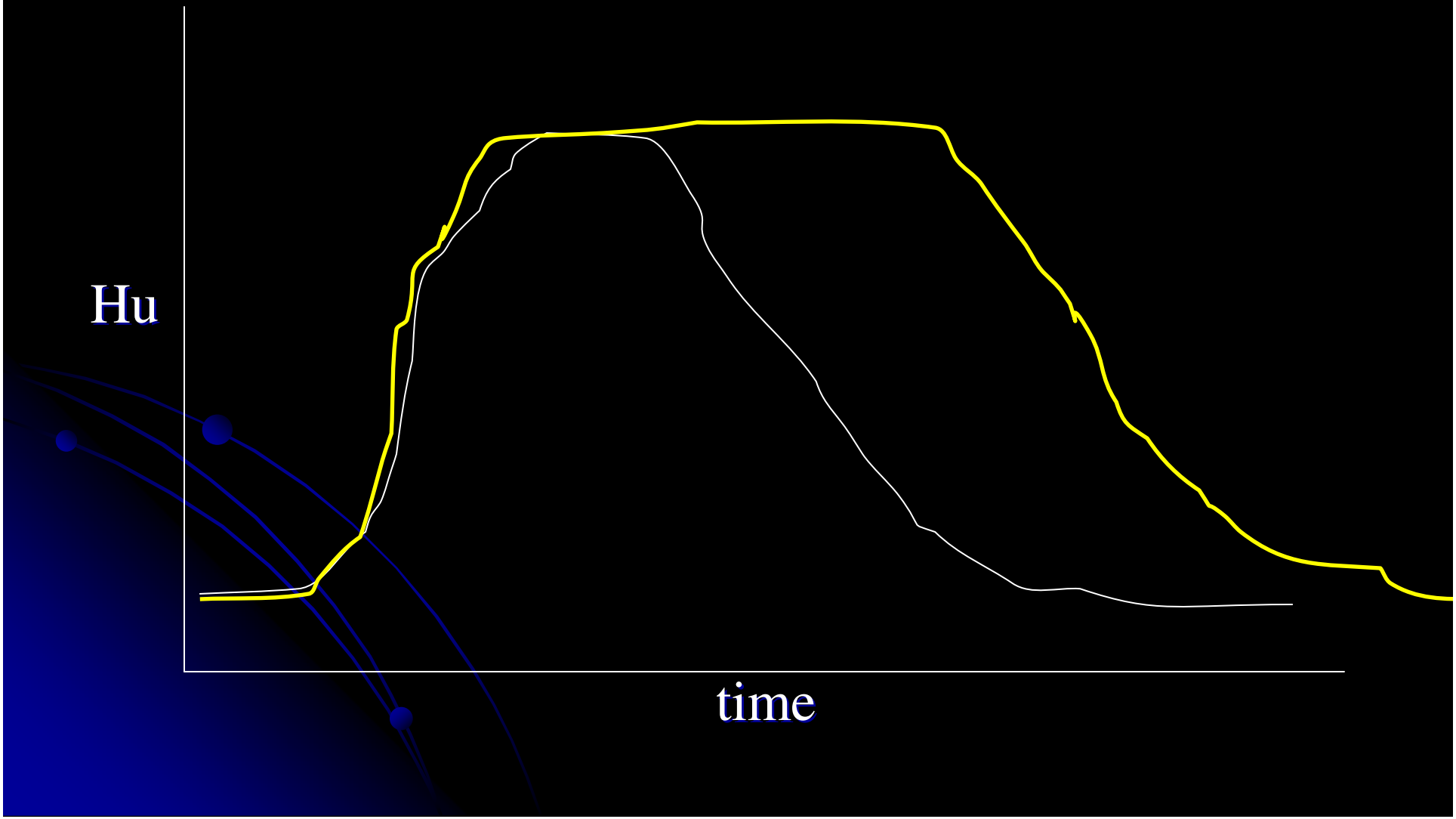
Multidetector cardiac CT

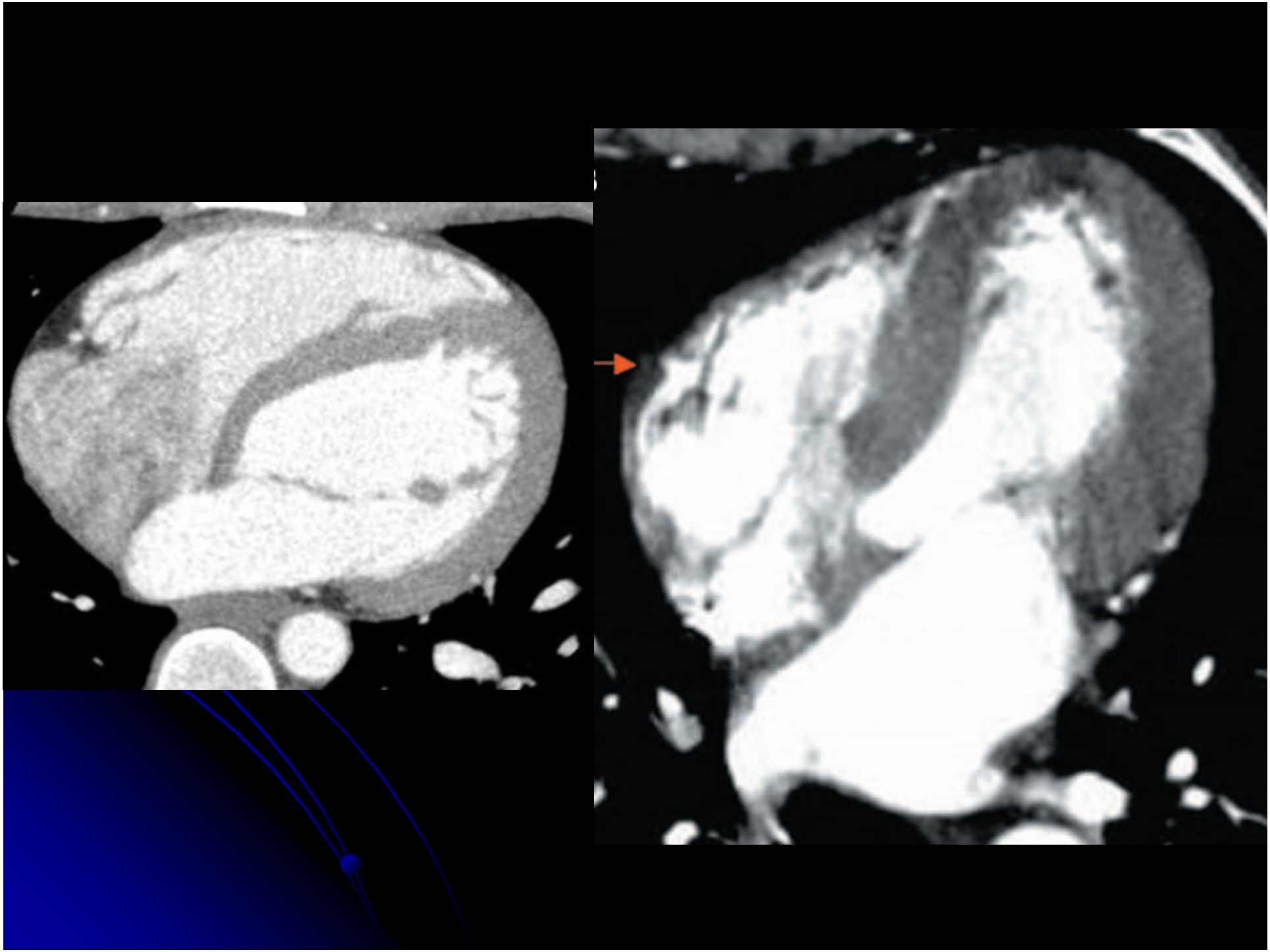
- coronary artery disease, aortic dissection, and PE.
- 也可以同時診斷: pneumonia, pneumothorax, esophageal rupture, tumor.

Table 2. Emergency department (ED) triage guidelines

Risk category	CT interpretation	Clinical guideline
Negative study	Normal scan	Discharge from ED; follow-up with personal physician.
Low	Coronary calcium score <100	Discharge from ED; follow-up with preventive cardiologist.
Intermediate	Coronary calcium score 100–400 Stenosis 30% to 70% in any vessel	Cardiology consultation in ED; discharge from ED or admission to hospital at cardiologist's discretion.
High	Coronary calcium score >400 Hard or soft plaque Stenosis >70% in any vessel Stenosis >50% in left main	Admission to hospital

顯影劑 濃度與時間關係





Triple rule-out CT 的挑戰

- 輻射劑量
- 顯影劑施打的注射量(腎功能)
- 掃描時間點
- 閉氣時間較長
- 影像解析度
- 心律變化, 心跳速率控制.

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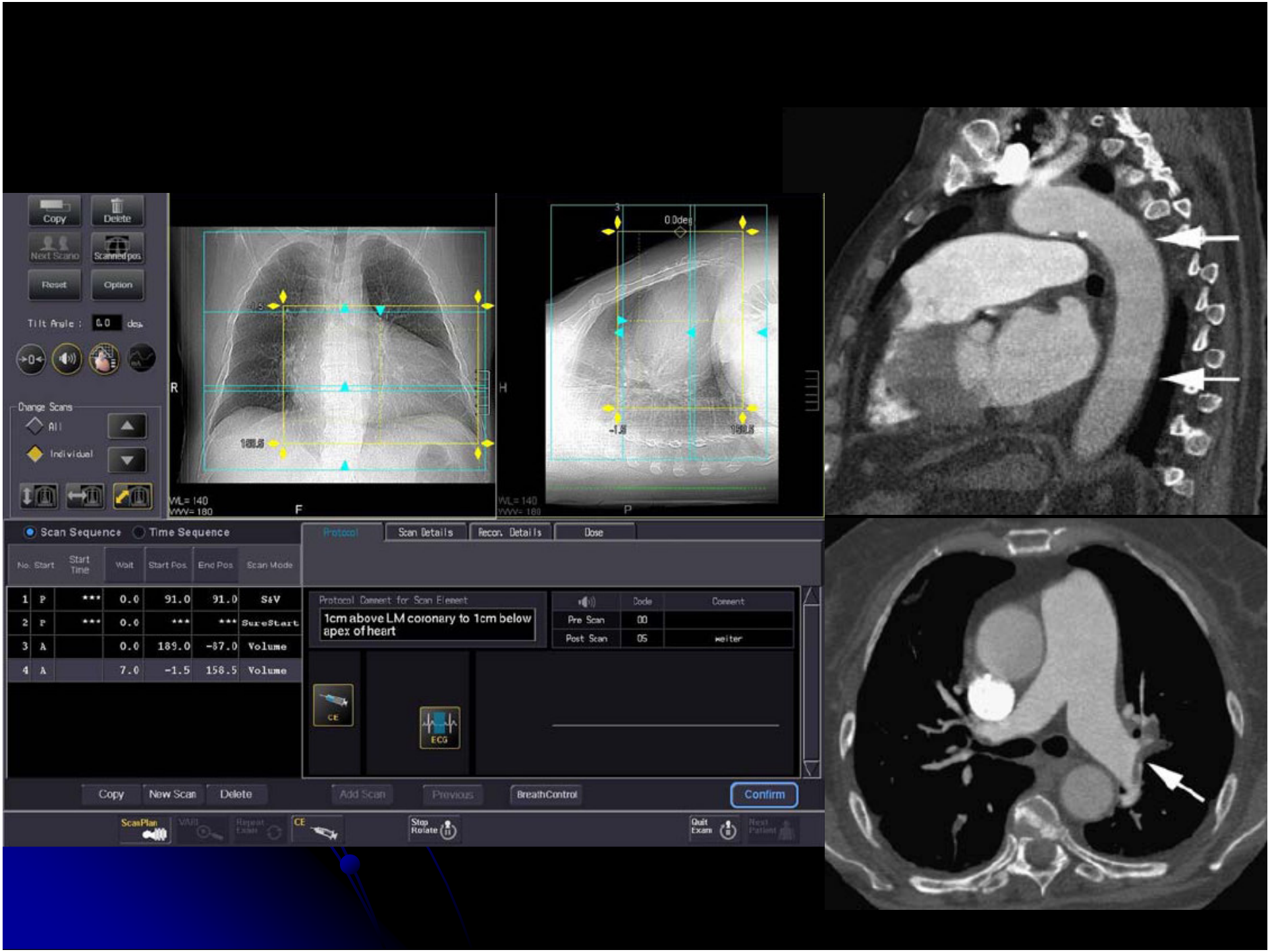
- 320-slice CT 有可能可以解決上述問題

- 照相技術師 + 護士 + 判讀醫師 ➔ 必須能夠24Hr available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End Pos.
Scan Mode
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2 P *** 0.0 *** *** SureStart
3 A 0.0 189.0 -87.0 Volume
4 A 7.0 -1.5 158.5 Volume
Protocol Comment for Scan Element
1cm above LM coronary to 1cm below apex of heart
Code
Comment
Pre Scan
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Post Scan
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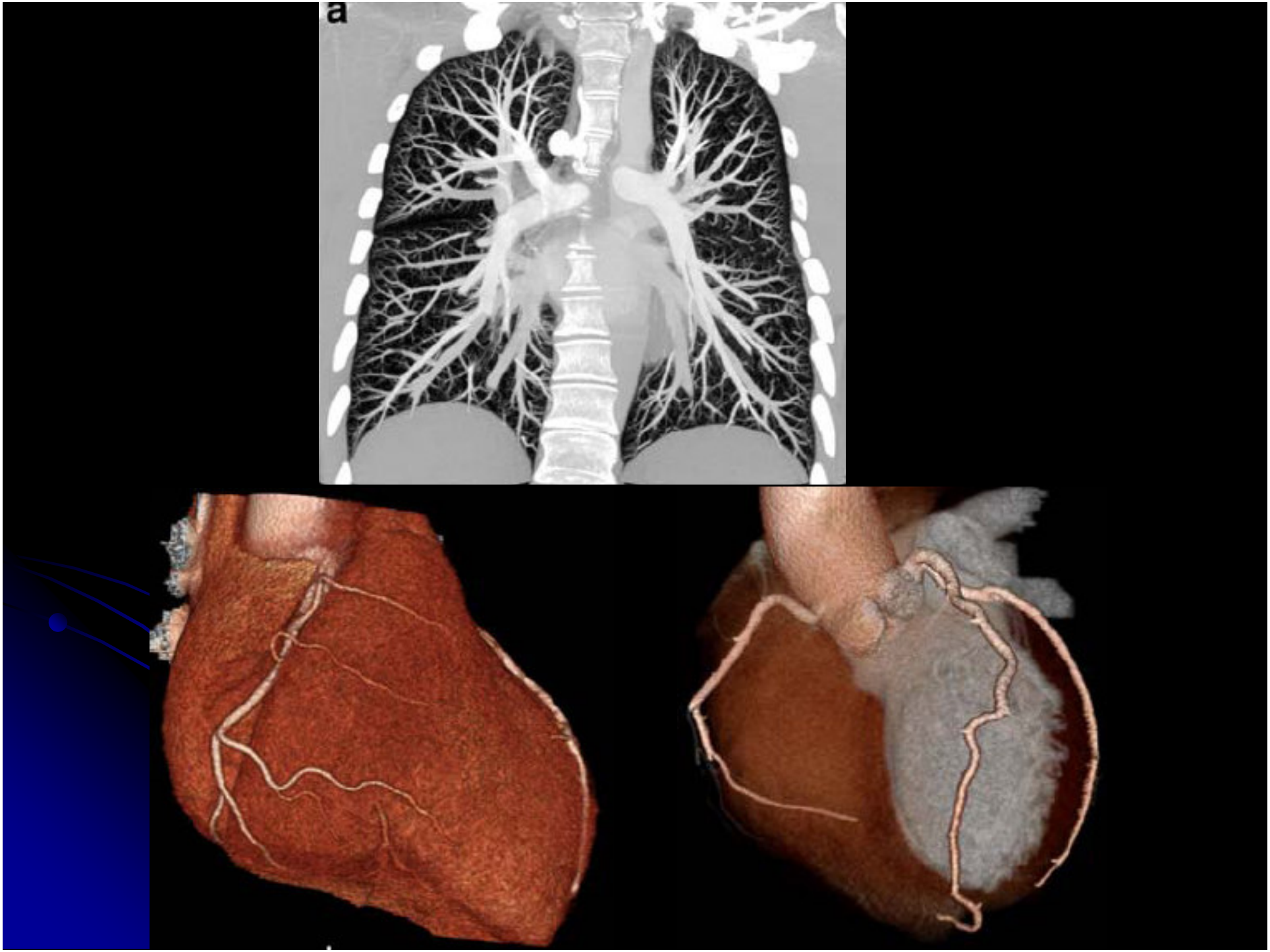
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Conclusion

- Diagnostic accuracy for the detection of acute aortic dissection and PE are equivalent or superior to competing methods.
- For ACS, CT coronary angiography has an excellent negative predictive value.
- Given the prevalence of chest pain and the considerable radiation dose from CT, clinical tools that can reliably exclude life-threatening causes of chest pain should be rigorously applied to avoid unnecessary imaging.

Websites to subscribe to

- www.cardiosource.com
- www.cardiosmart.org
- www.theheart.org
- www.incirculation.net
- www.tctmd.com
- www.summitmd.com
- www.crtonline.org