手術及心血管危險性之評估及處置

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前言

- 「術前及心血管危險性之評估及處置」是指病人接受手術前，醫療團隊針對其心血管系統健康狀況進行評估，並根據結果做出相應的處置，以減少手術期間及術後的心血管併發症風險

目標

- 評估病人是否有潛在的心血管疾病（如冠心病、心衰竭、心律不整等）。
- 預測手術相關的心血管風險。
- 決定是否需要進一步檢查或治療，以降低手術風險。

評估步驟

•臨床評估:

1.病史詢問：是否有心臟病史（心肌梗塞、心衰竭、瓣膜疾病等）、高血壓、糖尿病、中風等。

2.身體檢查：血壓、心音、肺部聽診、周邊血管檢查。

3.功能性評估：病人的活動耐受力，如能否輕鬆上下樓梯、走路一段距離（METs指標）。

•危險分層:

•根據病人的狀況及預定手術的風險（例如心臟手術 vs 小型皮膚手術）分類為低、中、高心血管風險。

評估步驟

- **非侵入性檢查**
- 心電圖（ECG）。
- 心臟超音波（Echo）。
- 運動心電圖（Stress test）。
- 核子醫學掃描（如心肌灌流掃描）。
- **侵入性檢查**
- 若有高風險指標，可考慮心導管檢查（冠狀動脈攝影）。

處置原則

- **控制危險因子**
  - 血壓控制　血糖控制　戒菸
  - 調整用藥（例如 β-blockers、statins、抗血小板藥物）
- **優化心臟功能**
  - 若有心衰竭、心律不整等，應在術前控制到穩定狀態。
- **藥物調整**
  - **β-blocker**：對於高心血管風險病人，可能需要術前開始或持續使用。
  - **抗血小板/抗凝藥物**：需根據手術性質與出血風險作調整（如停藥、換藥）。

處置原則

- **手術延後**
  - 若評估結果顯示心血管狀況不穩定，可能需先接受心臟介入治療或手術，再安排原定手術。
- **麻醉選擇**
  - 視病人心血管狀況，選擇適合的麻醉方式（局部麻醉、全身麻醉）。

•。

特殊情況

- **急症手術：**

- 在無法延後的情況下，需即時評估與即時最佳化處置，並與心臟科、麻醉科密切合作。

- **無症狀但高風險病人：**

- 須依照指引，個別化決定是否需進一步檢查。

術前心血管危險分層（低／中／高風險）

- 參考標準:
- 2022 ESC/ESA Guidelines on cardiovascular assessment for non-cardiac surgery

依 **手術種類** 分類心血管風險

風險層級	手術類型	30天內心血管重大事件（MACE）風險	範例
低風險（<1%）	小型或表淺手術	<1%	皮膚手術、白內障手術、乳房手術、牙科手術
中等風險（1–5%）	腹腔、胸腔或頭頸手術（非急症）	1–5%	膝關節置換術、頸動脈內膜切除術、婦科手術、前列腺手術
高風險（>5%）	大型血管或高出血風險手術	>5%	主動脈修復手術、外周血管手術、重大緊急腹部手術

依 **病人體況** 危險因子分層

（根據 Revised Cardiac Risk Index，簡稱 **RCRI**）

每一項符合者加一分：

- 高危險手術（如上）
- 既往有心臟病（心肌梗塞、心衰竭）
- 既往有腦中風或短暫性腦缺血（TIA）
- 胰島素治療中的糖尿病
- 術前血肌酸酐 ≥2.0 mg/dL（腎功能不全）
- 術前功能性狀態不良（<4 METs，例如無法上兩層樓）

依 **病人體況** 危險因子分層

RCRI得分解讀：

分數	風險層級	預測心血管併發症機率
0	低風險	約 0.5%
1–2	中風險	約 1–5%
≥3	高風險	>9%

其他需要考慮的因素

- 有無不穩定的心血管狀況（**術前必須穩定**）
  - 不穩定心絞痛或近期心肌梗塞（≤30天）
  - 失代償性心衰竭
  - 嚴重瓣膜疾病（如重度主動脈瓣狹窄）
  - 高風險心律不整（如持續性心室頻脈）
- 若有上述情況 → 必須延後手術，進一步心臟評估與治療。

小提醒：

- 若是低危險手術 ➔ 大部分病人**不需要進一步心臟檢查**。
- 若是中高危險手術 ➔ 依病人症狀和RCRI得分，考慮非侵入性檢查（如負荷心電圖）或直接心臟介入治療

術前心血管評估流程圖

流程六大步驟：

1. 是否急診手術？
2. 活動能力（METs）
3. 是否有不穩定心血管疾病
4. 手術類型風險分類
5. RCRI心血管風險評估
6. 根據結果決策：直接手術或延後處置

術前心血管評估流程圖

1. 是否急診手術？

- ☐ **是** → 立即手術 + 同步最佳化病人狀態（如給氧、控制血壓、心律調整）
- ☐ **否** → 繼續下一步

術前心血管評估流程圖

2. 有無活動能力受限？（METs < 4）

（METs例子：能否輕鬆爬兩層樓？能否快走？）

- ☐ **活動受限或不明確** → 進一步評估
- ☐ **活動良好** → 若無症狀，**可直接手術**

術前心血管評估流程圖

3. 是否有不穩定的心血管疾病？

（例如：不穩定型心絞痛、急性心肌梗塞、失代償性心衰竭、重度瓣膜疾病）

- □ 有 → 暫緩手術 ➔ 心臟專科介入治療
- □ 沒有 → 繼續下一步

術前心血管評估流程圖

4. 手術危險性分類（依手術種類）

- 低危險手術（皮膚手術、白內障手術）→ **直接手術**
- 中/高危險手術（如腹部大手術、血管手術）→ 評估病人心血管風險

術前心血管評估流程圖

5. 計算 Revised Cardiac Risk Index (RCRI)

- 0 分 → **低風險** → 直接手術
- 1–2 分 → **中風險** → 視情況進行非侵入性測試（如負荷心電圖）
- ≥3 分 → **高風險** → 強烈建議心臟進一步評估 ± 介入治療

術前心血管評估流程圖

6. 根據評估結果決定

- 風險可接受 ➔ 手術
- 風險過高 ➔ 延後手術，治療後再手術

術前心血管評估流程圖

🔑 **流程小提醒**：

- **術前最佳化**（如調整β-blocker、statin、抗血小板藥物）
- **團隊溝通**（與心臟科、麻醉科、外科合作）
- **病人告知**（清楚告知病人手術風險）

Chest discomfort

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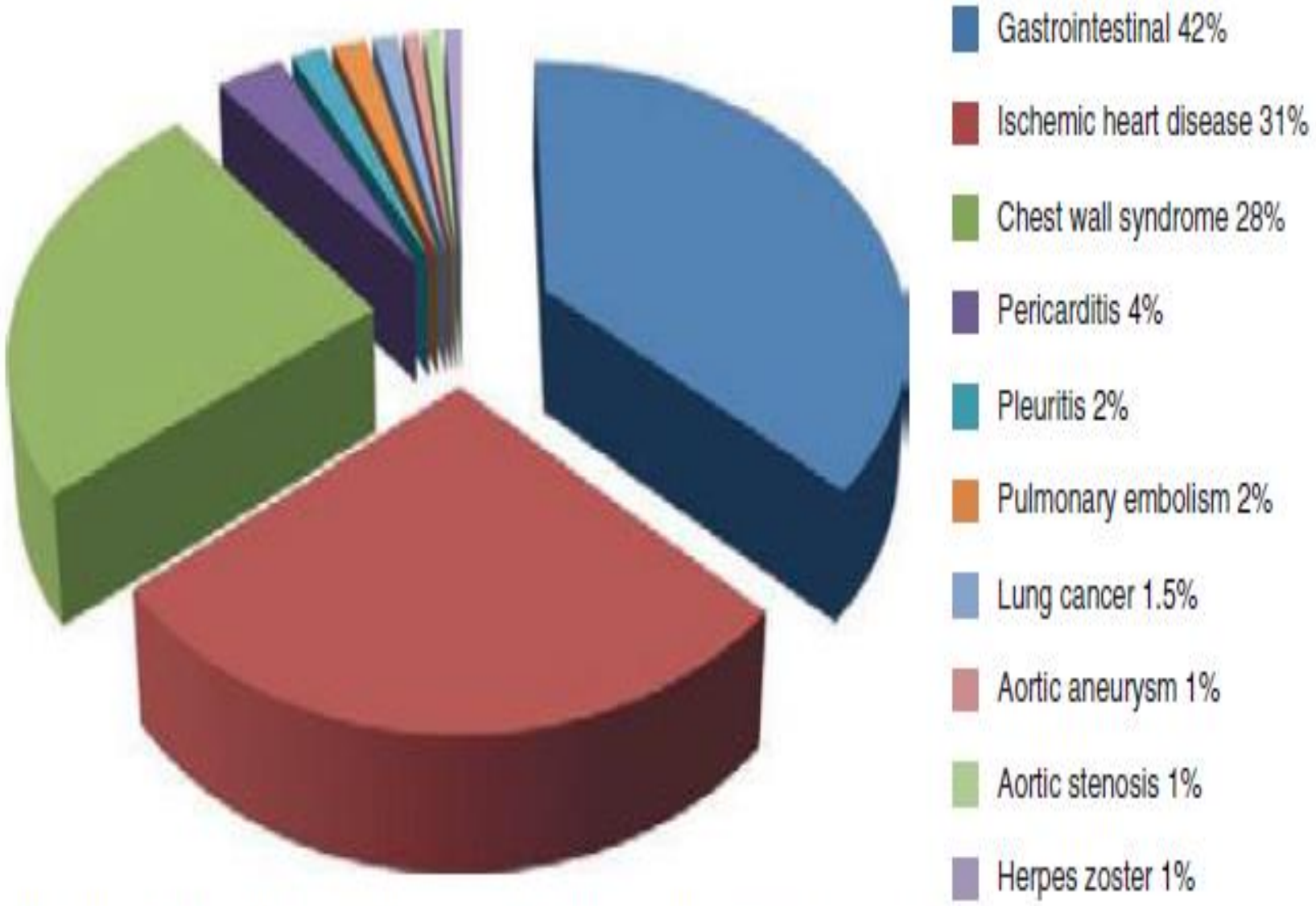
History taking (LQQOPERA)

- Location (位置) .
- Quality (型態) .
- Quantity / time course (歷時長短) .
- Onset mode (起病狀態或發作形式) .
- Precipitation factors (情境或誘發因素) .
- Exaggerating factors (加重因素) .
- Relieving factors (緩解因素) .
- Accompanying symptoms (伴隨症狀)



IGURE 19-1 Distribution of final discharge diagnoses in patients with nontraumatic acute chest pain. *(Figure prepared from data in Fruergaard et al: Eur Heart J 17:1028, 1996.)*

TABLE 19-1 TYPICAL CLINICAL FEATURES OF MAJOR CAUSES OF ACUTE CHEST DISCOMFORT

System	Condition	Onset/Duration	Quality	Location	Associated Features
Cardiopulmonary					
Cardiac	Myocardial ischemia	*Stable angina:* Precipitated by exertion, cold, or stress; 2–10 min *Unstable angina:* Increasing pattern or at rest *Myocardial infarction:* Usually >30 min	Pressure, tightness, squeezing, heaviness, burning	Retrosternal; often radiation to neck, jaw, shoulders, or arms; sometimes epigastric	S_4 gallop or mitral regurgitation murmur (rare) during pain; S_3 or rales if severe ischemia or complication of myocardial infarction
	Pericarditis	Variable; hours to days; may be episodic	Pleuritic, sharp	Retrosternal or toward cardiac apex; may radiate to left shoulder	May be relieved by sitting up and leaning forward; pericardial friction rub
Vascular	Acute aortic syndrome	Sudden onset of unrelenting pain	Tearing or ripping; knifelike	Anterior chest, often radiating to back, between shoulder blades	Associated with hypertension and/or underlying connective tissue disorder; murmur of aortic insufficiency; loss of peripheral pulses
	Pulmonary embolism	Sudden onset	Pleuritic; may manifest as heaviness with massive pulmonary embolism	Often lateral, on the side of the embolism	Dyspnea, tachypnea, tachycardia, and hypotension
	Pulmonary hypertension	Variable; often exertional	Pressure	Substernal	Dyspnea, signs of increased venous pressure
Pulmonary	Pneumonia or pleuritis	Variable	Pleuritic	Unilateral, often localized	Dyspnea, cough, fever, rales, occasional rub
	Spontaneous pneumothorax	Sudden onset	Pleuritic	Lateral to side of pneumothorax	Dyspnea, decreased breath sounds on side of pneumothorax

TABLE 19-1 TYPICAL CLINICAL FEATURES OF MAJOR CAUSES OF ACUTE CHEST DISCOMFORT

System	Condition	Onset/Duration	Quality	Location	Associated Features
Gastrointenstinal	Esophageal reflux	10–60 min	Burning	Substernal, epigastric	Worsened by postprandial recumbency; relieved by antacids
	Esophageal spasm	2–30 min	Pressure, tightness, burning	Retrosternal	Can closely mimic angina
	Peptic ulcer	Prolonged; 60–90 min after meals	Burning	Epigastric, substernal	Relieved with food or antacids
	Gallbladder disease	Prolonged	Aching or colicky	Epigastric, right upper quadrant; sometimes to the back	May follow meal
Neuromuscular	Costochondritis	Variable	Aching	Sternal	Sometimes swollen, tender, warm over joint; may be reproduced by localized pressure on examination
	Cervical disk disease	Variable; may be sudden	Aching; may include numbness	Arms and shoulders	May be exacerbated by movement of neck
	Trauma or strain	Usually constant	Aching	Localized to area of strain	Reproduced by movement or palpation
	Herpes zoster	Usually prolonged	Sharp or burning	Dermatomal distribution	Vesicular rash in area of discomfort
Psychological	Emotional and psychiatric conditions	Variable; may be fleeting or prolonged	Variable; often manifests as tightness and dyspnea with feeling of panic or doom	Variable; may be retrosternal	Situational factors may precipitate symptoms; history of panic attacks, depression

Life-threatening conditions

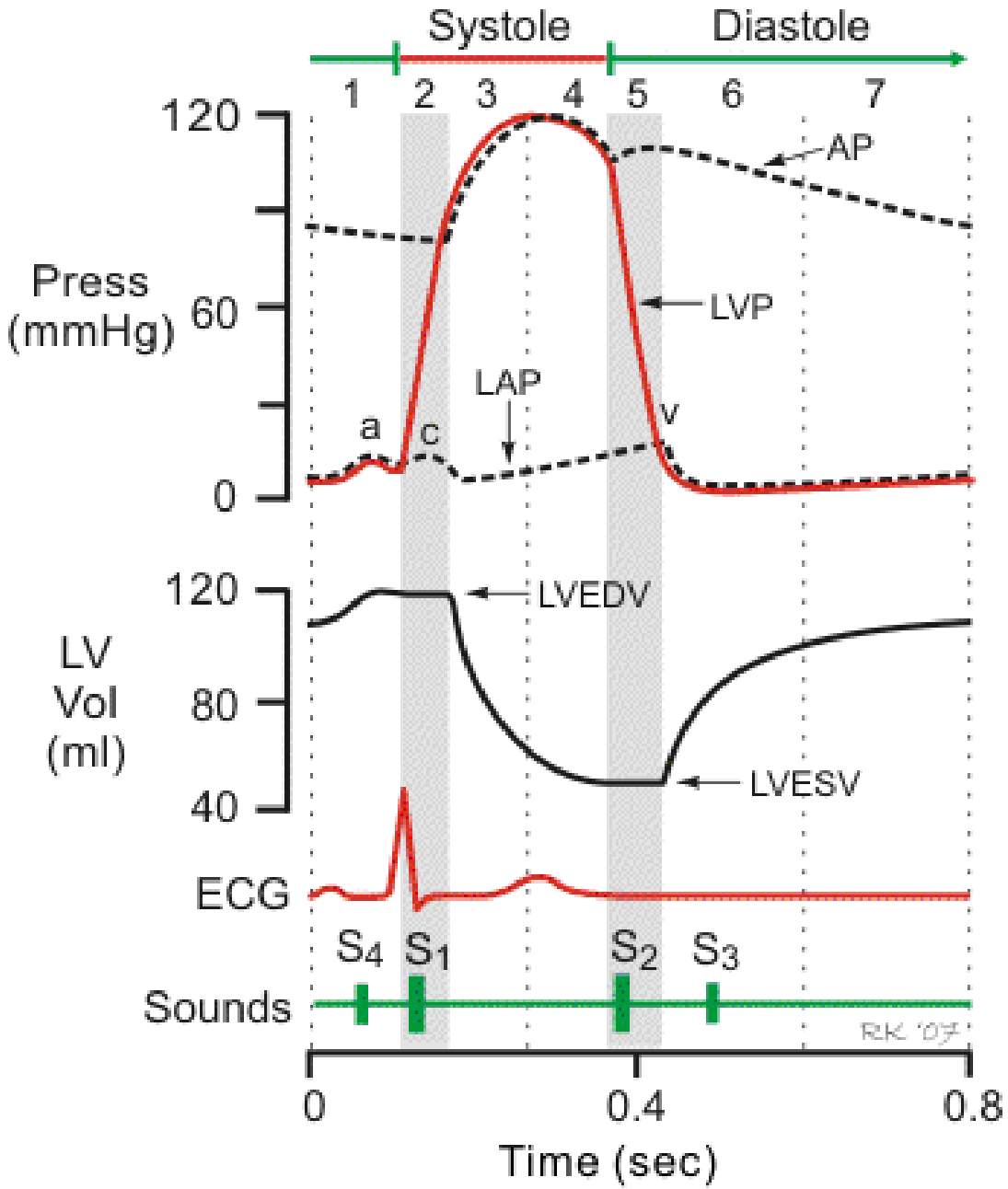
- Acute coronary syndrome
- Acute aortic syndrome
- Pulmonary embolism
- Pericardial tamponade
- Tension pneumothorax
- Mediastinitis (eg, esophageal rupture)

Acute coronary syndrome

- Unstable angina pectoris
- Non-ST elevation myocardial infarction
- ST elevation myocardial infarction.

Acute coronary syndrome

- Electrocardiography
- Physical examination: Basal rales, S3 gallop, abnormal murmur
- Cardiac biomarker
- Immediately life-threatening cause for their chest pain tend to appear anxious and distressed and may be diaphoretic and dyspneic



Reference: https://cvphysiology.com/heart-disease/hd010

Heart Sound	*Occurs during:*	*Associated with:*
S_1	Isovolumetric contraction	Closure of mitral and tricuspid valves
S_2	Isovolumetric relaxation	Closure of aortic and pulmonic valves
S_3	Early ventricular filling	Normal in children; in adults, associated with ventricular dilation (e.g. ventricular systolic failure)
S_4	Atrial contraction	Associated with stiff, low compliant ventricle (e.g., ventricular hypertrophy; ischemic ventricle)

Reference: https://cvphysiology.com/heart-disease/hd010

Risk factor for ACS

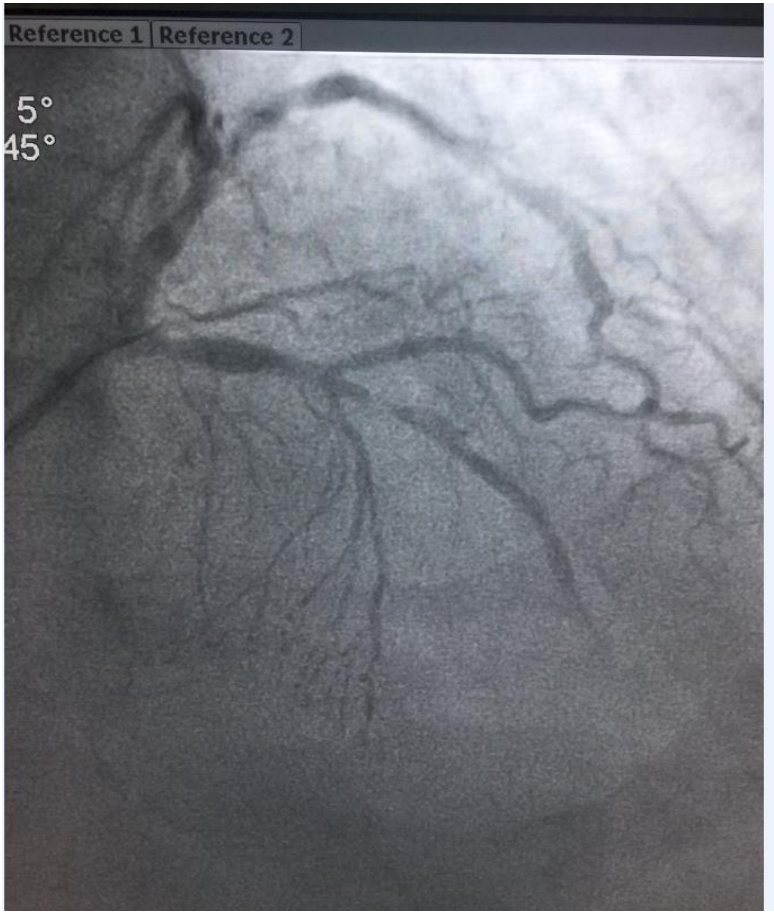
- Age
- Hypertension
- Diabetes mellitus
- Hypercholesteremia
- Smoking
- Family history

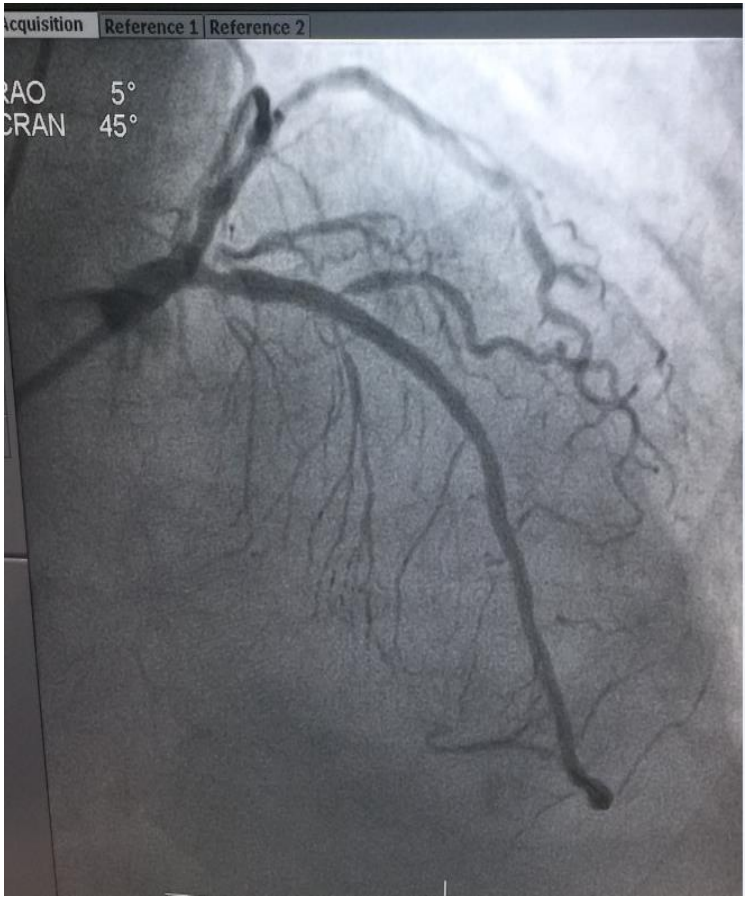
Management

- MONA
- Heparin
- Coronary artery angiography
- DAPT, ACEI/ARB, Beta-blocker, statin

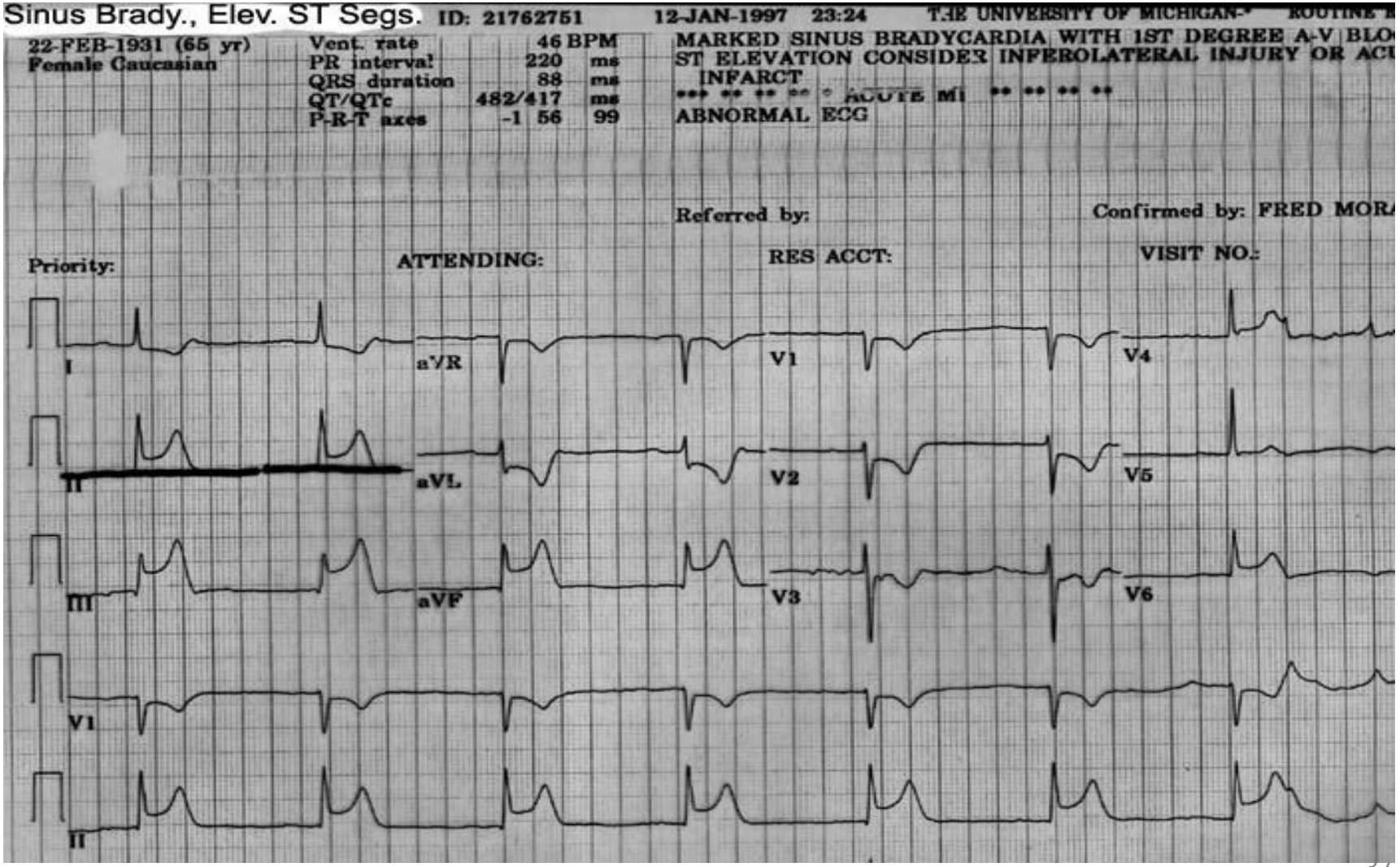
Anterior wall ST Elevation MI

Coronary angiography





Inferior wall ST Elevation MI



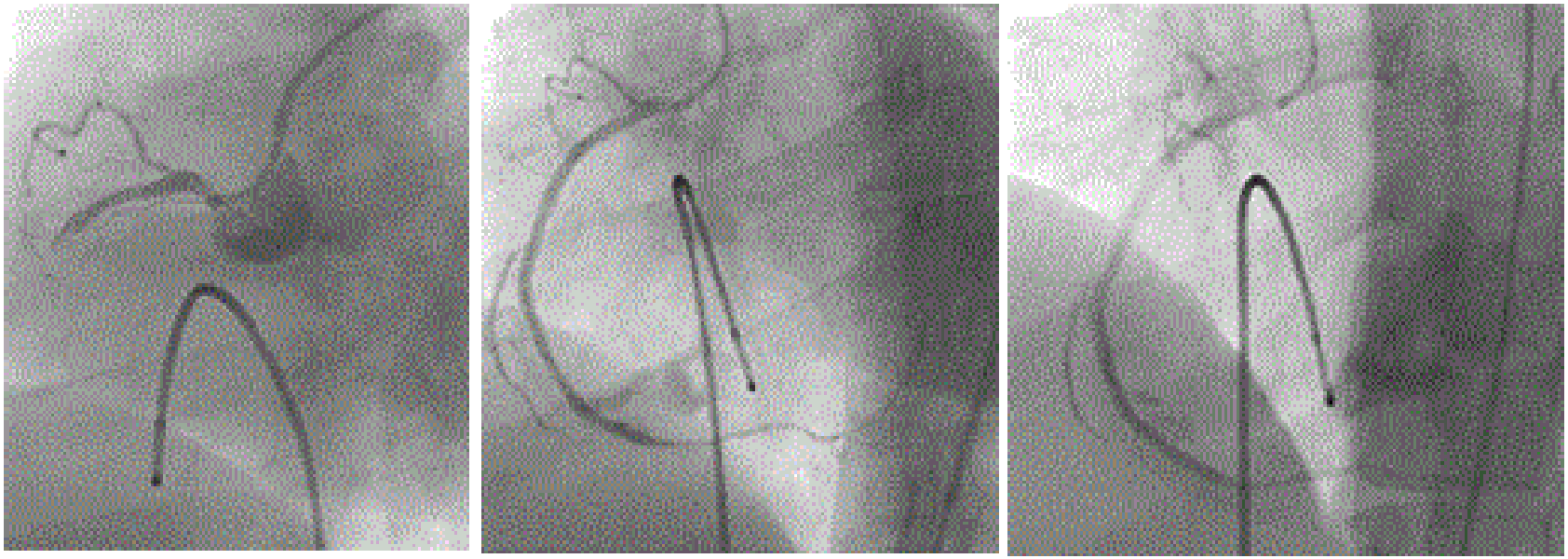
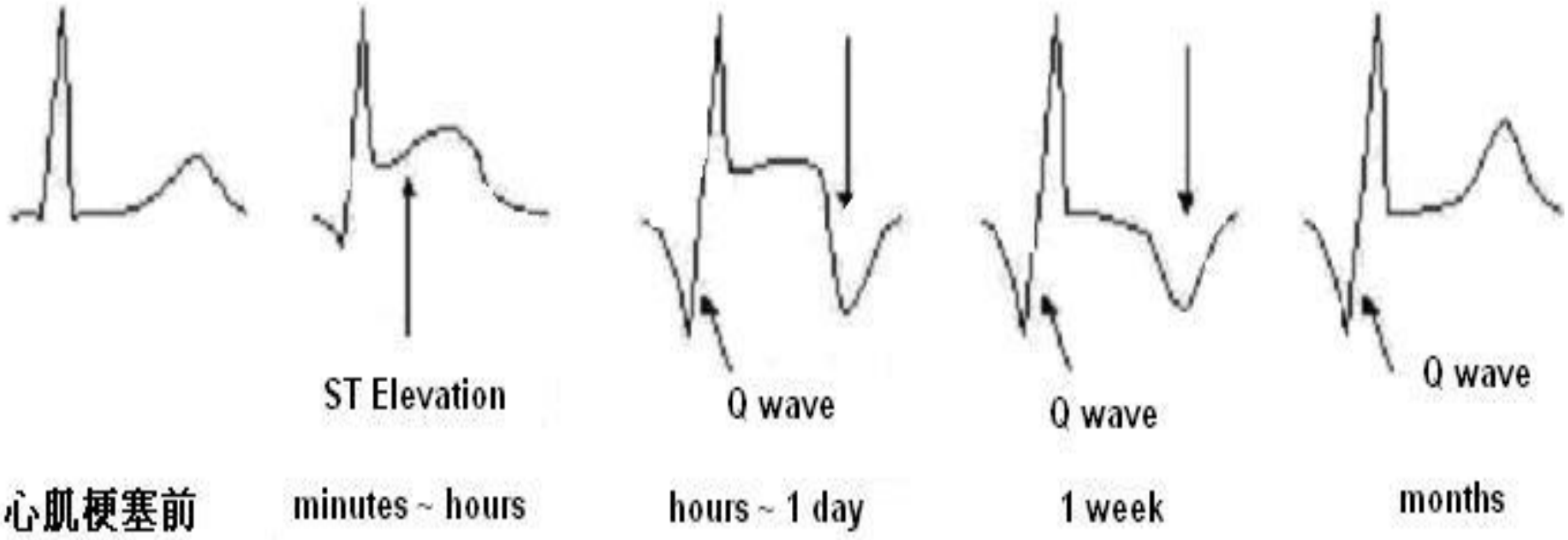


Figure 1: Mid RCA occluded by organized thrombus, developed a protracted perforation upon recanalising that sealed with prolonged ballooning. Lesion extends down to rPda (type 2 presentation).

心肌梗塞後：Q wave 隨著時間的變化

ST節段上升及T波倒立

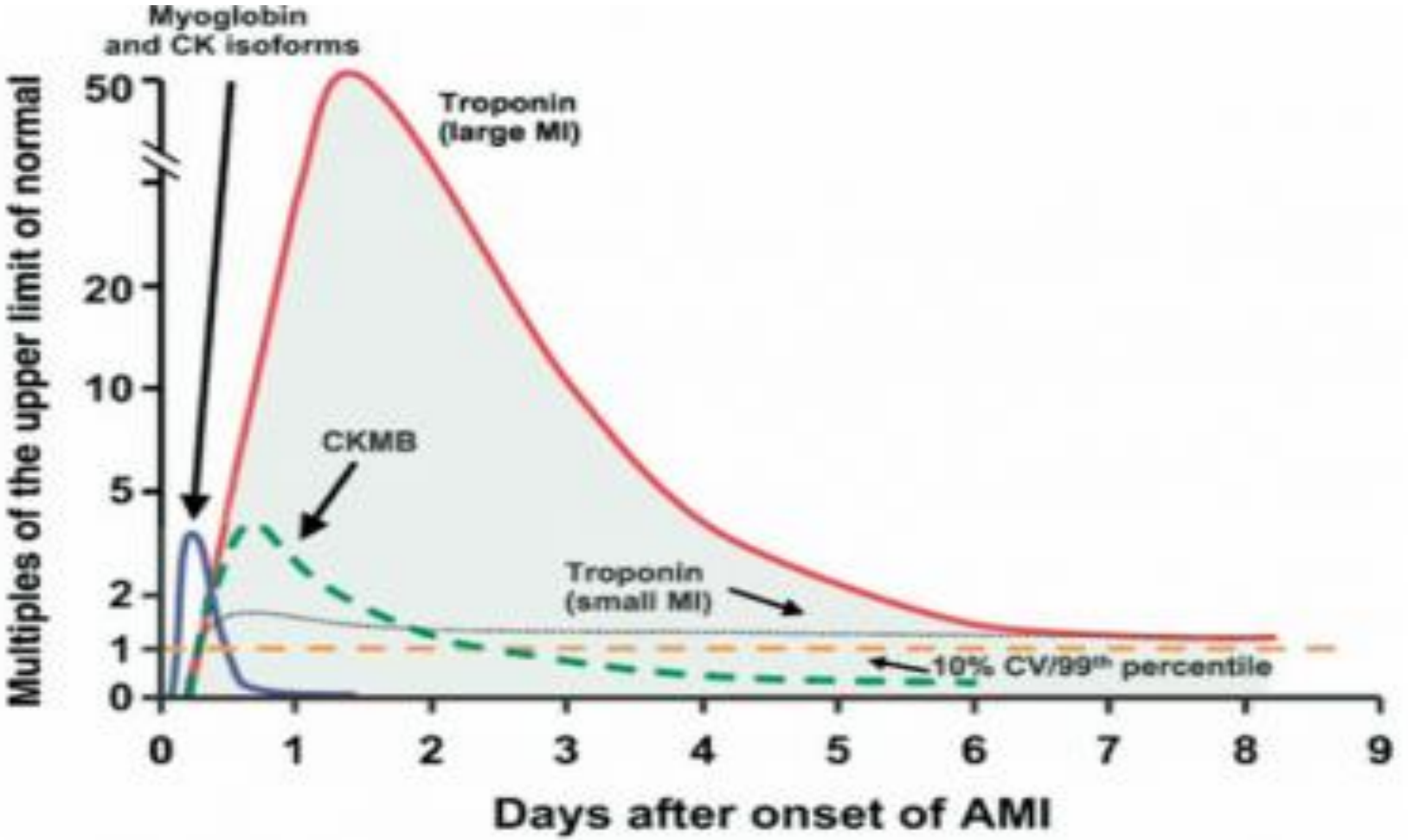


深（4mm以上）,寬（0.04秒以上）的Q波

Acute MI

Old MI

Cardiac biomarker



Aortic dissection

- Abrupt onset of thoracic or abdominal pain with a sharp, tearing and/or ripping character
- Variation in pulse (absence of a proximal extremity or carotid pulse) and/or blood pressure (>20 mmHg difference between the right and left arm)
- Chest radiograph (CXR): Mediastinal and/or aortic widening (a measured width greater than 6 cm on an upright PA or 8 cm on supine AP chest film).

Aortic dissection

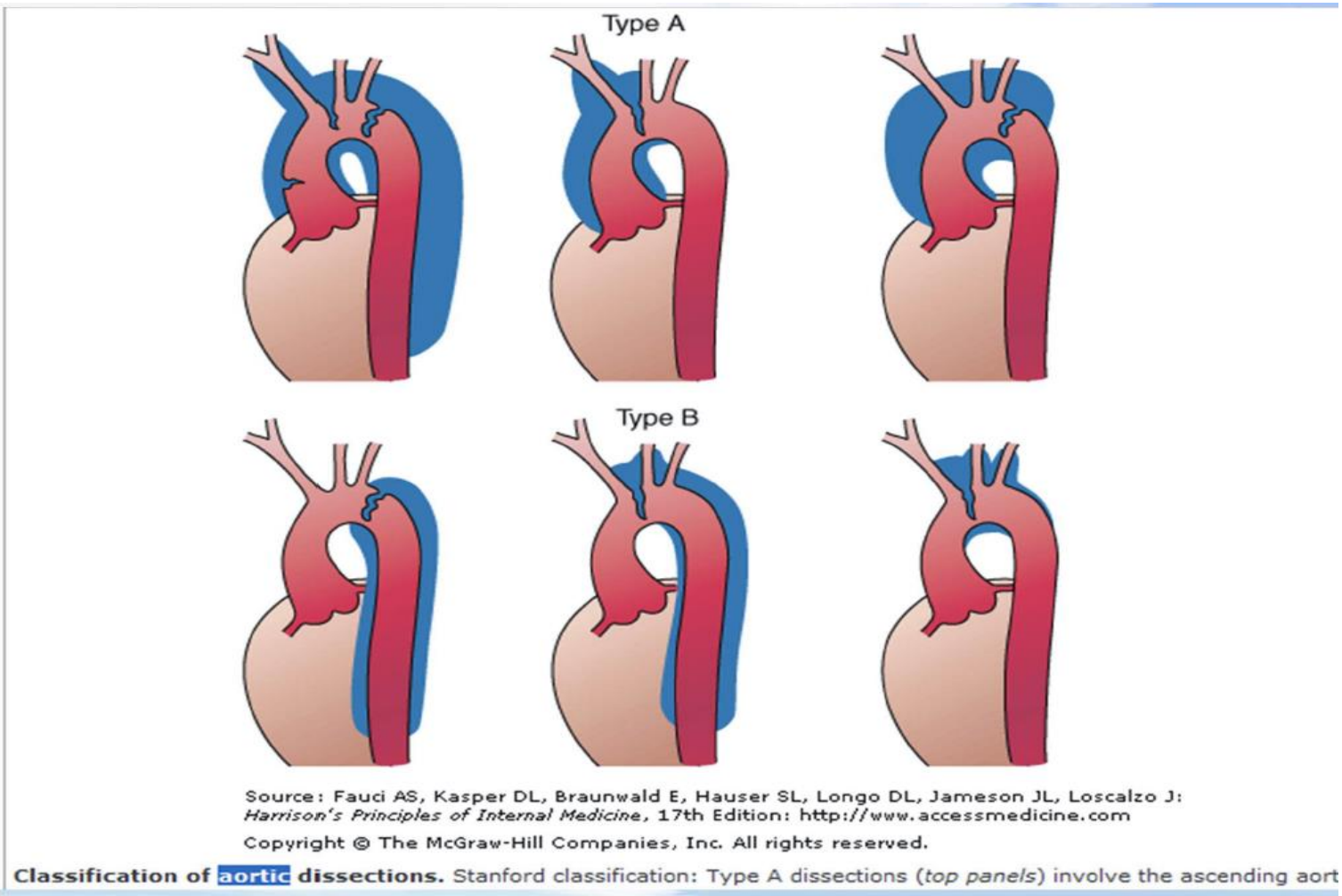
- 83 percent of patients with classic aortic dissection pain and suggestive CXR findings
- 92 percent of patients with classic pain and an absent pulse or significant difference in blood pressure.
- When all three variables coexist, aortic dissection is present in all patients.
- When no variables are present approximately 7 percent of patients have aortic dissection.

Previous history taking

- Hypertension (abrupt, transient severe increase)
- Genetically mediated aortic disease

  eg. Marfan syndrome, Turner syndrome, Bicuspid valve of aortic
- Preexisting thoracic aortic aneurysm (TAA) and abdominal aortic aneurysm (AAA)
- Inflammatory conditions
- Aortic instrumentation, trauma, or surgery

Standford classification of aortic dissection

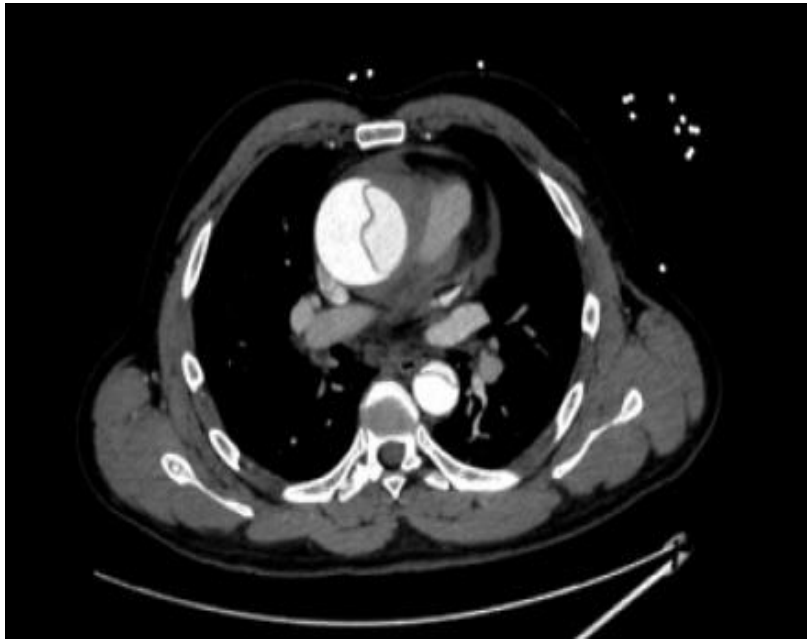


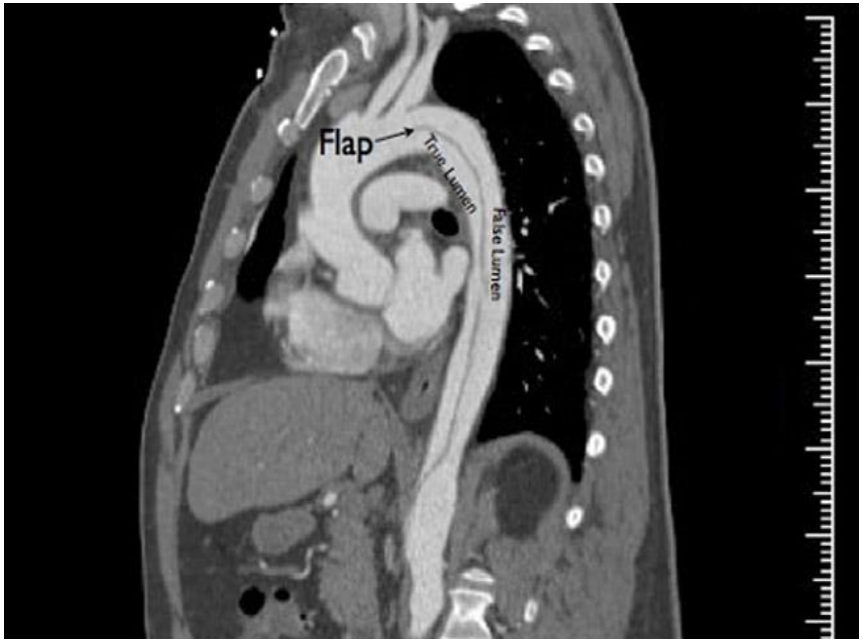
Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: http://www.accessmedicine.com

Classification of aortic dissections. Stanford classification: Type A dissections (*top panels*) involve the ascending aort

Diagnosis and evaluation the severity of aortic dissection

- CT of aorta
- Echocardiography
- MRI of aorta




Flap
True Lumen
False Lumen

Management of aortic dissection

- Type A : Emergent operation
- Type B: Conservative treatment

  Pain control: morphine

  BP control: for SBP 110~120 mmHg. According to the urine amount

  IV or oral form Beta-blocker: for HR< 60/min

Pulmonary embolism

Tachycardia

Tachypnea

Hypotension

Desaturation

- D-dimer
- ABG

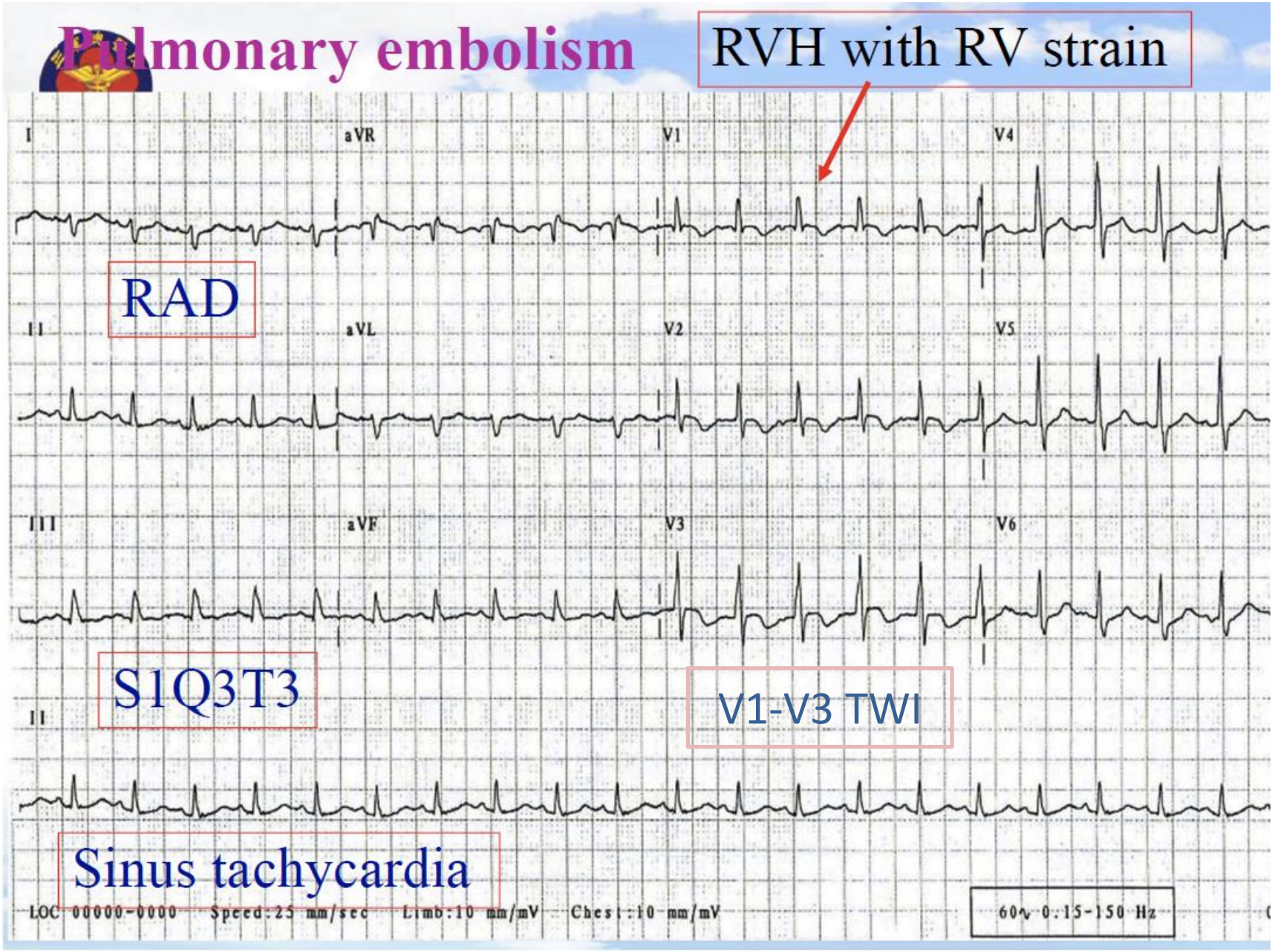
TABLE 3-2 WELLS CLINICAL PREDICTION RULE FOR PULMONARY EMBOLISM

Clinical Feature	Points
Clinical signs of deep vein thrombosis	3
Alternative diagnosis is less likely than pulmonary embolism	3
Heart rate >100 beats/min	1.5
Immobilization ≥3 days or surgery in previous 4 weeks	1.5
History of deep vein thrombosis or pulmonary embolism	1.5
Hemoptysis	1
Malignancy (with treatment within 6 months) or palliative	1
Interpretation	
Score >6.0	High
Score 2.0–6.0	Intermediate
Score <2.0	Low

EKG

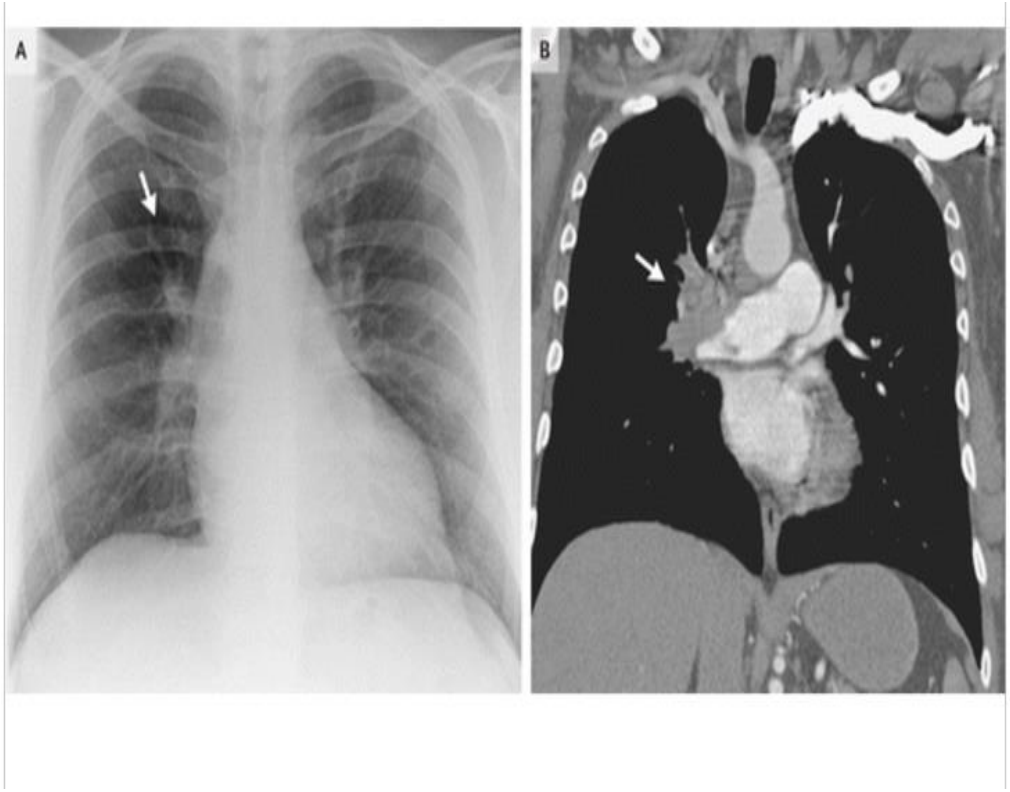
- Sinus tachycardia is most common
- S1Q3T3 sign is relative specific but insensitive
- RV strain pattern
- T wave inversion in V1-3 may be occurred

Pulmonary embolism

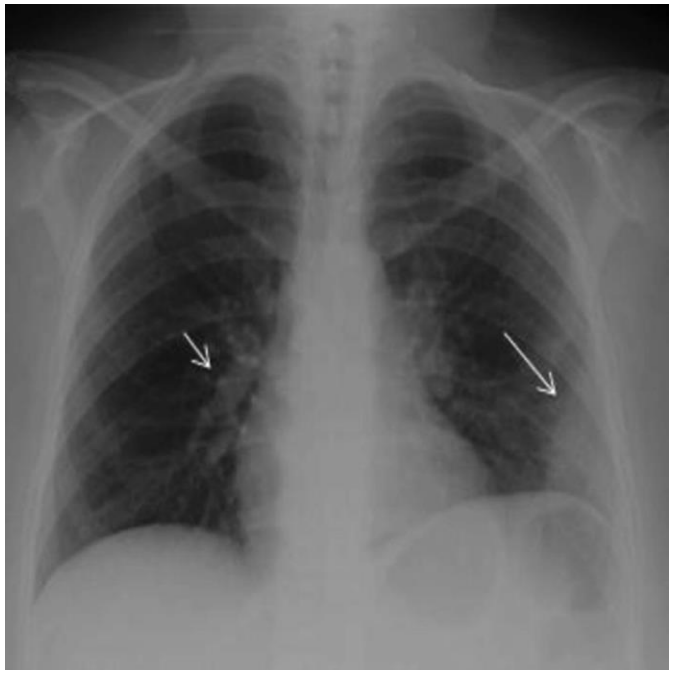


CXR

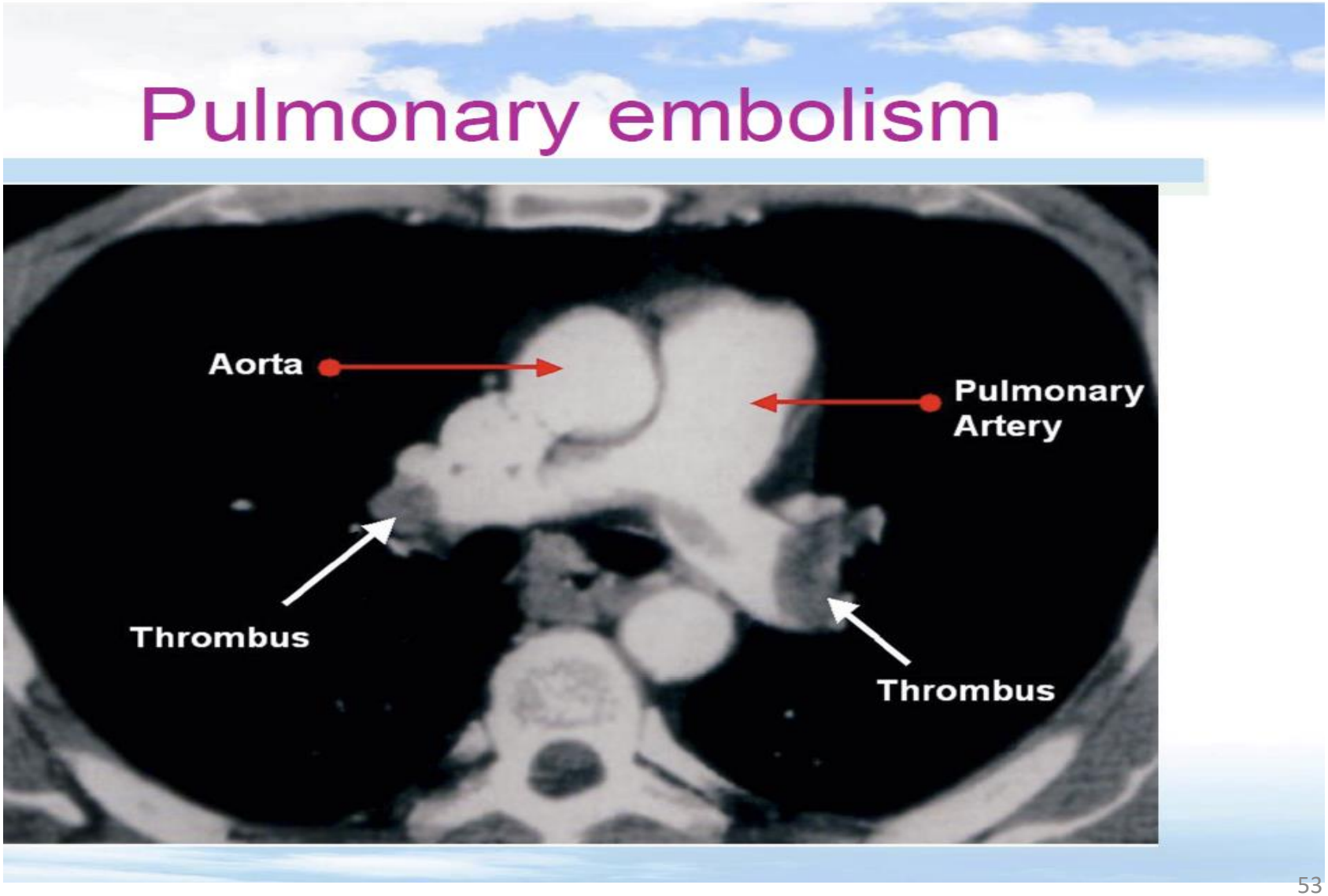
Westermark's signs



Palla's signs
Hampton's hump signs

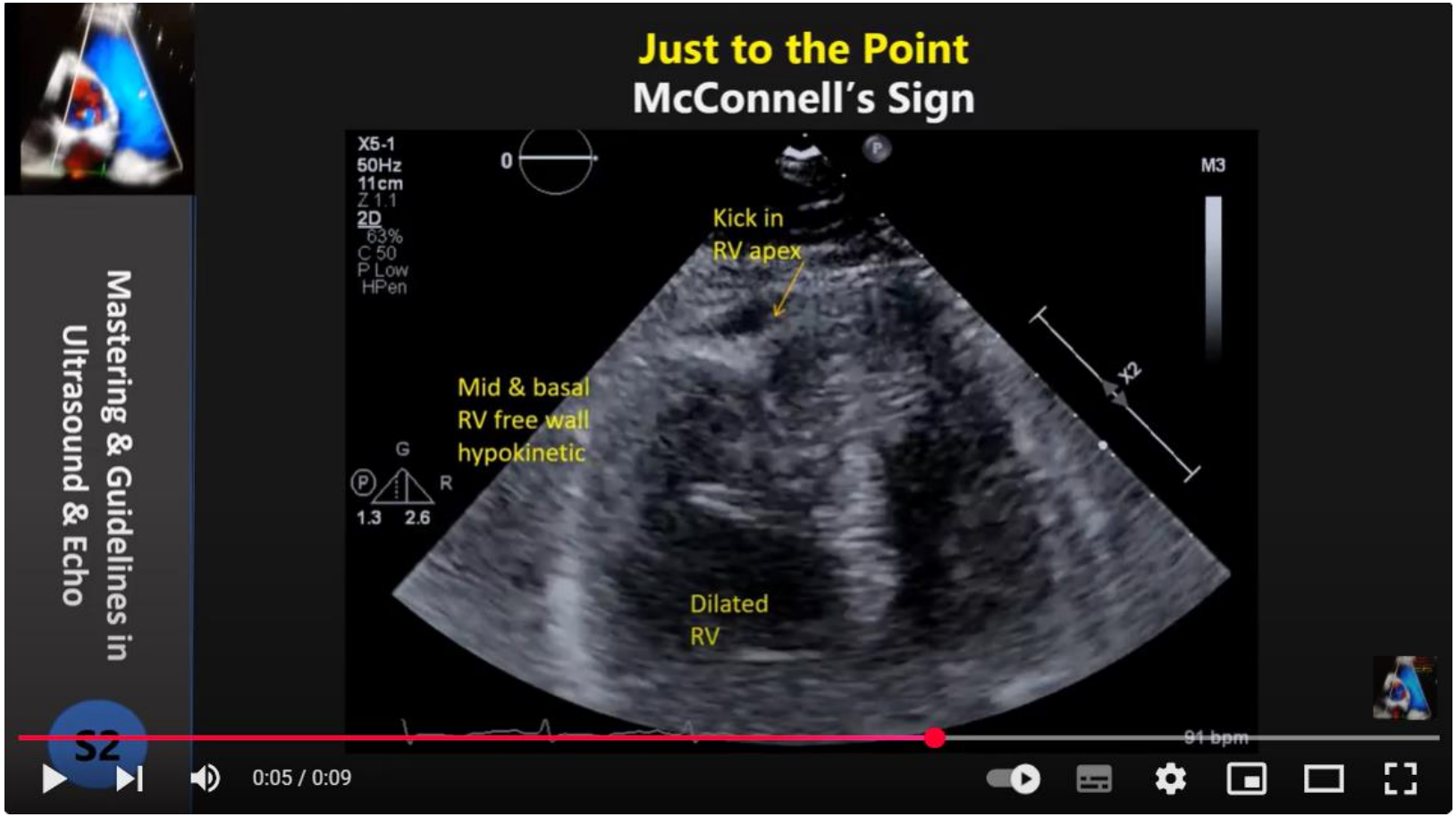


CT of chest


Pulmonary embolism
Aorta
Pulmonary Artery
Thrombus
Thrombus

Echocardiography

- McConnell's sign: hypokinesis of the RV free wall with normal or hyperkinetic motion of the RV apex.
- Elevated of pulmonary artery pressure



Reference: https://www.youtube.com/watch?v=__ZTKRwHVkY

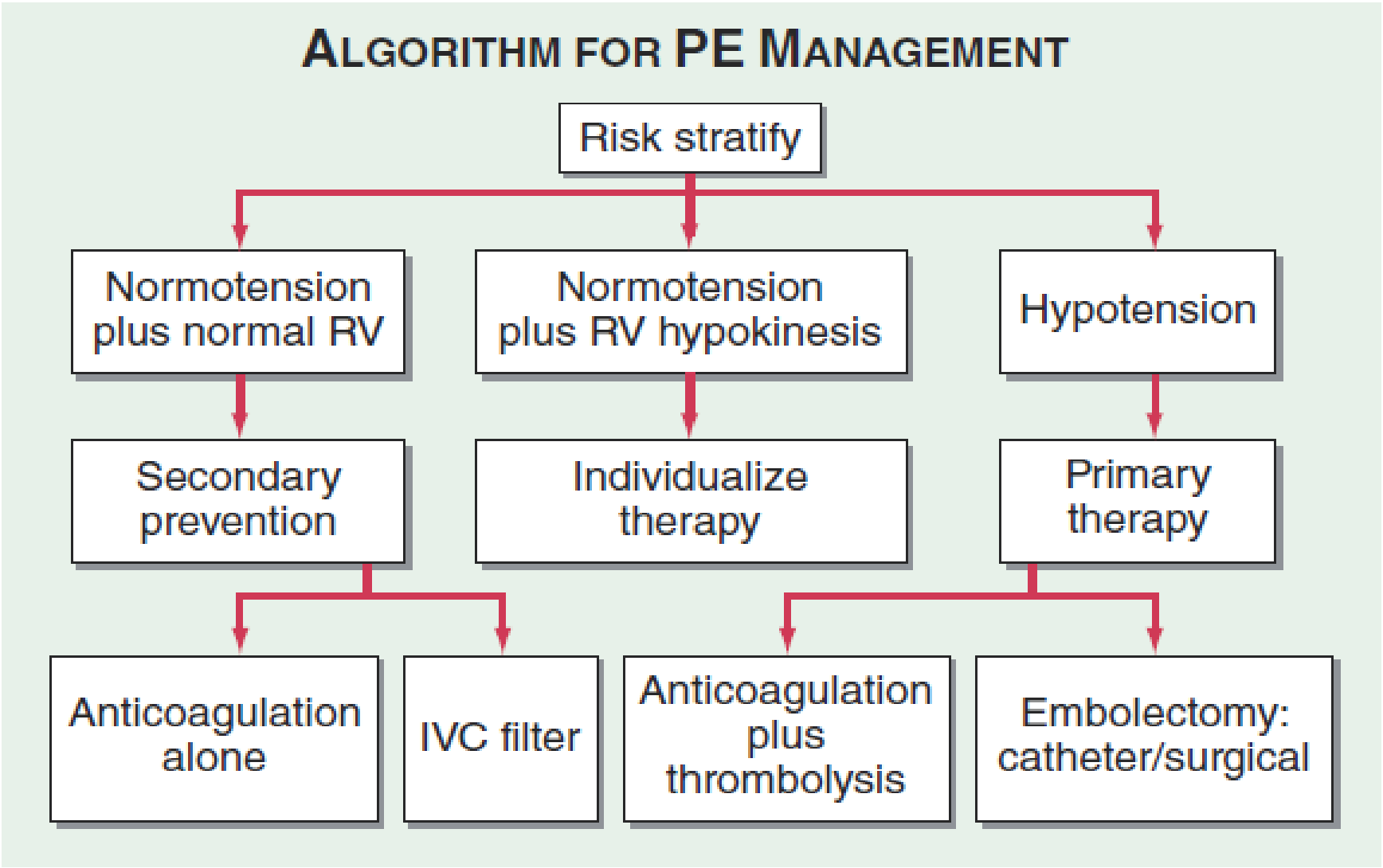


FIGURE 300-7 **Acute management of pulmonary thromboembolism.** RV, right ventricular; IVC, inferior vena cava.

Medical treatment for pulmonary embolism

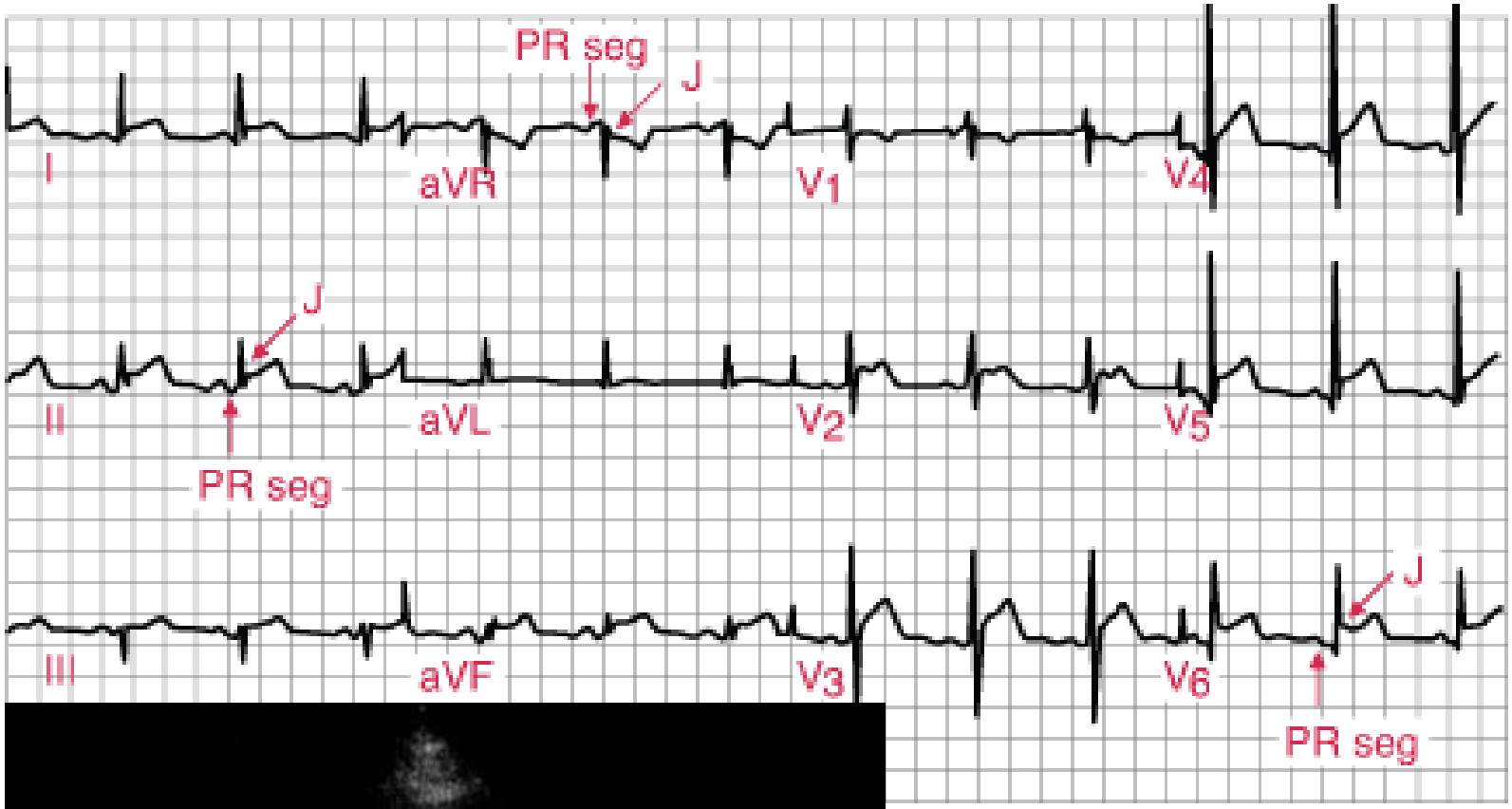
- Unfractioned heparin
- Low molecular heparin
- rt-PA
- Maintained with warfarin and rivaroxaban for following 3-6 months.

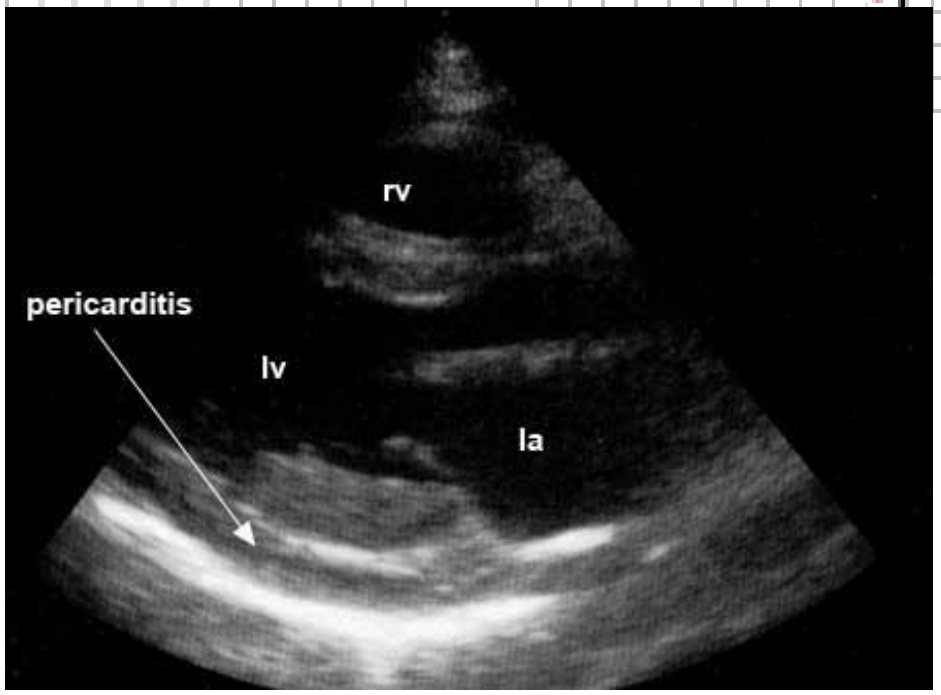
Pericarditis and Pericardial tamponade

- Any type of pericarditis can cause an effusion.
- Post-cardiac OP (rarely tamponade)

→ resolve in several weeks.

- Trauma, post-MI LV rupture, complication of PCI & device implantation→ bleeding into the pericardial sac.
- Aortic dissection: retrograde bleeding→ fatal.
- High incidence of progression to tamponade: bacteria (include TB), fungus, HIV–related, bleeding, and neoplastic involvement





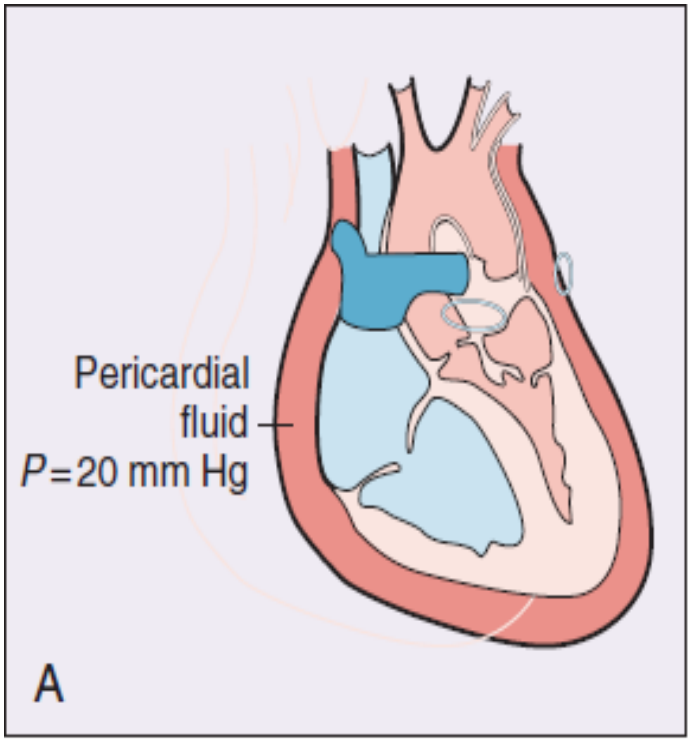
- Treatment
  - High dose aspirin
  - NSAID

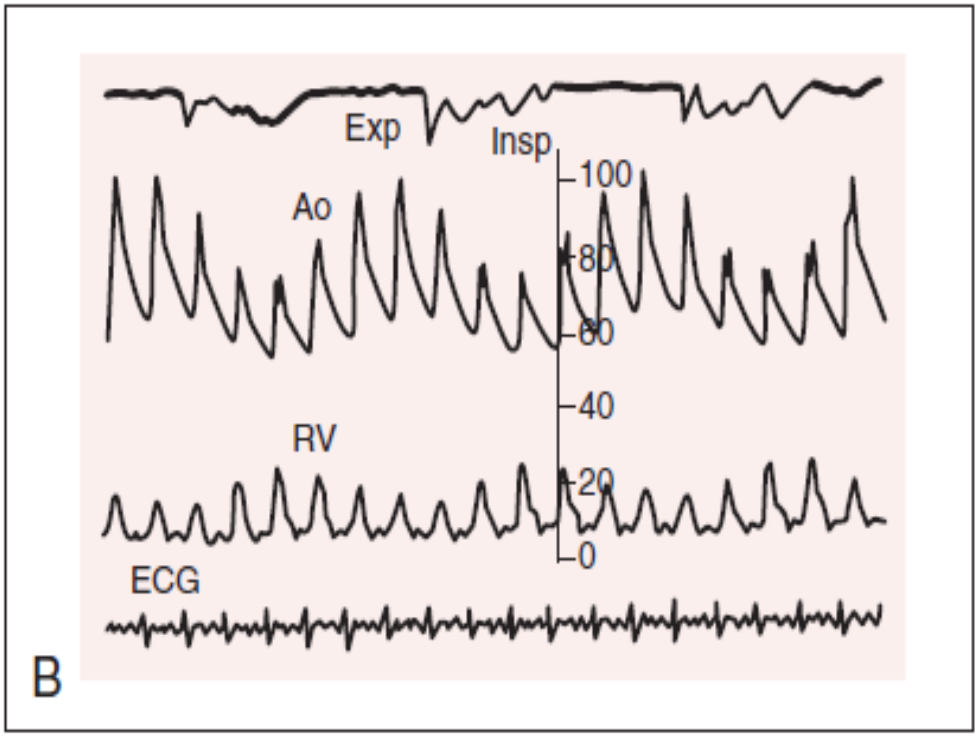
Physical examination

- Hypotension
- Distant heart sound.
- JVE
- Tachycardia
- Tachypnea
- Friction rub
- Pulsus paradoxus
- Limbs edema

Beck's triad

Pulsus paradoxus





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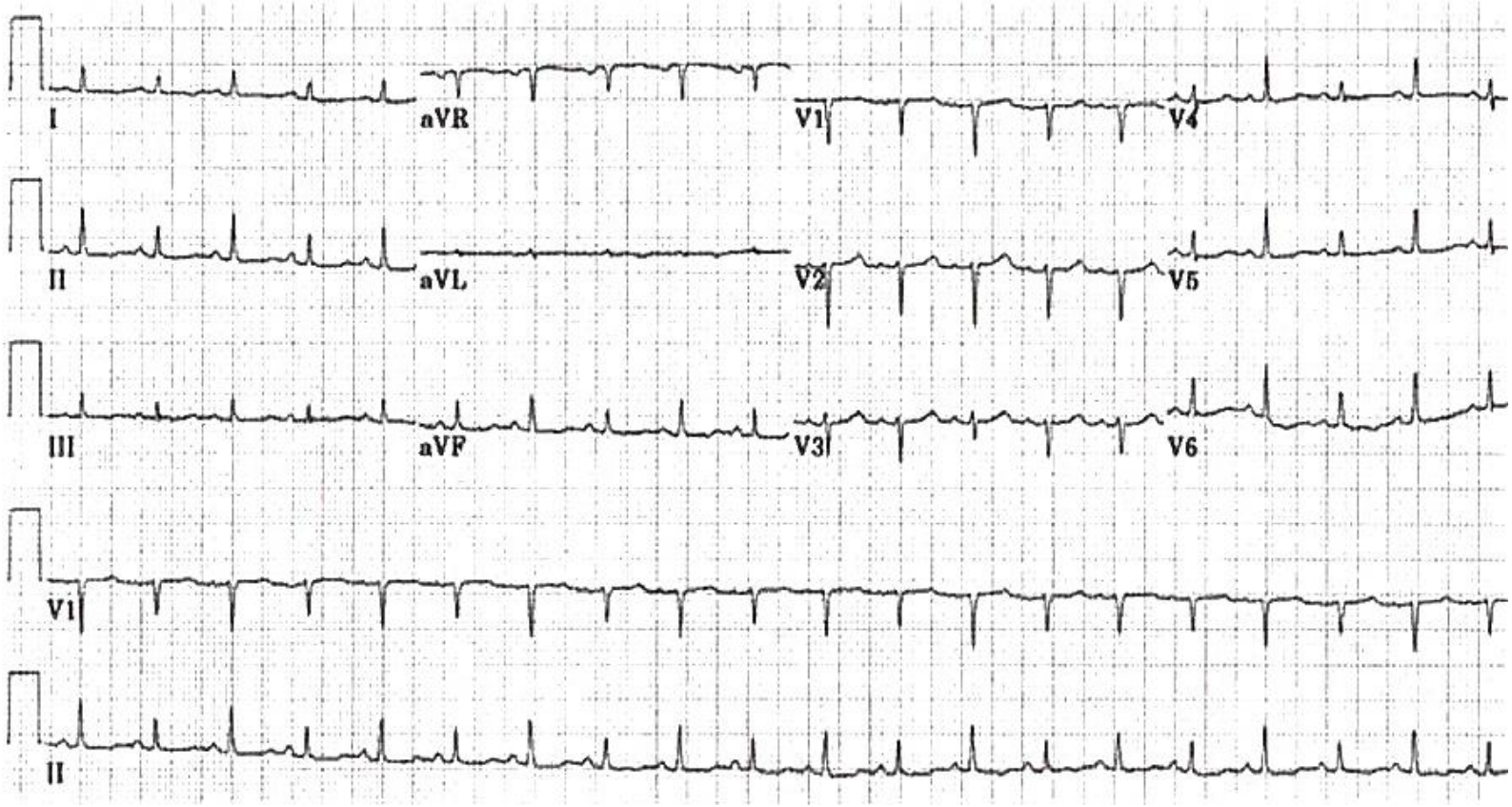
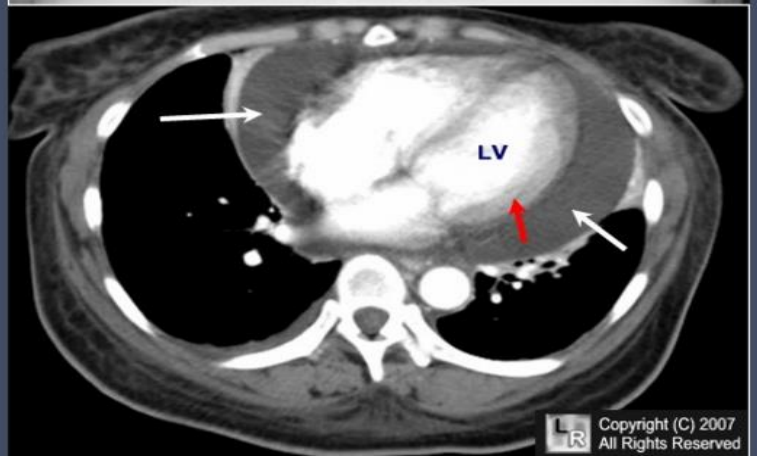
12-leads EKG

- Low QRS voltage
- Electrical alternans



CXR and CT



Echocardiography

- End diastolic collapse of RA
- Early diastolic collapse of RV

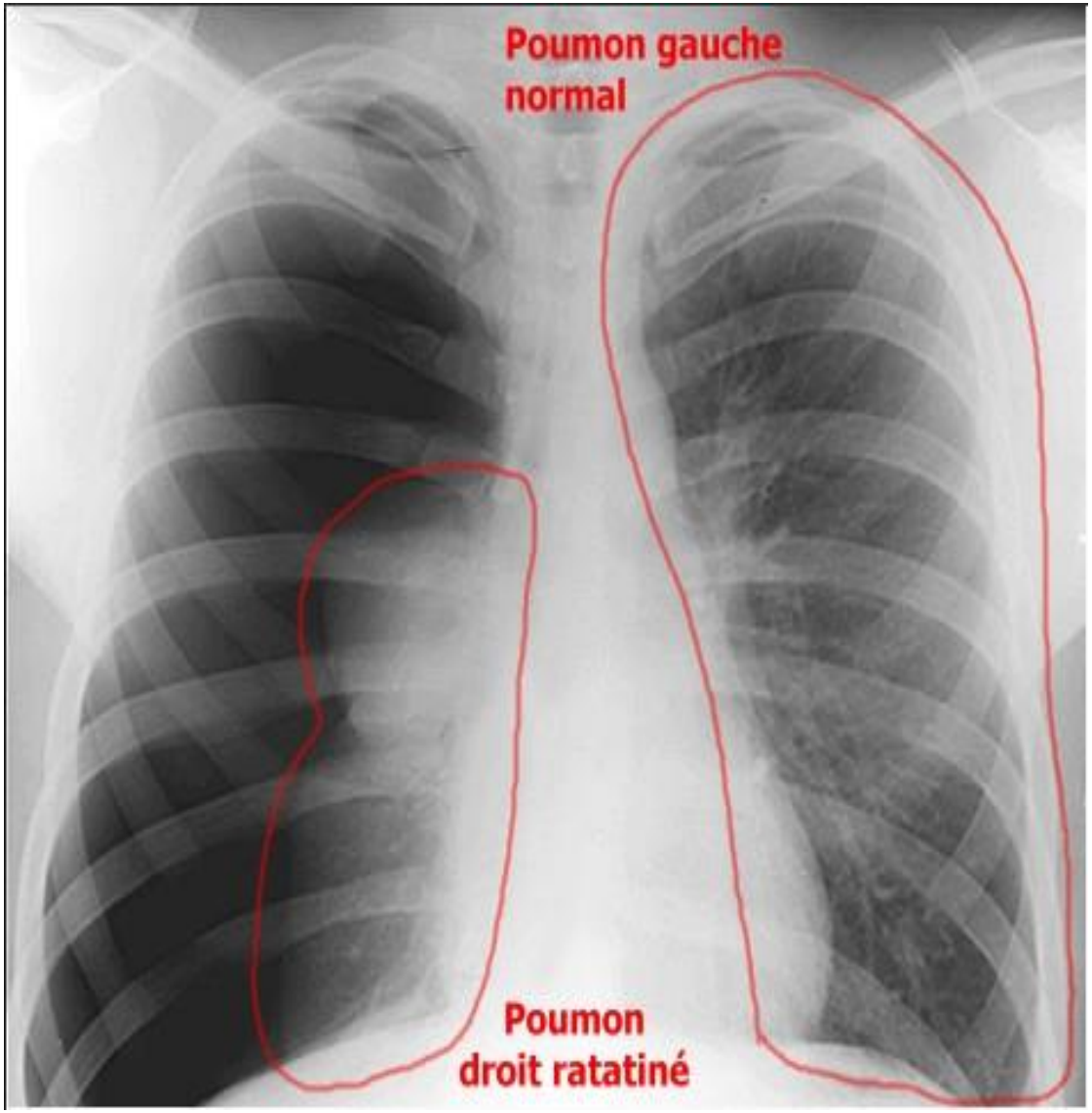
Treatment

- Pericardiocentesis and drainage by pigtail or surgery
- Control underlying disease.

(6) Other causes of Prolonged Chest pain

- 1.Pneumothorax
- 2.Mediastinal emphysema
- 3.Acute pancreatitis
- 4.Acute cholecystitis
- 5.Peptic ulcer disease
- 6.Perforated ulcers

1



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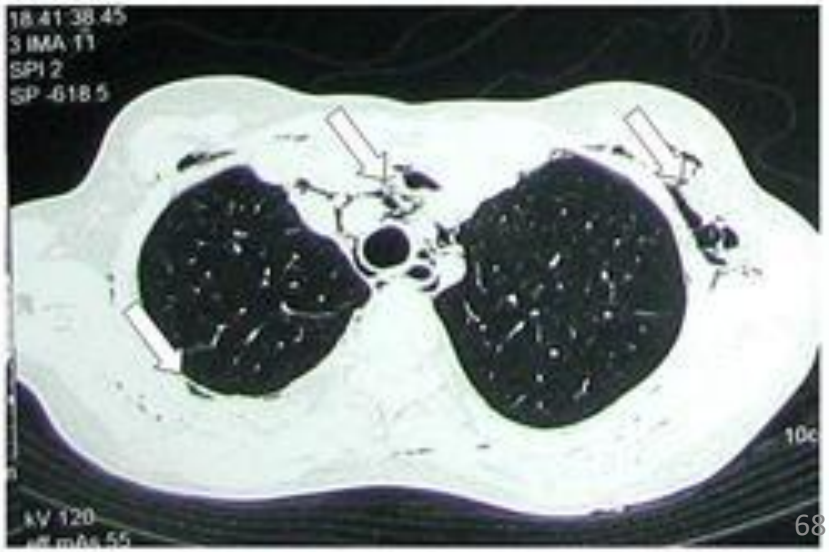

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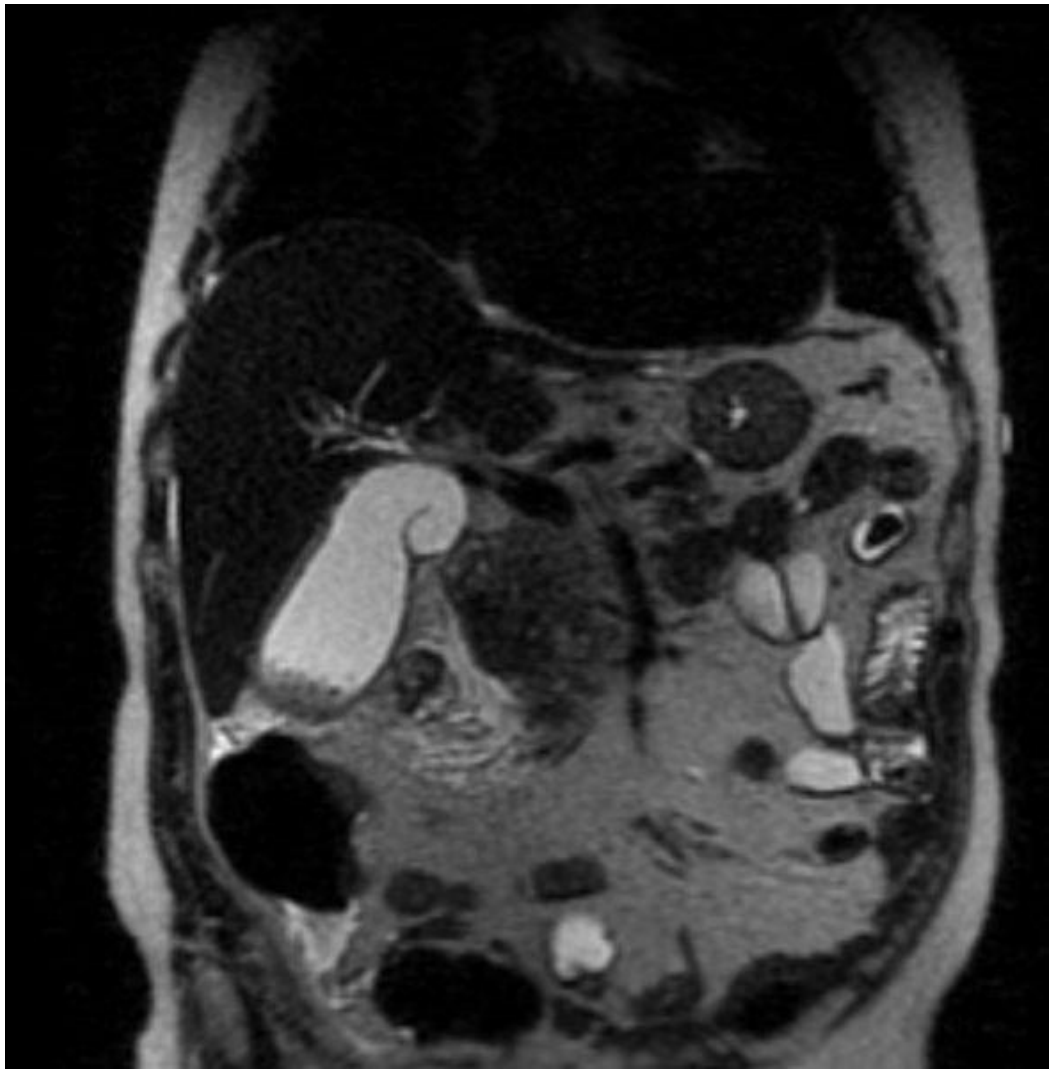

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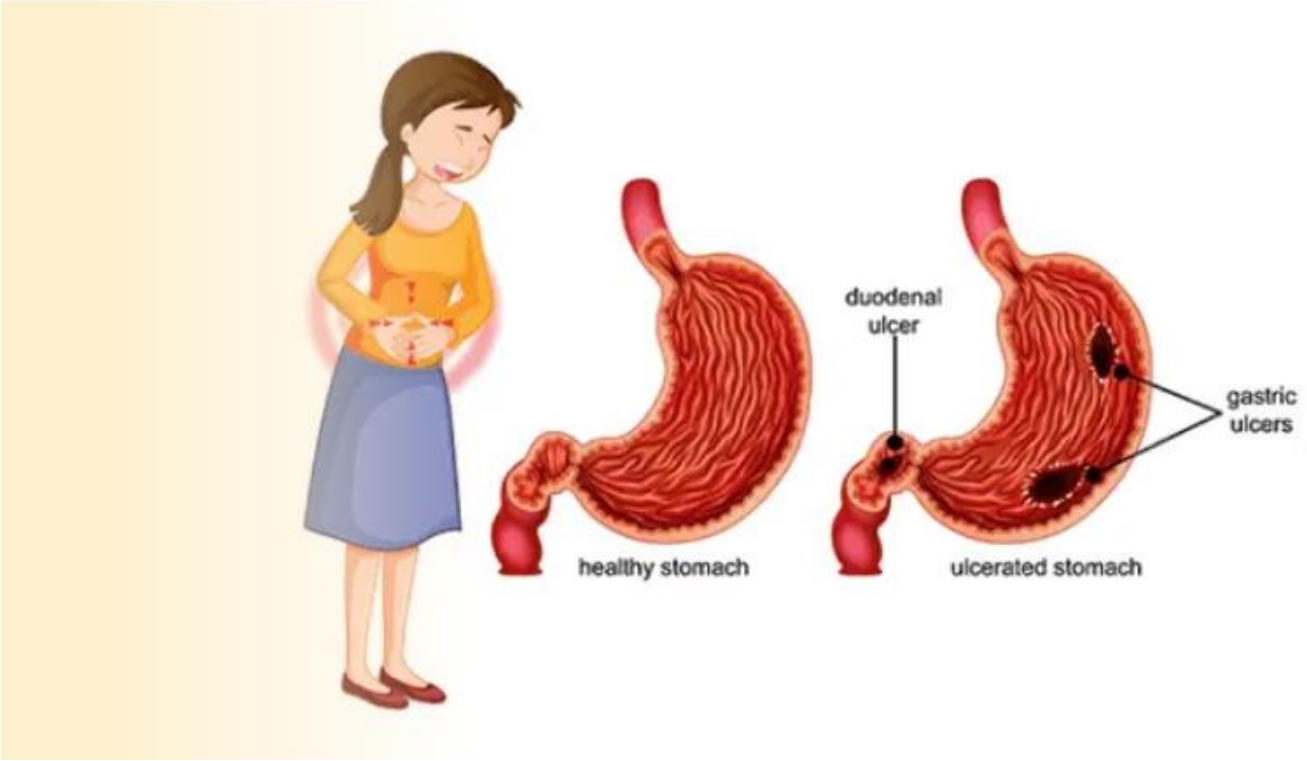
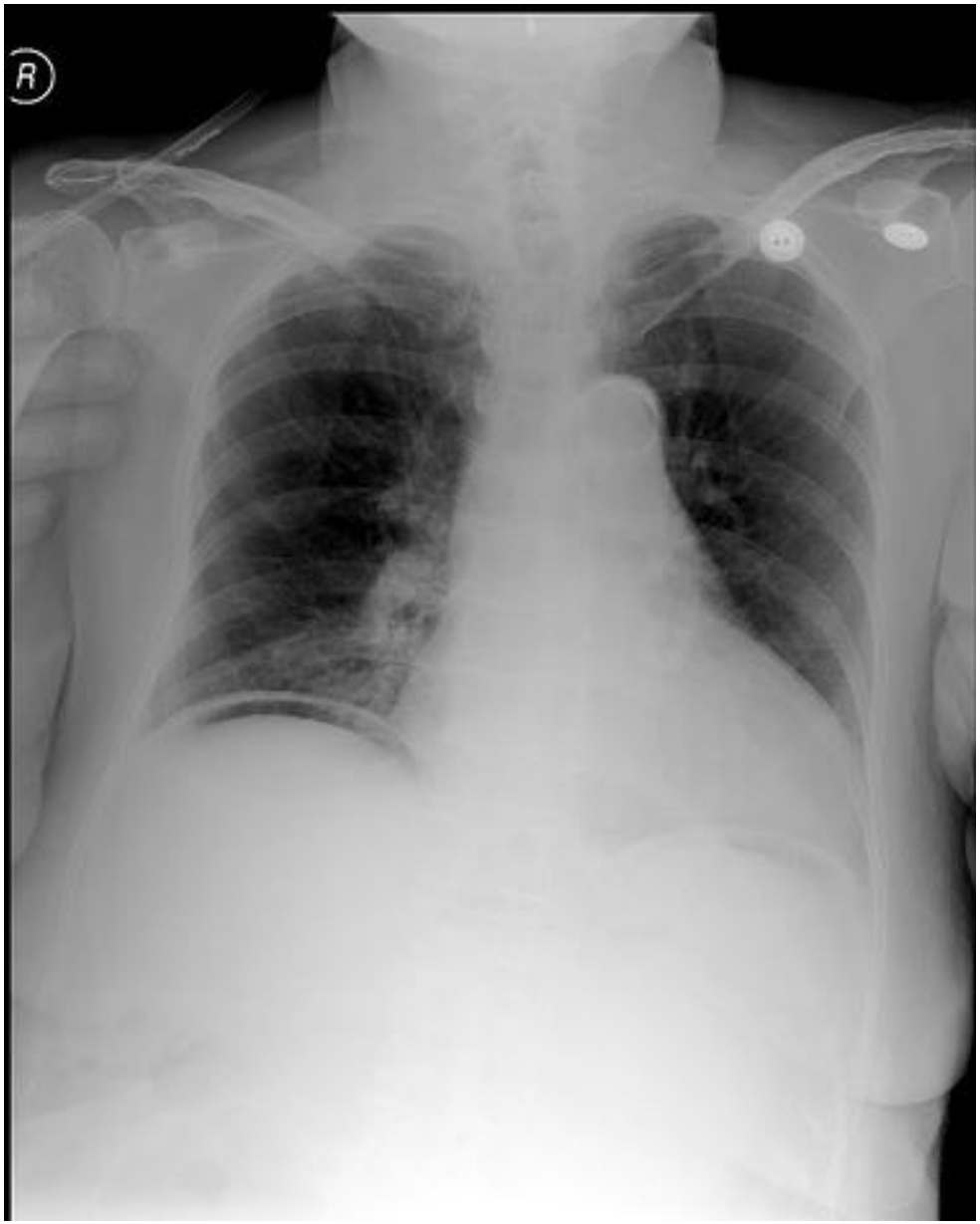


Reference: https://www.apexhospitals.com/symptoms/peptic-ulcer

6



參考文獻

- Up To Date
- Harrisons Principles of Internal Medicine, 19th Edition
- FEIGENBAUM Text book

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