Pulmonary Embolism

Embolism : Impaction of a thrombus (that has travelled from elsewhere in the body through the bloodstream), or foreign matter in the pulmonary vascular bed.

Infarction : The pathological changes which develop in the lung as a result of pulmonary embolism.

Etiology

Three primary influences predispose a patient to thrombus formation; these form the so-called Virchow triad, which consists of :

Endothelial injury

Stasis or turbulence of blood flow

Blood hypercoagulability

Risk factors

- Venous stasis
- Hypercoagulable states
- Immobilization
- Surgery and trauma
- Pregnancy
- Oral contraceptives and estrogen replacement
- Malignancy
- Hereditary factors: Antithrombin III deficiency, Protein S&C deficiency, Plasminogen&Fibrinogen abnormality
- Acute medical illness: AIDS, CHF, SLE.

When a pulmonary embolism is identified, it is characterized as acute or chronic.
In terms of pathologic diagnosis,

An embolus is acute if it is situated centrally within the vascular lumen or if it occludes a vessel.

An embolus is chronic if it is eccentric and contiguous with the vessel wall it reduces the arterial diameter by more than 50%, evidence of recanalization within the thrombus is present, and an arterial web is present.

Pathophysiology

Respiratory consequences

Increased alveolar dead space and hypoxemia due to ventilation-perfusion mismatch, intrapulmonary shunts, reduced cardiac output.

Pulmonary infarction is an uncommon consequence because of the bronchial arterial collateral circulation.

Hemodynamic consequences

Increment in pulmonary vascular resistance, which, in turn, increases the right ventricular afterload.

If the afterload is increased severely, right ventricular failure may ensue.

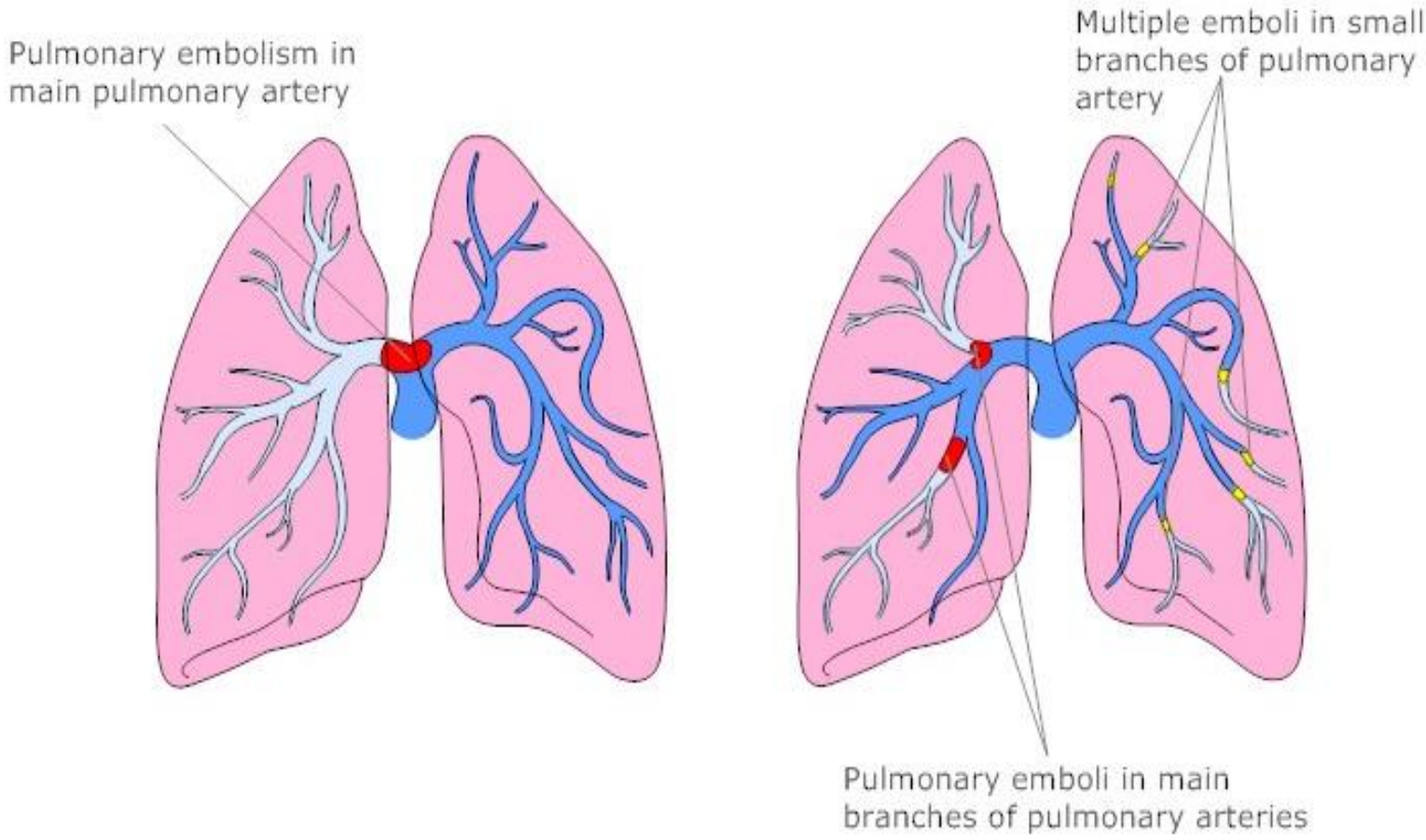
Clinical Features

Size of the embolus and blood vessel occluded.

State of the lung.

Associated diseases

Massive Pulmonary Embolism (MPE)
Pulmonary Infarction (PI)
Obliterative Pulmonary Hypertension


Pulmonary embolism in main pulmonary artery
Multiple emboli in small branches of pulmonary artery
Pulmonary emboli in main branches of pulmonary arteries

Signs and symptoms

- No obvious symptoms at presentation.

- Pleuritic chest pain
- Shortness of breath
- Hypoxia.

- Gradually progressive dyspnea
- Sudden hemodynamic collapse

Atypical symptoms

- Hemoptysis
- Seizures
- Syncope
- Abdominal pain
- Fever
- Wheezing
- Decreasing level of consciousness
- Atrial fibrillation
- Delirium (in elderly patients)

- Tachcardia(more than 100/ min)
- Tachypnoea
- Jaundice
- Cyanosis

- Consolidation, Diminished Intensity of Breath Sounds, Crepitus
- Wheezing Chest
- Pleural Rub
- Signs of Pleural Effusion

Differential Diagnosis

- **Myocardial Infarction.**
- **Dissecting Aortic Aneurysm.**
- **Peumothorax.**
- **Major Pulmonary Collapse.**
- **Perforating Peptic Ulcer.**
- **Acute Pancreatitis.**

Diagnosis

Clinical scoring systems to determine the clinical probability before proceeding with testing.

- ***Tachypnea***
- ***Rales***
- ***Accentuated second heart sound***
- ***Tachycardia (heart rate >100/min)***
- ***Fever***
- ***Clinical signs and symptoms suggesting thrombophlebitis***
- ***Cardiac murmur***
- ***Cyanosis***

Testing

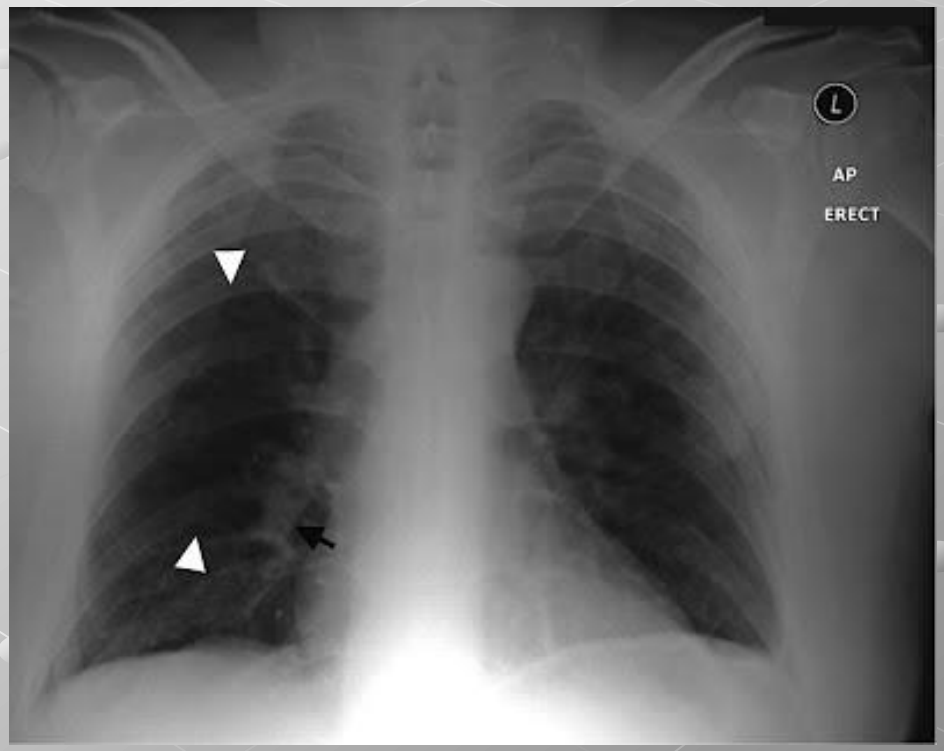
Perform diagnostic testing on symptomatic patients with suspected pulmonary embolism to confirm or exclude the diagnosis.

- ***D-dimer testing: non specific***
- ***Arterial blood gases***
- ***Serum troponin levels***
- ***Brain natriuretic peptide***

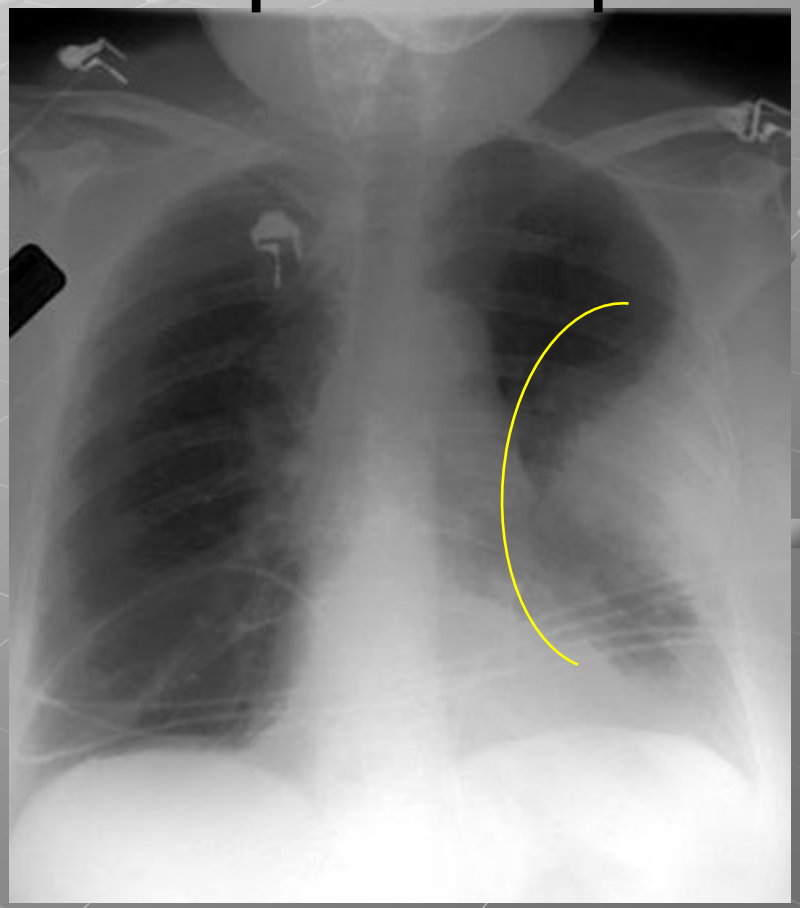
Imaging studies

1- Chest x-ray

Westermark sign,

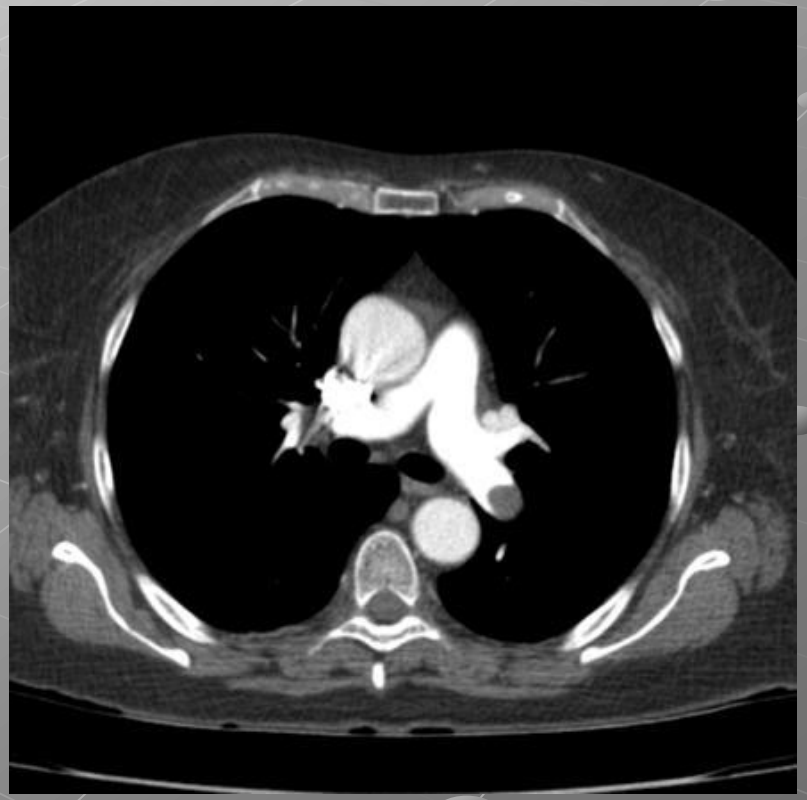


Hampton's hump

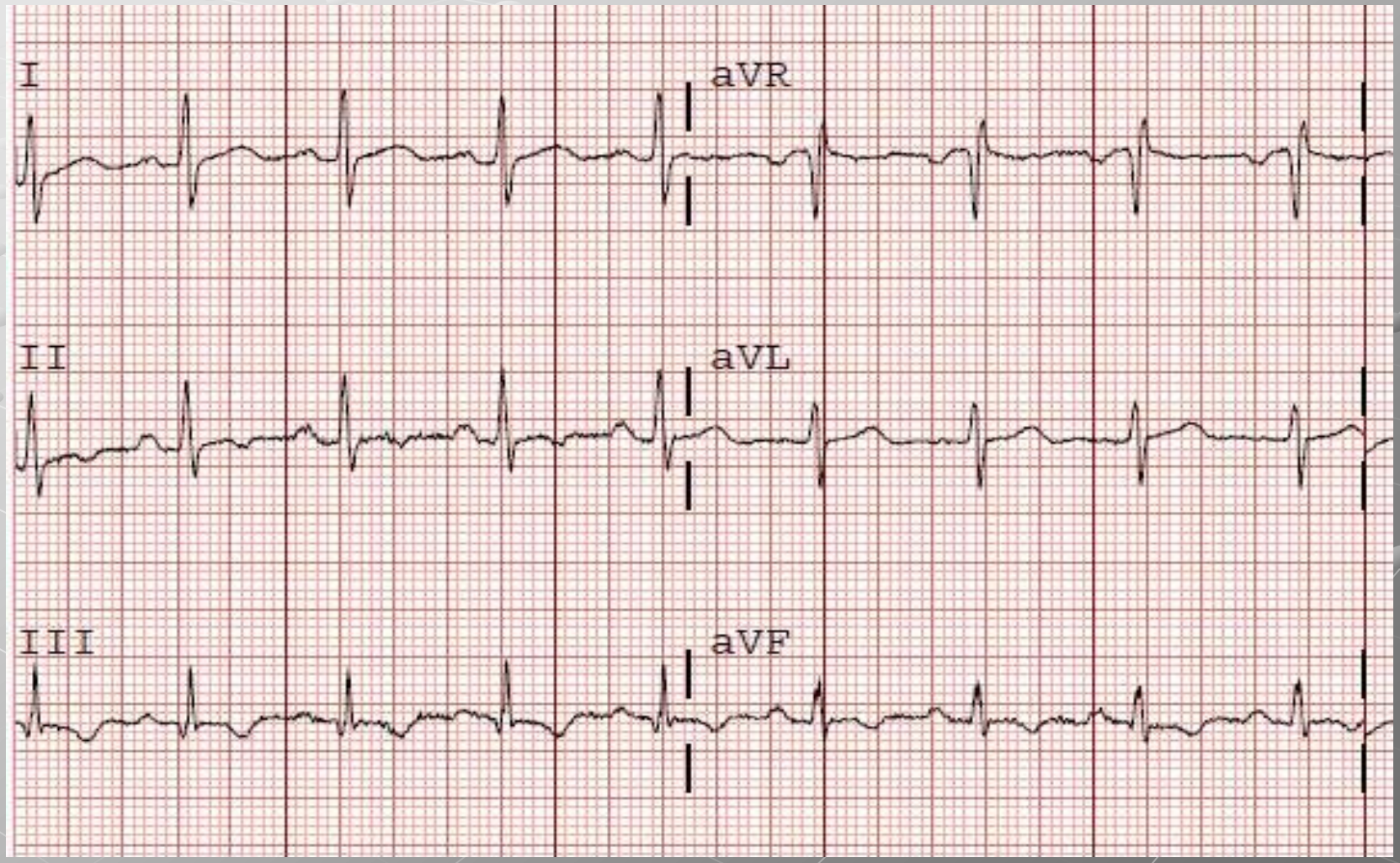


2- Chest CT

3- Helical CT: Rapid and noninvasive



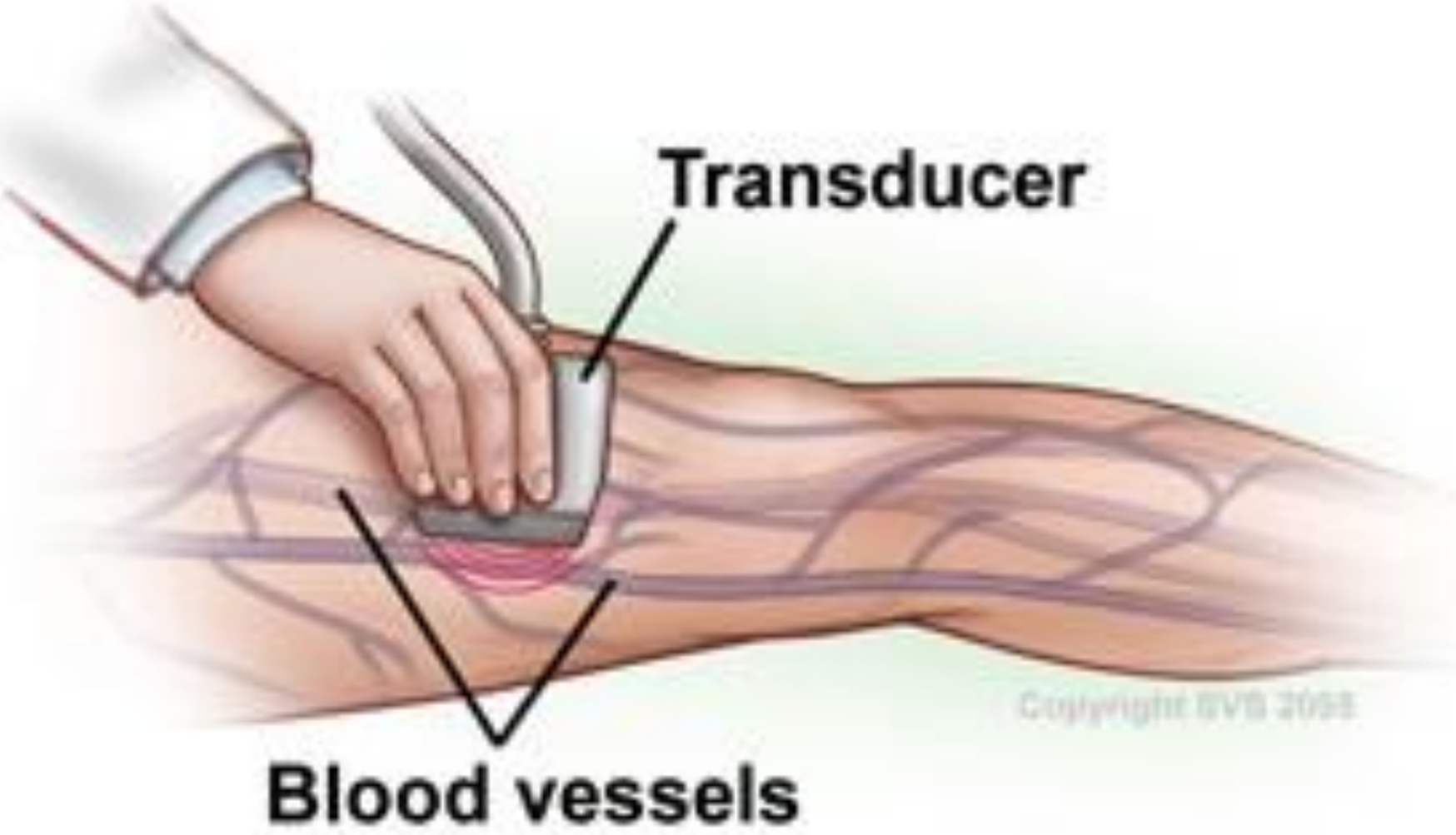
-ECG: (S1Q3T3) & Echocardiography



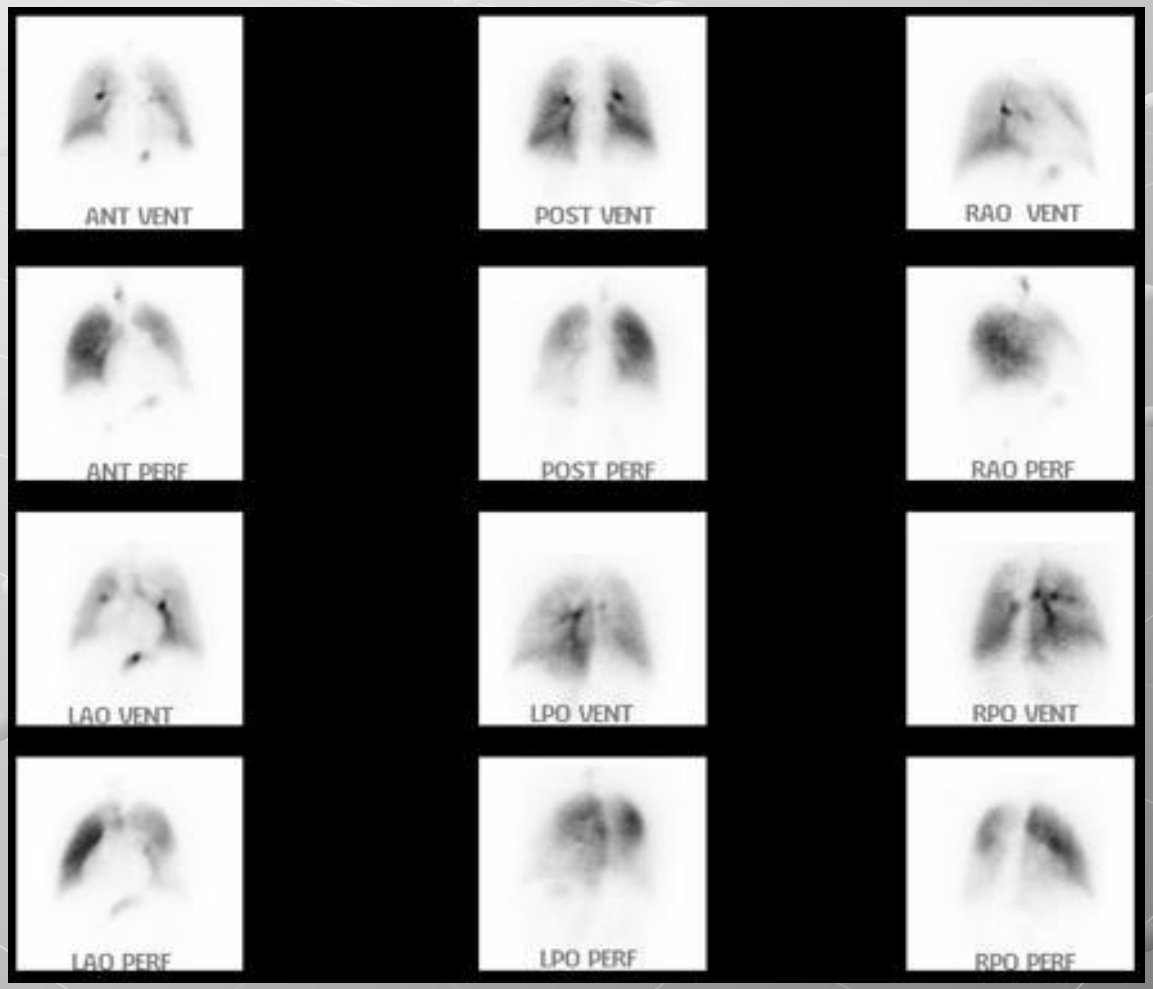
-Pulmonary angiography

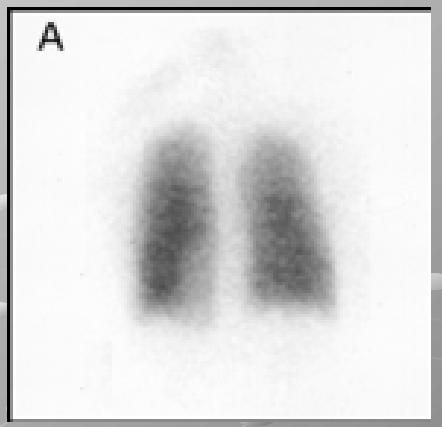
-Venography & Duplex ultrasonography

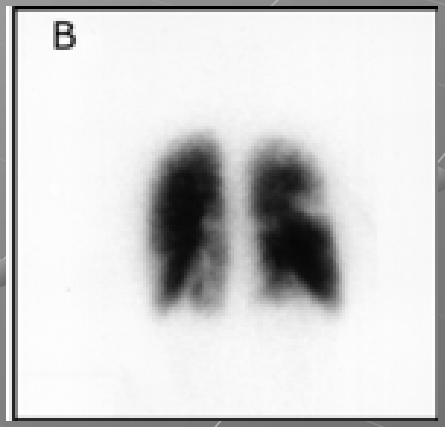
for deep vein thrombosis



-ventilation perfusion scan: (V/Q)







Treatment

Thrombolysis

Alteplase

Reteplase

Urokinase

Streptokinase

Used for : 1- Haemodynamically unstable patients

2- Cardiac arrest.

This treatment is

- **Expensive, not available.**
- **Side effects are bleeding and allergy**

Anticoagulation

1- Heparin : 5000 - 25 000 U iv Bolus

Followed up: Partial Thromboplastin Time (PTT).kept at 1.5 – 2.5

Antidote: is Protamine Sulphate

Used for For 7 – 10 days.

2- Low MV heparin.

- Low-Molecular-Weight-Heparin:
- Can be given Subcutaneously.
- Longer duration of Anticoagulant effect.
- PTT monitoring is not necessary.
- Enoxaparin: 1 mg/kg every 12h.

3-Oral Anticoagulant

Warfarin:

- Act after 2-3days
- Monitoring by prothrombin time& activity and INR.
- INR kept at 2.5 (theraputic level)
- Duration of treatment 3-6 months.

4- Surgical options

- Catheter embolectomy & fragmentation or surgical embolectomy
- Placement of vena cava filters

5- Adjuvants

- Oxygen, Antibiotics, Rest in bed.


Thanks!