

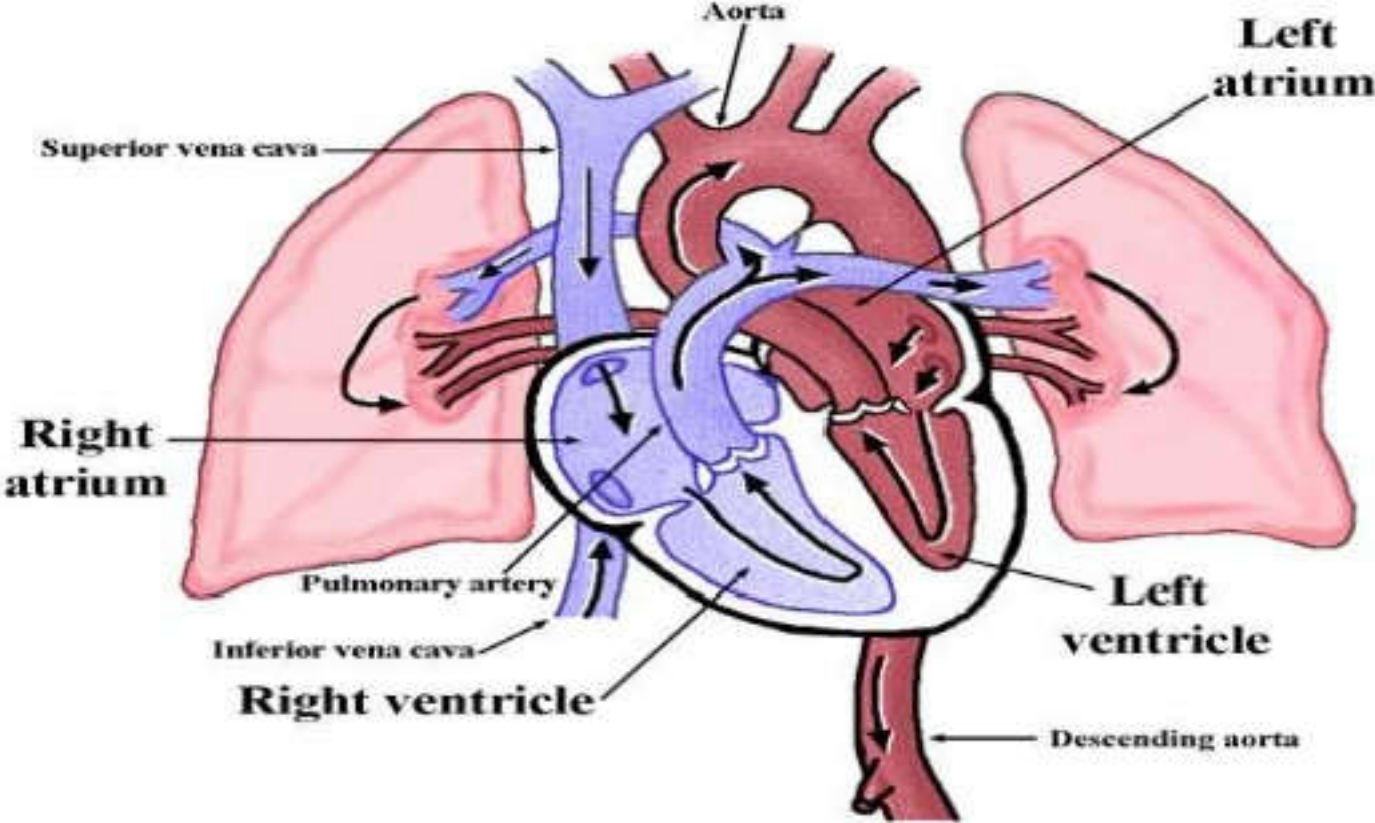
Acute Pulmonary Embolism

Prof. Ali .Kassem

**Internal Medicine Department
Sohag Faculty of Medicine**



Pulmonary circulation



Source

- DVT
- IEC of the right side of heart

- Air embolism
- Fat embolism
- Amniotic fluid embolism
- Septic embolism
- Tumor embolism



Risk Factors

- Prior DVT or PE
- Congestive Heart Failure
- Malignancy
- Obesity
- smoking
- Estrogen, OCP, HRT
- Pregnancy
- Lower limbs injury
- Orthopedic Surgery
- Prolonged immobilization, travel
- Surgery requiring > 30 minutes general anesthesia



Risk Factors cont'd

- Age > 40
- Venous Stasis
- Factor V Leiden mutation
- Protein C deficiency
- Protein S deficiency
- Antithrombin deficiency
- Prothrombin G20210A mutation
- Anticardiolipin antibodies
- SLE, APS
- Hyperhomocystinemia



Clinical Presentation

- **Small PE:** Asymptomatic, SOB, chest discomfort.
- **Medium PE:** SOB, Haemoptysis, Pleuritic chest pain, Tachycardia, Tachypnea, Pleural rub.
- **Massive PE:** Death, Shock, Severe central chest pain, Syncope, Pallor, Sweating, Central cyanosis, Elevated JVP, Loud P2, S2 split, gallop rhythm.
- DVT



Differential Diagnosis

- Myocardial Infraction
- Pleurisy
- Pneumonia
- Bronchitis
- Pneumothorax
- Costochondritis
- Rib #



Investigations

Laboratory:

CBC, Coagulation profile, ESR, LDH, ABG

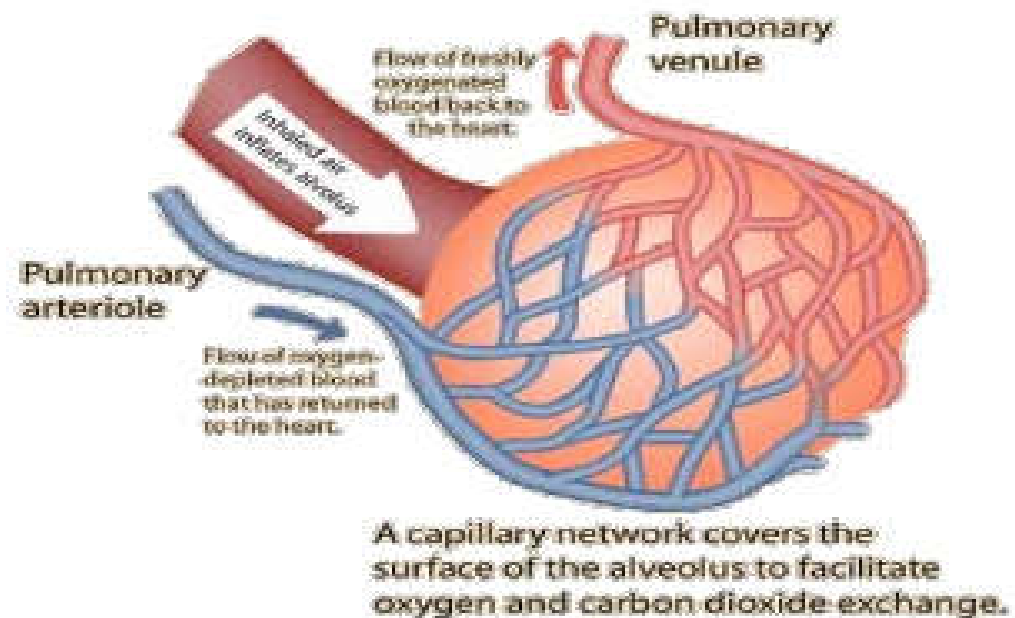
D-dimer:

- Sensitive but not specific
- Up to 80% of ICU patients have elevated D-dimer in the absence of VTE
- More than 500 Mg/mL



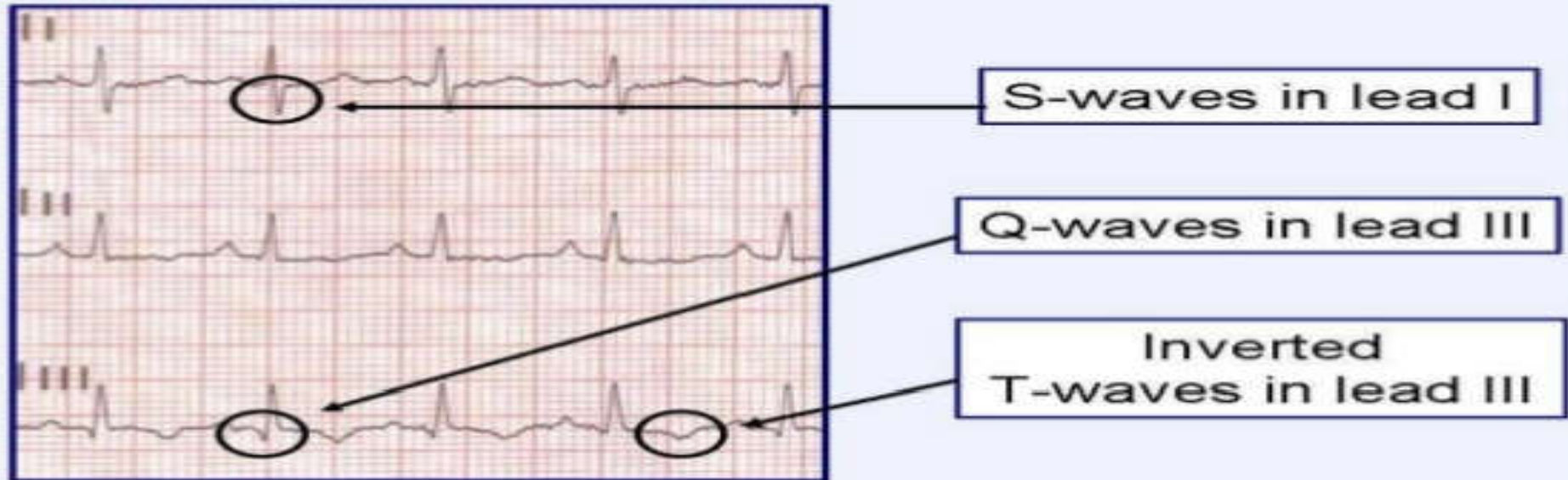
Alveolar-Arterial O₂ Gradient

- **A-a O₂ gradient = PaO₂ (alveolar) - PaO₂ (arterial)**
- Gradient > 15-20 is considered abnormal.



ECG

S1Q3T3



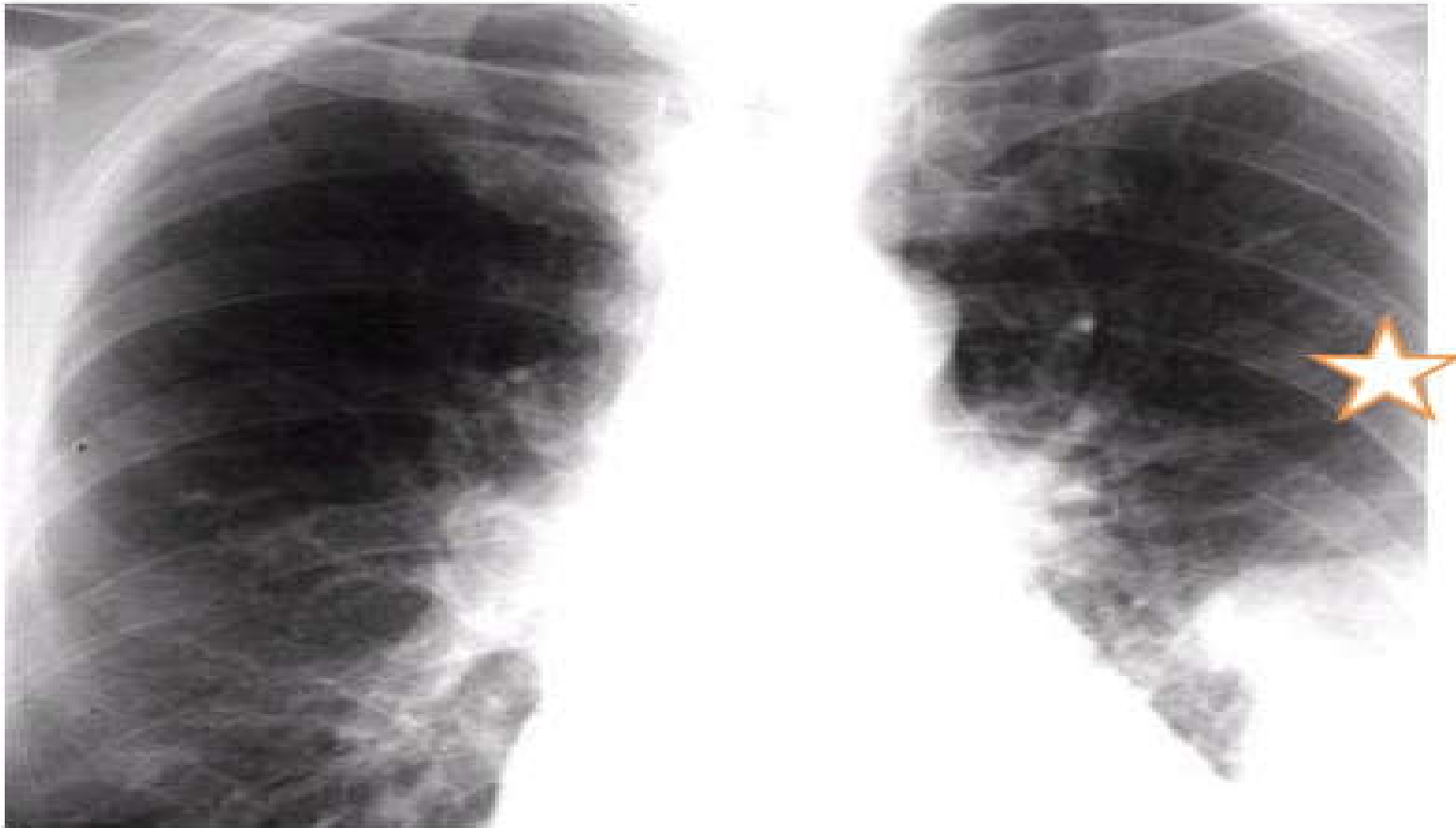
Imaging Investigations

Table 8. Chest X-Ray Findings In Patients With Pulmonary Embolism.

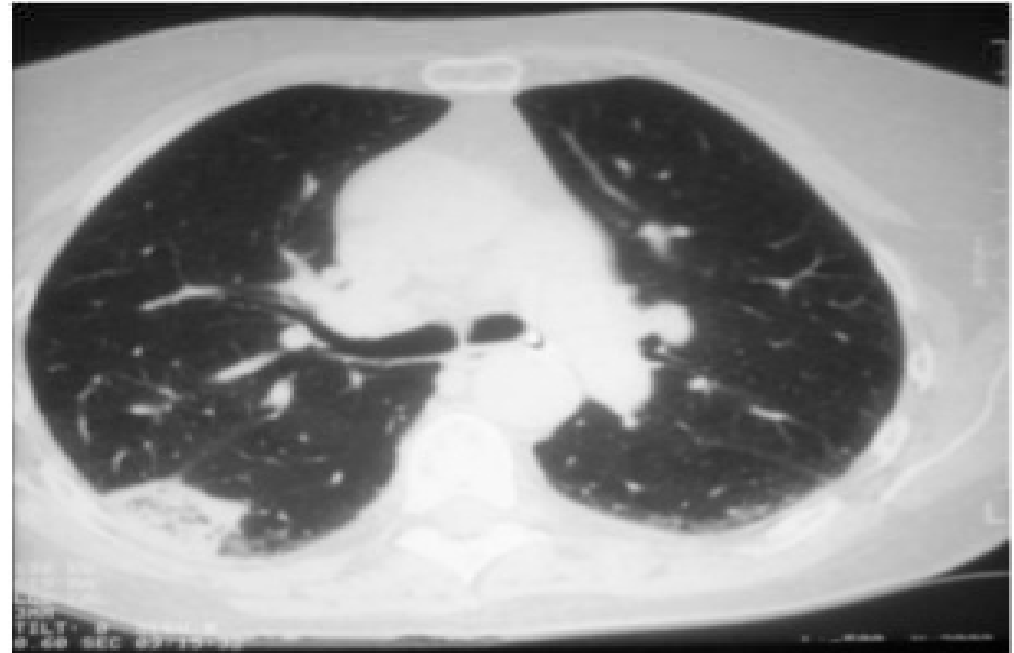
- Atelectasis
- Parenchymal infiltrates
- Elevated diaphragm (both unilateral and bilateral)
- Enlarged hilum
- Enlarged mediastinum
- Cardiomegaly (in chronic PE)
- Pleural effusion
- Oligemia (Westermark's sign)
- Prominent central pulmonary artery (Fleischner sign)
- Pleural-based area of increased opacity (Hampton's hump)
- Pulmonary edema



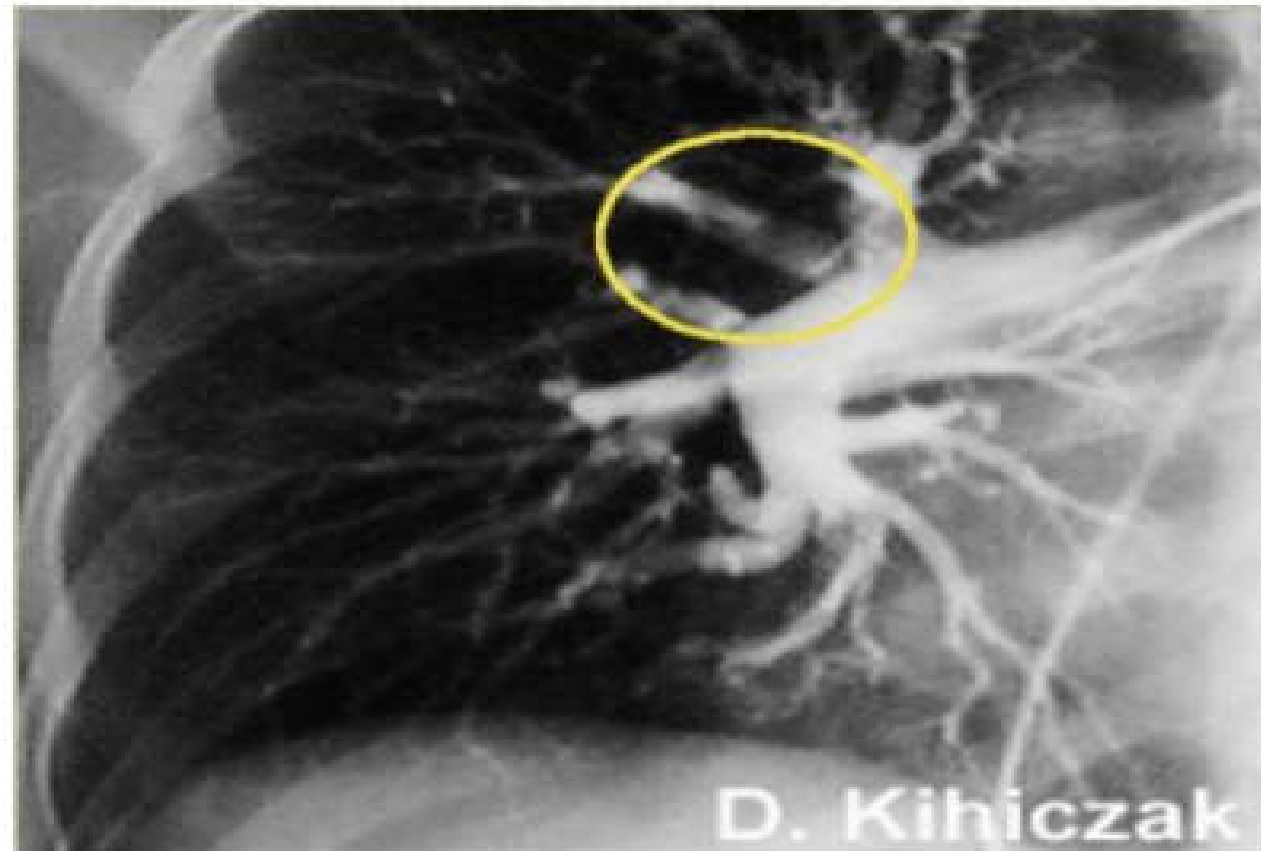
Westermarck's sign



CT Pulmonary Angiography



Pulmonary Angiography



D. Kihiczak



Other Tests

- Echocardiography
- Cardiac troponin



Management

- Emergency management
- Further management: Anticoagulation, Thrombolysis,



Resuscitation

- ABC
- Oxygen 100%
- IV access. Send baseline bloods, including clotting profile. Perform ECG
- Analgesia: Pethidine, Morphine 5-10 mg IV
- Management of cardiogenic shock (fluids and inotropes- Dobutamine)



Thrombolytic Therapy

- Streptokinase, Urokinase, Alteplase
, Recombinant tissue plasminogen activator
- Streptokinase 250,000 U over 30 mins
- Aim to: Relieve pulmonary vasculature obstruction, Improve right ventricular efficacy, Correct the hemodynamic instability.



Anticoagulant Therapy

Heparin

- 5000-10000 Units IV Loading Dose
Then 1000 Units/hr IV infusion drip
- Duration: 7-10 days OR till clinical improvement
- Follow up by PTT (1.5-2.5)



Anticoagulant Therapy Cont'd

- **Warfarin**
- 2.5-7.5 mg/day Orally
- Started with Heparin (5-7 days to start acting)

- Duration: 3-6 months

- Monitor INR (2-3)



Initial Treatment

Unfractionated heparin
Low-molecular-weight heparin
Fondaparinux
Thrombolysis
Percutaneous mechanical embolectomy
Surgery
Vitamin K antagonists

≥5 Days

Long-Term Treatment

Vitamin K antagonists
(INR target, 2.0–3.0)

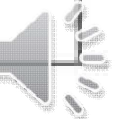
≥3 Mo


Extended Treatment

Vitamin K antagonists
(INR target, 2.0–3.0 or 1.5–1.9)

Recurrent PE
or PE and uncured
cancer:

Indefinite





New oral anticoagulants (NOAK)

Direct oral anticoagulants (DOAK)

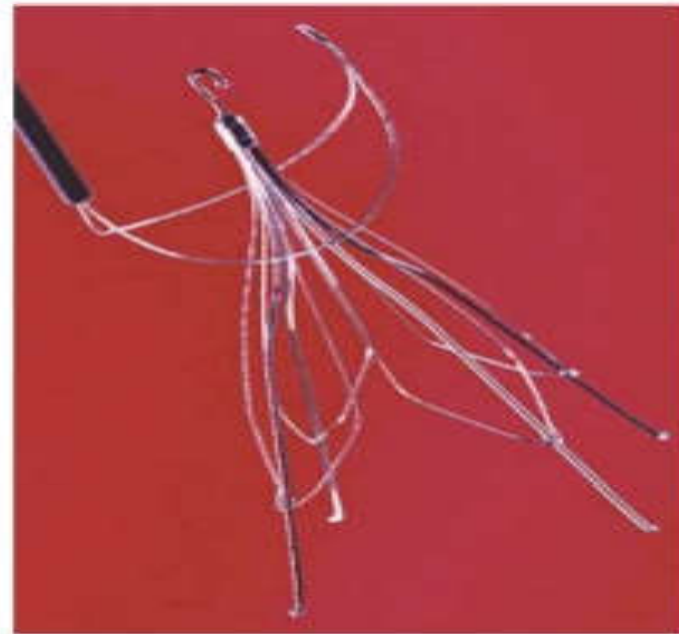
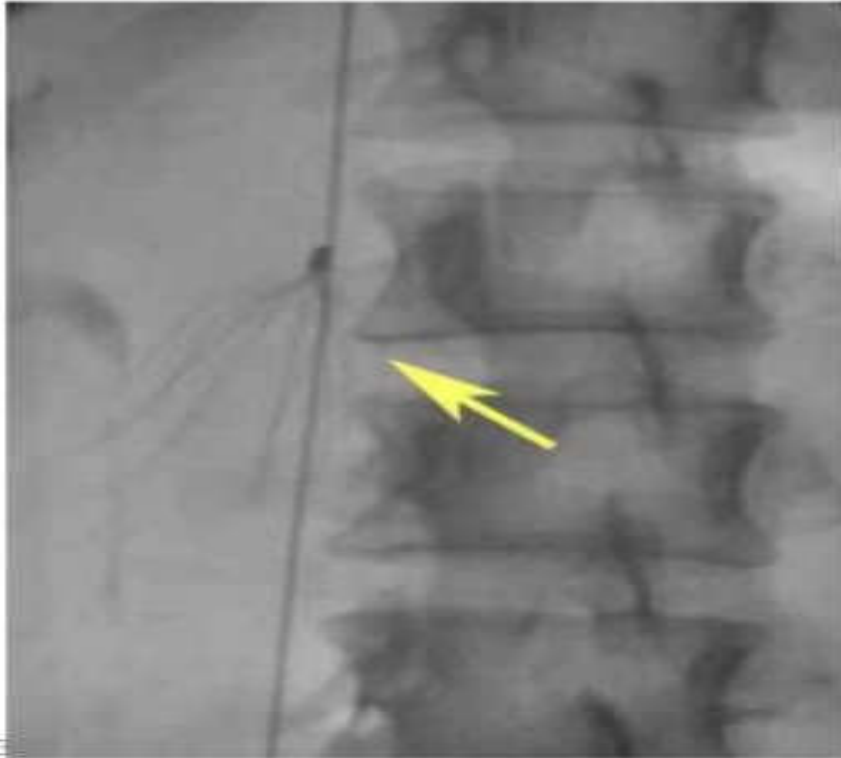


Embolectomy

- Surgical Embolectomy
- Catheter Embolectomy
- Massive life-threatening PE



- Recurrent DVT & PE: Vena cava filter



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Prevention

- **Prophylaxis is the single most important measure for ensuring patient safety in hospitalized patients**
- Compressive stockings, Aspirin, Anticoagulation
- Management of risk factors
- Follow up

