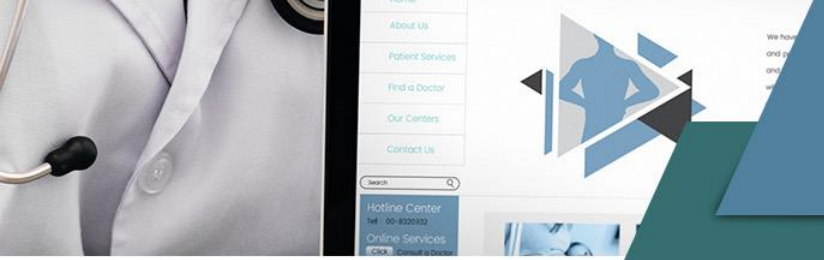
Chest CT scan

Dr. Asna Ashari

IUMS

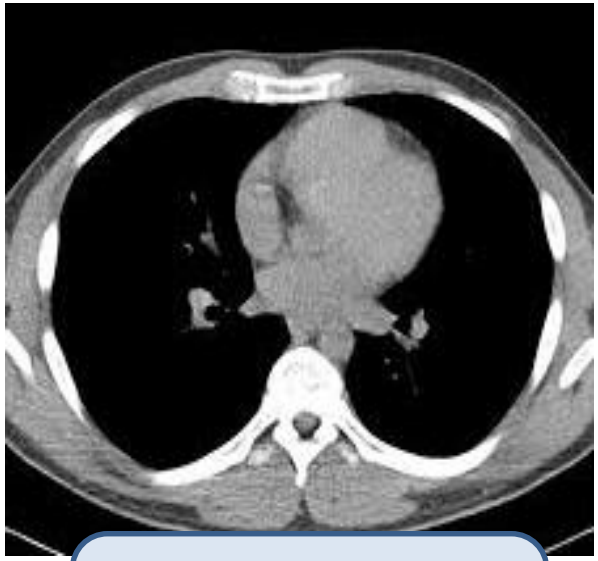
- **Standard CT:** 5 mm slice thickness for mediastinum and gross evaluation of lungs

- **High-resolution CT (HRCT):** thin sections (slice thickness of 0.625 to 1.25 mm) for evaluation of the secondary lobule of the lungs

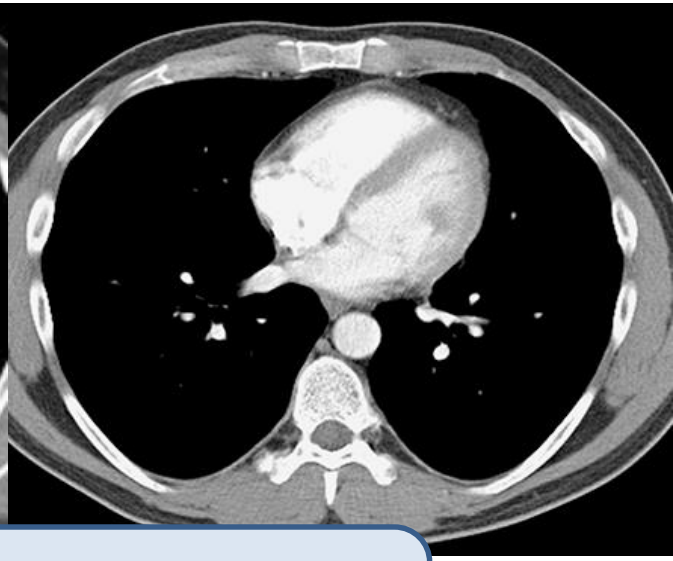


Chest Computed Tomography Techniques and Protocols

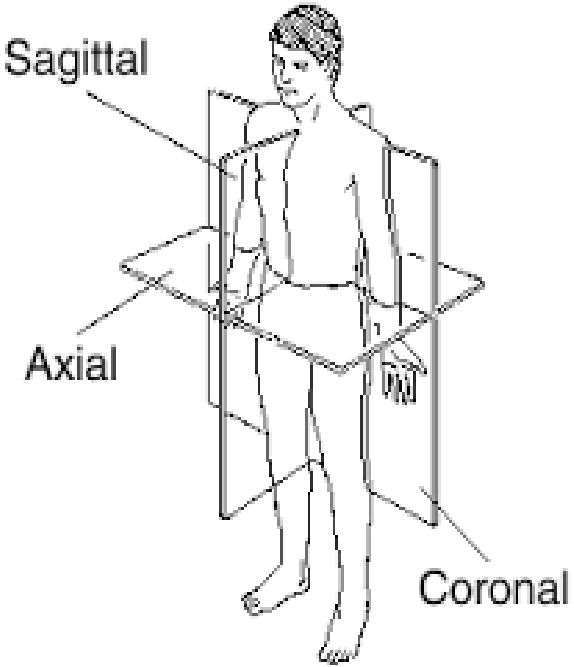
- **Without contrast**
- **With Intravenous Contrast**
- **Computed Tomography Angiography**



Without Contrast



With Intravenous Contrast

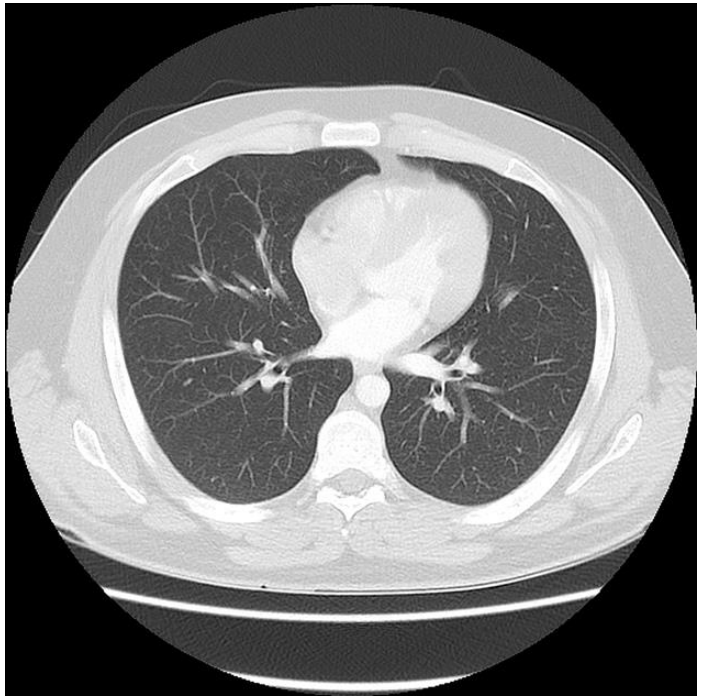


Axial

Coronal

Sagittal

Mediastinal Window

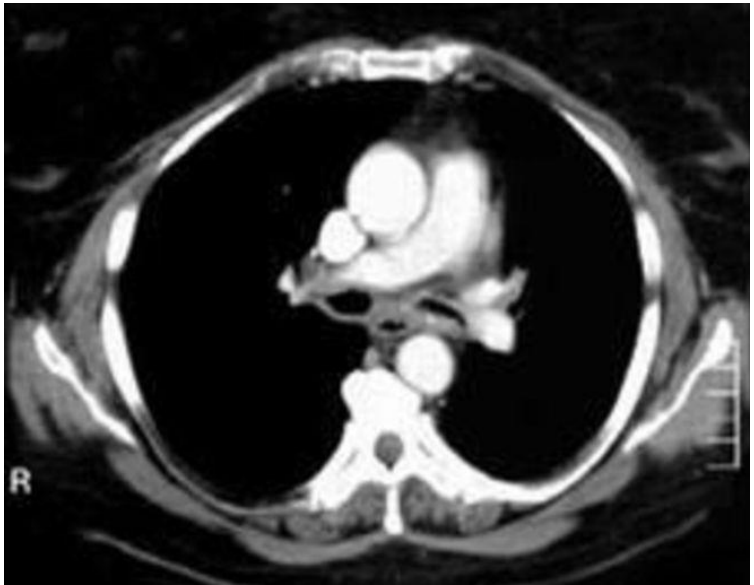


Lung window

Note

Mediastinal view is better to show

Vessels, Mediastinal pathologies, pleural effusion

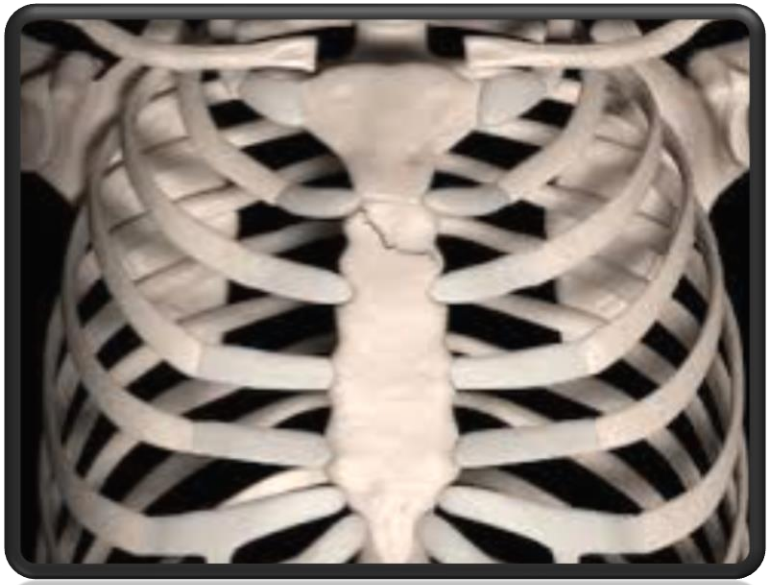


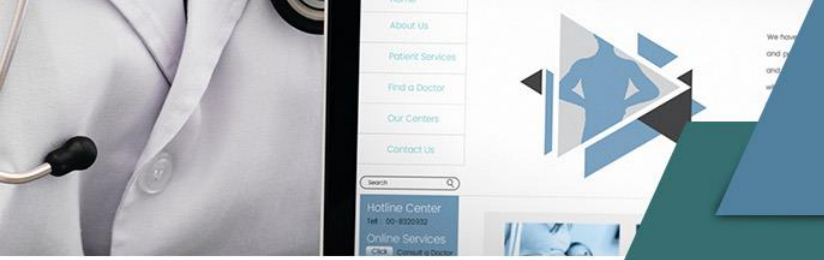
Chest CT scan interpretation

Systematic interpretation

1. *Soft tissue and bone*
2. *Mediastinum*
3. *Pleura*
4. *Lung*

1. Soft tissue & bone





Soft tissue and bone

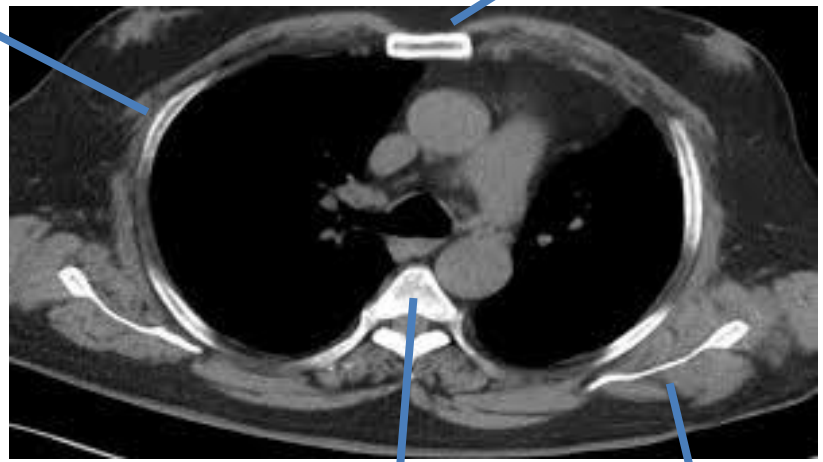
Bone fracture

Subcutaneous emphysema

Muscle hematoma

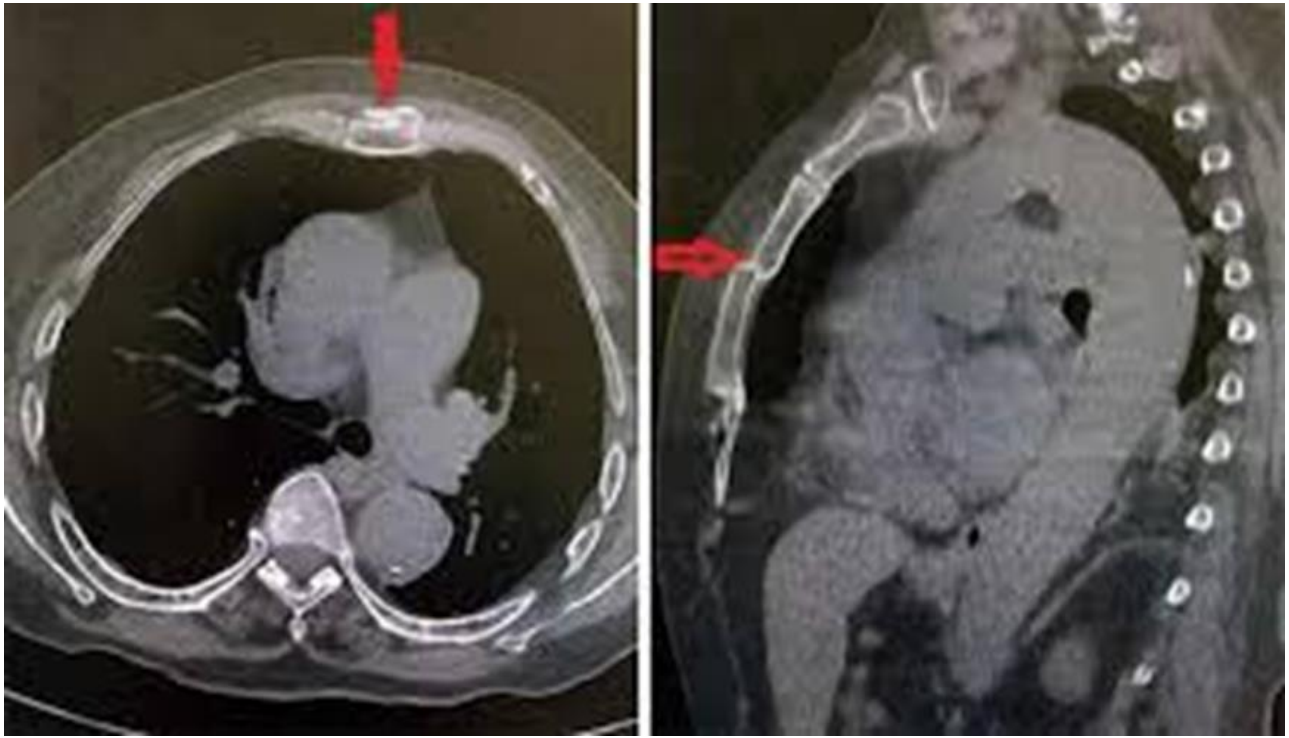
Bone

- Rib
- Sternum
- Scapula
- Humerus
- Spine (body, spinus process)

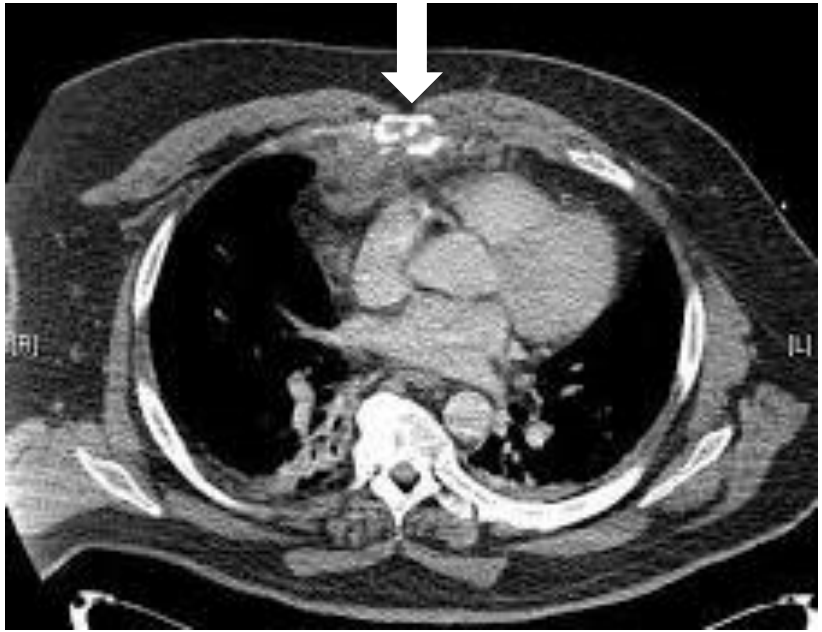


Sternum fracture

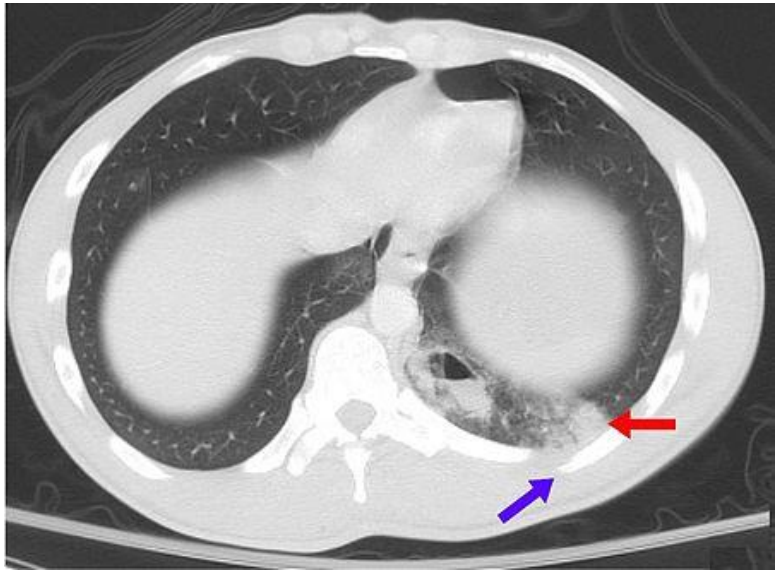
Sternum fracture

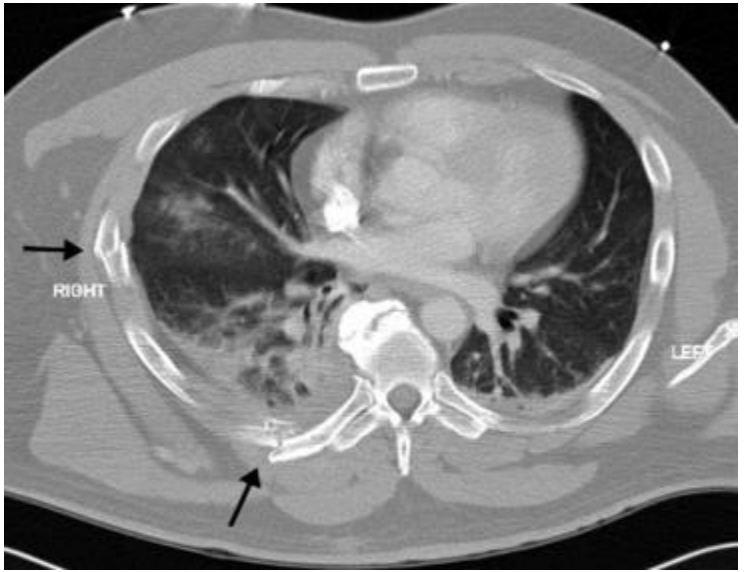


Sternum fracture

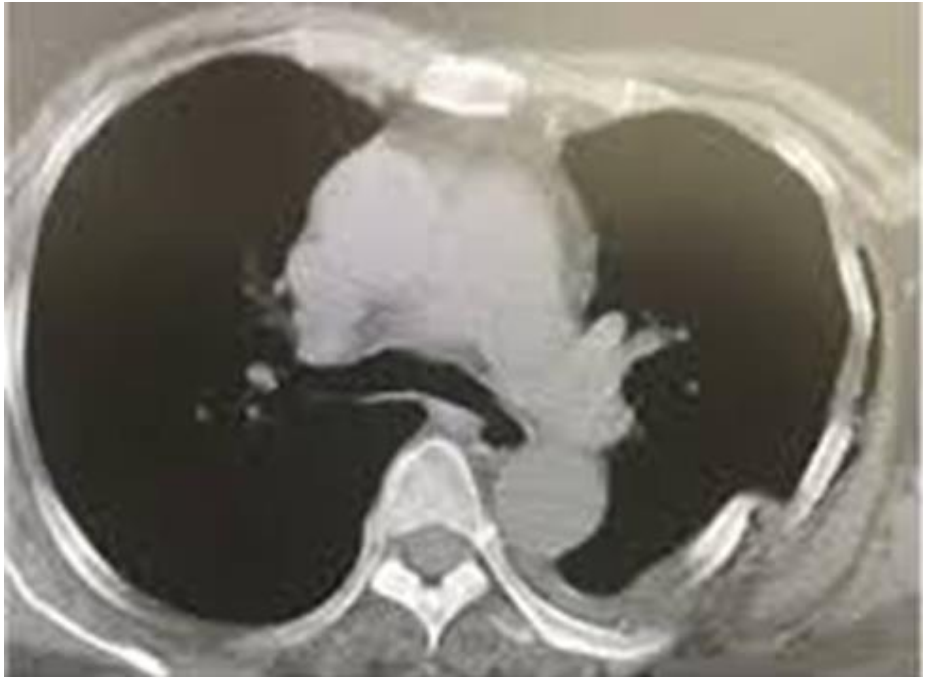


Sternum fracture





Rib fracture

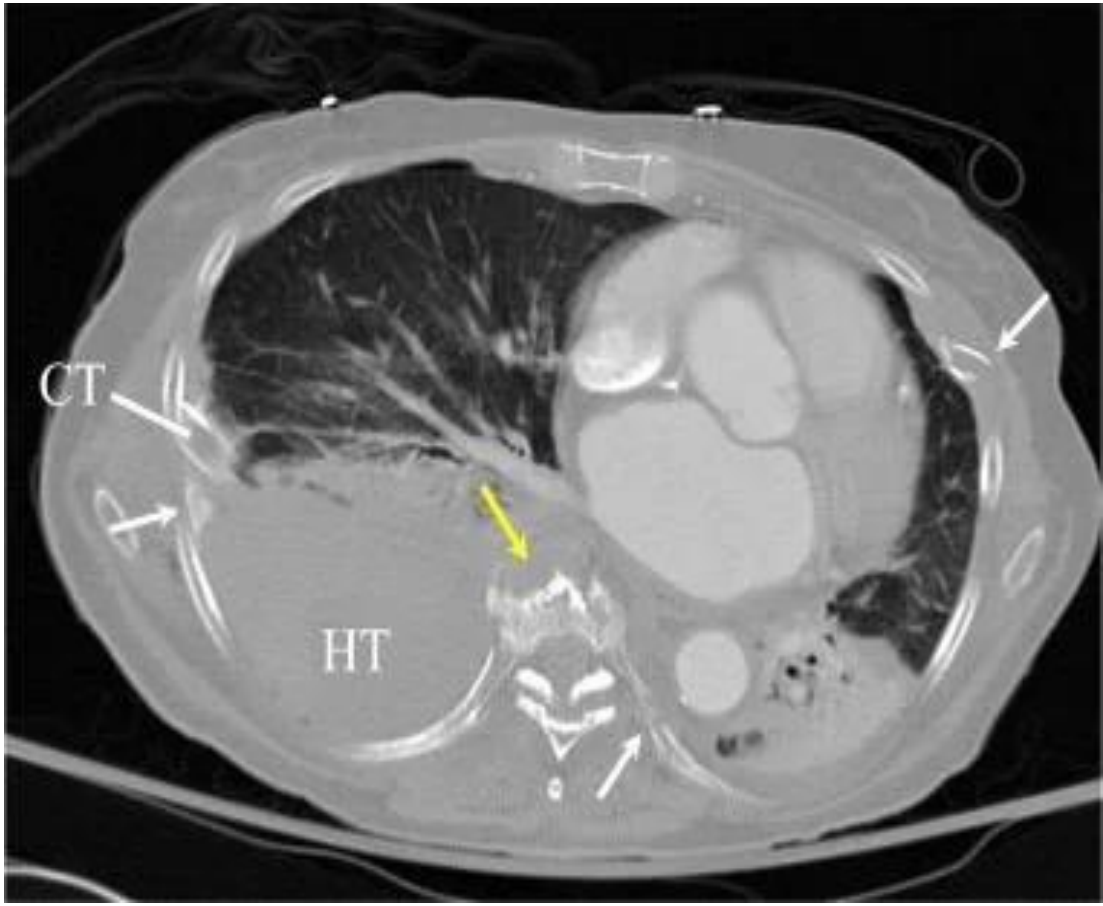


Rib fracture

Rib fracture

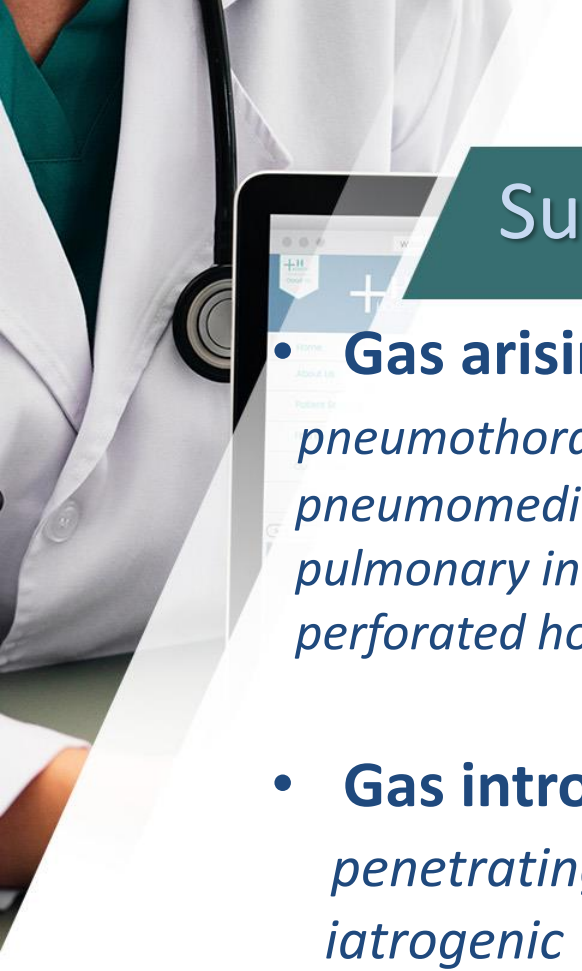
Rib fracture

1.Multiple rib fractures (white arrows)
2.midthoracic spine is fractured (yellow arrow)
3.large right hemothorax (HT)



Anterior and posterior thoracic injuries
1.Fracture of sternum
2.posterior left rib fracture

Rib fractures and a complex left scapular fracture



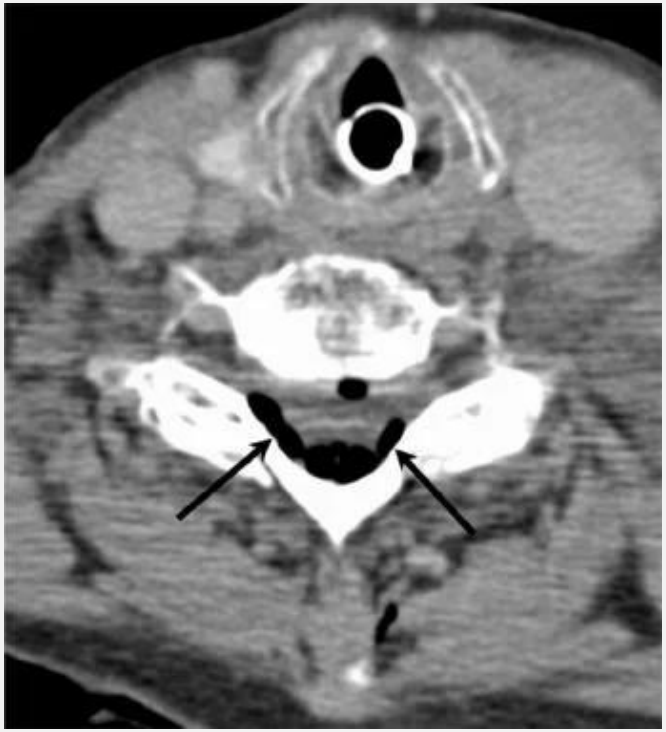
Subcutaneous emphysema

- **Gas arising internally**

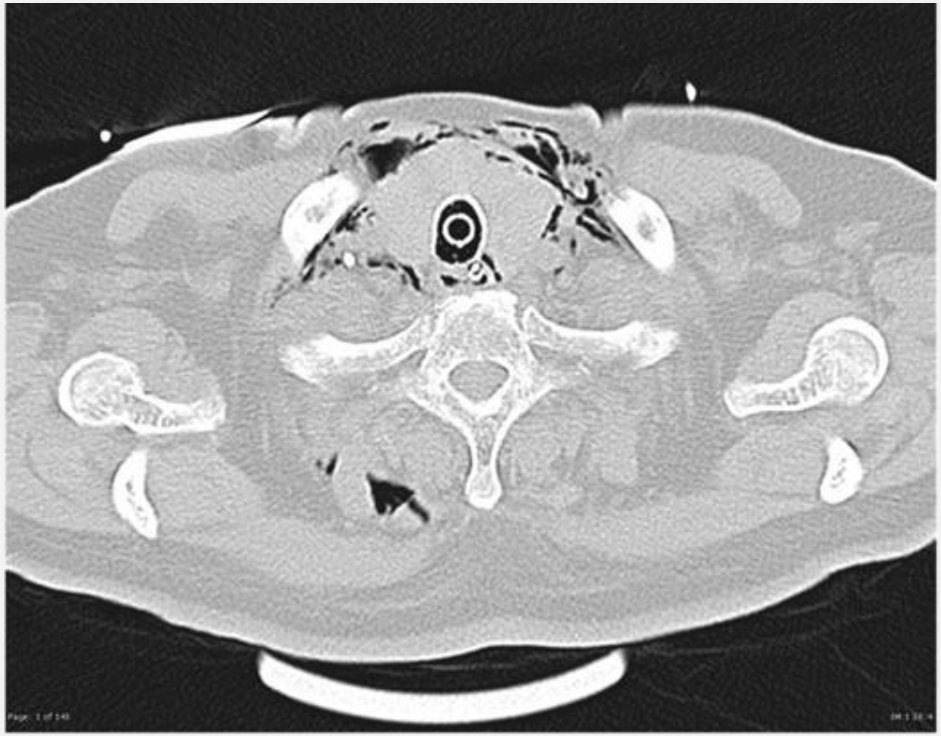
pneumothorax
pneumomediastinum
pulmonary interstitial emphysema
perforated hollow viscus in the neck, e.g. esophageal perforation

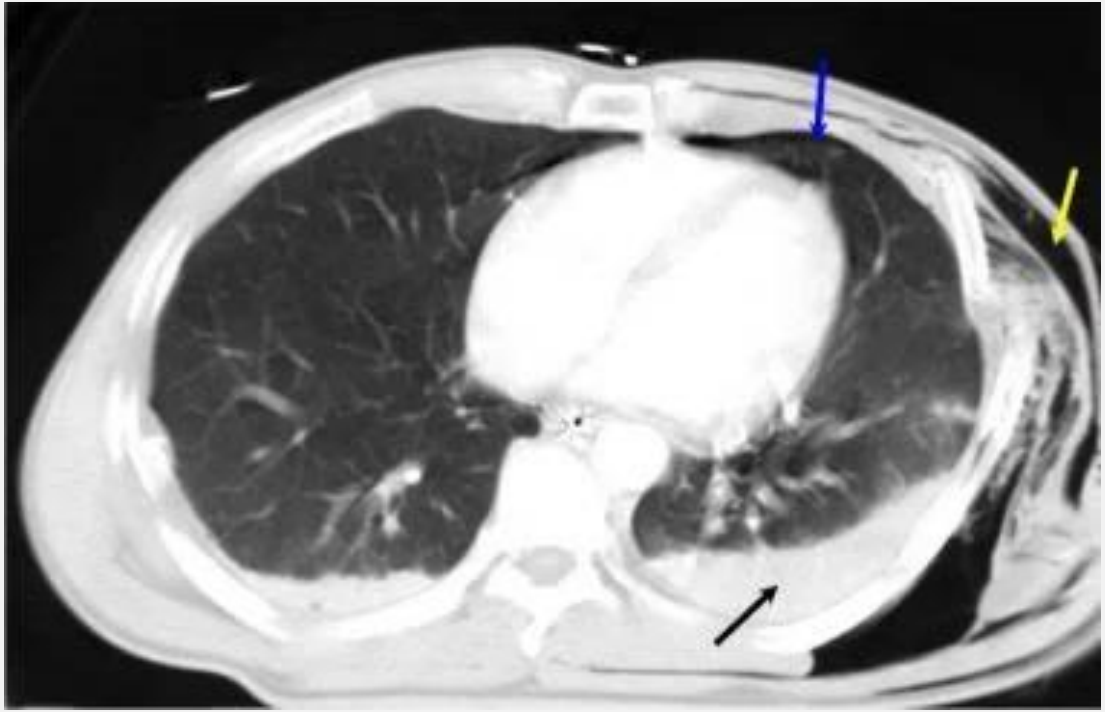
- **Gas introduced externally**

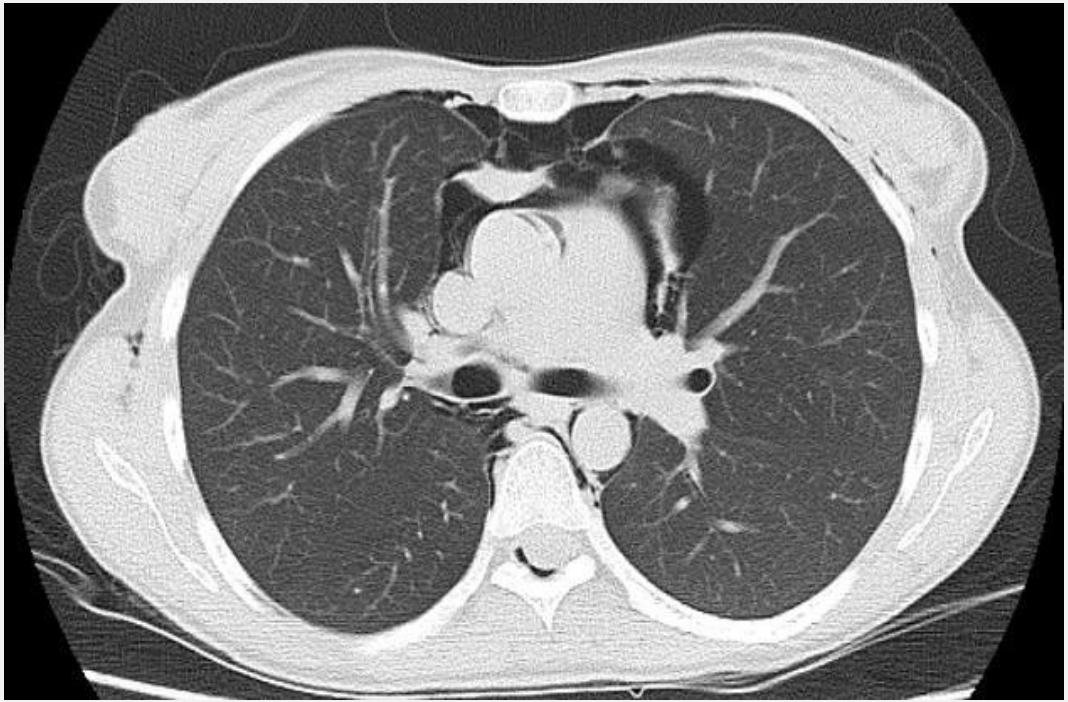
penetrating trauma
iatrogenic



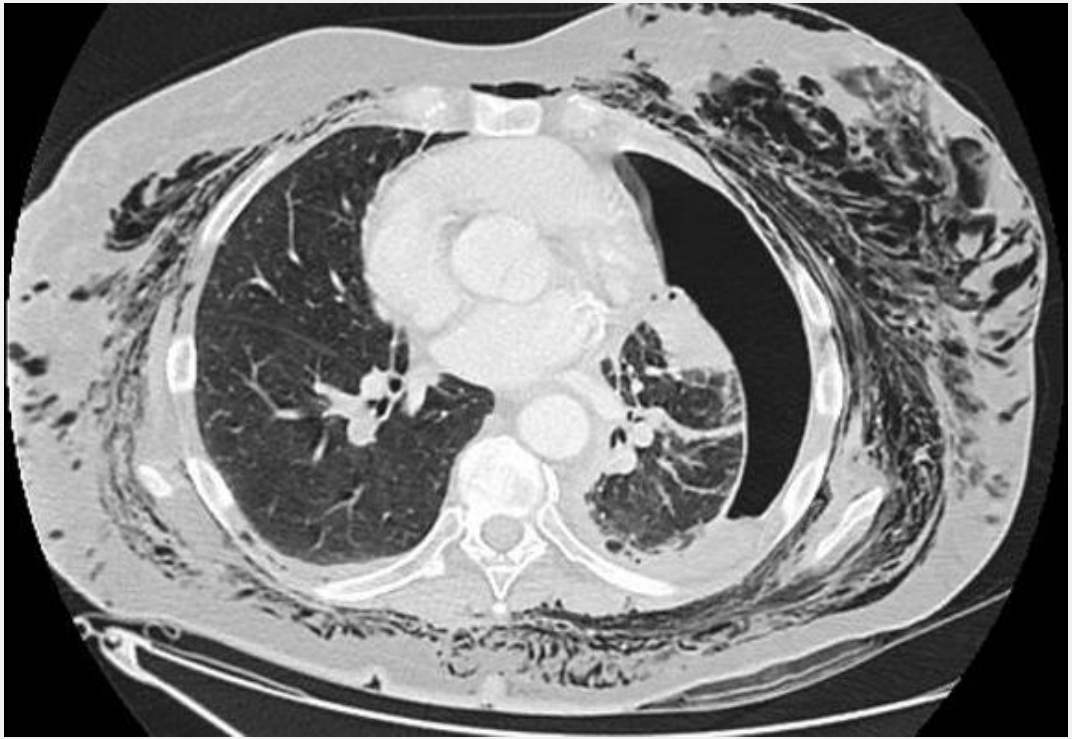
unstable fracture of the thoracic spine. Air has dissected into the epidural space posterior to the cervical dura







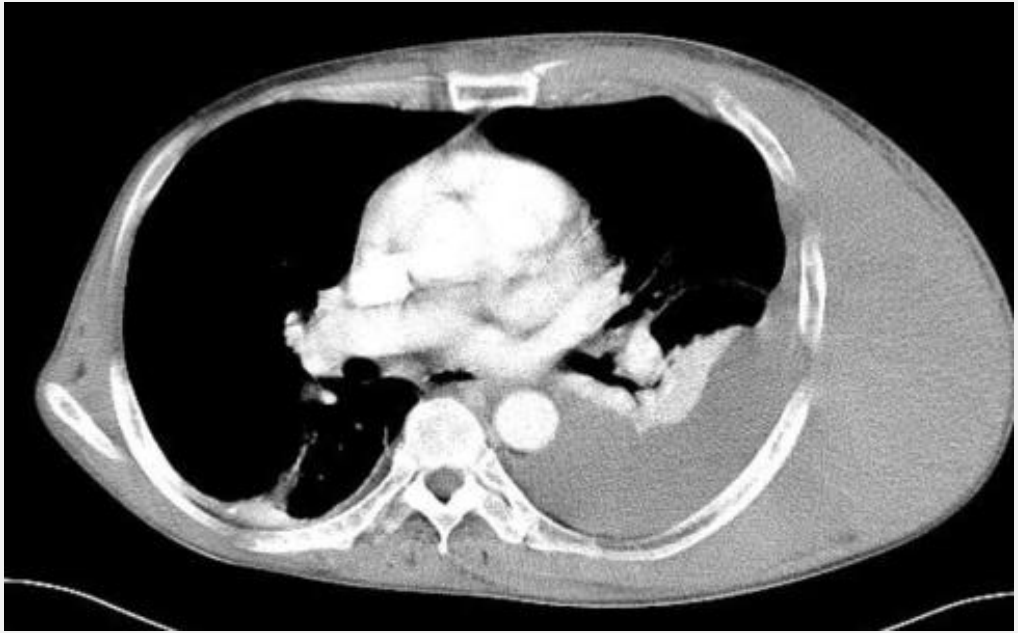
Extensive surgical emphysema and pneumomediastinum without pneumothorax



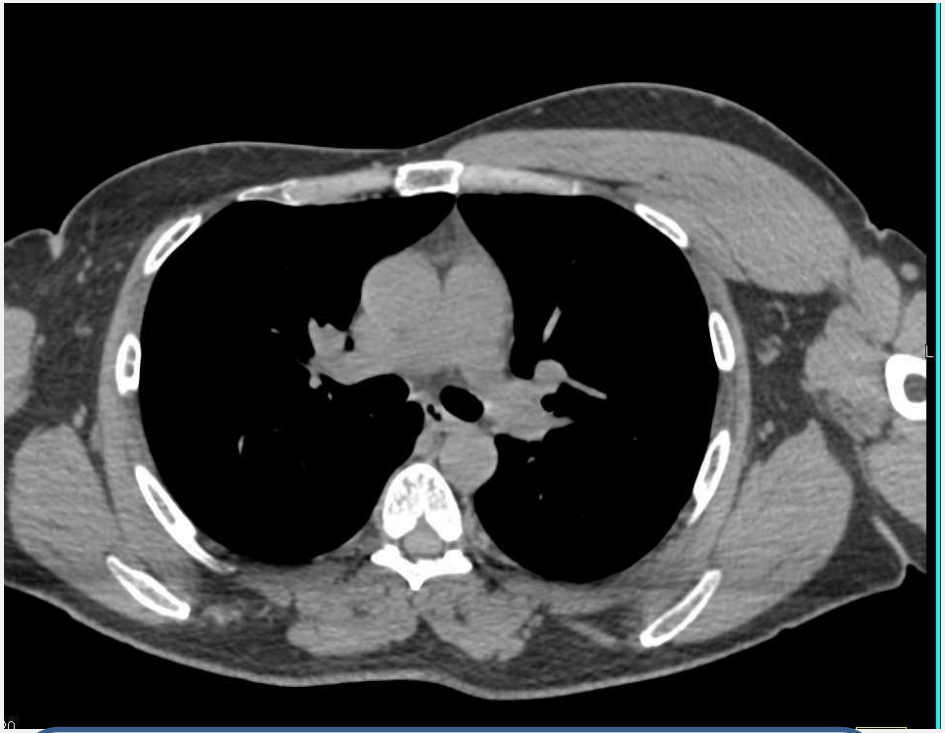
Extensive subcutaneous emphysema due to a misplaced chest tube

Muscle hematoma

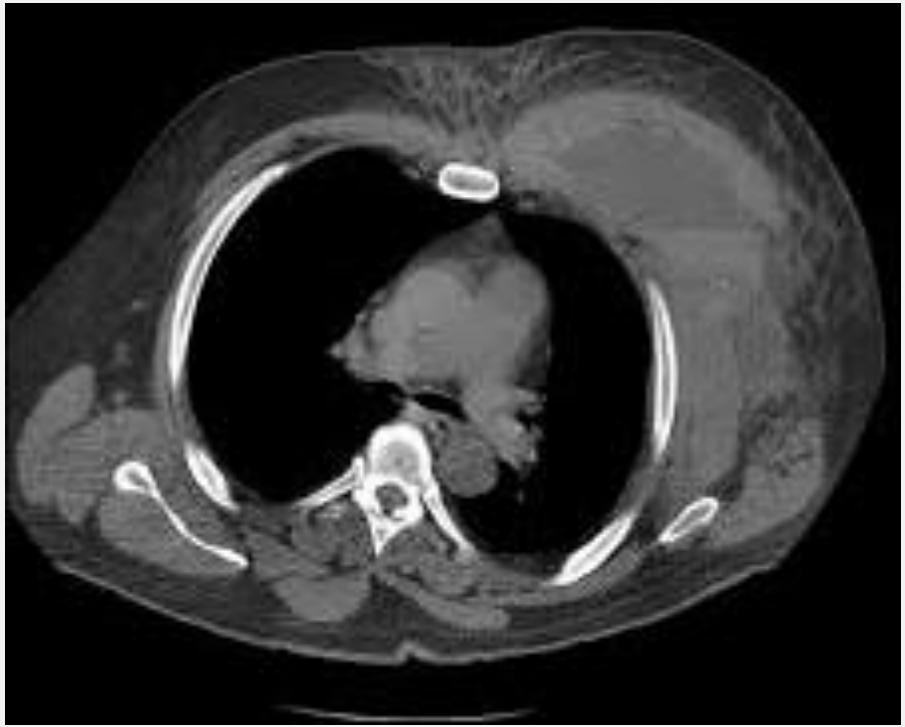
- *Hematoma* is generally defined as a collection of blood outside of blood vessels



Muscle hematoma

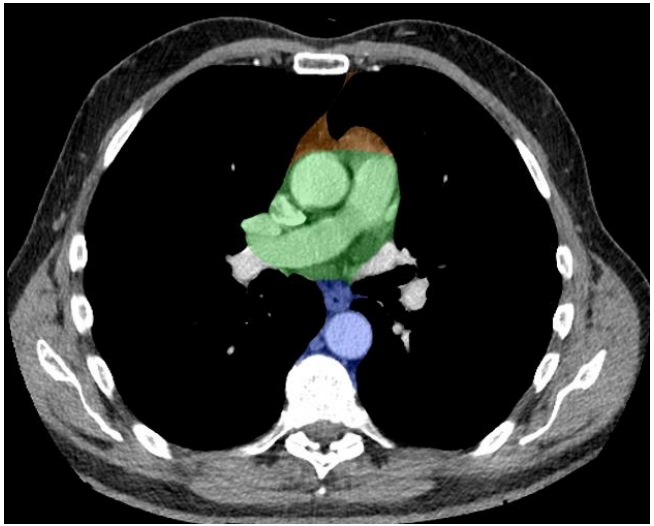


Muscle hematoma



Muscle hematoma

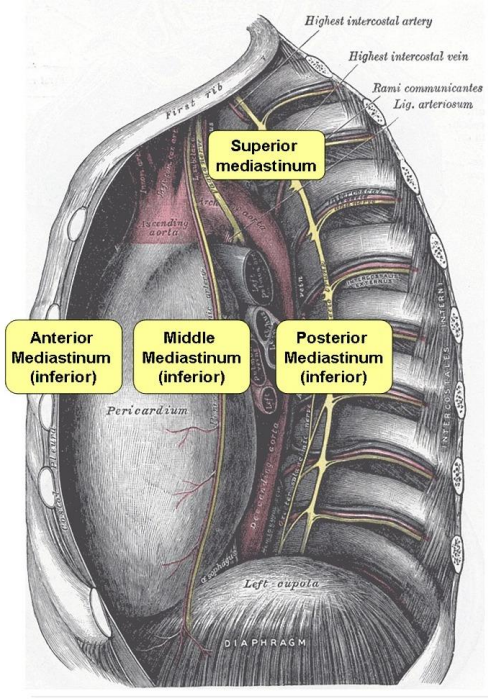
3. Mediastinum



Mediastinum

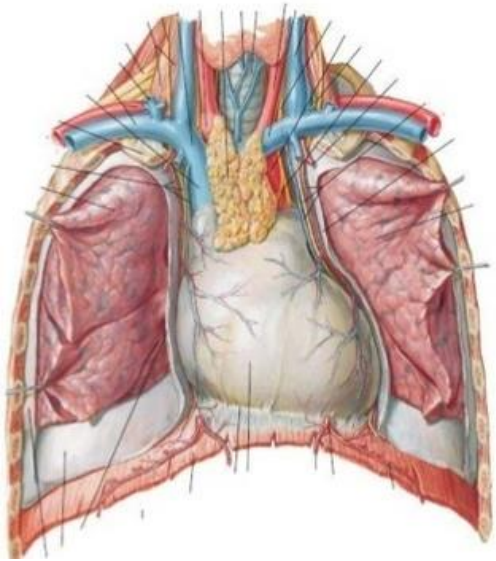
The space in the thorax that contains a group of non-delineated organs and their surrounding connective tissue

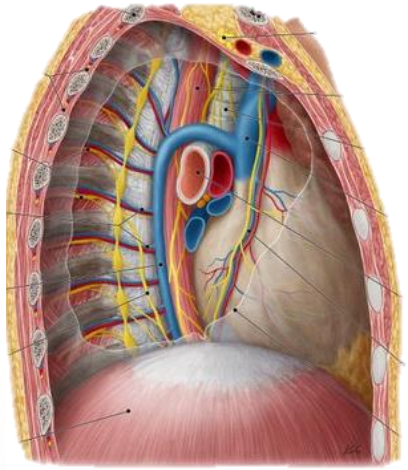
It lies in the **midline of the chest** between **the pleura of each lung** and extends from the **sternum** to the **vertebral column**



Mediastinum contents

- Thymus gland
- Heart
- Major Arties/Veins
- Esophagus
- Trachea



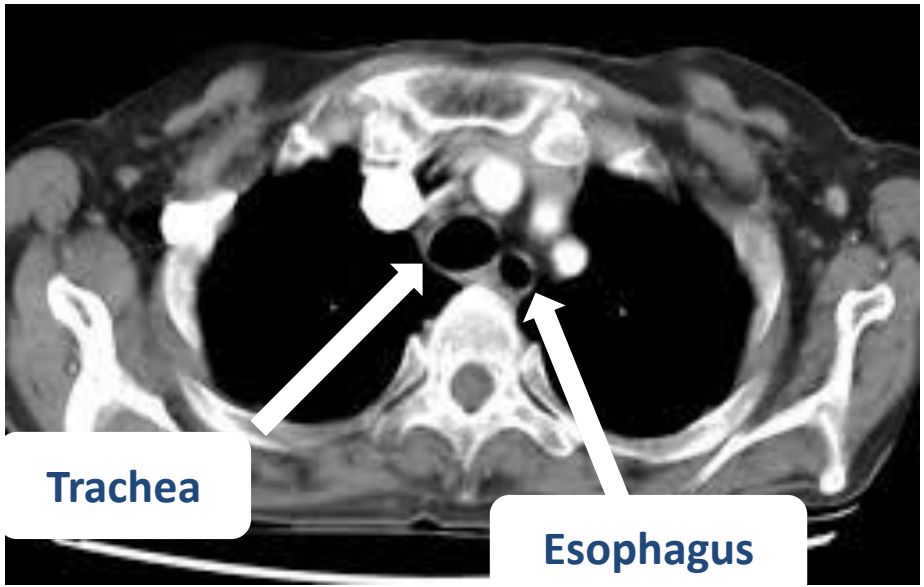


Mediastinum pathologies

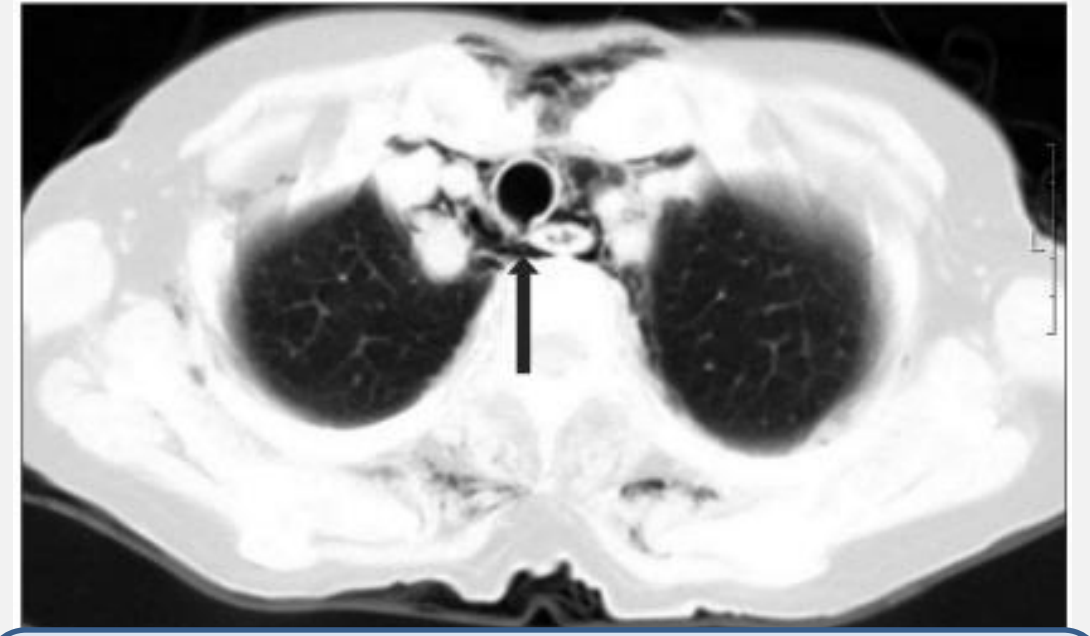
- Trachea perforation/ Trachea obstruction
- Esophageal perforation/ obstruction
- Aortic dissection, aneurysm
- Pneumomediastinum
- Pneumopericardium
- Pericardial effusion
- Mediastinal Mass

Trachea

Perforation
Obstruction

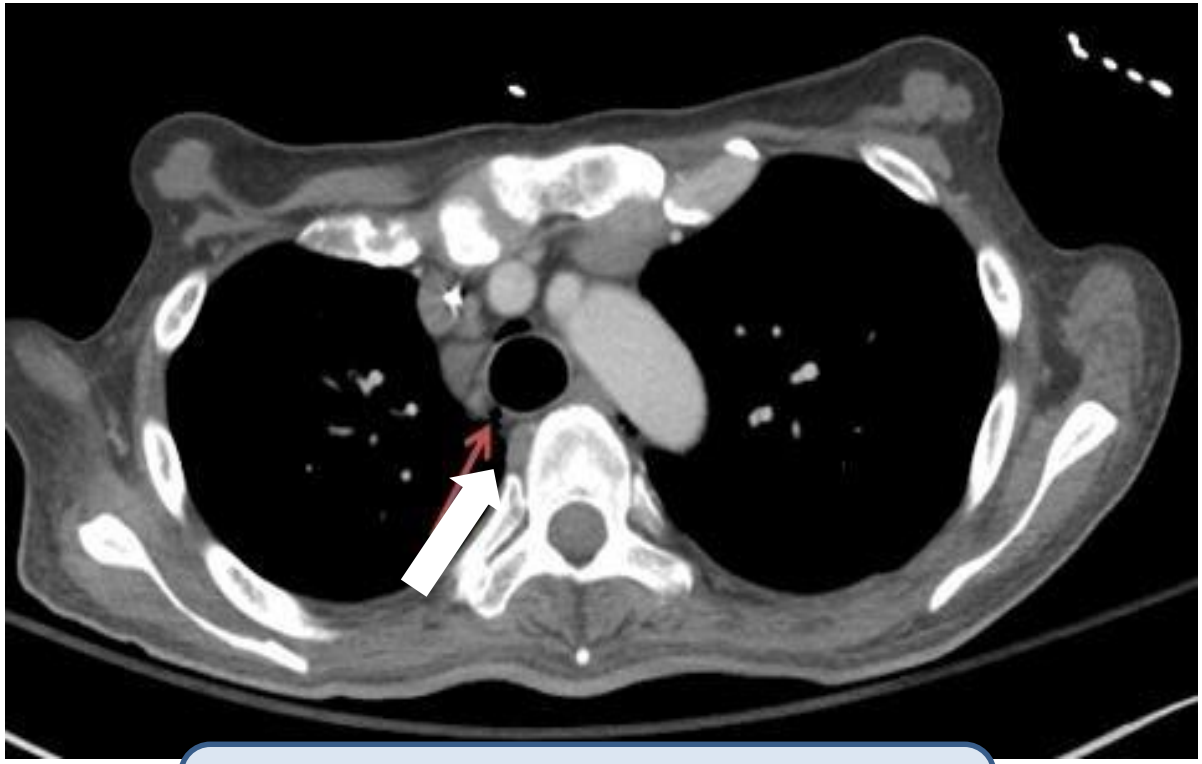


Trachea perforation

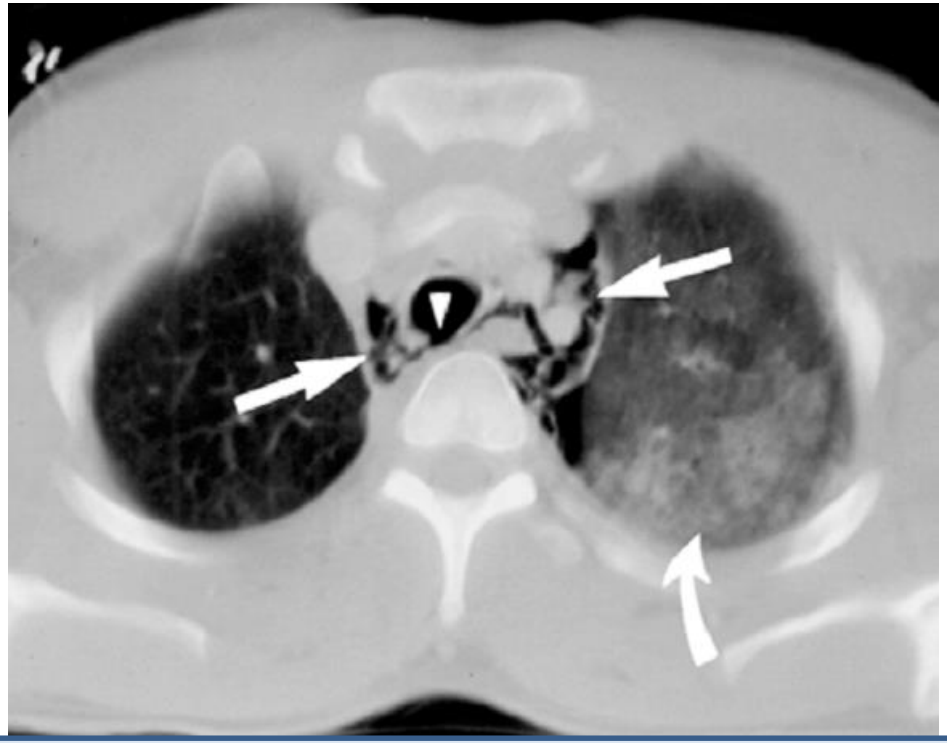


laceration on the posterior membranous wall of mid-trachea

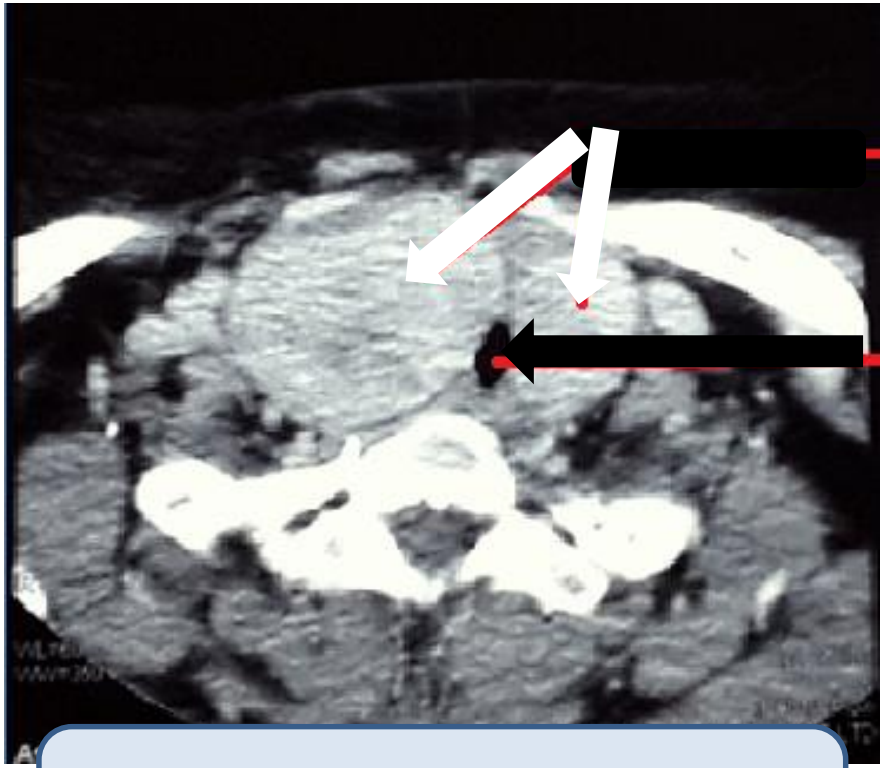
Trachea perforation



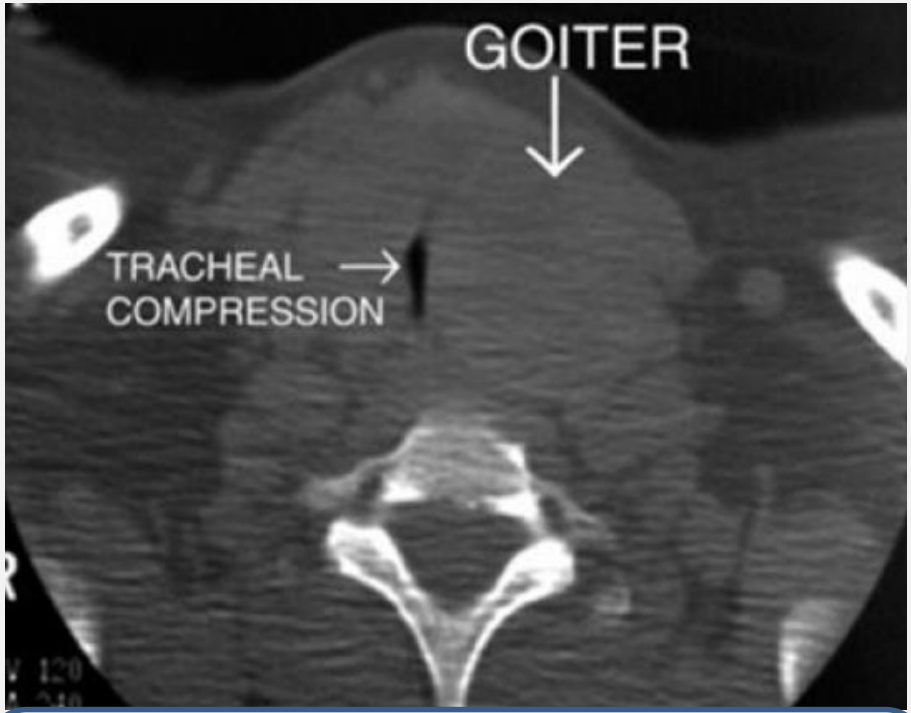
Trachea perforation



Tracheal rupture

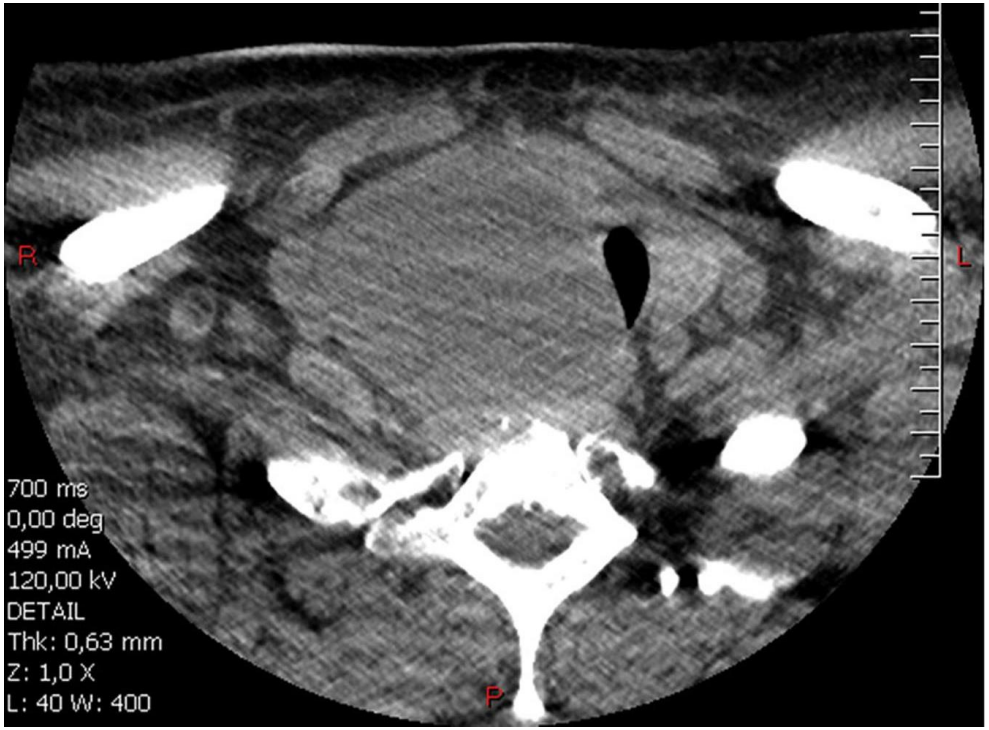


Tracheal Obstruction



Tracheal Obstruction

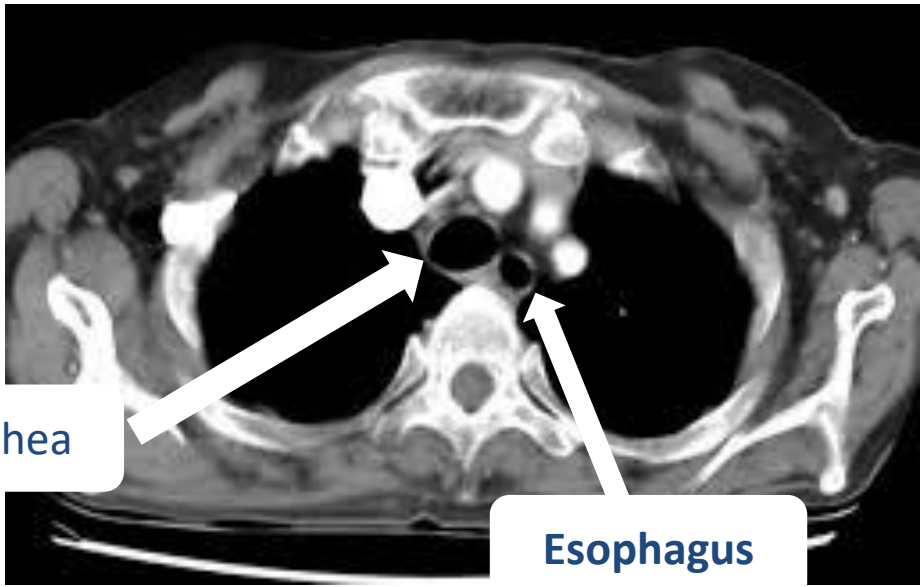
Tracheal compression by giant thyroid

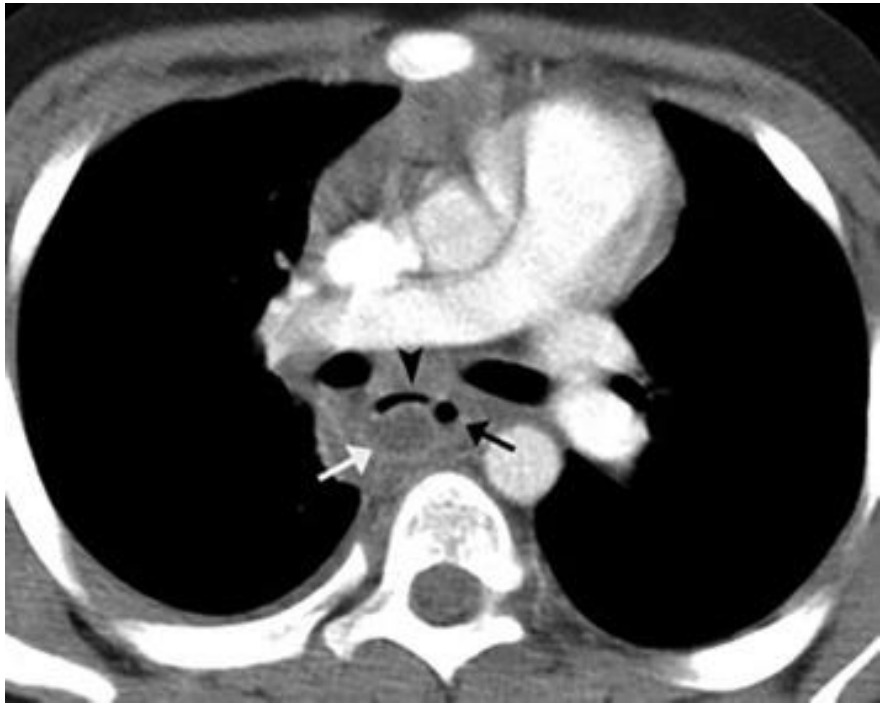


Tracheal Obstruction

Esophagus

- Perforation
- Obstruction





Esophageal perforation

1.Mediastinal fluid collection (white arrow)

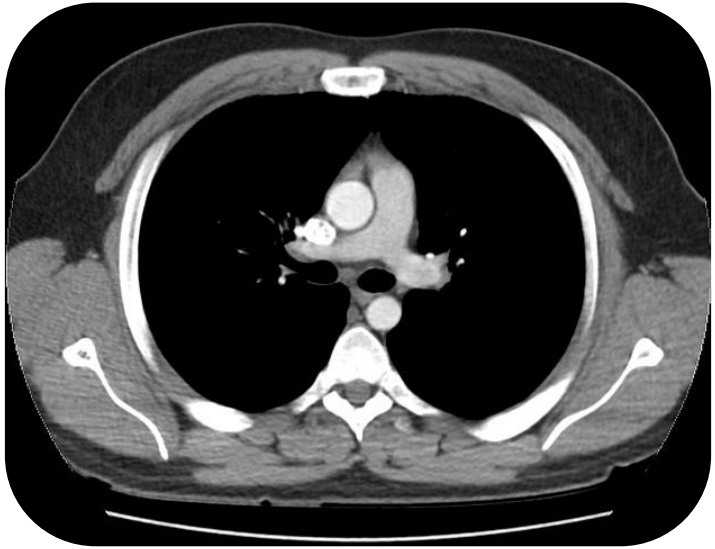
2.Extraluminal gas (black arrow)

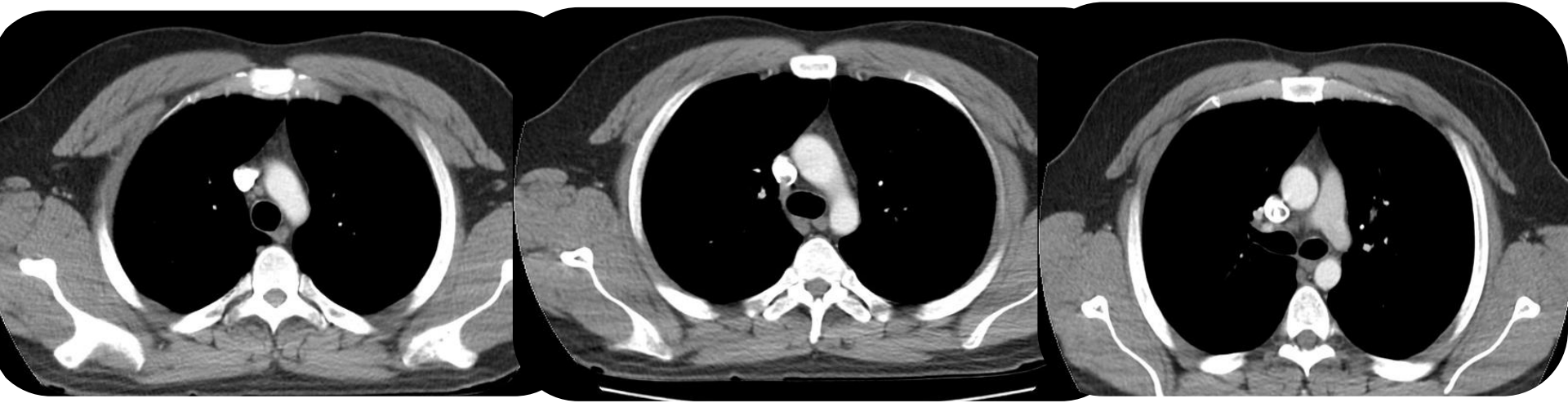
The fluid collection causes anterior displacement and narrowing of the esophagus (black arrowhead)

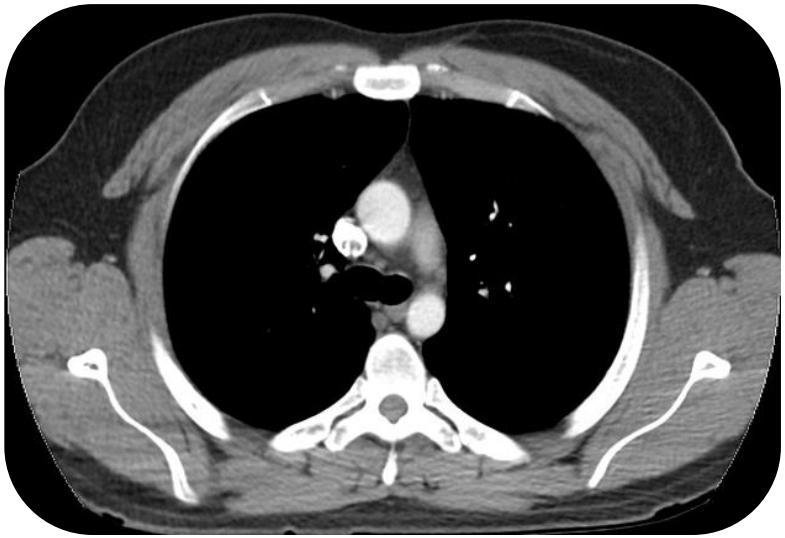
Esophageal obstruction
because of esophageal cancer

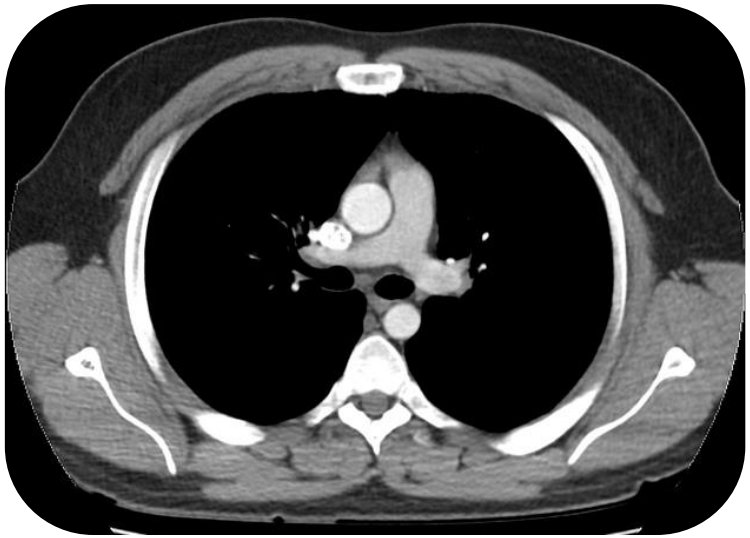
Great vessels

- Dissection
- Aneurysm

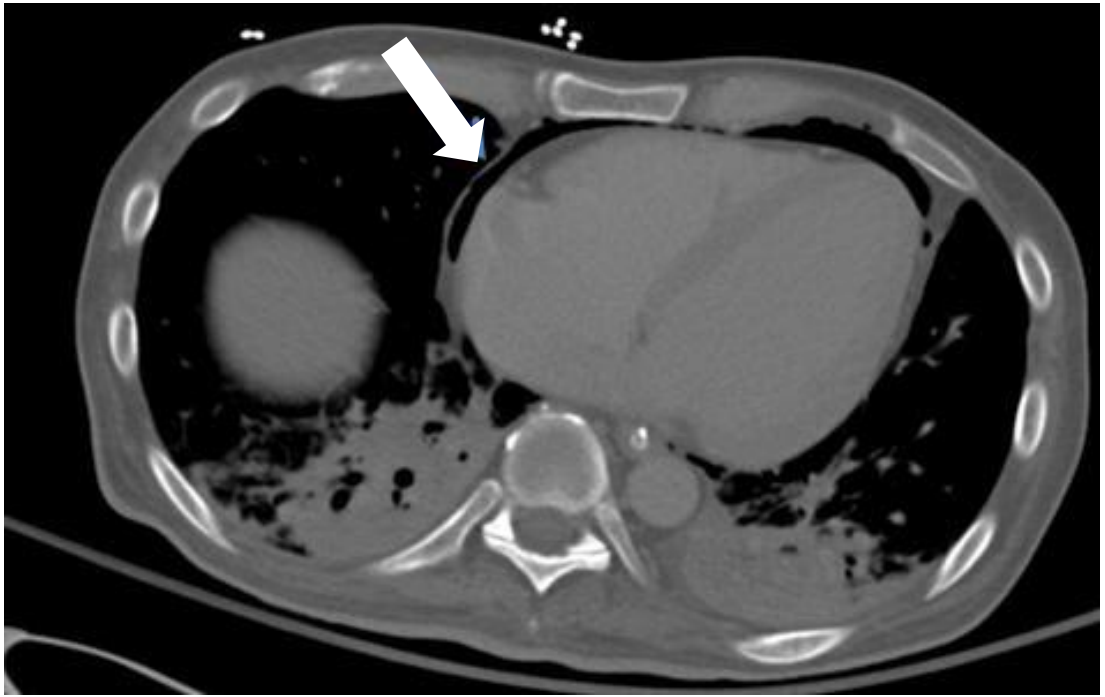




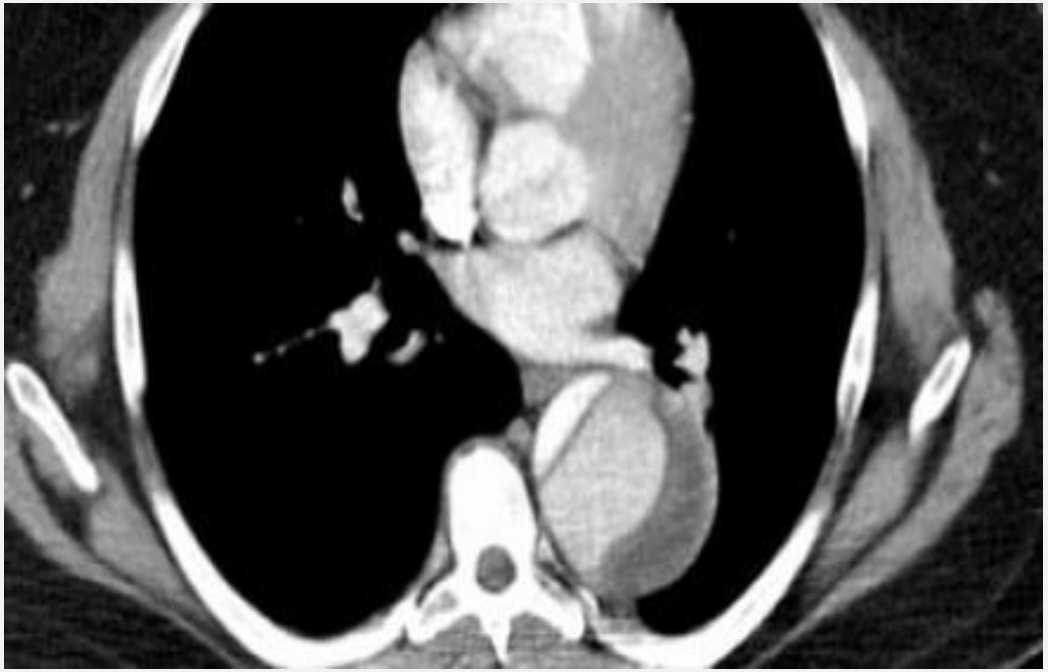




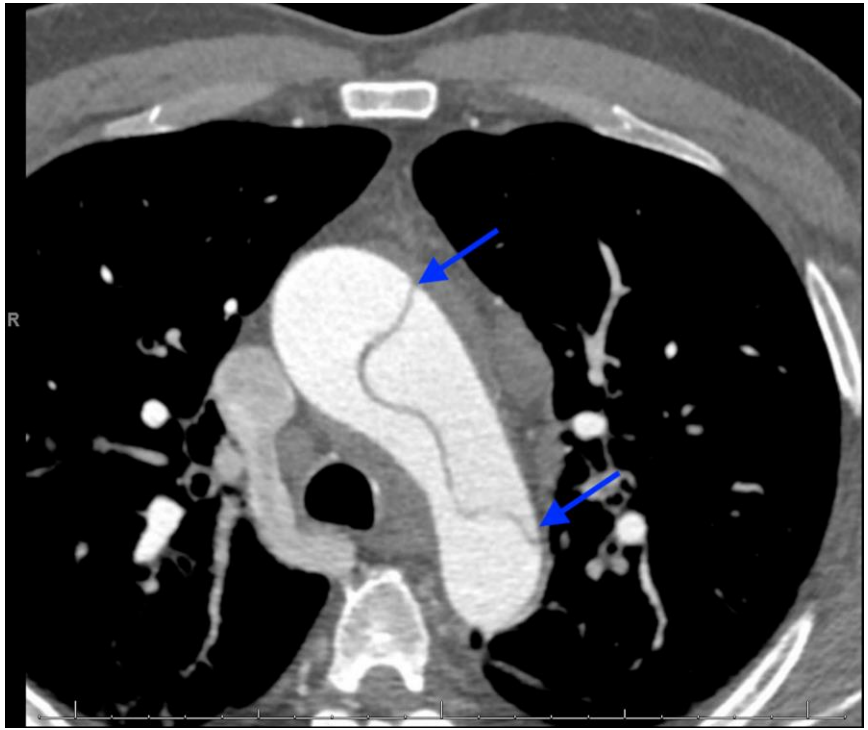
Pneumopericardium



Pneumopericardium



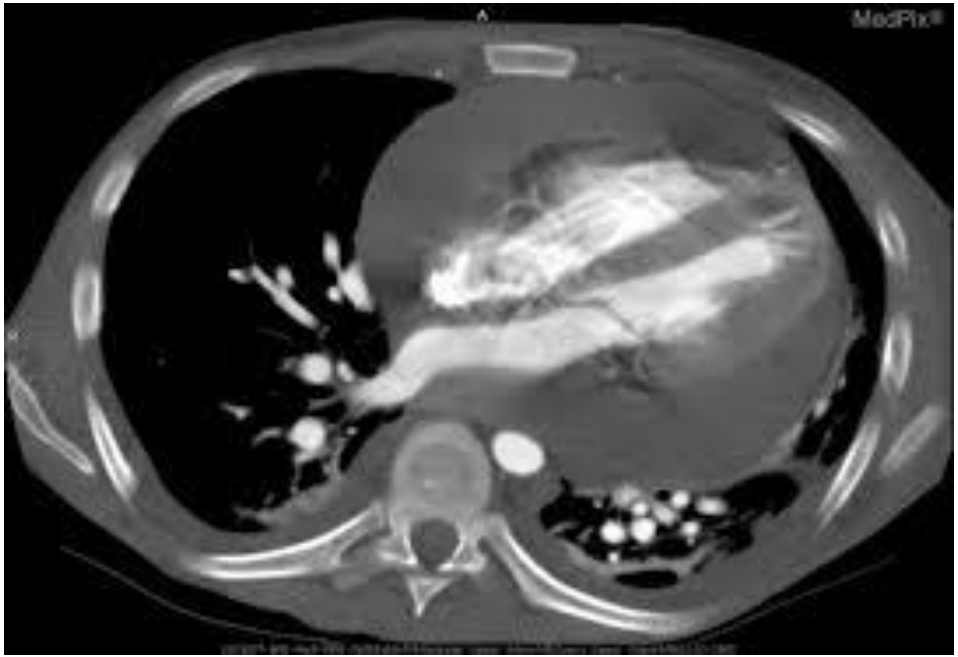
Aortic dissection



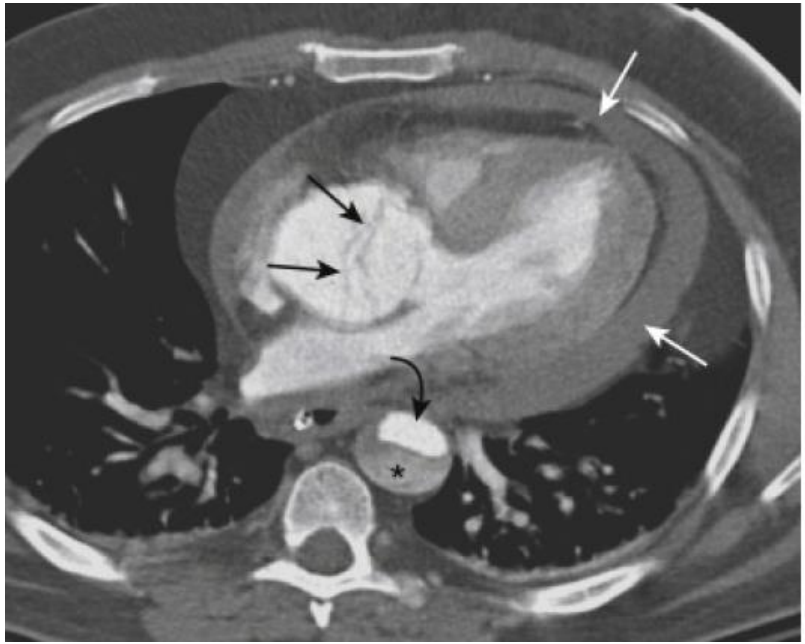
Aortic dissection

Aortic dissection

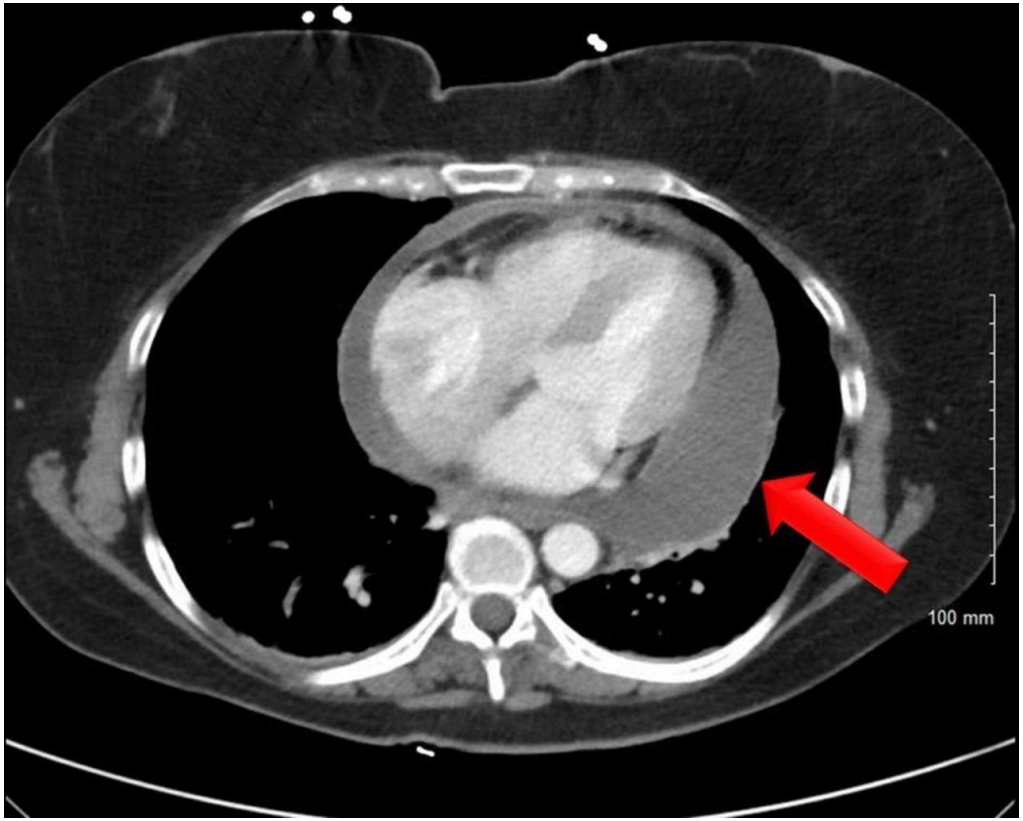
Pericardial Effusion

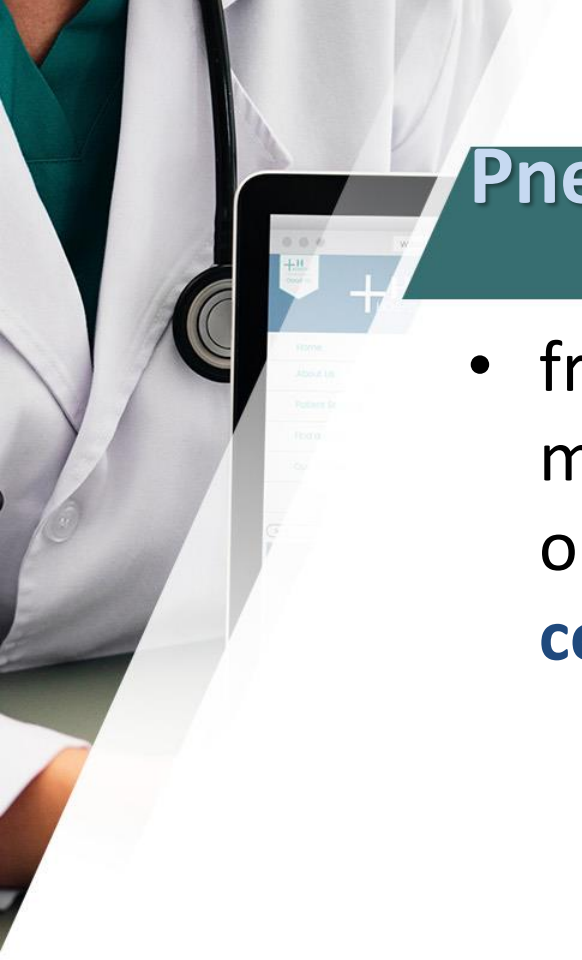


Pericardial Effusion with Tamponade



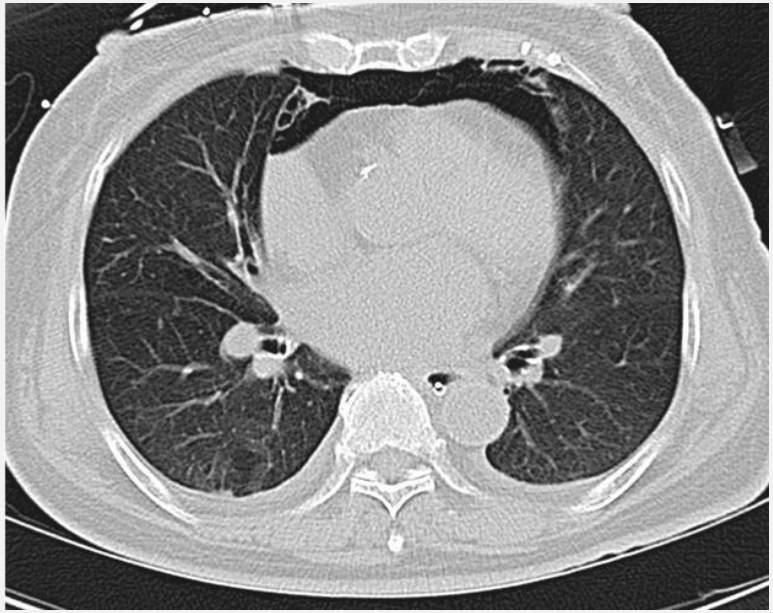
Hemopericardium (white arrows) resulting from type A aortic dissection


100 mm



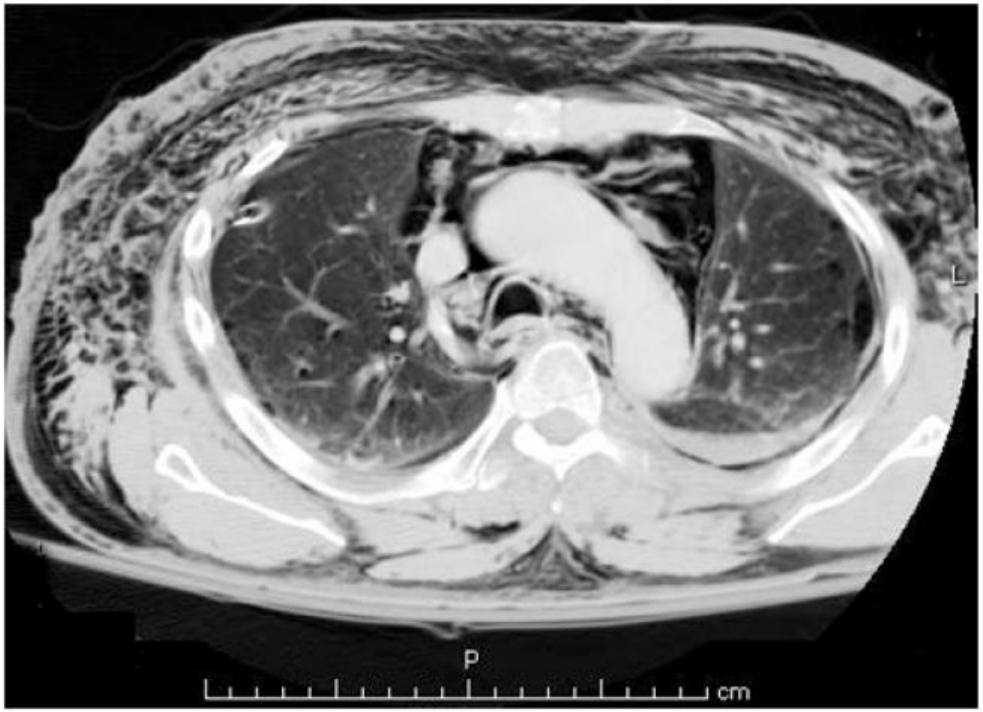
Pneumomediastinum

- free air or gas contained within the mediastinum, which almost invariably originates from the **alveolar space** or the **conducting airways**



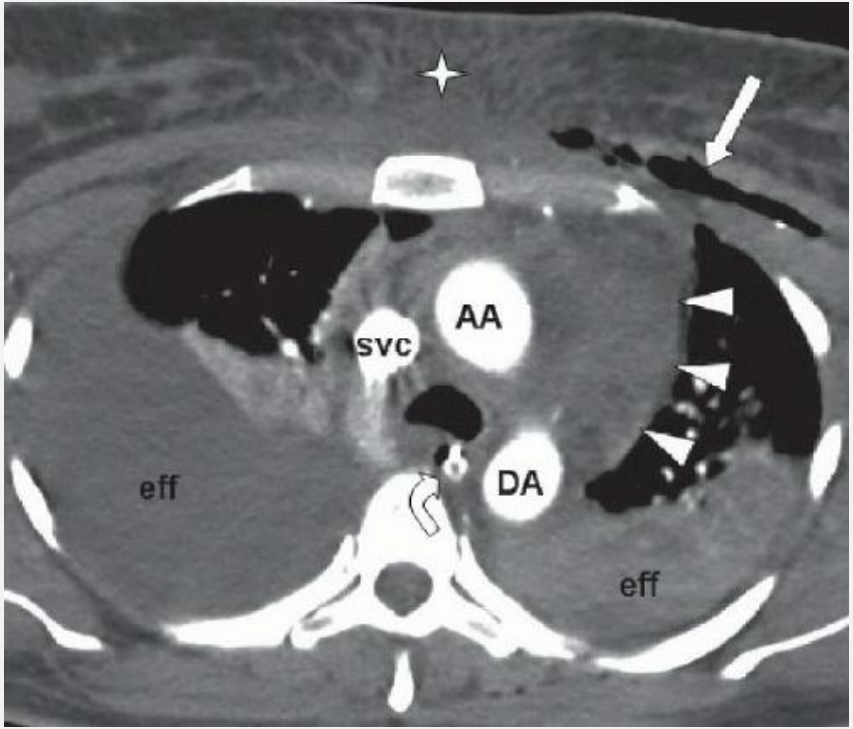
Pneumomediastinum

Pneumomediastinum



Pneumomediastinum

Mediastinal hematoma



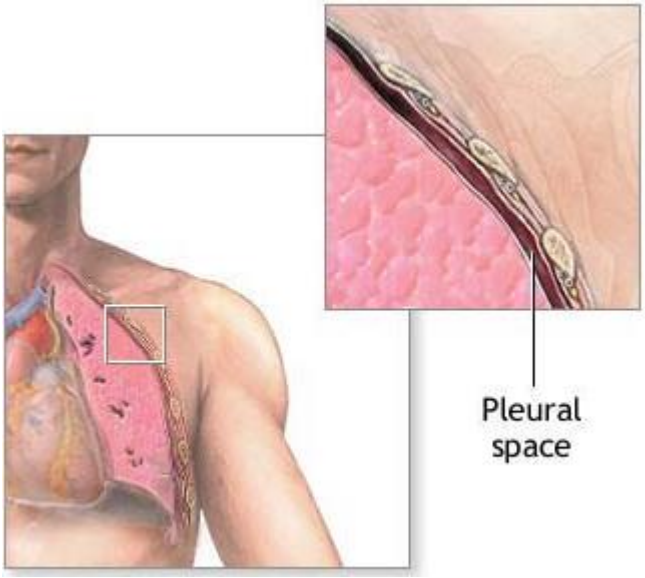
Mediastinal hematoma

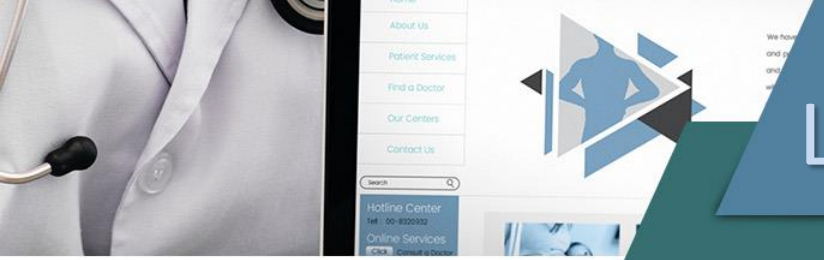
Mediastinal mass

2. lung

Lung

- Lung parenchyma
- Pleural space

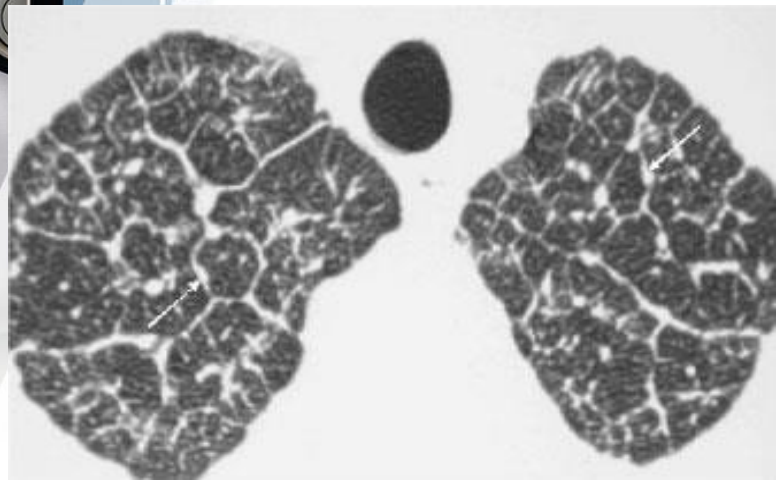


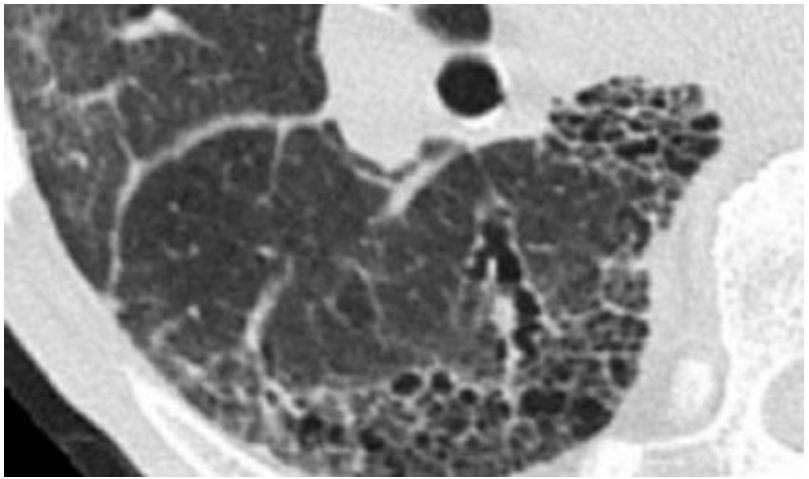


Lung interstitial pathology

- Reticular
- Nodular
- Reticonodular
- High attenuation (ground-glass, consolidation)
- low attenuation (emphysema, cystic)

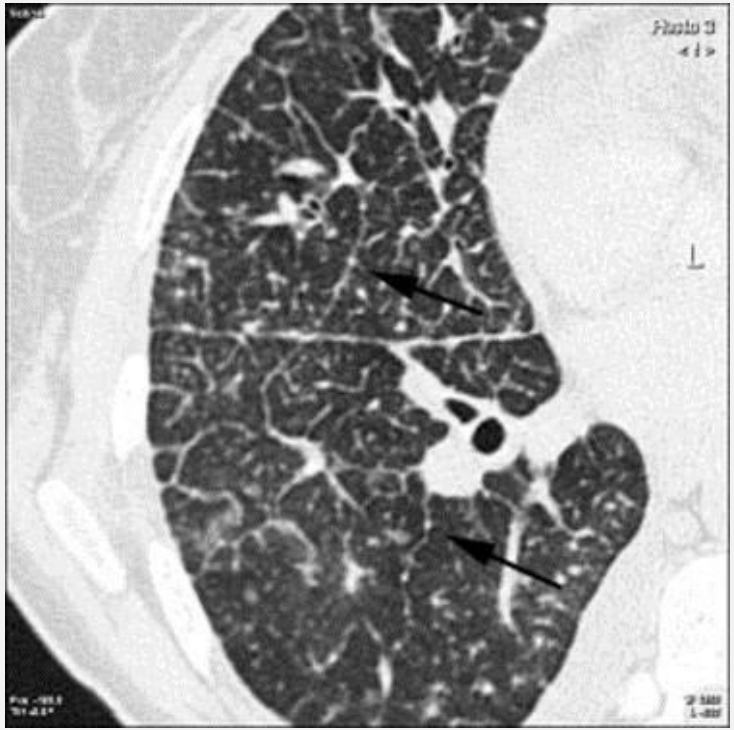
Reticular Pattern





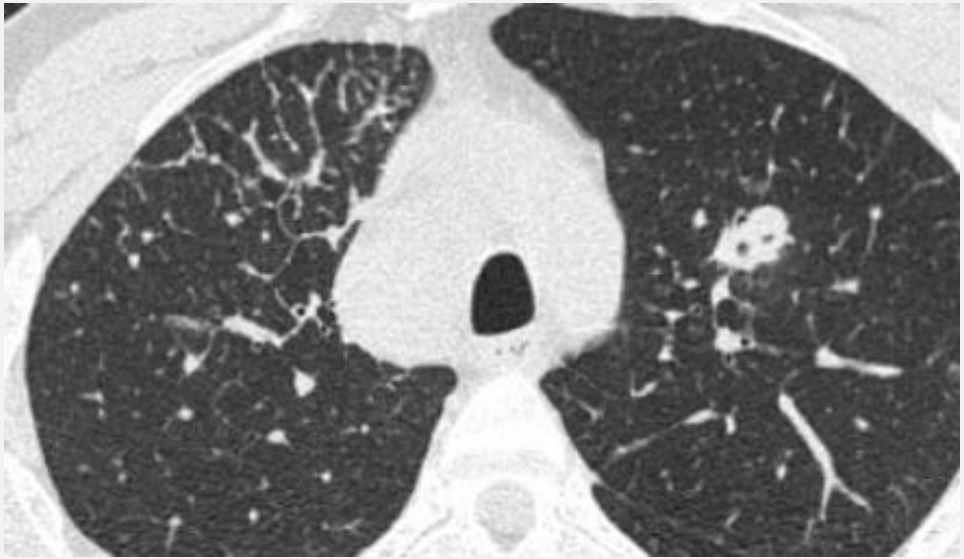
Result of thickening of the interlobular septa

Result of fibrosis as in honeycombing



Septal thickening

Reticular Pattern



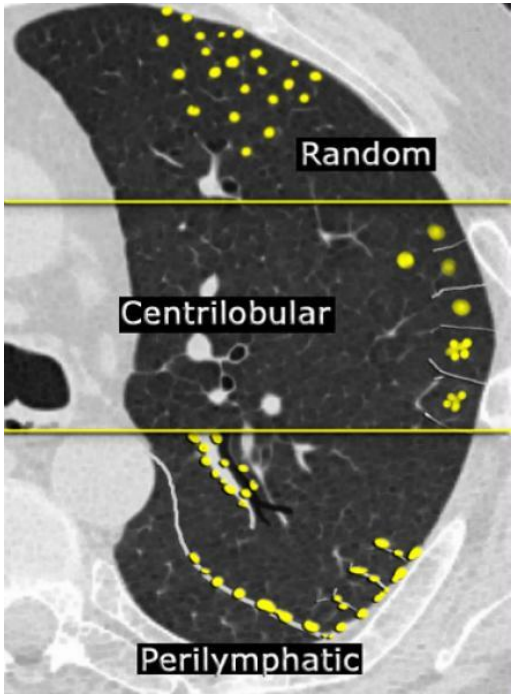
Thickening of the interlobular septa

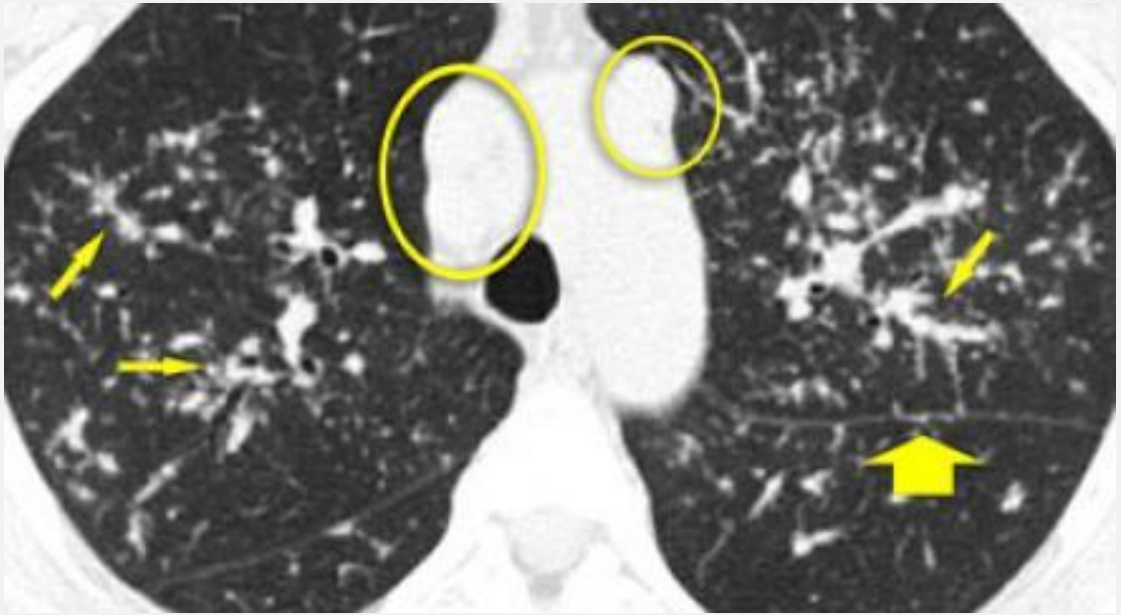
Bilateral septal thickening and ground-glass opacity.
Perihilar and gravitational distribution predominantly in the dependent lung.
Cardiomegaly and pleural fluid

Reticulonodular and ground glass

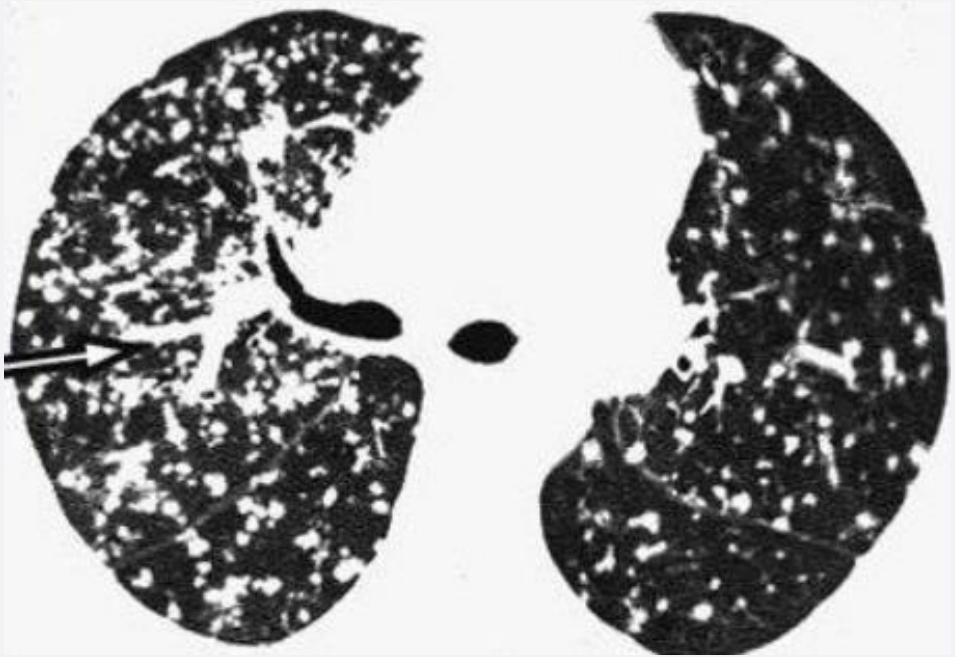
Nodular pattern

The distribution of nodules shown on HRCT is the most important factor in making an accurate diagnosis in the nodular pattern





Perilymphatic nodules in sarcoidosis



Nodular pattern

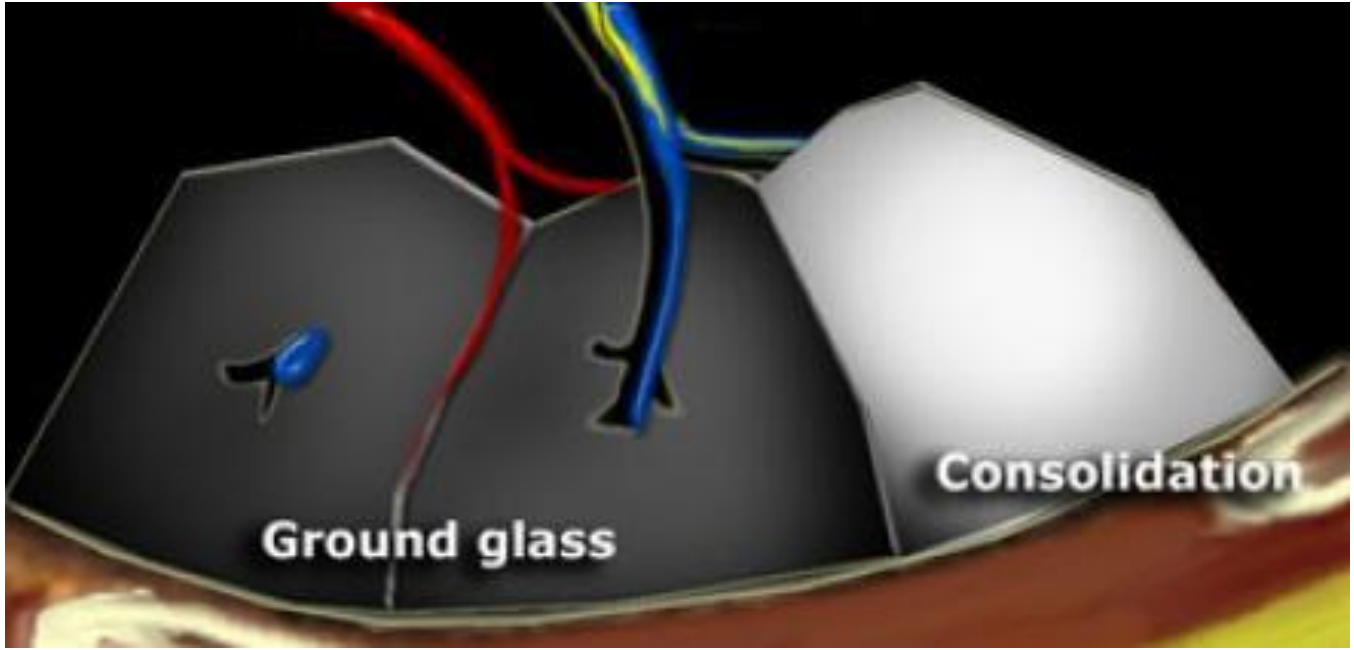
High attenuation pattern

Increased lung attenuation

Ground-glass opacity

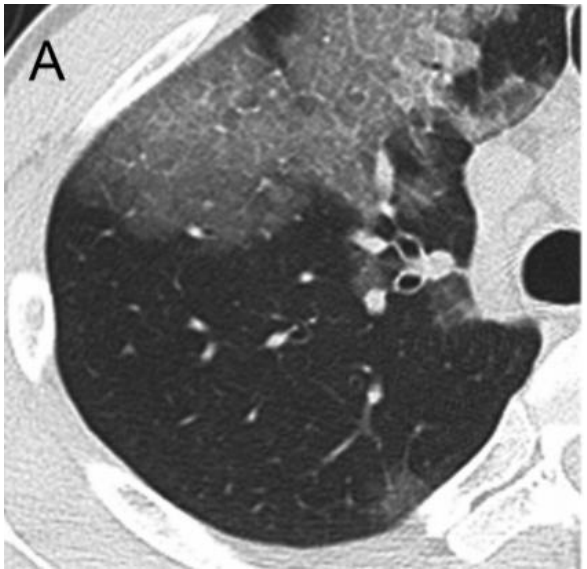
Consolidation

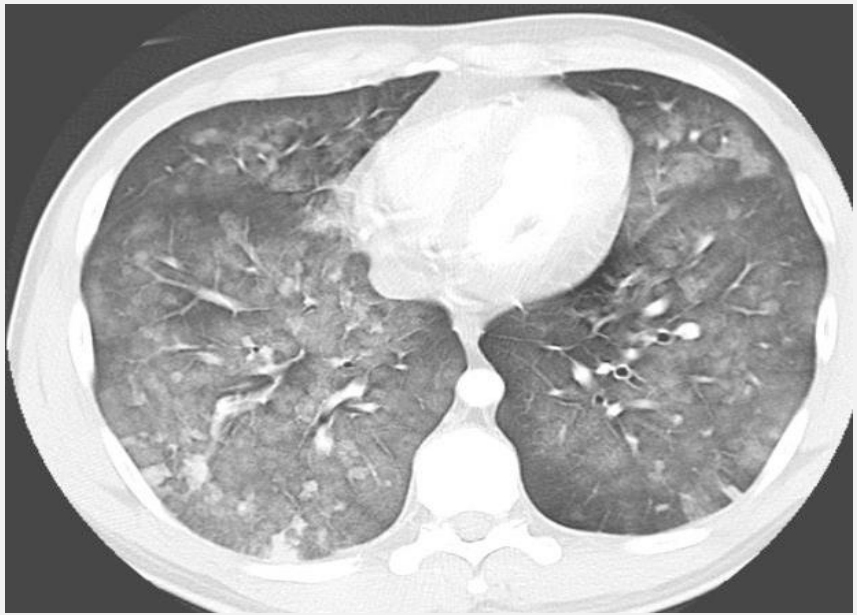
High attenuation pattern



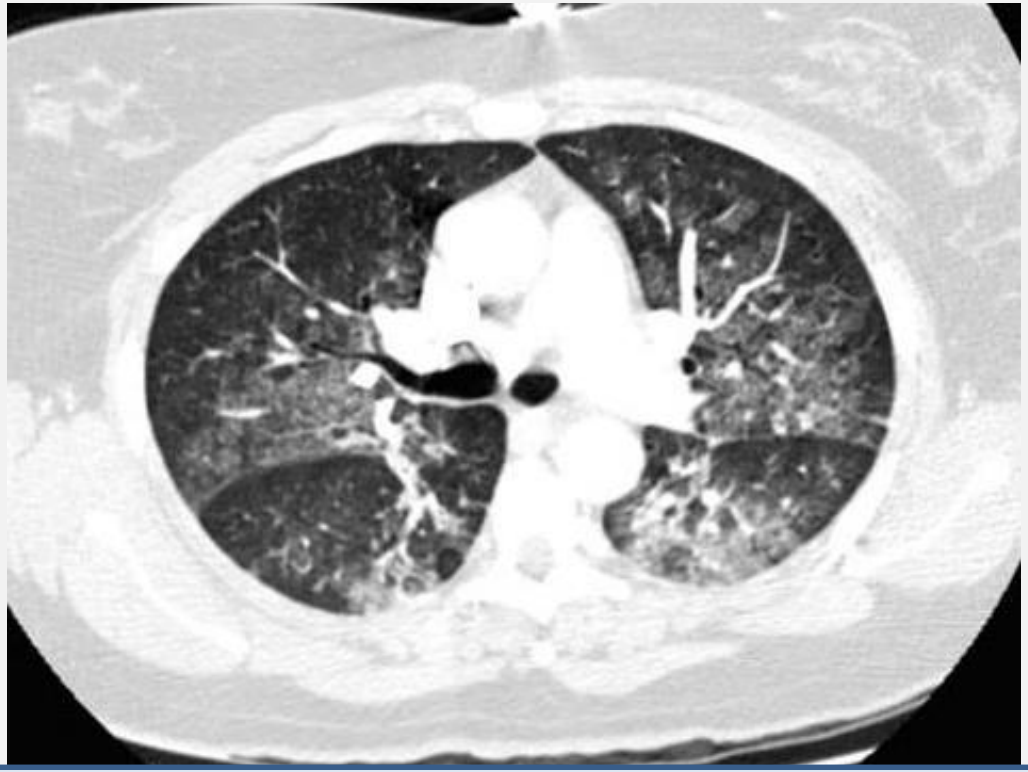
Ground-glass opacity

- *hazy increase in lung opacity without obscuration of underlying vessels*

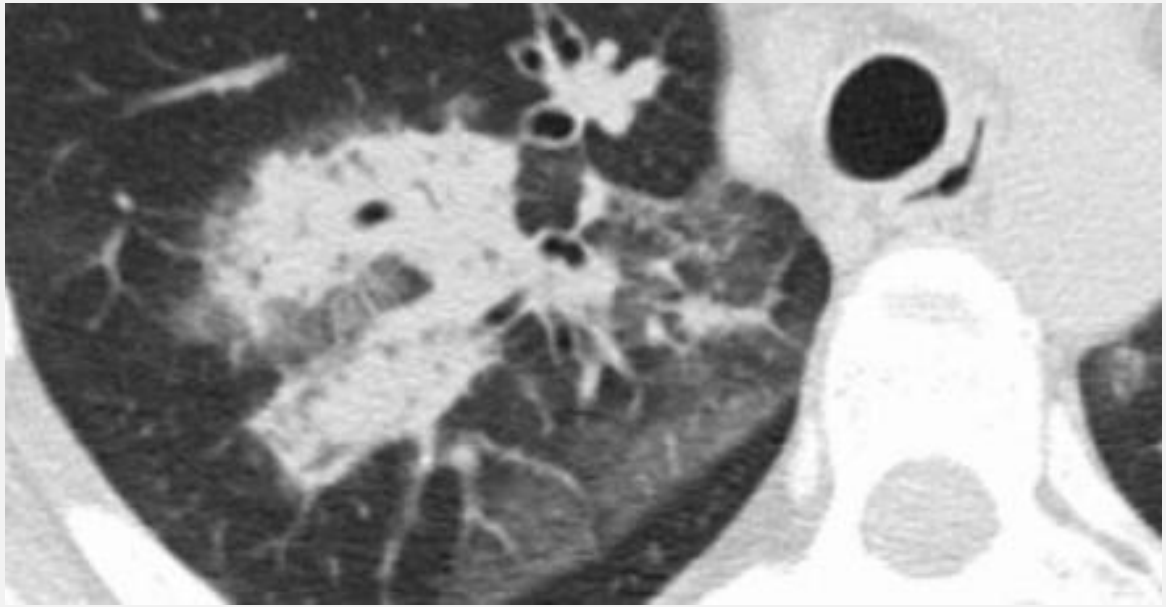




Diffuse ground glass and confluent airspace densities



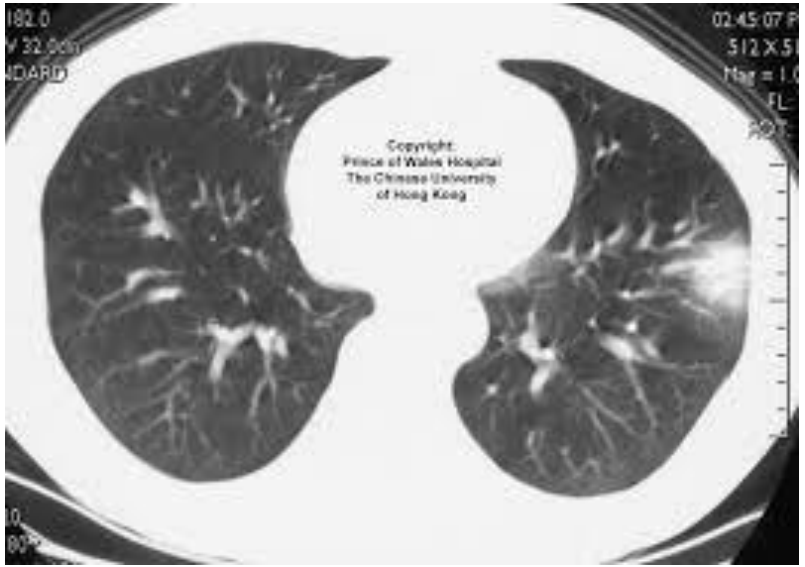
Ground glass opacity in a mainly perihilar and dependent distribution

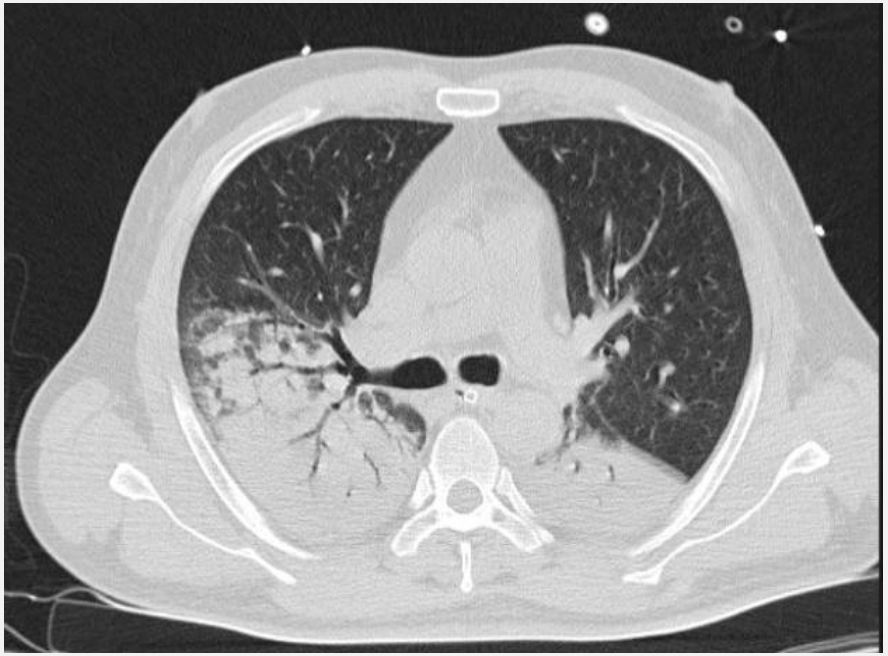


Consolidation+ Ground glass

Consolidation:

- *Increase in lung opacity obscures the vessels*

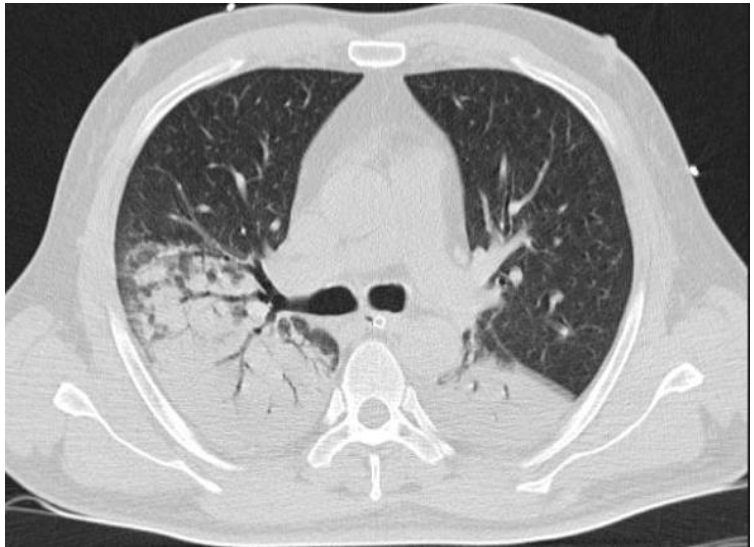


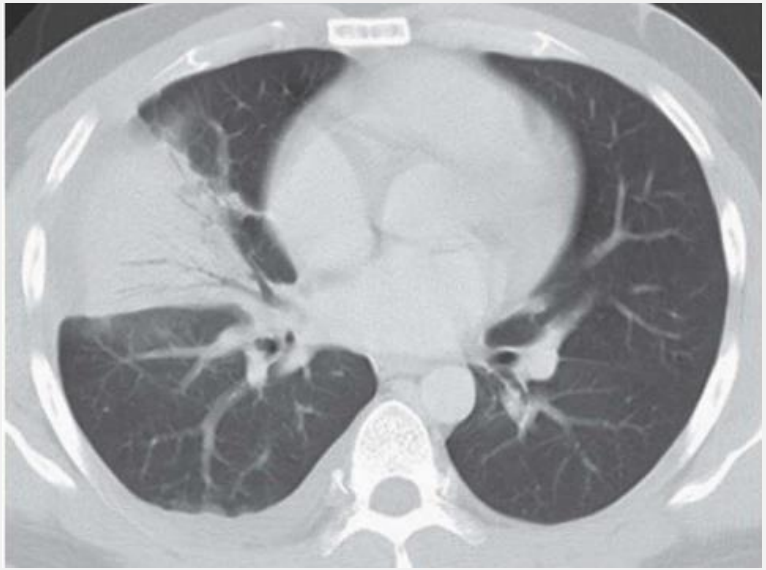


Pulmonary consolidation with airbronchograms

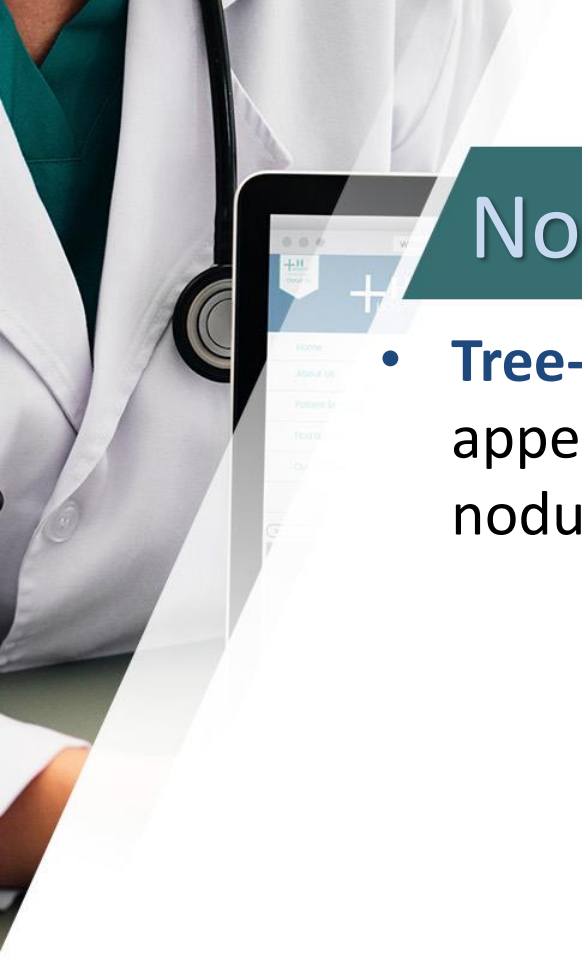
Note

Air bronchogram refers to the phenomenon of air-filled bronchi (dark) being made visible by the opacification of surrounding alveoli (grey/white)





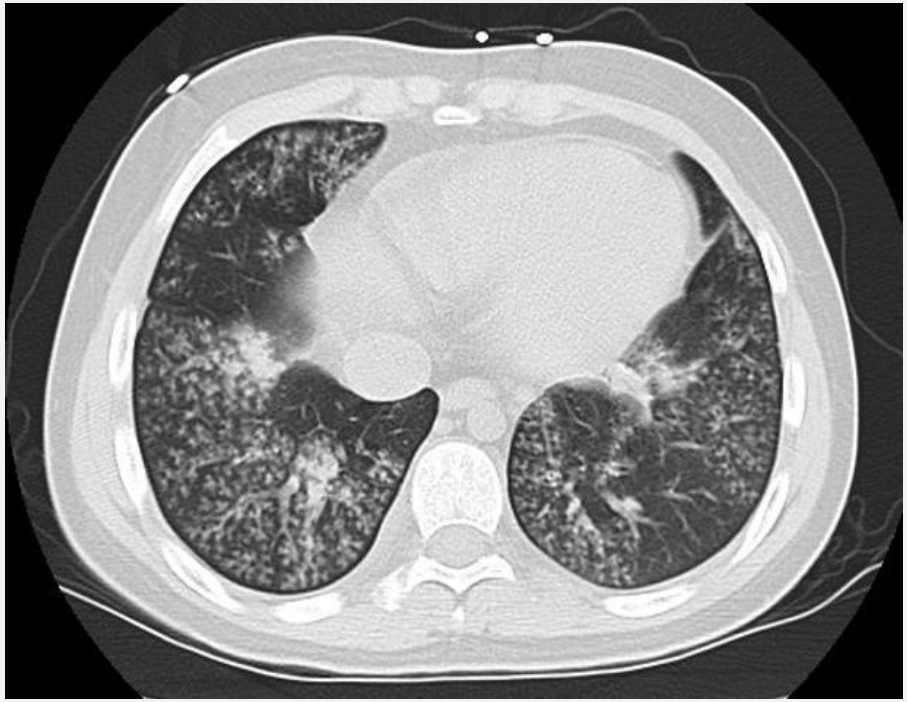
Lubar pneumonia



Note

- **Tree-in-bud sign** or **pattern** describes the CT appearance of multiple areas of centrilobular nodules with a linear branching pattern

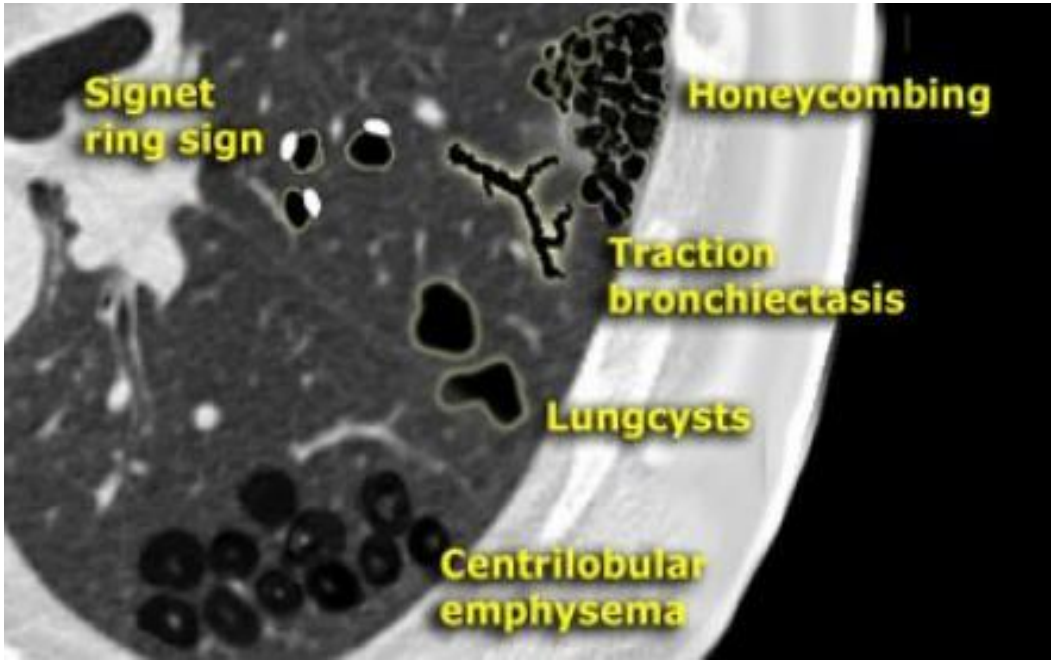
Tree-in-bud sign



Tree-in-bud sign

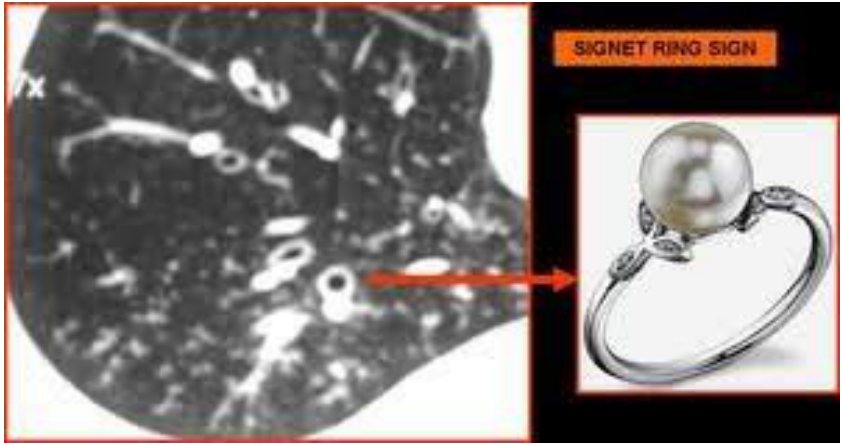
Low Attenuation pattern

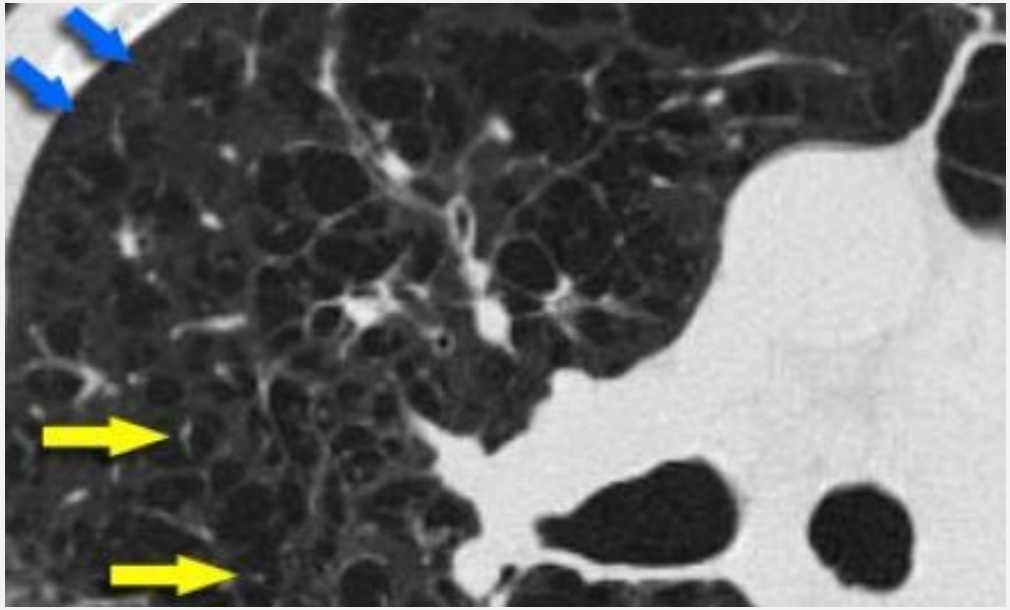
Emphysema
Lung cysts
Bronchiectasis
Honeycombing



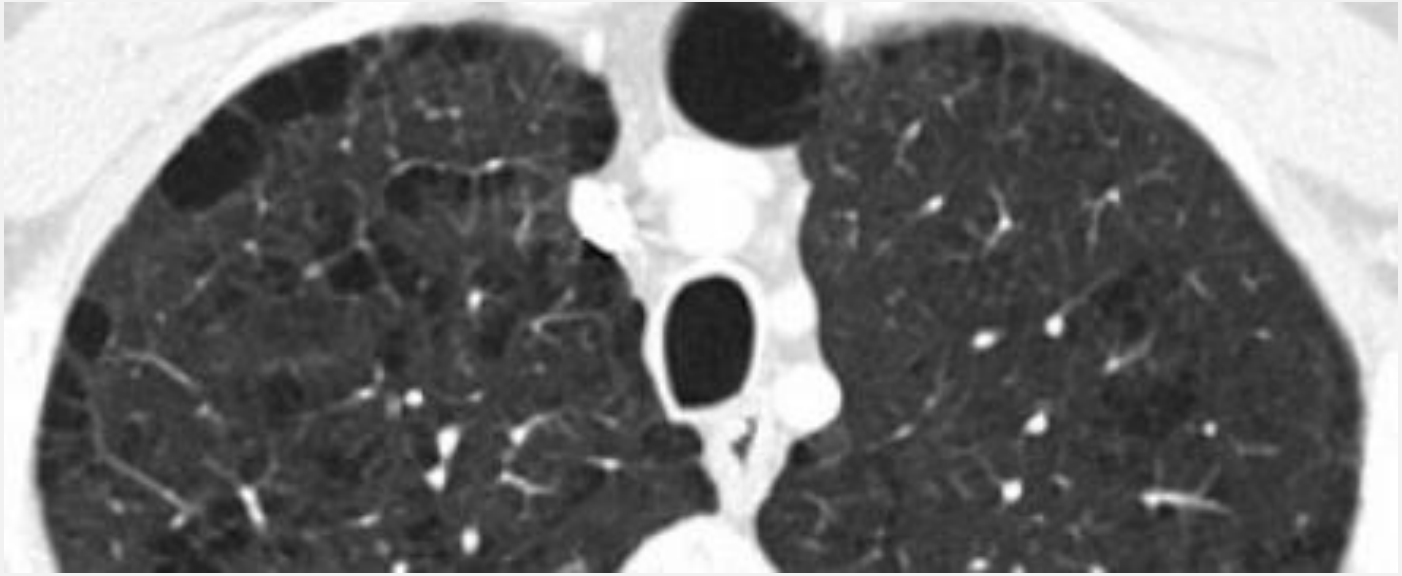
Note

A signet-ring sign represents an axial cut of a dilated bronchus (ring) with its accompanying small artery (signet).

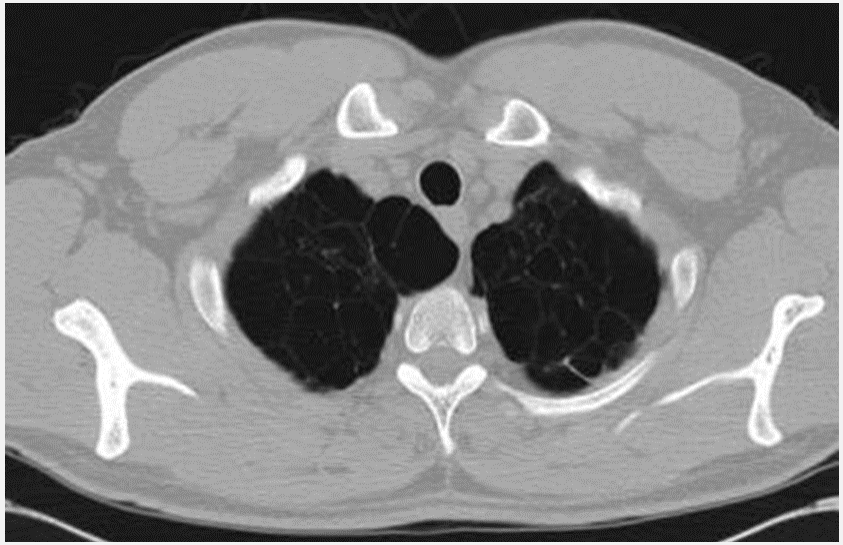


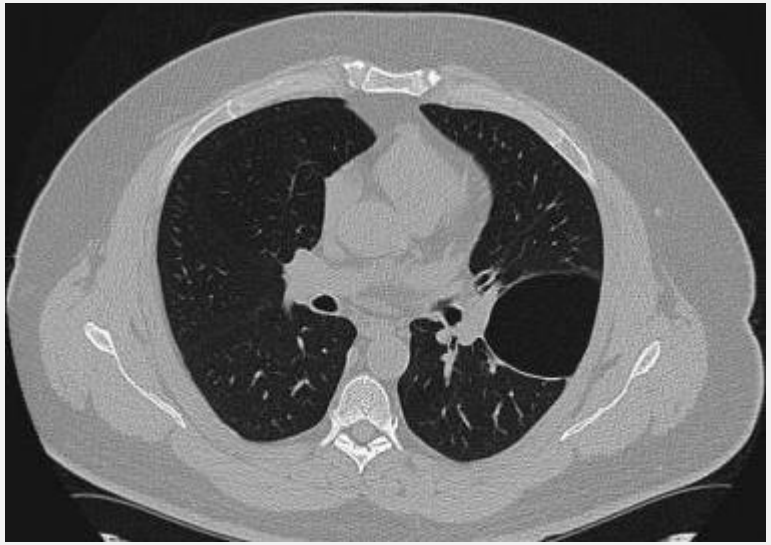


Centrilobular emphysema

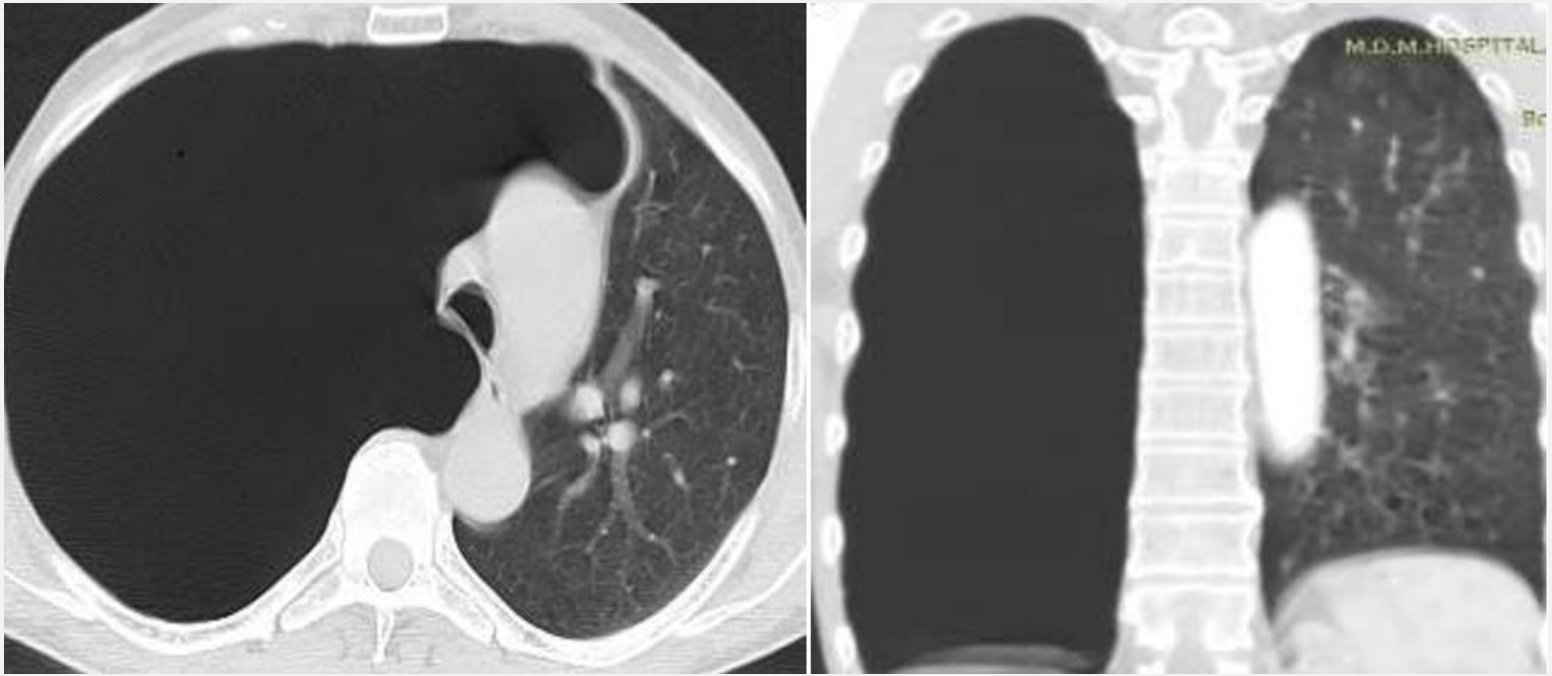


Paraseptal emphysema

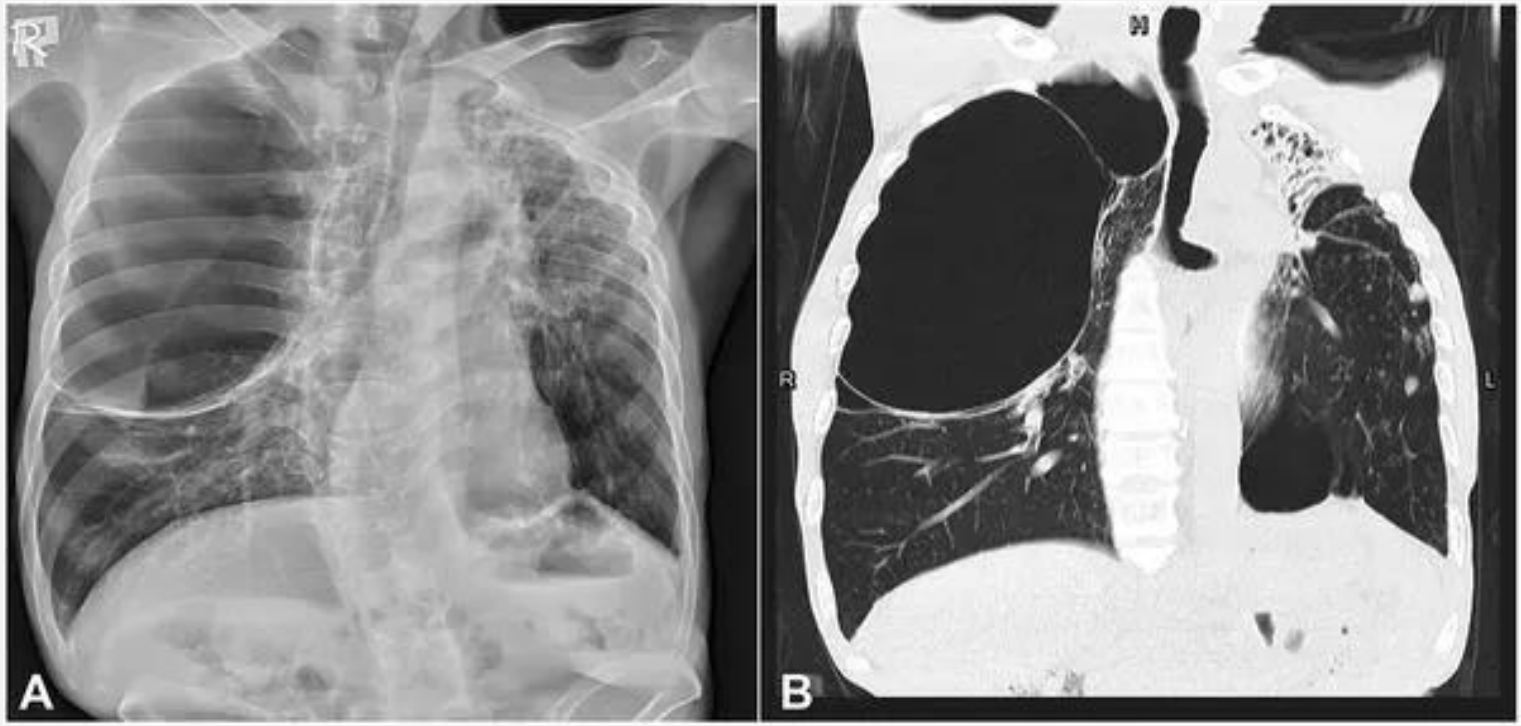




Pulmonary bullae are focal regions of emphysema with no discernible wall which measure more than 1 or 2 cm in diameter

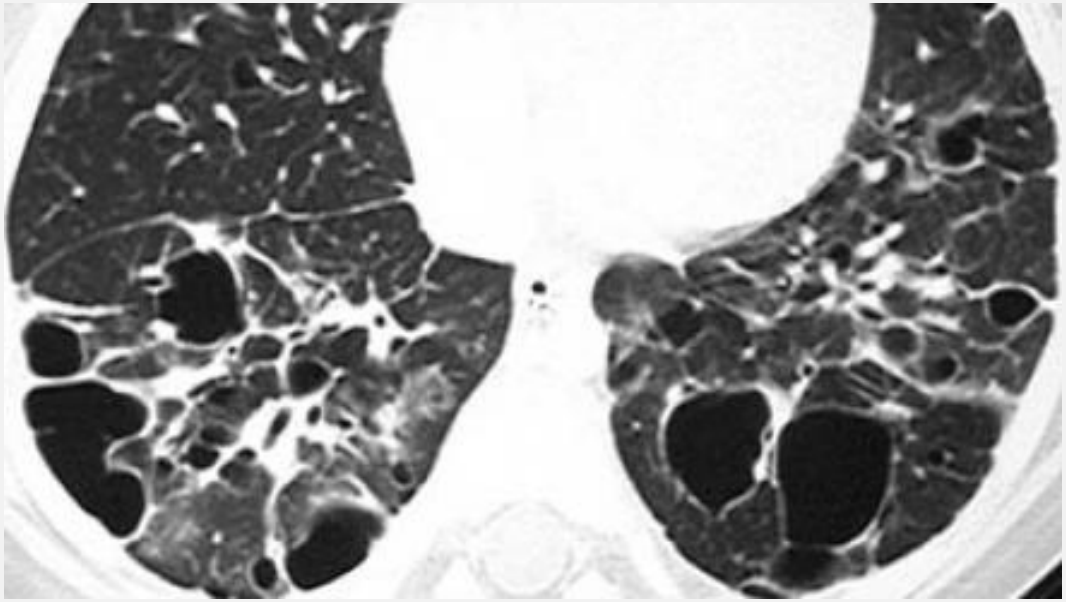


Giant bulla

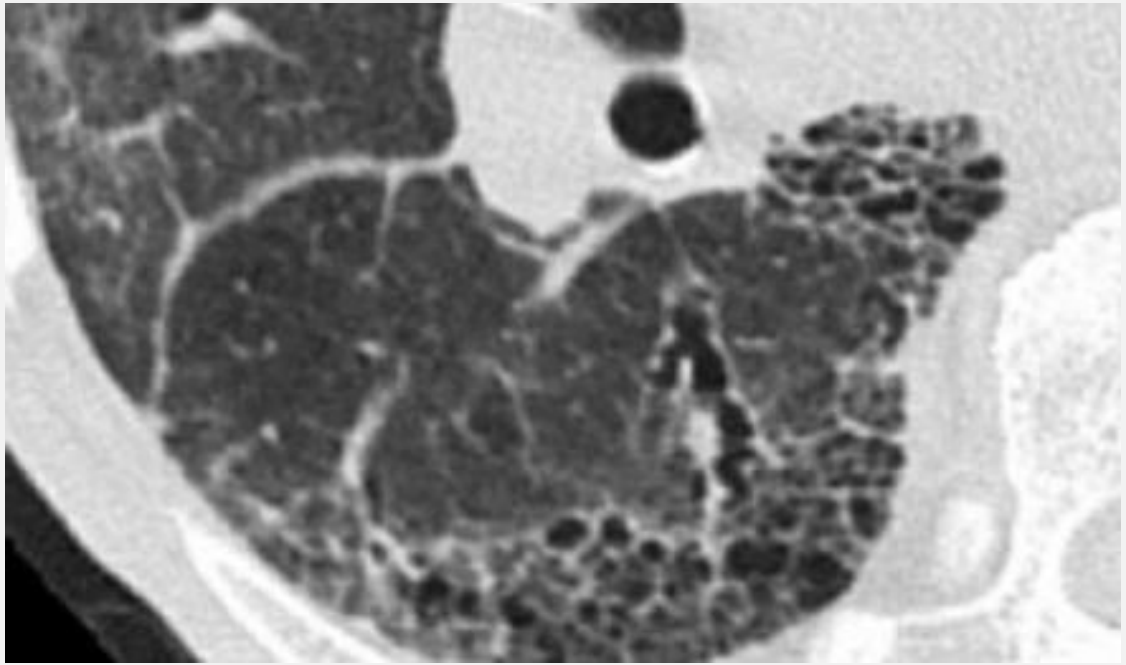


Giant bulla

Pulmonary bulla



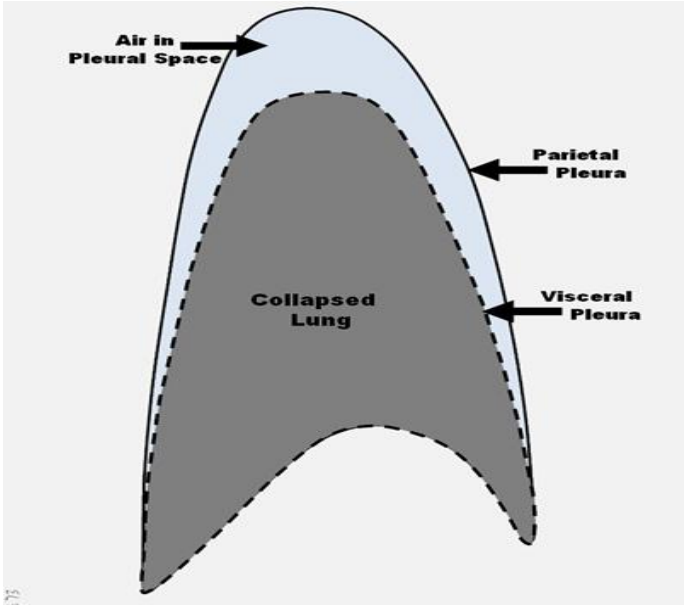
Cystic lung disease



Honeycombing

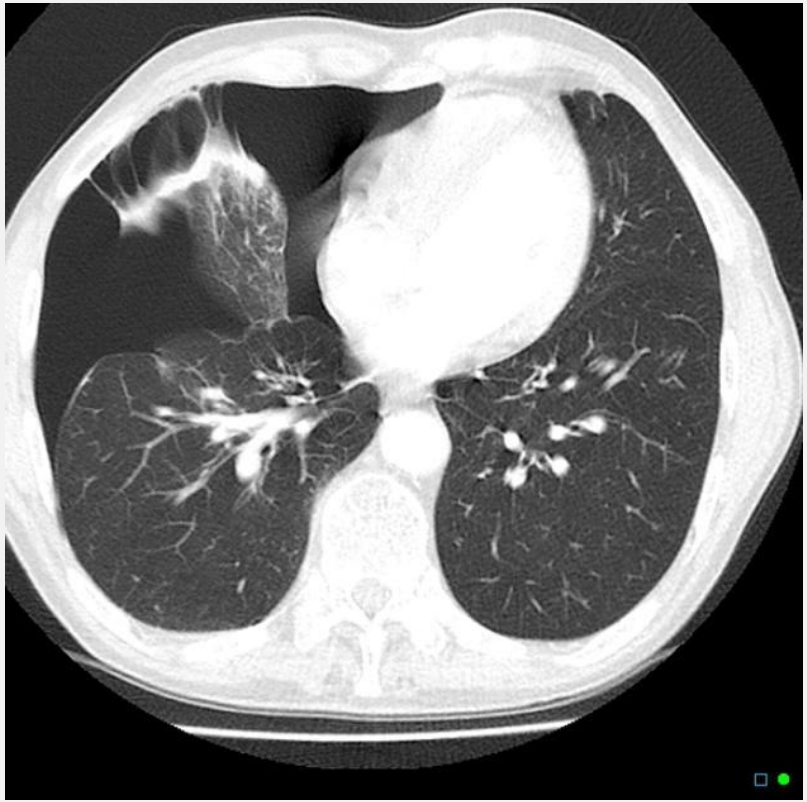
Pleural space

- Pneumothorax
- Pleural effusion

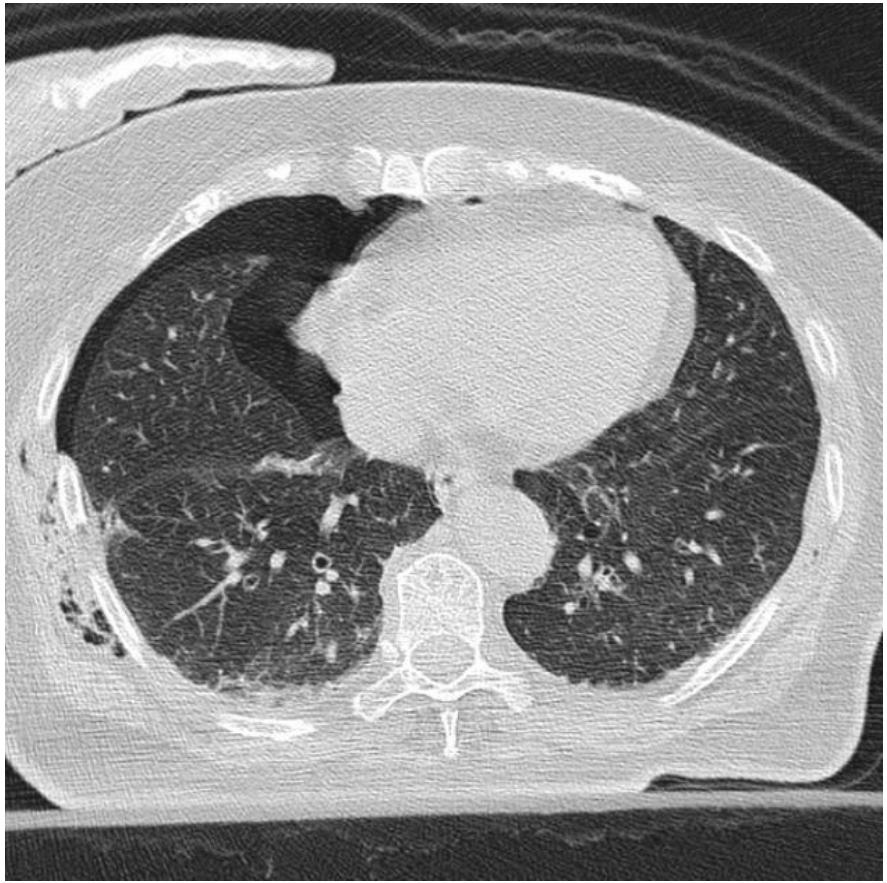


Pneumothorax

- Pneumothorax is defined as the presence of air or gas in the pleural cavity



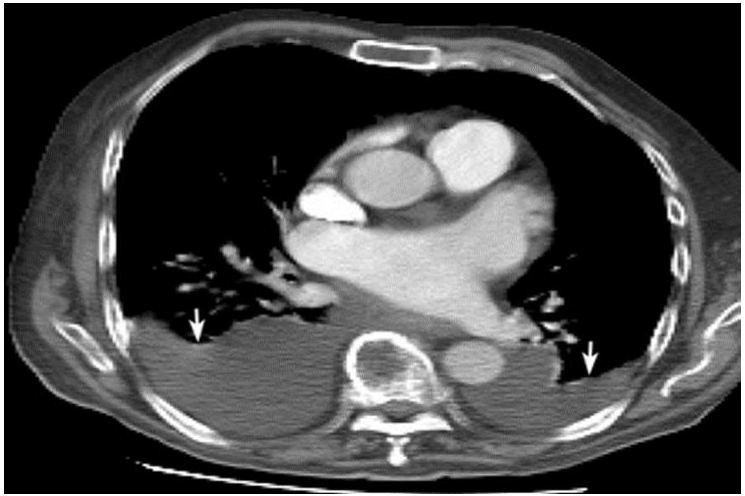
Loculated pneumothorax due to pleural adhesions

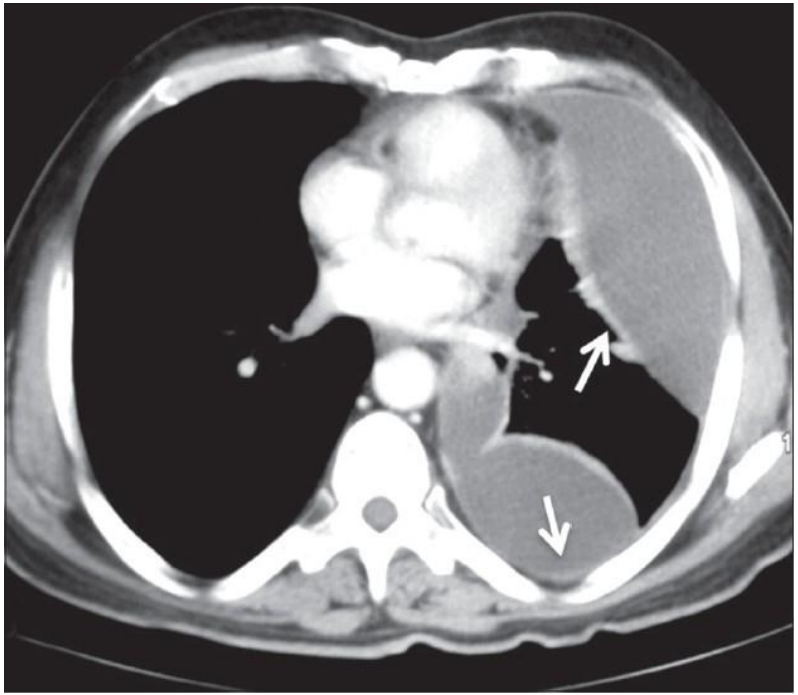


Tension pneumothorax

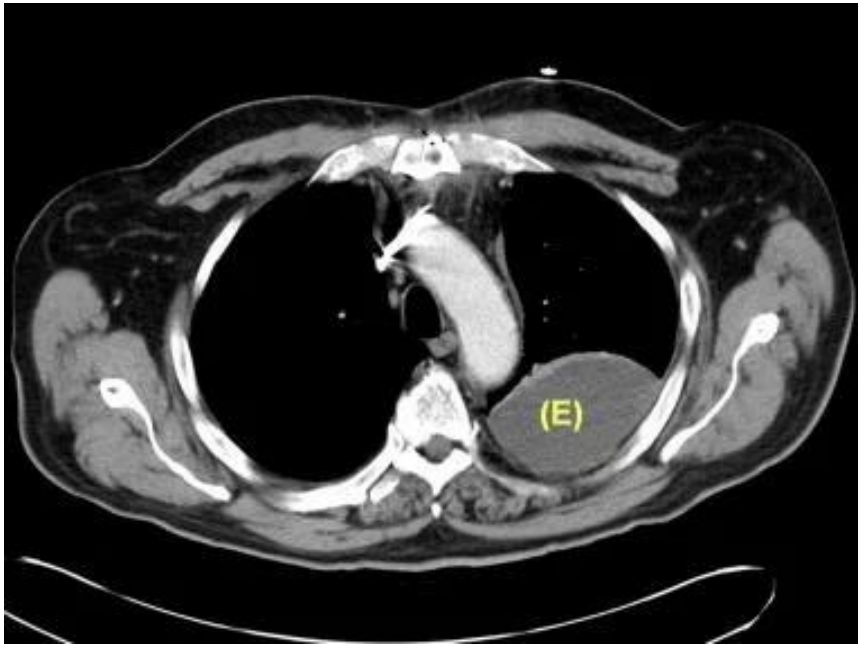
Pleural effusion

- Crescent-shaped attenuating area in the dependent portion of the hemithorax

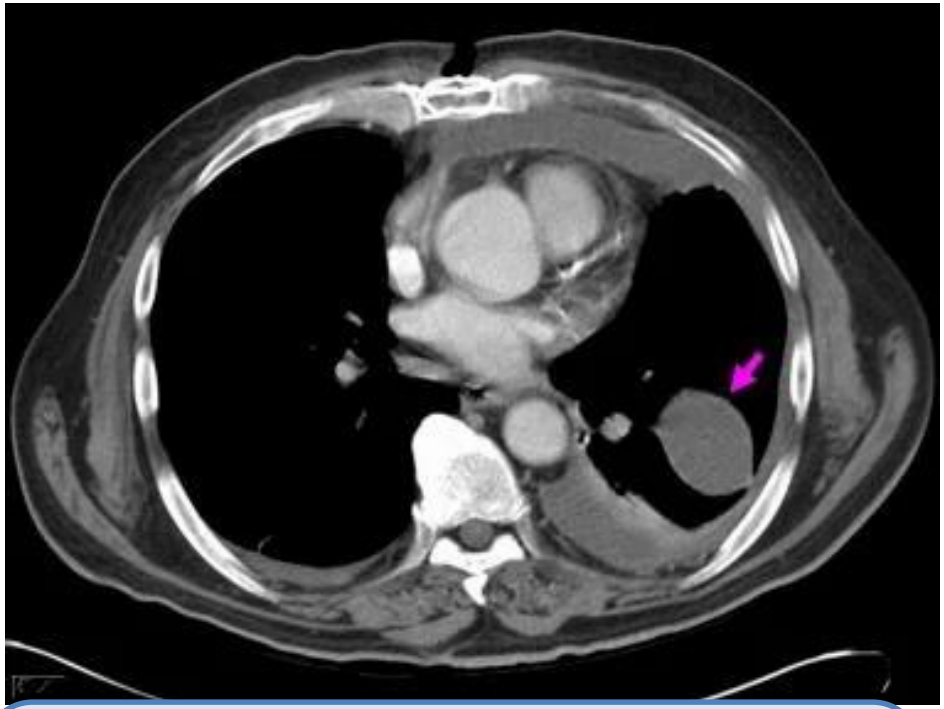




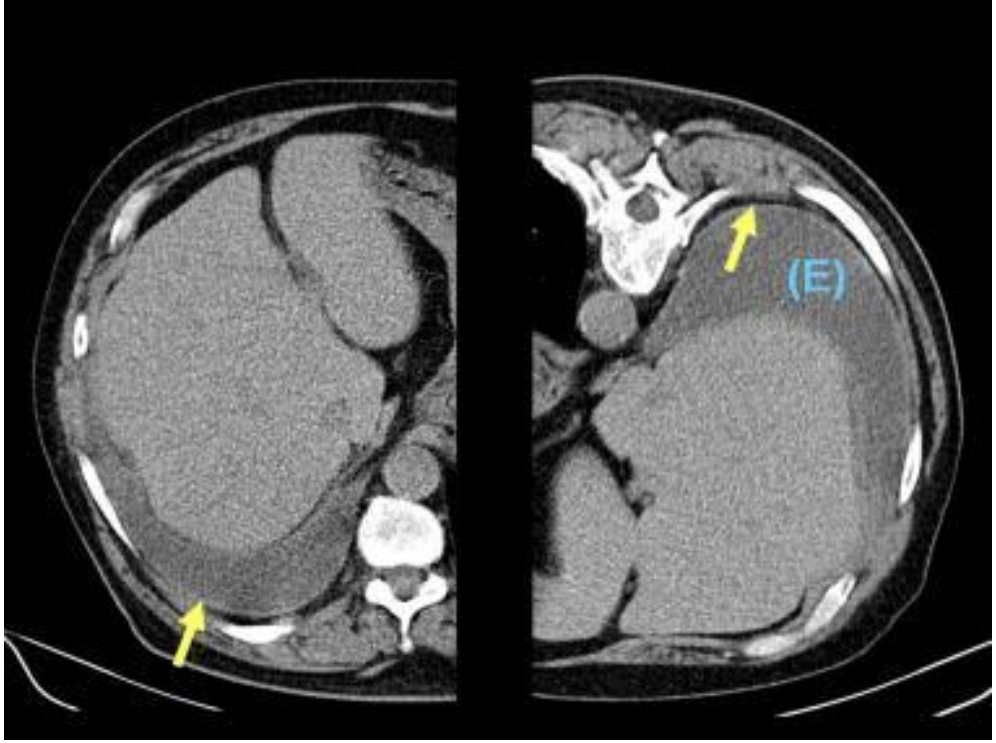
Mesothelioma presenting as a pleural effusion
left pleural effusion as loculated collection with thickening of pleura



Left hemithorax Loculated PE

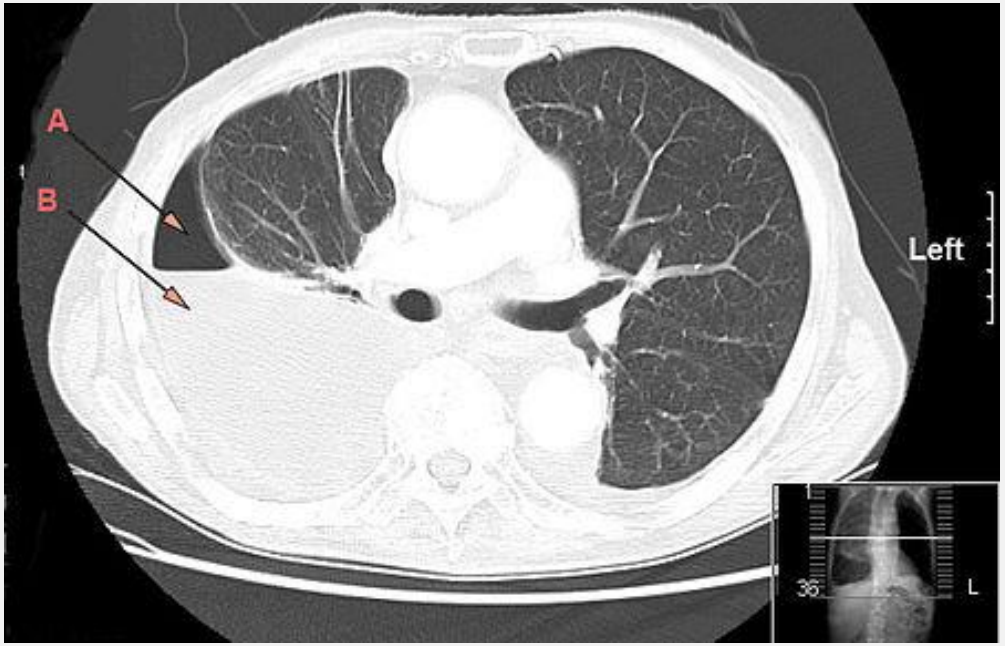


loculated pleural effusion in the left major fissure

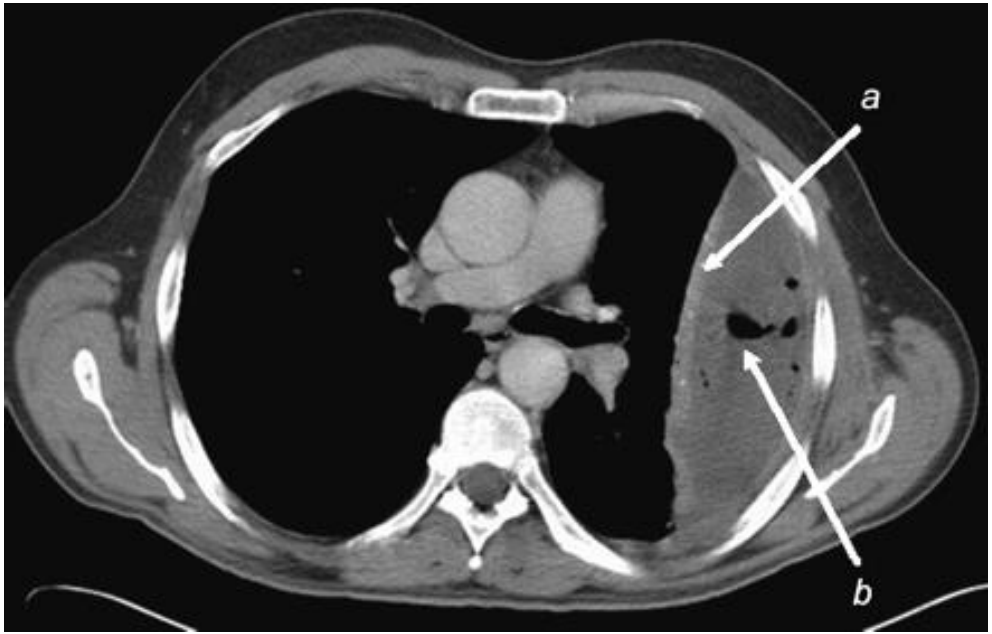


loculated pleural effusion
Right: Supine position
Left: Prone position

1.large effusion
2.Pneumothorax
3.shift of the mediastinum to the left
4.Atelectasis of the left lung



large right sided hydro-pneumothorax from pleural empyema

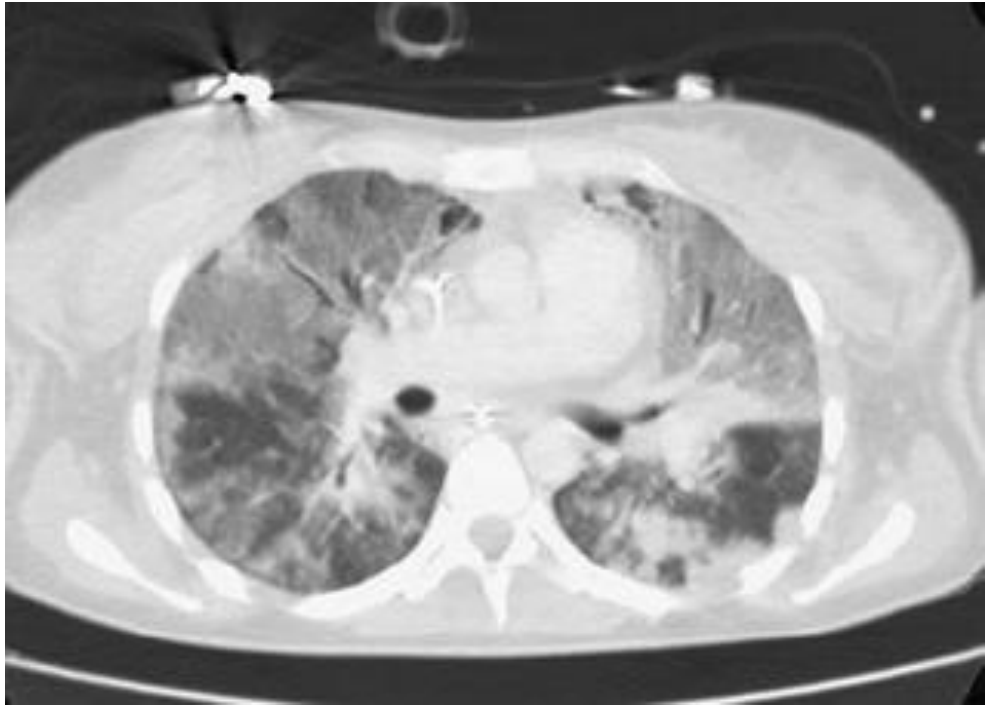


CT scan of left empyema with pleural enhancement (a) and suspended air bubbles (b).

Review of some case

ARDS

Small right pleural effusion, consolidation with air-bronchograms, and some ground-glass-appearing opacities



ARDS

A 32-year-old pregnant woman with H1N1 virus infection who developed ARDS