

# CHEST IMAGING

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# CHEST IMAGING

Chest imaging remains major component of diagnostic radiology.

The chest x-ray is the most commonly performed diagnostic x-ray examination.

A chest x-ray makes images of the heart, lungs, airways, blood vessels and the bones of the spine and chest.

# *Anatomy of the lungs*

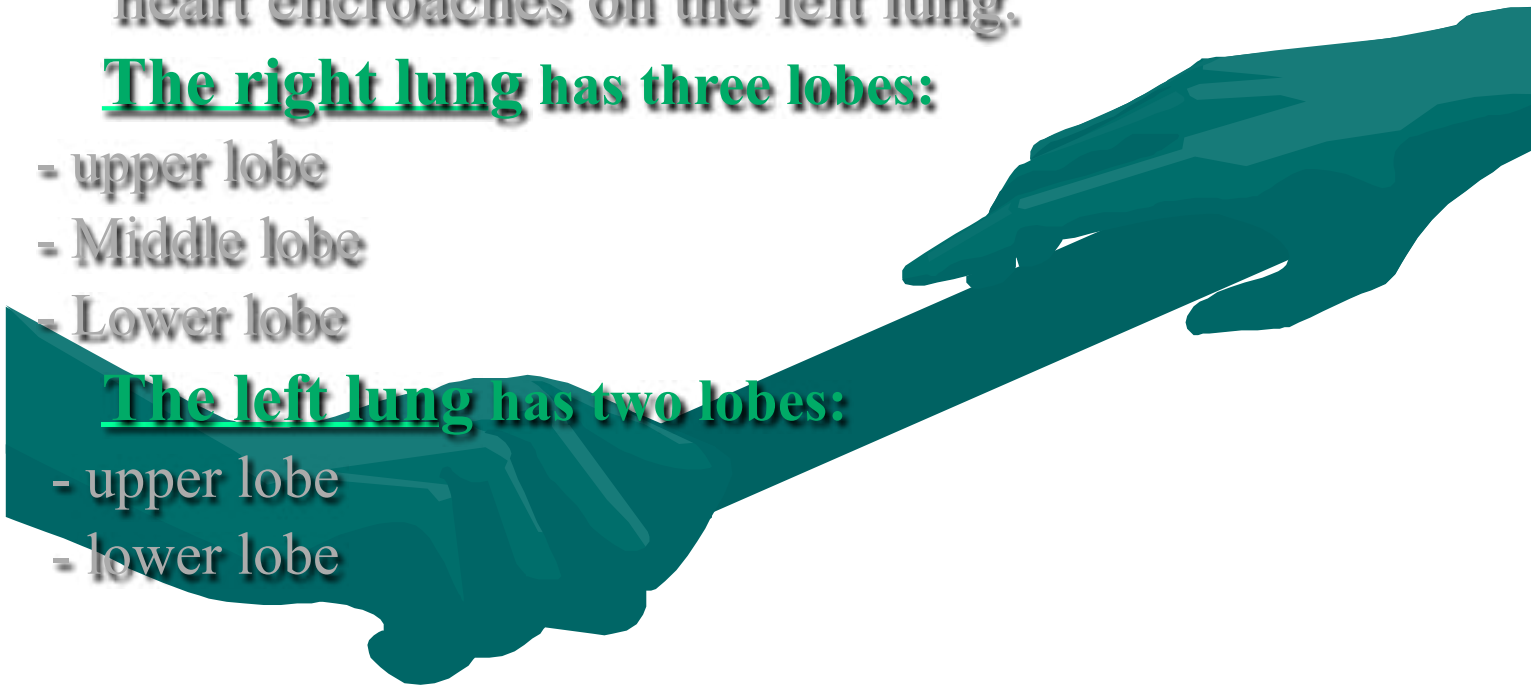
The Right lung is larger than the left, because most of the heart encroaches on the left lung.

## The right lung has three lobes:

- upper lobe
- Middle lobe
- Lower lobe

## The left lung has two lobes:

- upper lobe
- lower lobe



# *Anatomy of the lungs / 2*

Adjacent lobes are separated by an interlobar fissure.

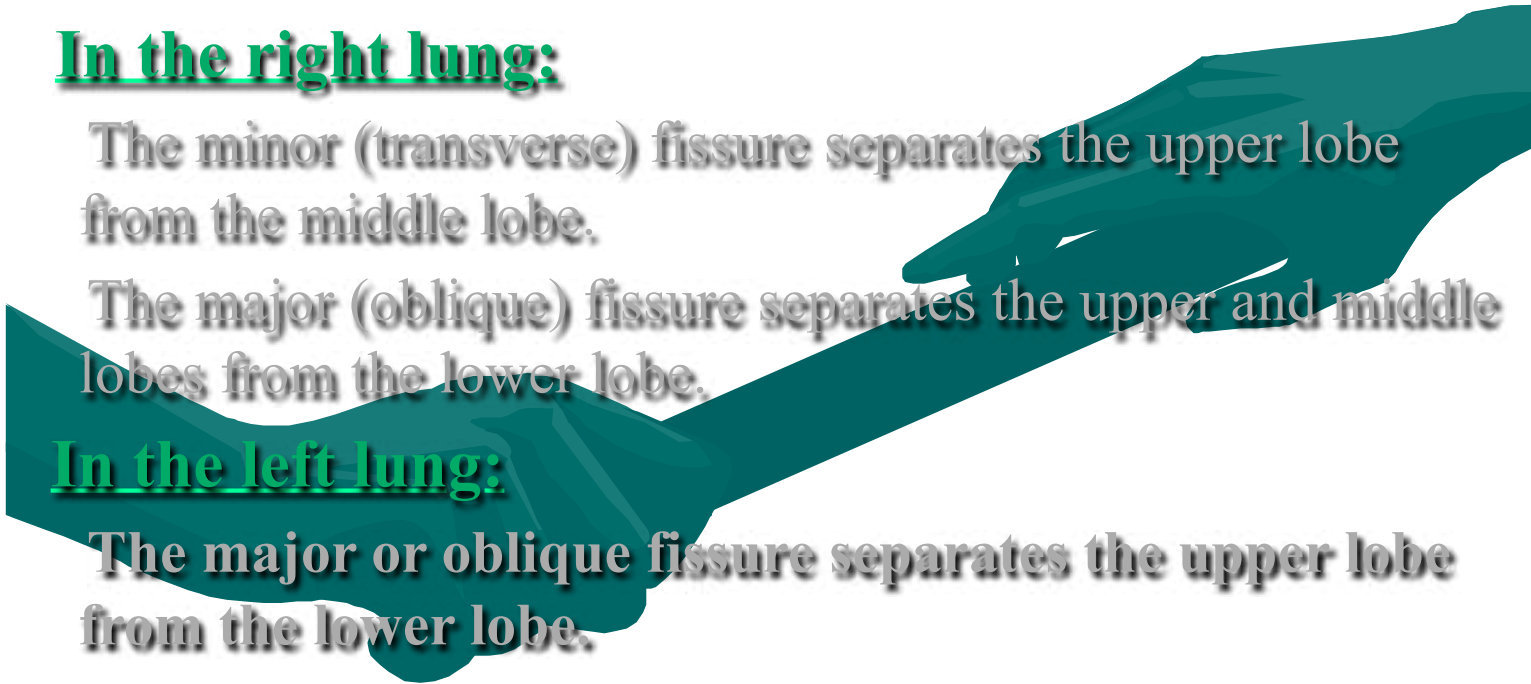
## **In the right lung:**

The minor (transverse) fissure separates the upper lobe from the middle lobe.

The major (oblique) fissure separates the upper and middle lobes from the lower lobe.

## **In the left lung:**

The major or oblique fissure separates the upper lobe from the lower lobe.



# *Segmental anatomy*

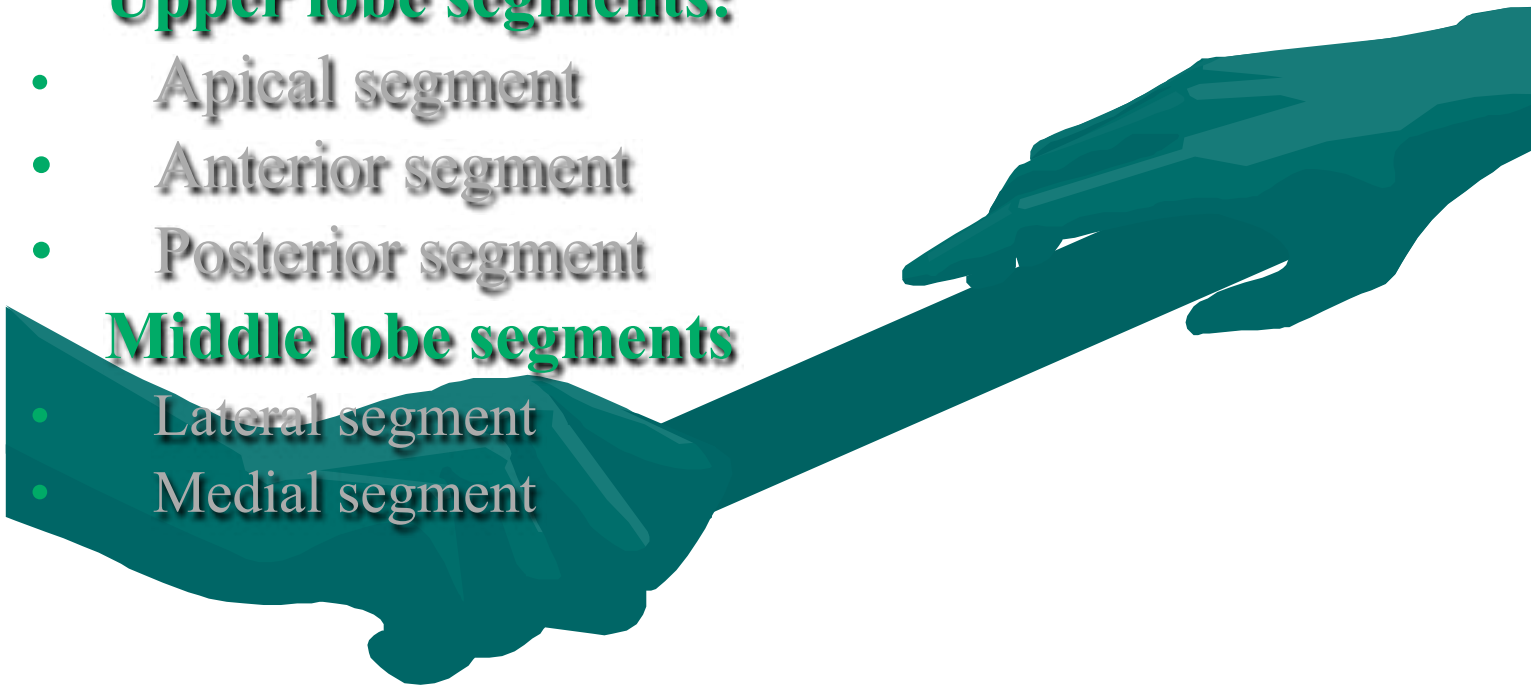
## Segments of the right lung

### **Upper lobe segments:**

- Apical segment
- Anterior segment
- Posterior segment

### **Middle lobe segments**

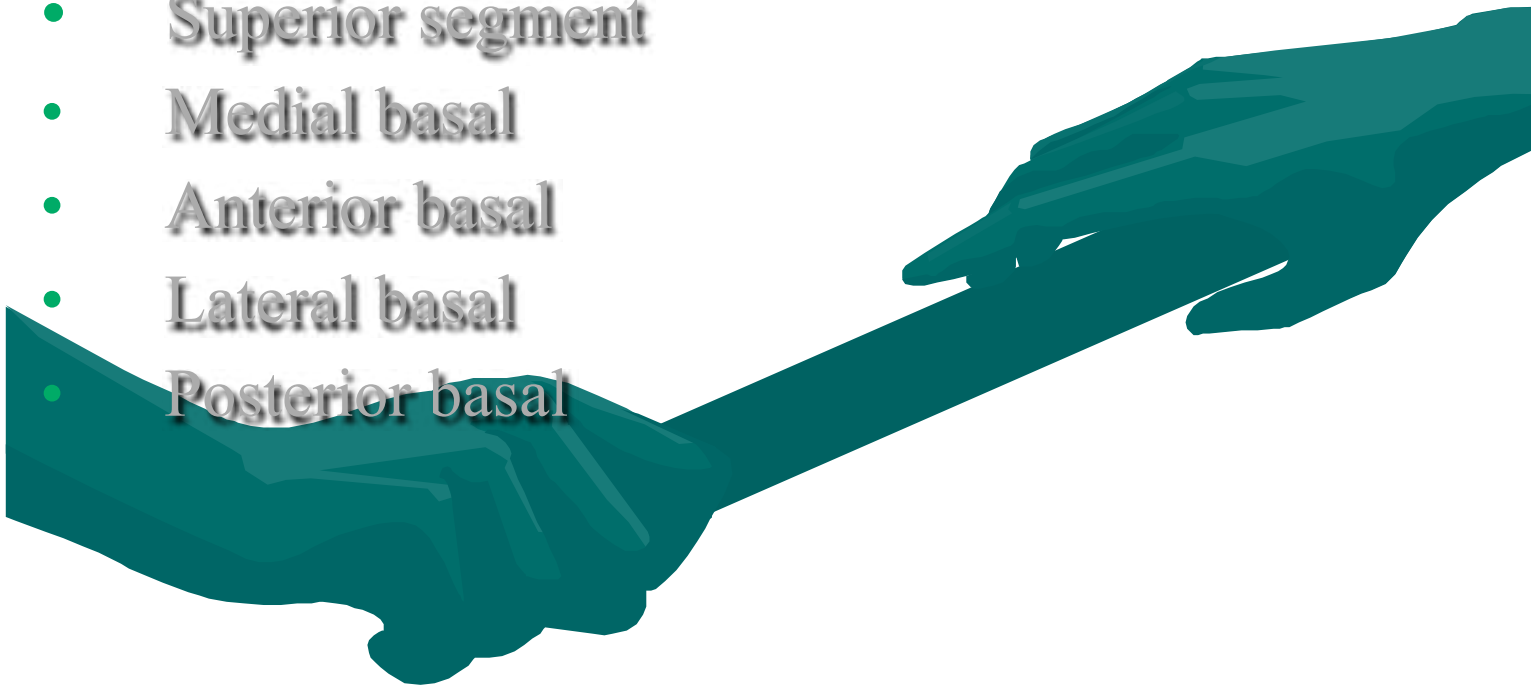
- Lateral segment
- Medial segment



## *Segmental anatomy / 2*

### Right lower lobe segments:

- Superior segment
- Medial basal
- Anterior basal
- Lateral basal
- Posterior basal



## *Segmental anatomy / 3*

### Left lung segments:

#### Upper lobe

- Apical posterior segment
- Anterior segment
- Superior lingular segment
- Inferior lingular segment

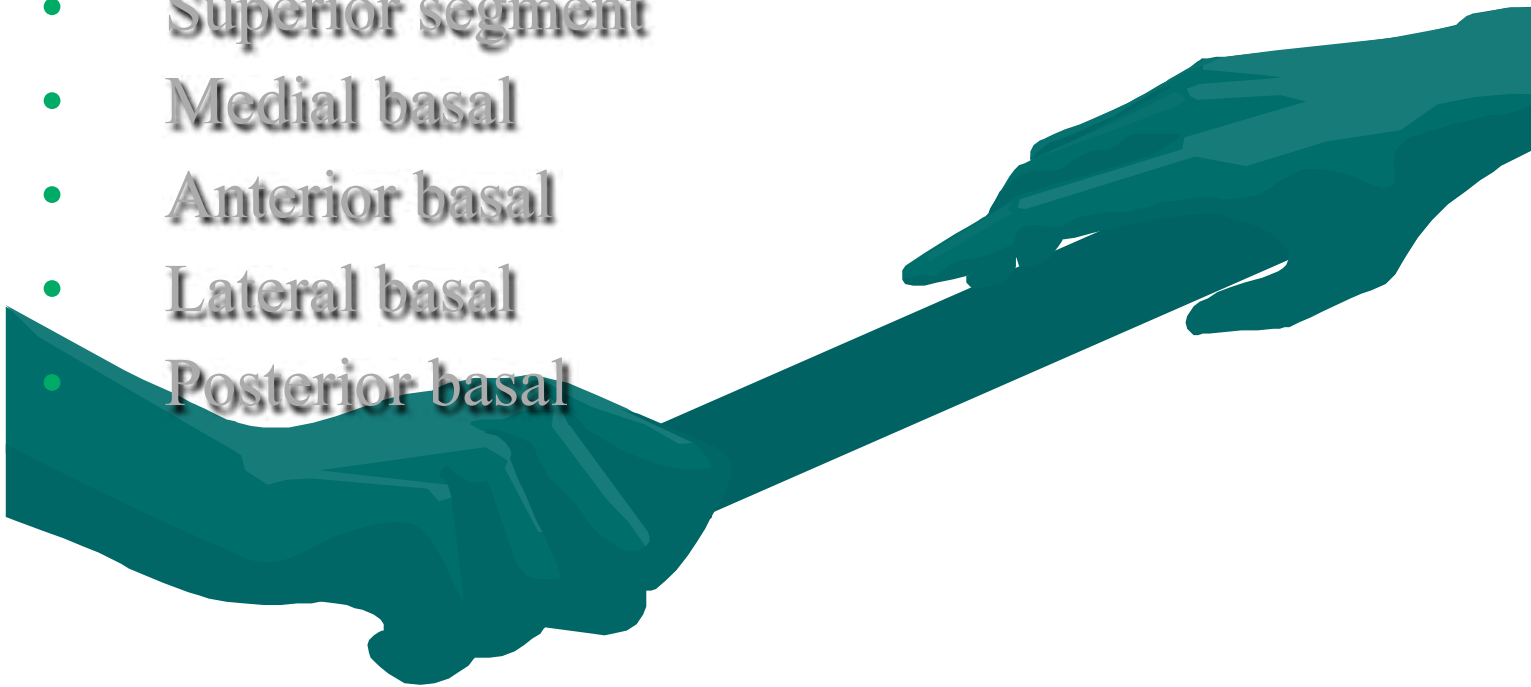
The lingular segment in the left lung is similar in position to the right middle lobe.



## *Segmental anatomy / 4*

### Left lower lobe segments:

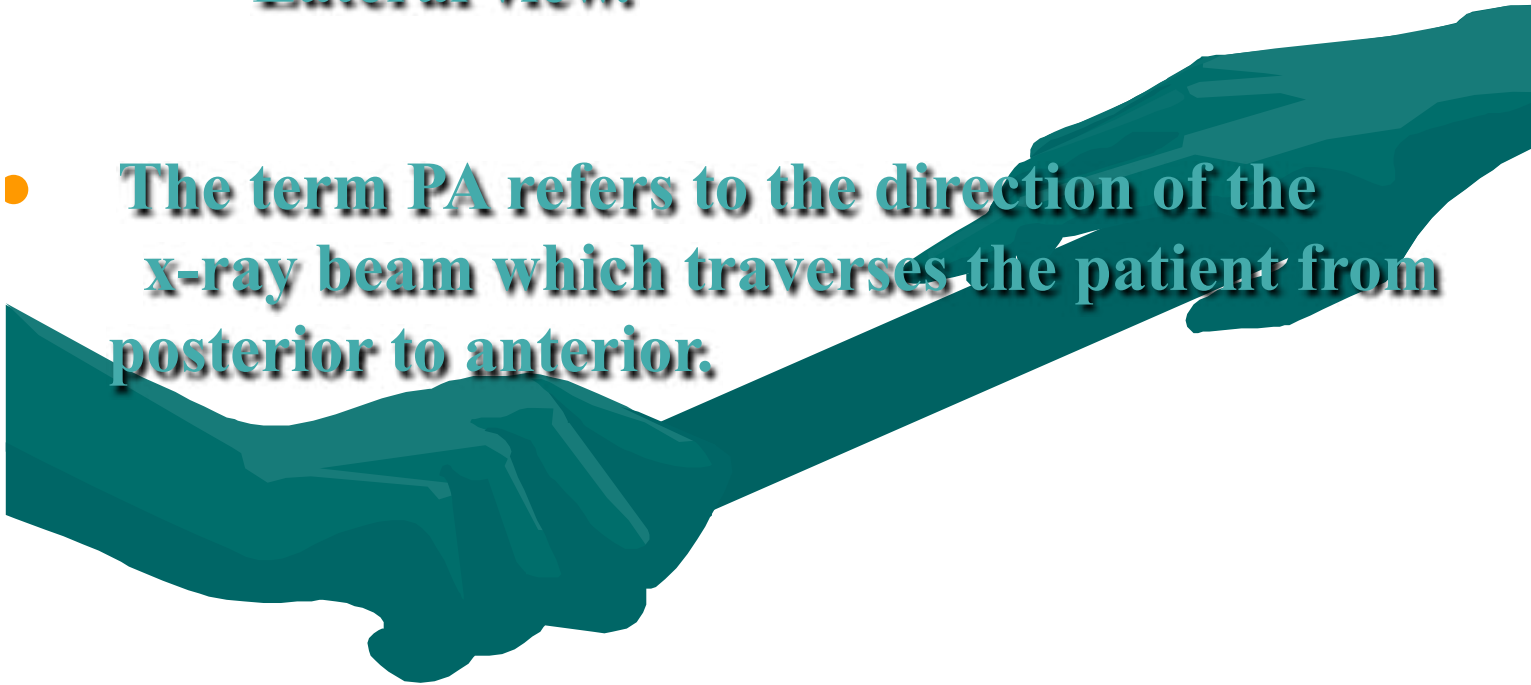
- Superior segment
- Medial basal
- Anterior basal
- Lateral basal
- Posterior basal





## **Routine plain chest radiography:**

- **Postero-anterior view (PA)**
- **Lateral view.**
- **The term PA refers to the direction of the x-ray beam which traverses the patient from posterior to anterior.**





# PA chest radiography is preferred to AP,

why ?

**Less magnification of the heart.**

**More lung fields are visualized.**

**The PA projects the scapula away from the lung fields.**

**The apices of the lungs are closer to the film**

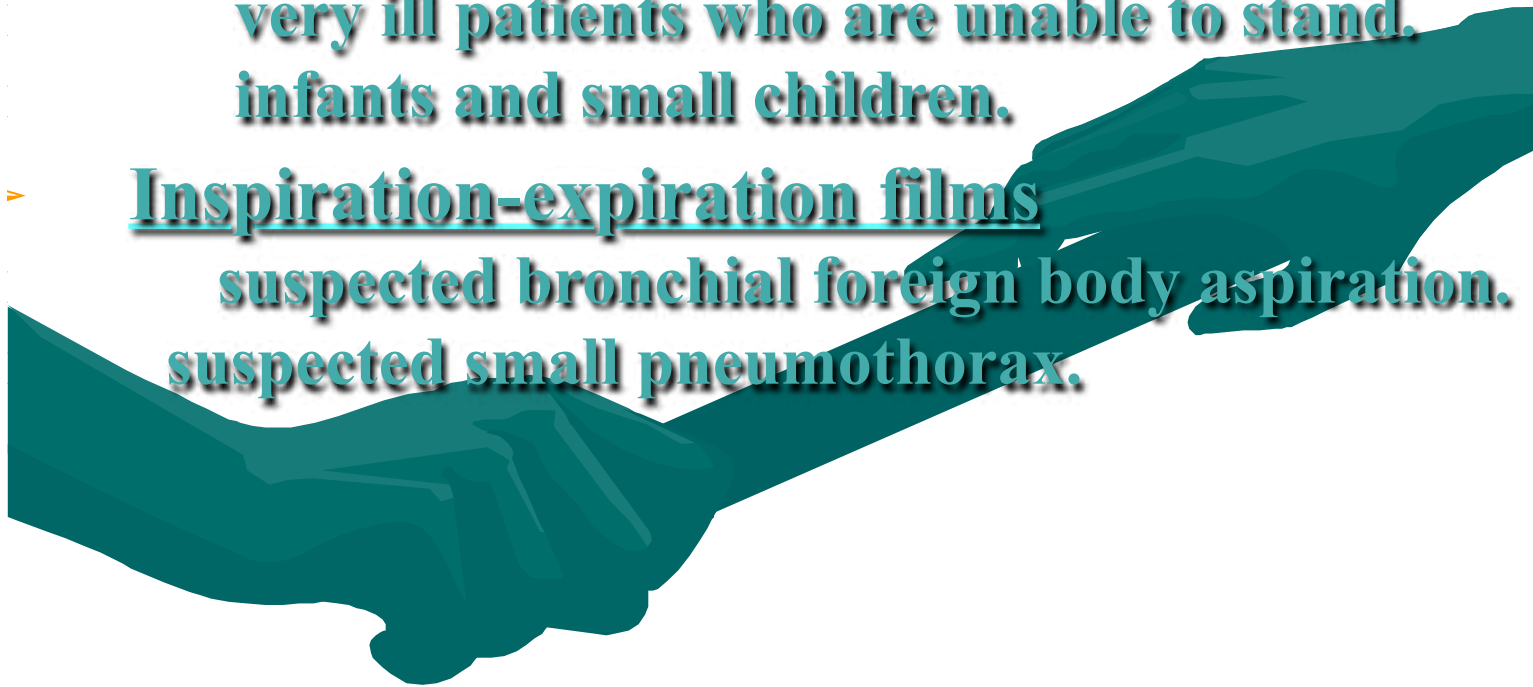
## Other plain chest radiography:

### Antero-posterior view (AP)

very ill patients who are unable to stand.  
infants and small children.

### Inspiration-expiration films

suspected bronchial foreign body aspiration.  
suspected small pneumothorax.



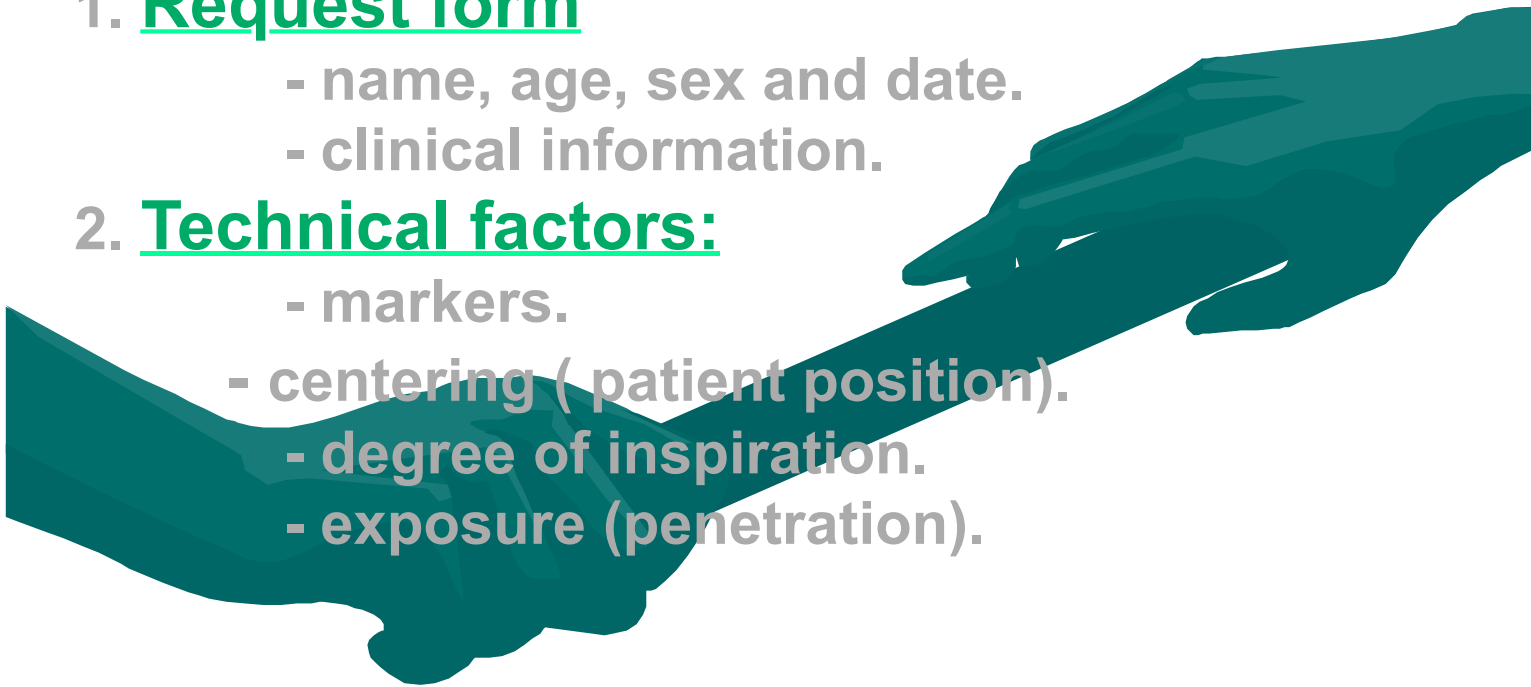
# Before reading the x-ray film, the following should be checked:

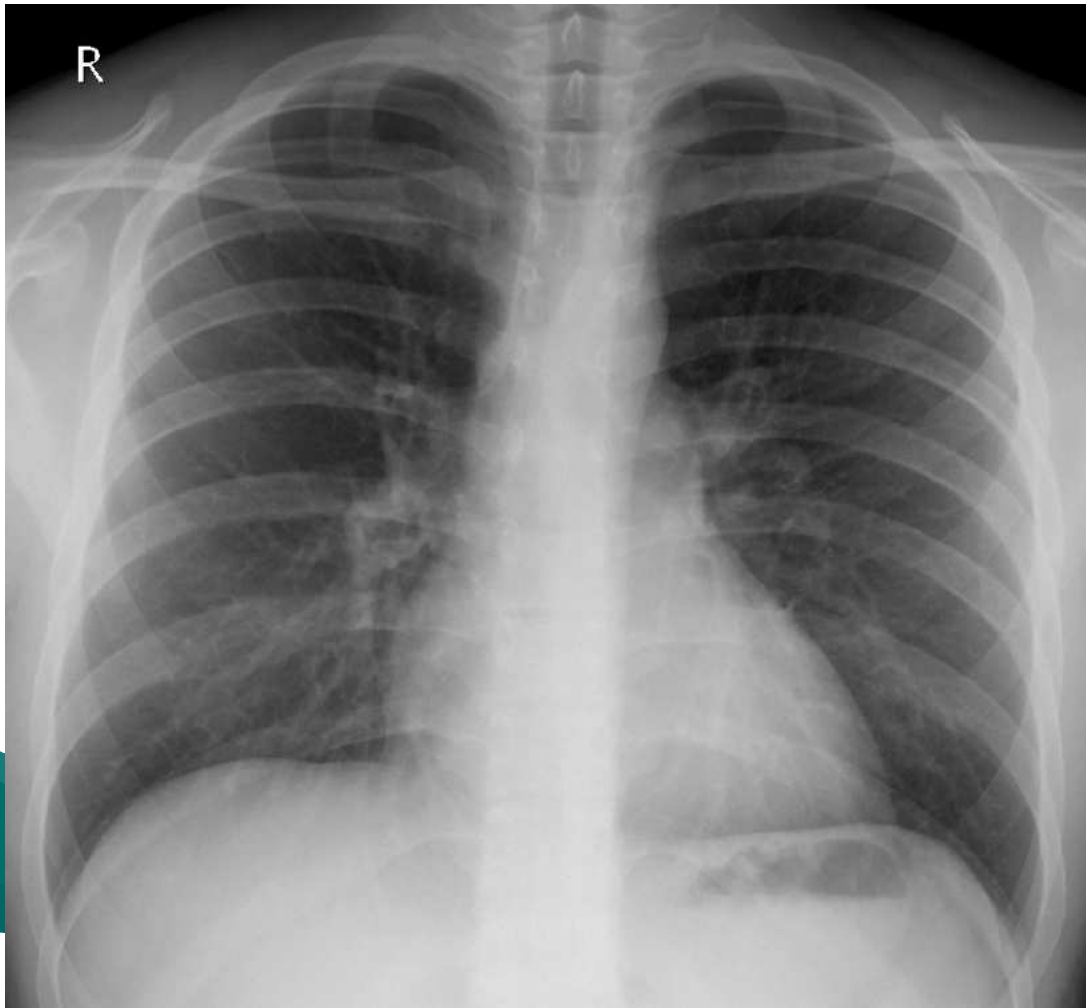
## 1. Request form

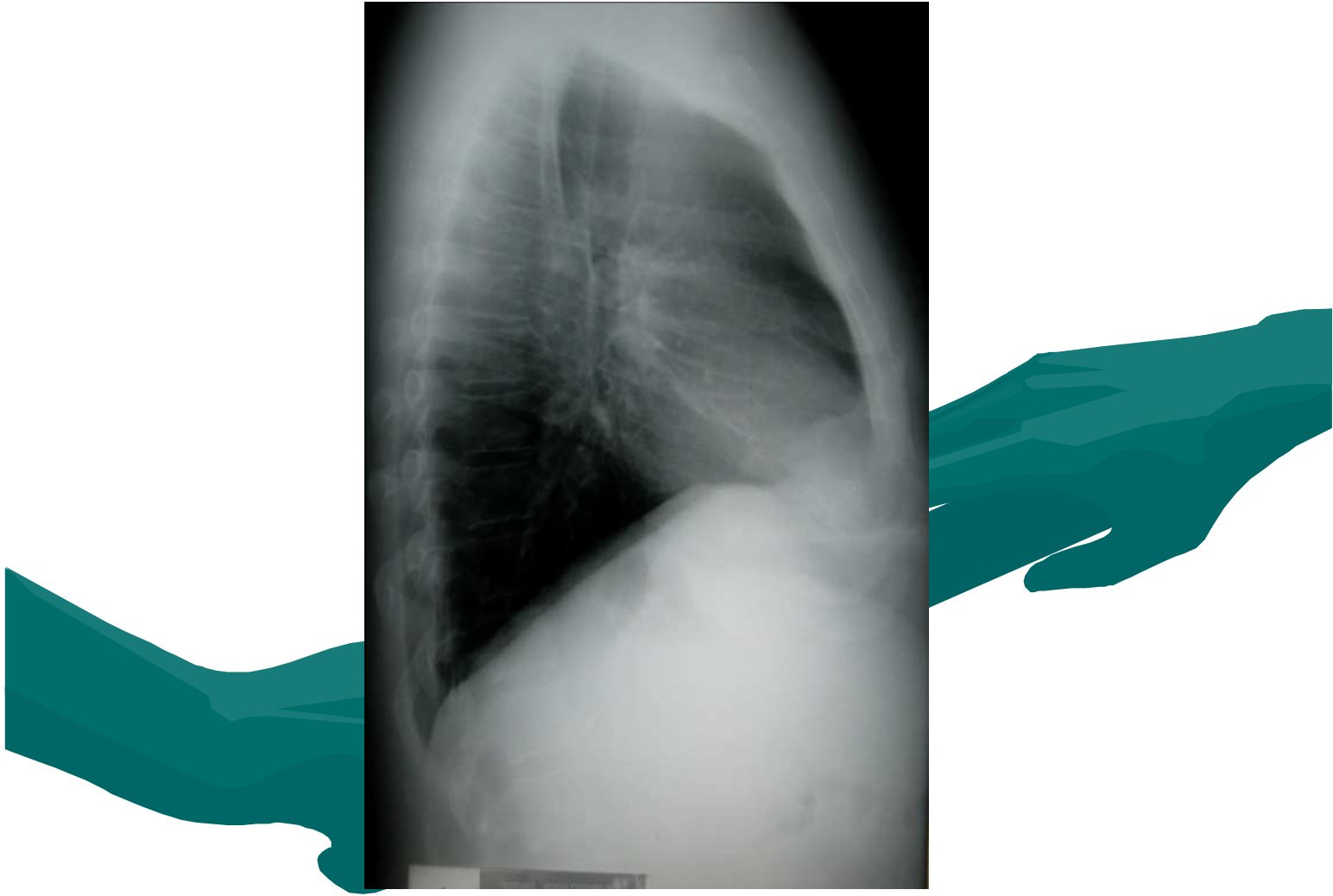
- name, age, sex and date.
- clinical information.

## 2. Technical factors:

- markers.
- centering ( patient position).
- degree of inspiration.
- exposure (penetration).







# PNEUMONIA

Is an inflammation of the lung, which can be caused by a variety of micro-organisms, including bacterias, viruses, and fungi.

**Lobar pneumonia:** inflammation confined to a lobe of the lung.

**Bronchopneumonia:** refers to bilateral multifocal areas of consolidation.

Pneumonia can be classified into:

**Primary pneumonia :** arising in a normal lung.

**Secondary pneumonia**

result of a disease or abnormality already present in the lung.



# Pneumonia / 2

With treatment most types of bacterial pneumonia can be resolved within 2 weeks.

Viral pneumonia may last longer.

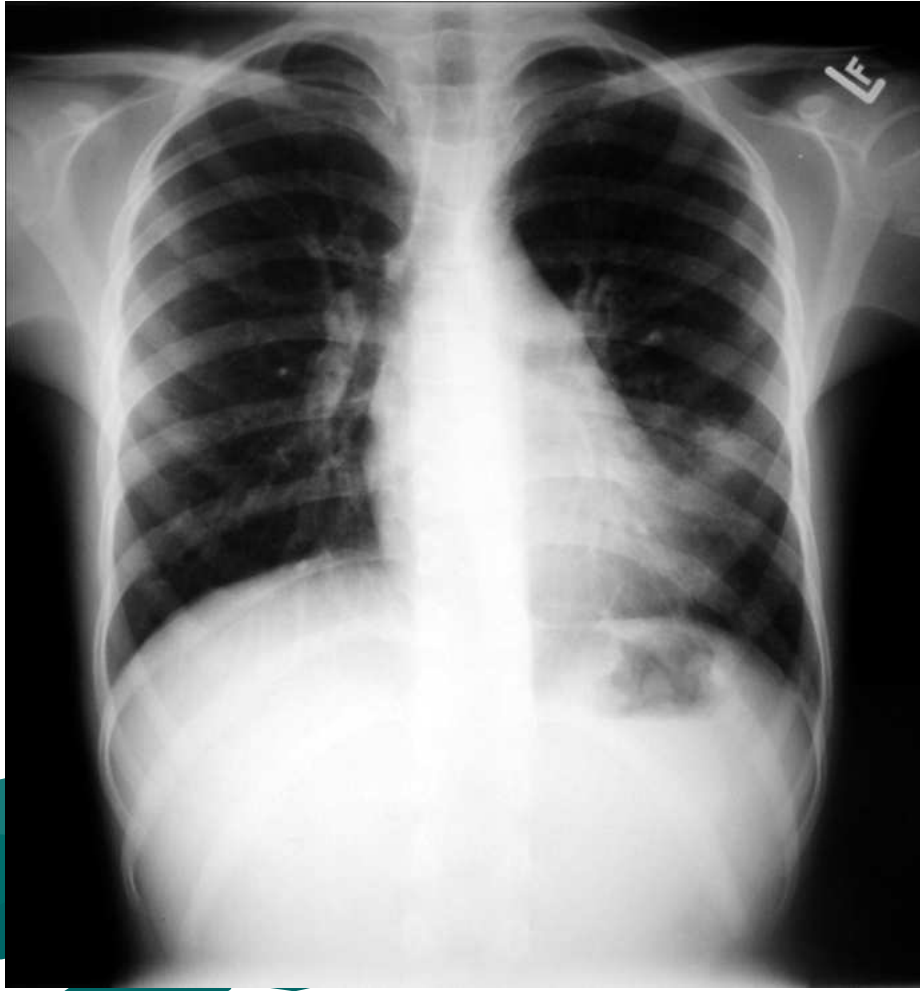
Mycoplasmal pneumonia may take 4 weeks to resolve completely.

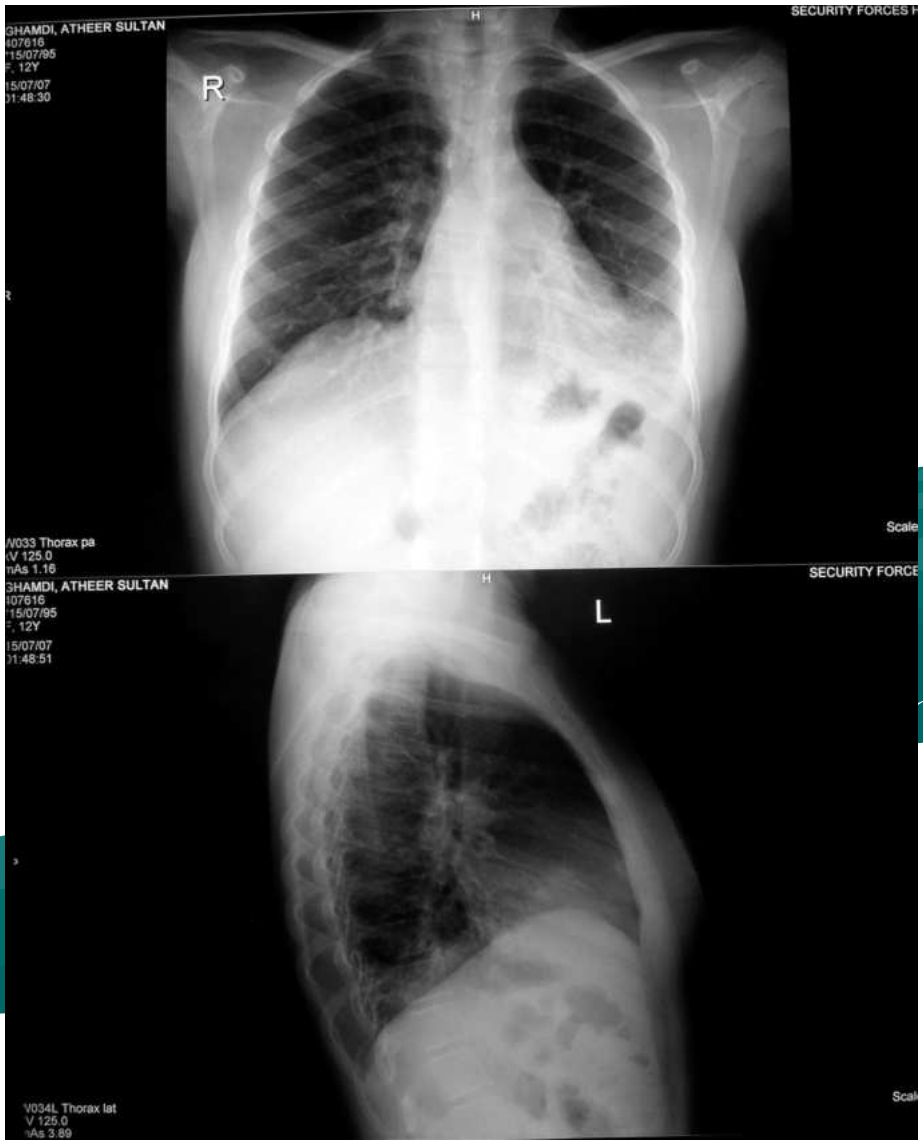
What examinations should be considered in patients with pneumonia that does not resolve as promptly as it should ?

CT scan

Bronchoscopy

















# Pulmonary collapse

Pulmonary collapse or atelectasis refers to a decrease in volume of a lung, lobe or segment.

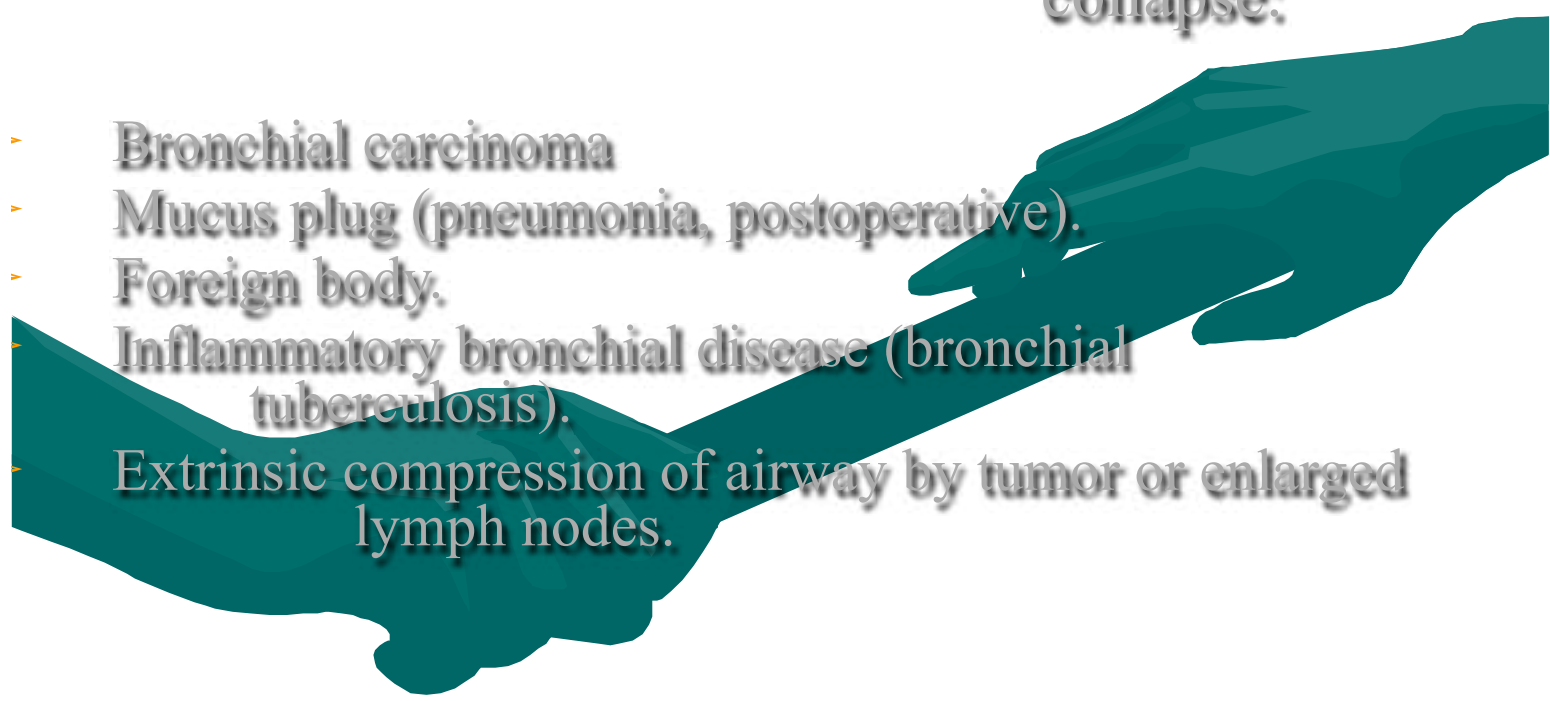
Obstruction to flow of air is the most common cause of collapse.

Air in the alveoli is absorbed and because no further air enters the alveoli distal to the obstruction, the lung tissue collapses and becomes more opaque

# Pulmonary collapse / 2

Common causes of bronchial obstruction causing collapse:

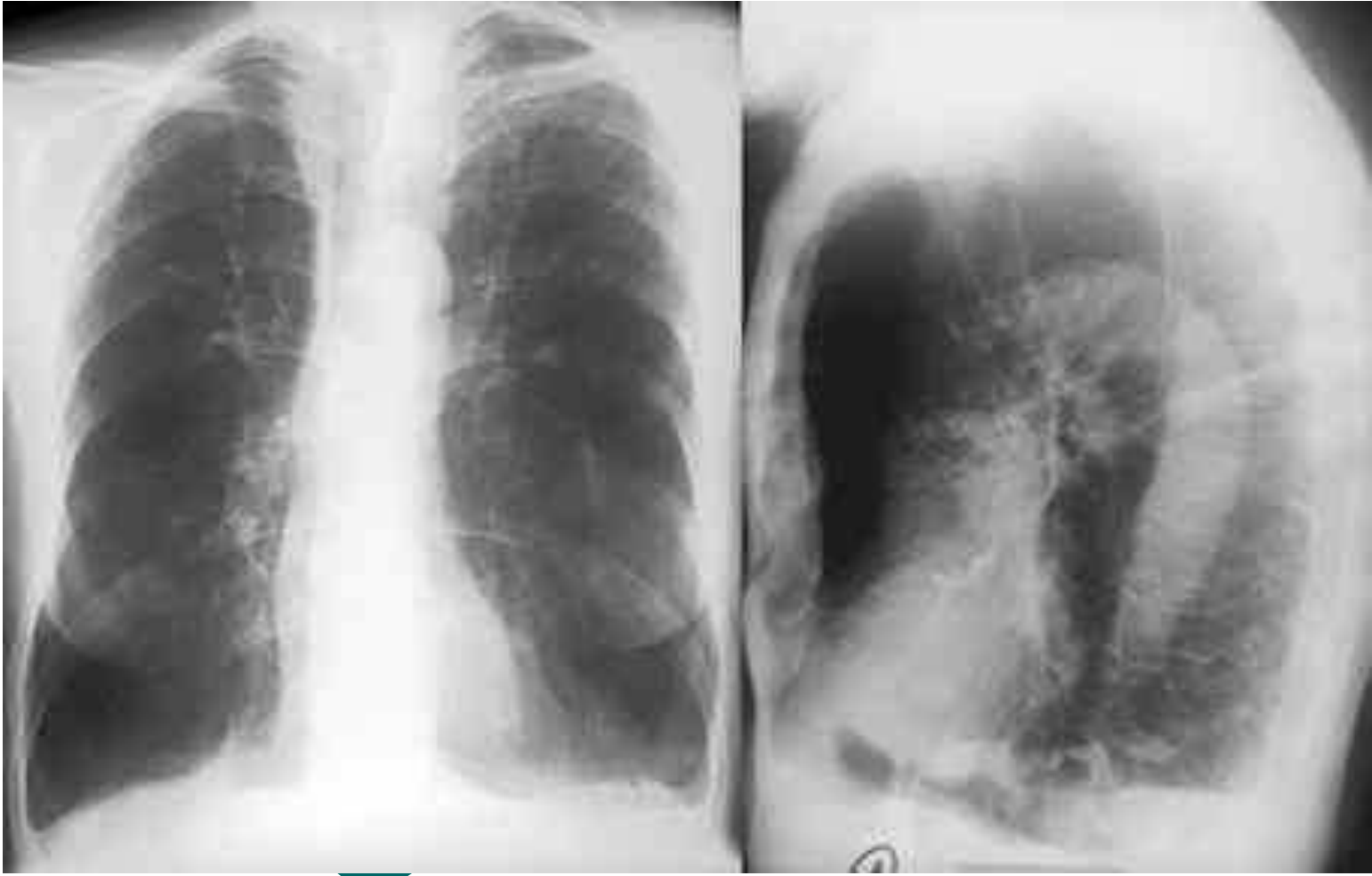
- ▶ Bronchial carcinoma
- ▶ Mucus plug (pneumonia, postoperative).
- ▶ Foreign body.
- ▶ Inflammatory bronchial disease (bronchial tuberculosis).
- ▶ Extrinsic compression of airway by tumor or enlarged lymph nodes.





# *Emphysema*

- Is an increase in the size of the air spaces distal to the terminal bronchioles, with dilatation or destruction of their walls.
- The lung appear more translucent with reduction in size and number of the small vascular markings.
- The diaphragms are low and flat.
- The heart shadow is long and narrow.
- The postero-anterior diameter of the chest is increased in the lateral view resulting in barrel chest.



# *Pleural effusion*

Is fluid collection in the space between the parietal and visceral layers of the pleura, usually contains serous fluid, but may have differing contents.

- **Haemothorax:** blood, usually following trauma.
- **Empyema:** purulent fluid (pus).
- **Hydropneumothorax:** fluid and air.

# Pleural effusion / 2

## **Radiological features of pleural effusion on a chest x- ray:**

Homogeneous opacification.

Loss of the diaphragm outline.

No visible pulmonary or bronchial markings.

Concave upper border which appear higher laterally.

blunting or obliteration of the costophrenic angle.



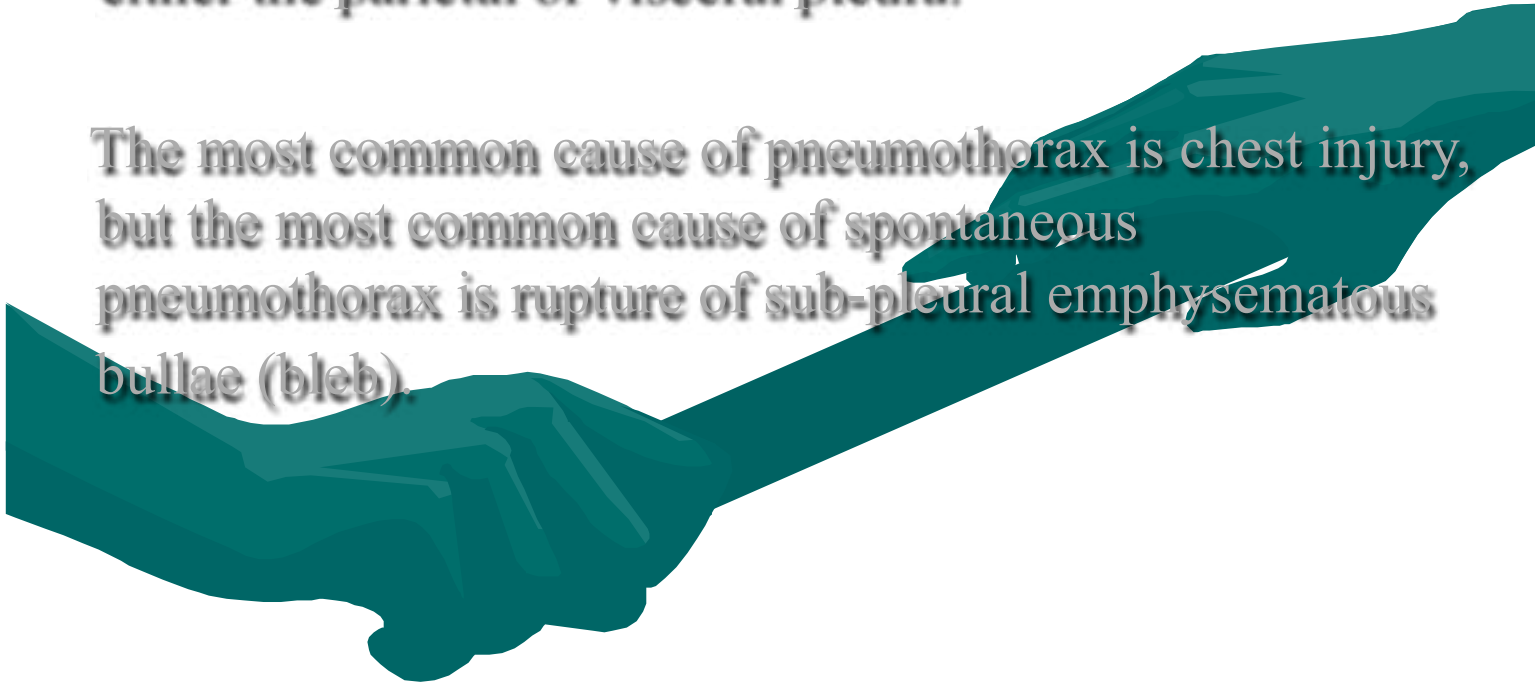




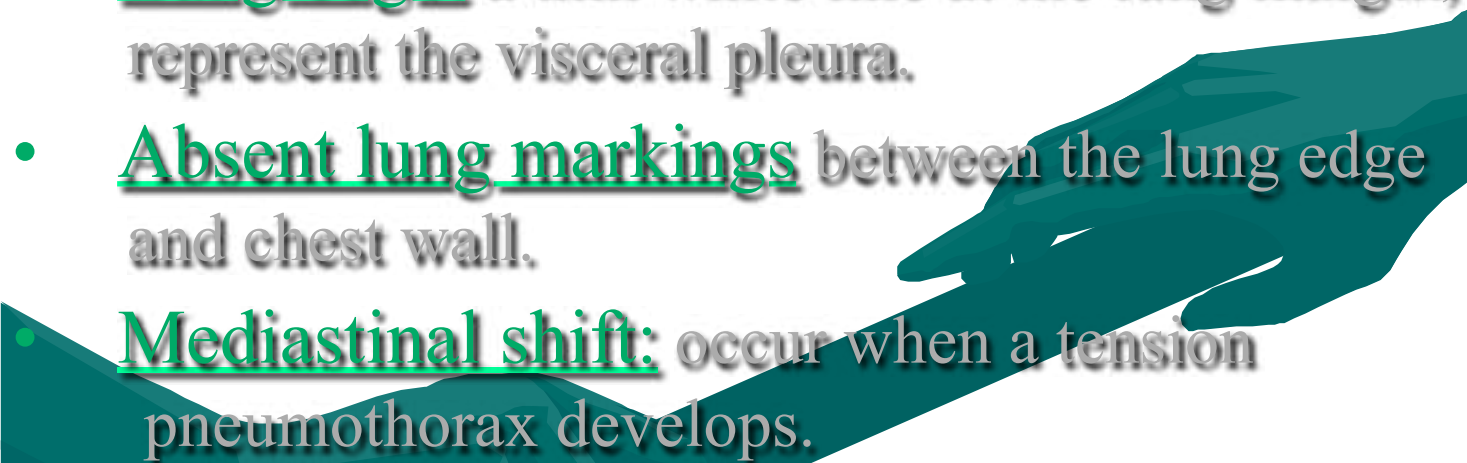
# Pneumothorax

Is the presence of free air in the pleural space, by a tear in either the parietal or visceral pleura.

The most common cause of pneumothorax is chest injury, but the most common cause of spontaneous pneumothorax is rupture of sub-pleural emphysematous bullae (bleb).



# Radiological features of pneumothorax

- Lung edge: a thin white line at the lung margin, represent the visceral pleura.
  - Absent lung markings between the lung edge and chest wall.
  - Mediastinal shift: occur when a tension pneumothorax develops.
- 





# WHAT IS SOLITARY PULMONARY NODULE ?

It must be nodular or roughly spherical.

Not larger than 3cm in diameter.

About 40% of solitary pulmonary nodules are malignant.

A nodule is assessed for its:

## - size

The larger the nodule, the greater the likelihood of malignancy.

## - Margins

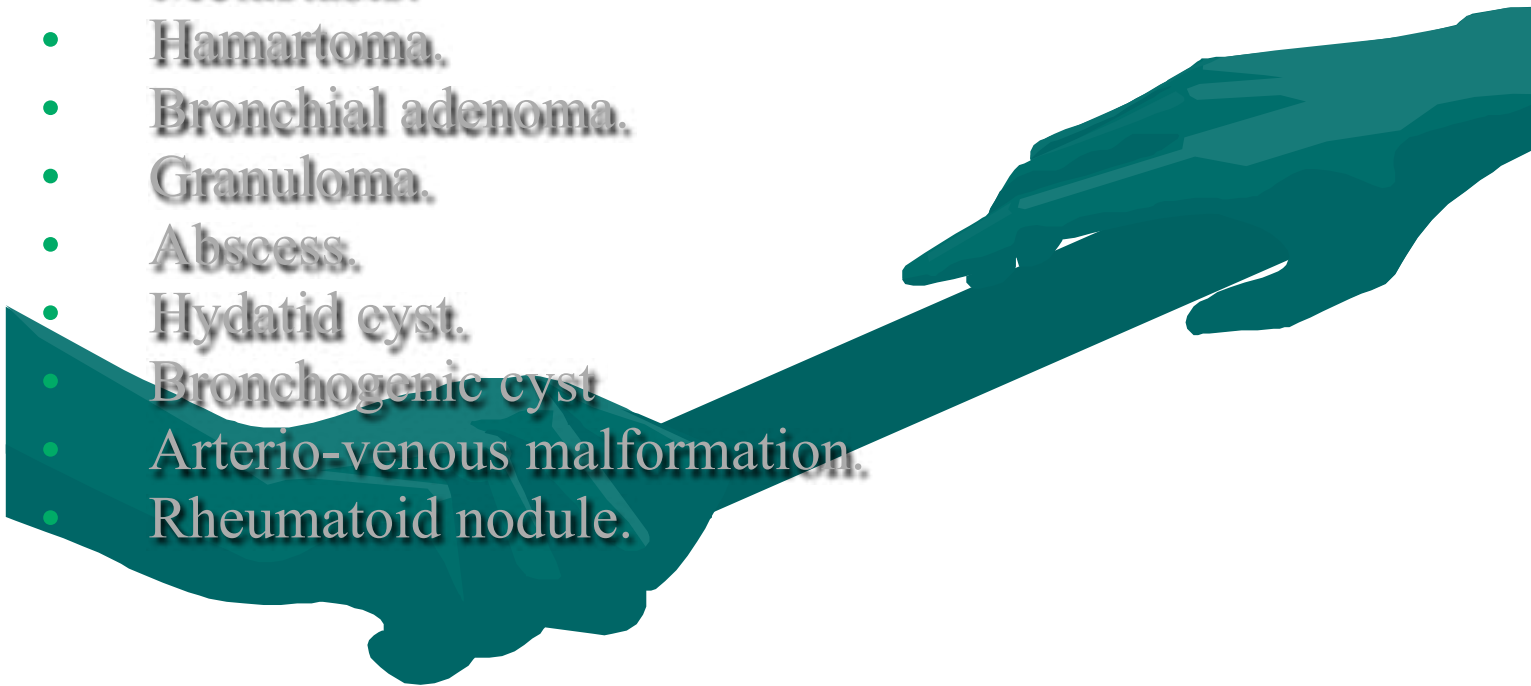
Irregular contour or spiculated margins increase the probability of malignancy

## - Calcification

The presence of calcification within a nodule are in favor of benign lesion.

# CAUSES OF SOLITARY PULMONARY NODULE

- Bronchial carcinoma.
- Metastasis.
- Hamartoma.
- Bronchial adenoma.
- Granuloma.
- Abscess.
- Hydatid cyst.
- Bronchogenic cyst
- Arterio-venous malformation.
- Rheumatoid nodule.









# THE MEDIASTINUM

The mediastinum is situated between the lungs and extends from the thoracic inlet superiorly to the diaphragm inferiorly.

The mediastinum is divided into three parts:

## 1- Anterior mediastinum

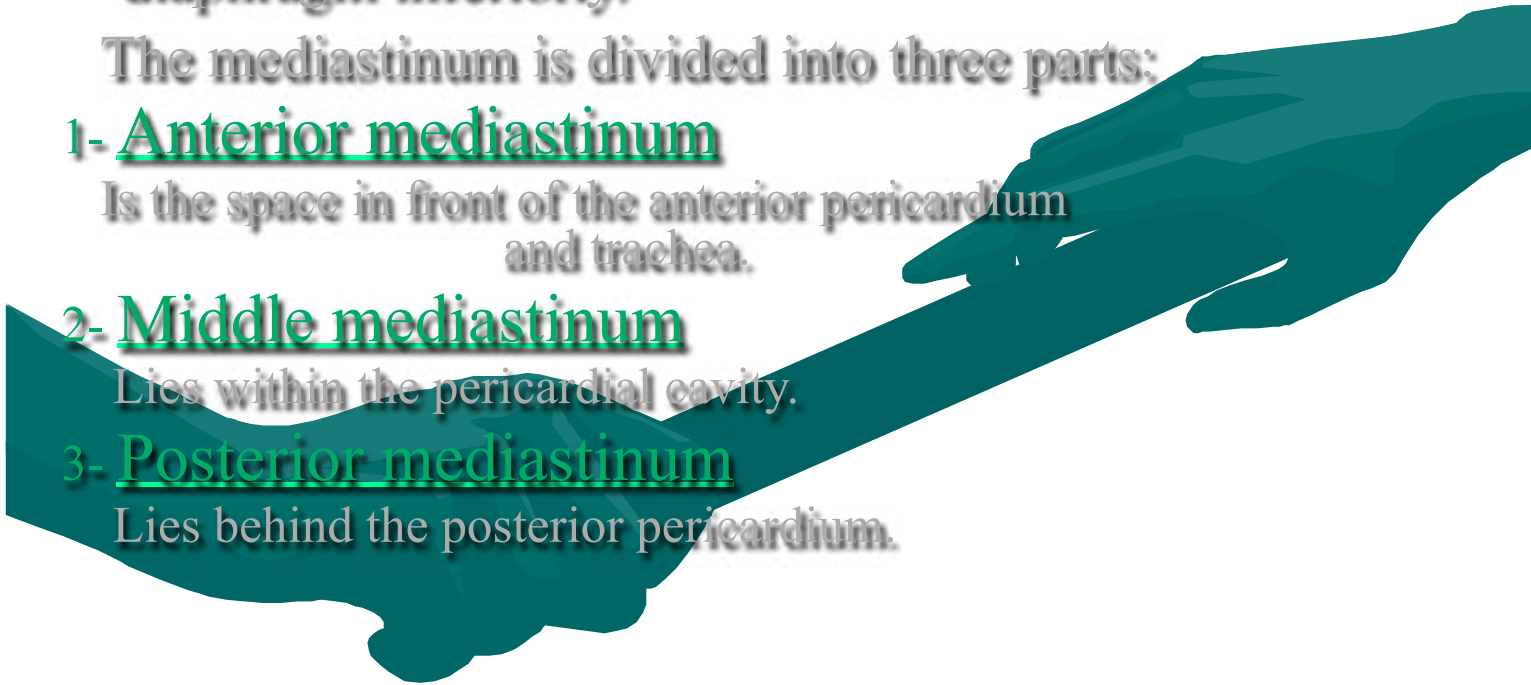
Is the space in front of the anterior pericardium and trachea.

## 2- Middle mediastinum

Lies within the pericardial cavity.

## 3- Posterior mediastinum

Lies behind the posterior pericardium.



# ANTERIOR MEDIASTINAL MASSES

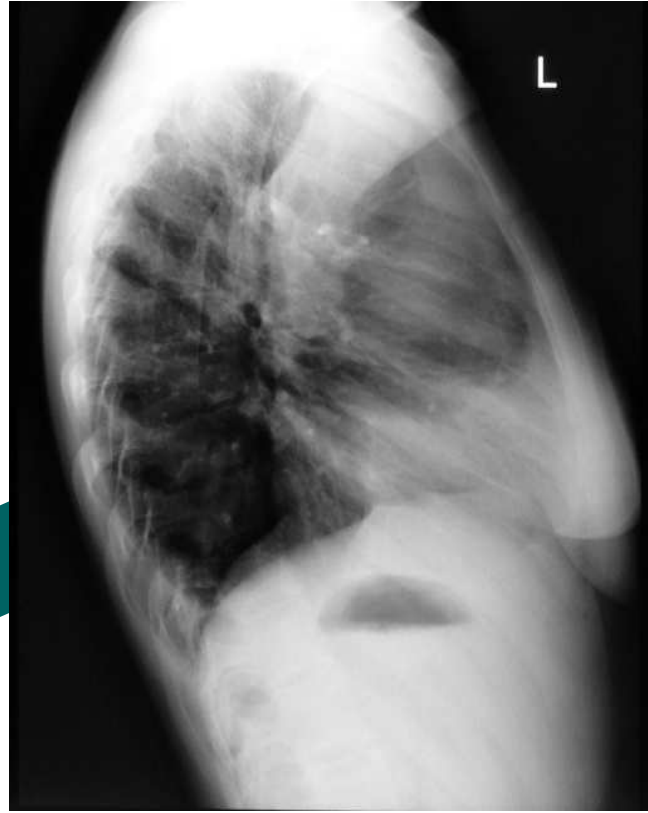
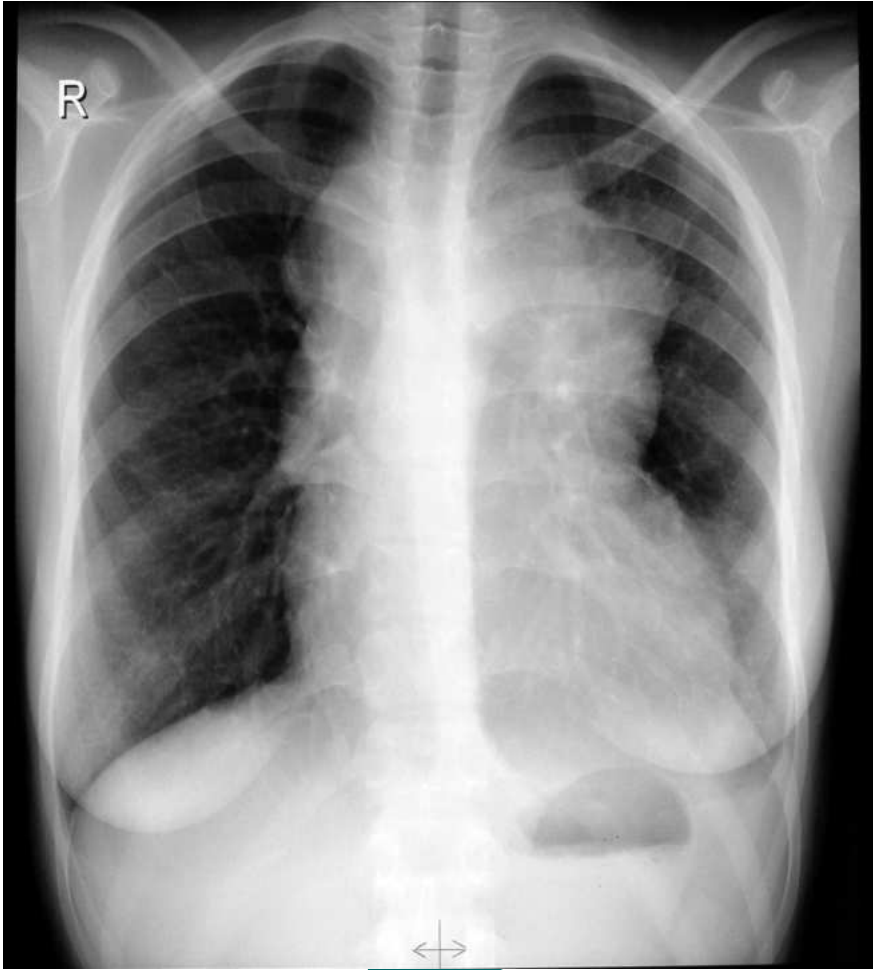
- Lymphoma.
- Thyroid (Retrosternal goiter).
- Teratoma.
- Thymic tumor.
- Pericardial cyst.
- Diaphragmatic hernia (morgagni hernia).

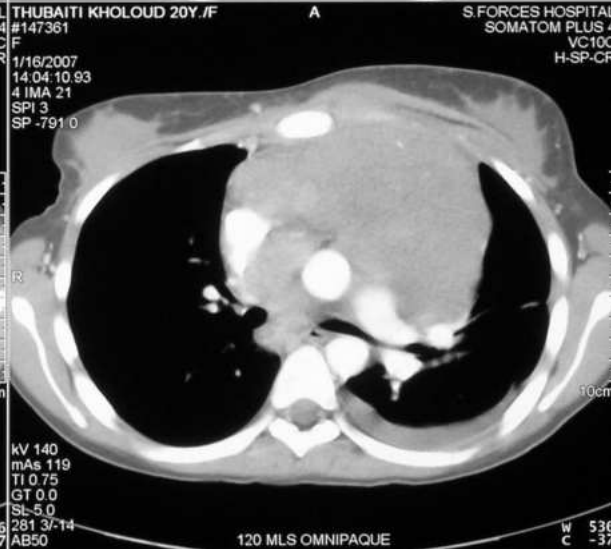
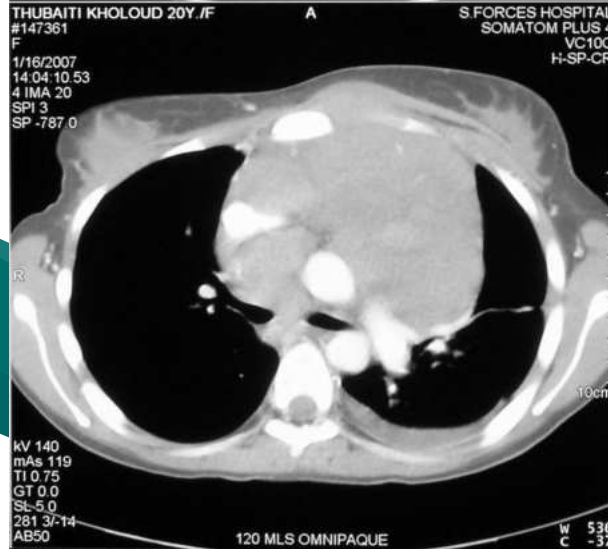
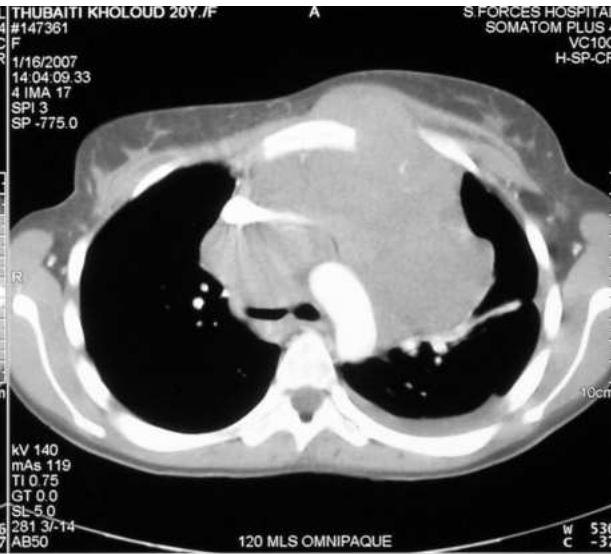
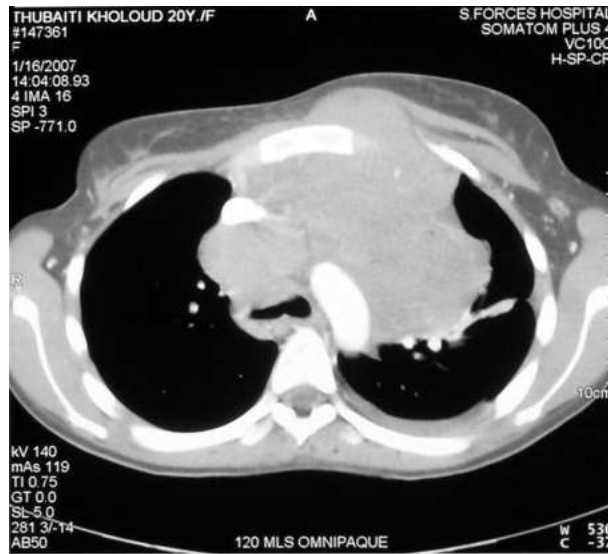


# MIDDLE MEDIASTINAL MASSES

- Lymph node enlargement:
  - lymphoma
  - primary tuberculosis
  - sarcoidosis
- Bronchogenic cyst.
- Aneurysm of aortic arch.



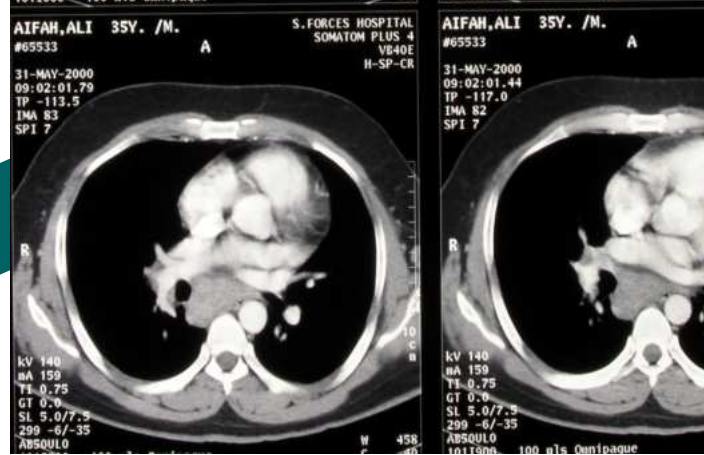
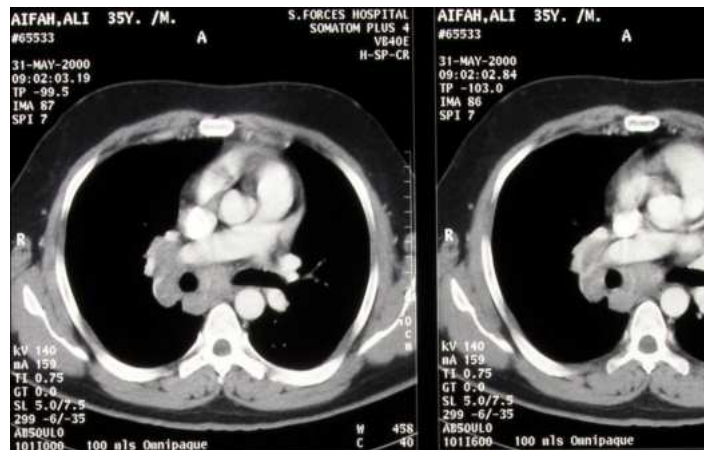
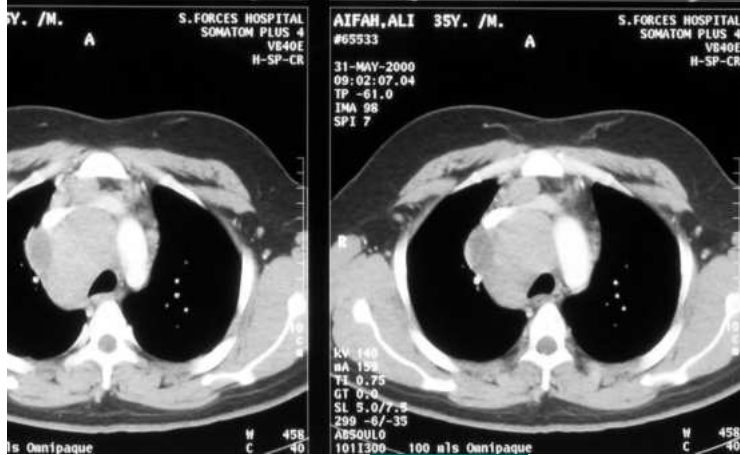
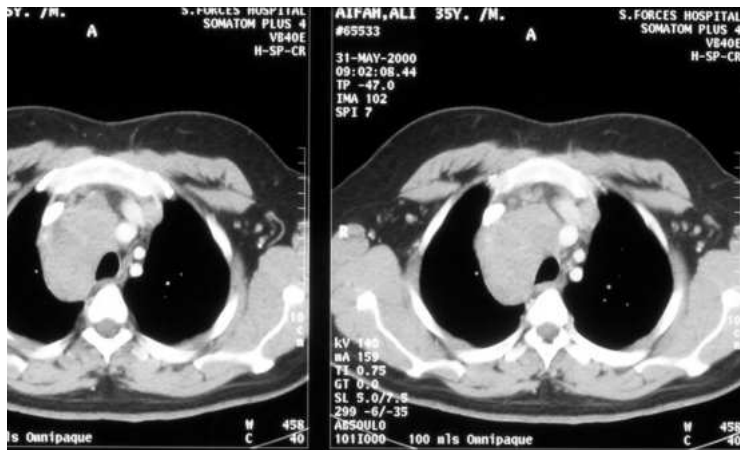






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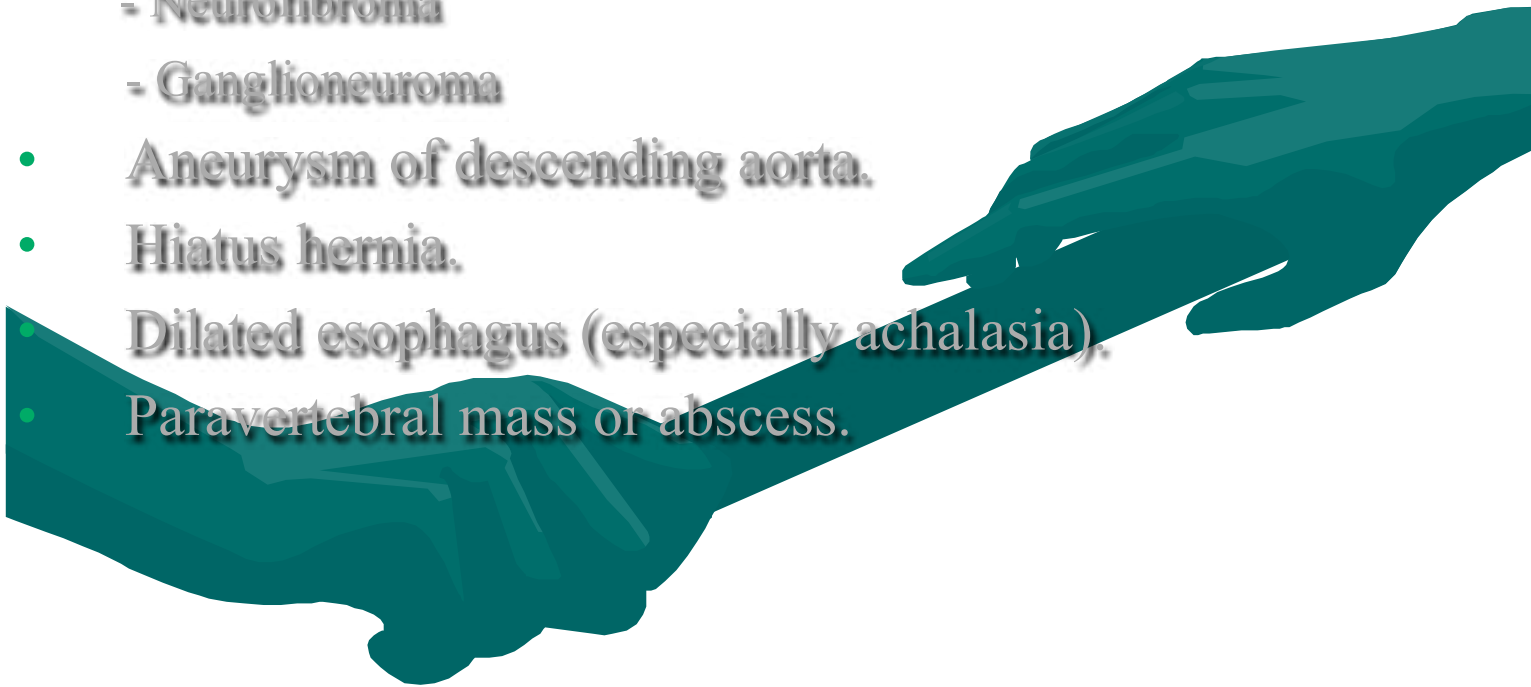


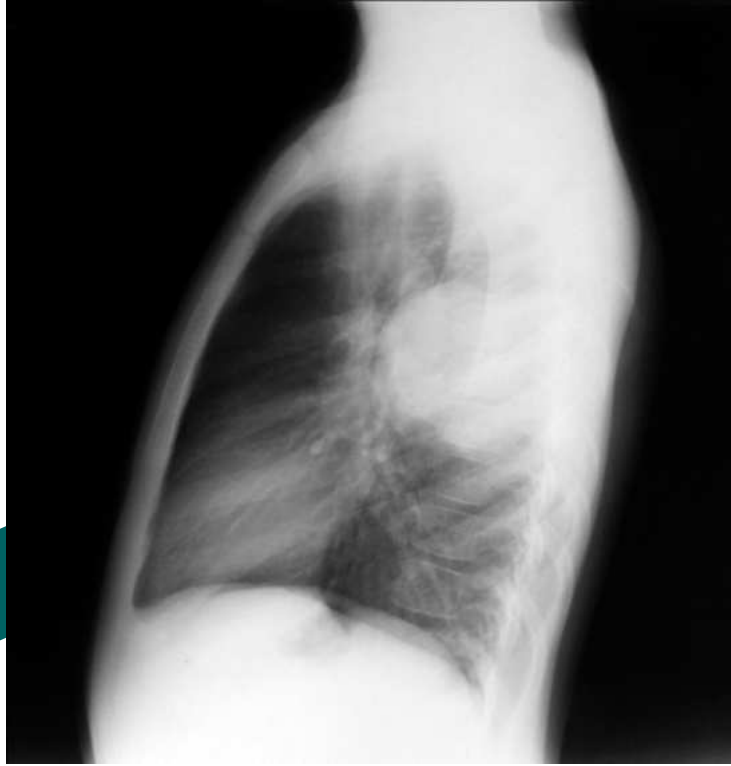
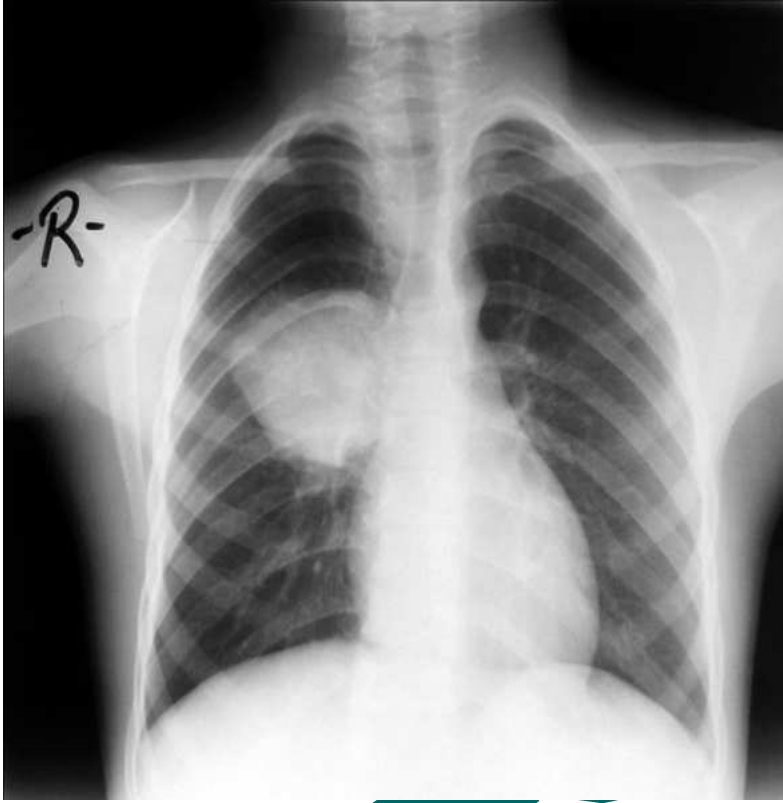




# POSTERIOR MEDIASTINAL MASSES

- Neurogenic tumors
  - Neurofibroma
  - Ganglioneuroma
- Aneurysm of descending aorta.
- Hiatus hernia.
- Dilated esophagus (especially achalasia).
- Paravertebral mass or abscess.







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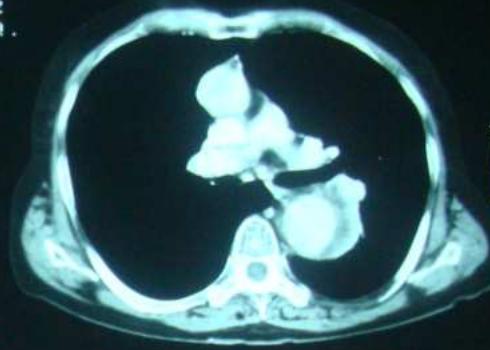
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INFUSION GASTROGRAFIN

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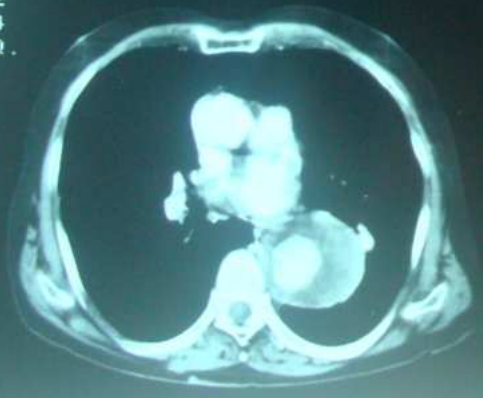
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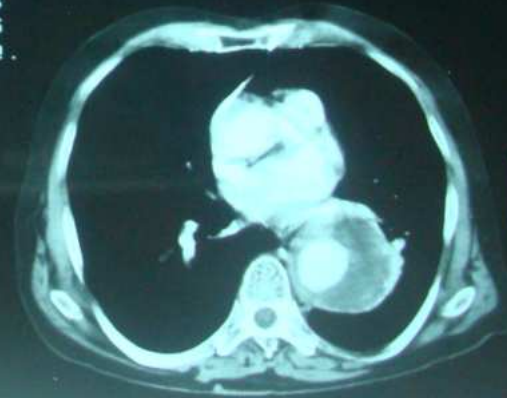
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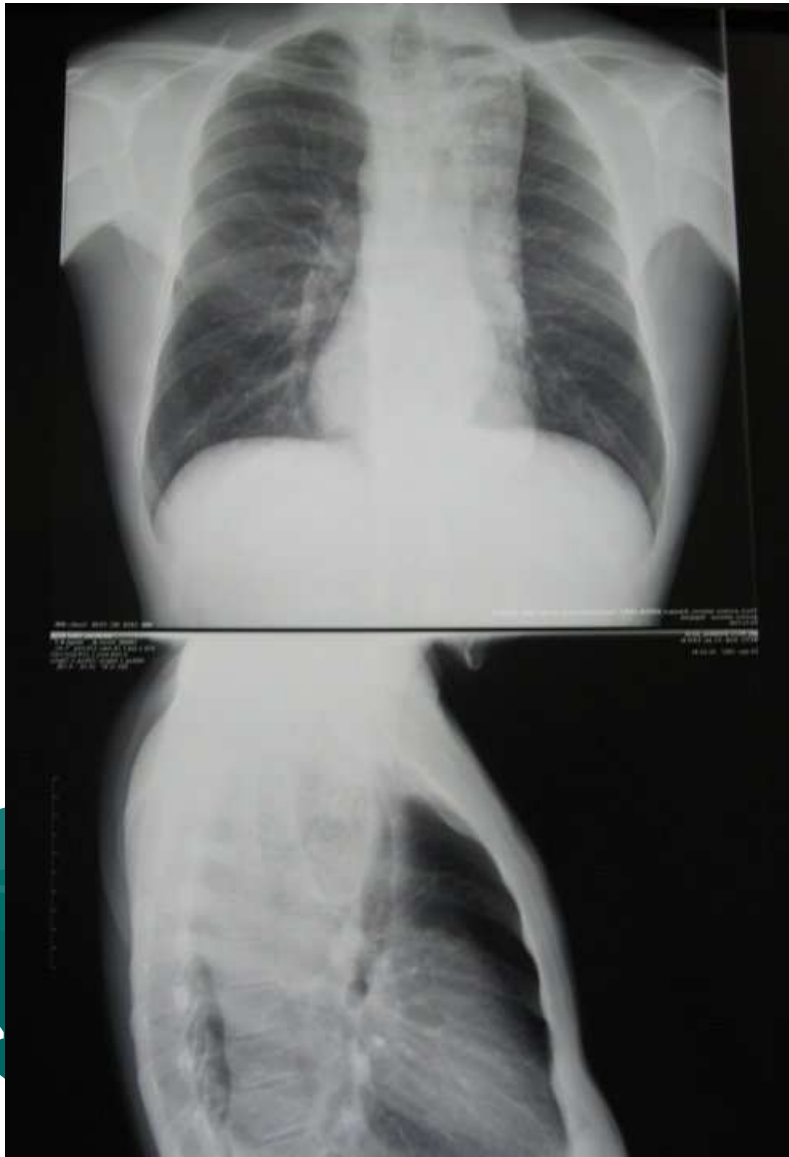
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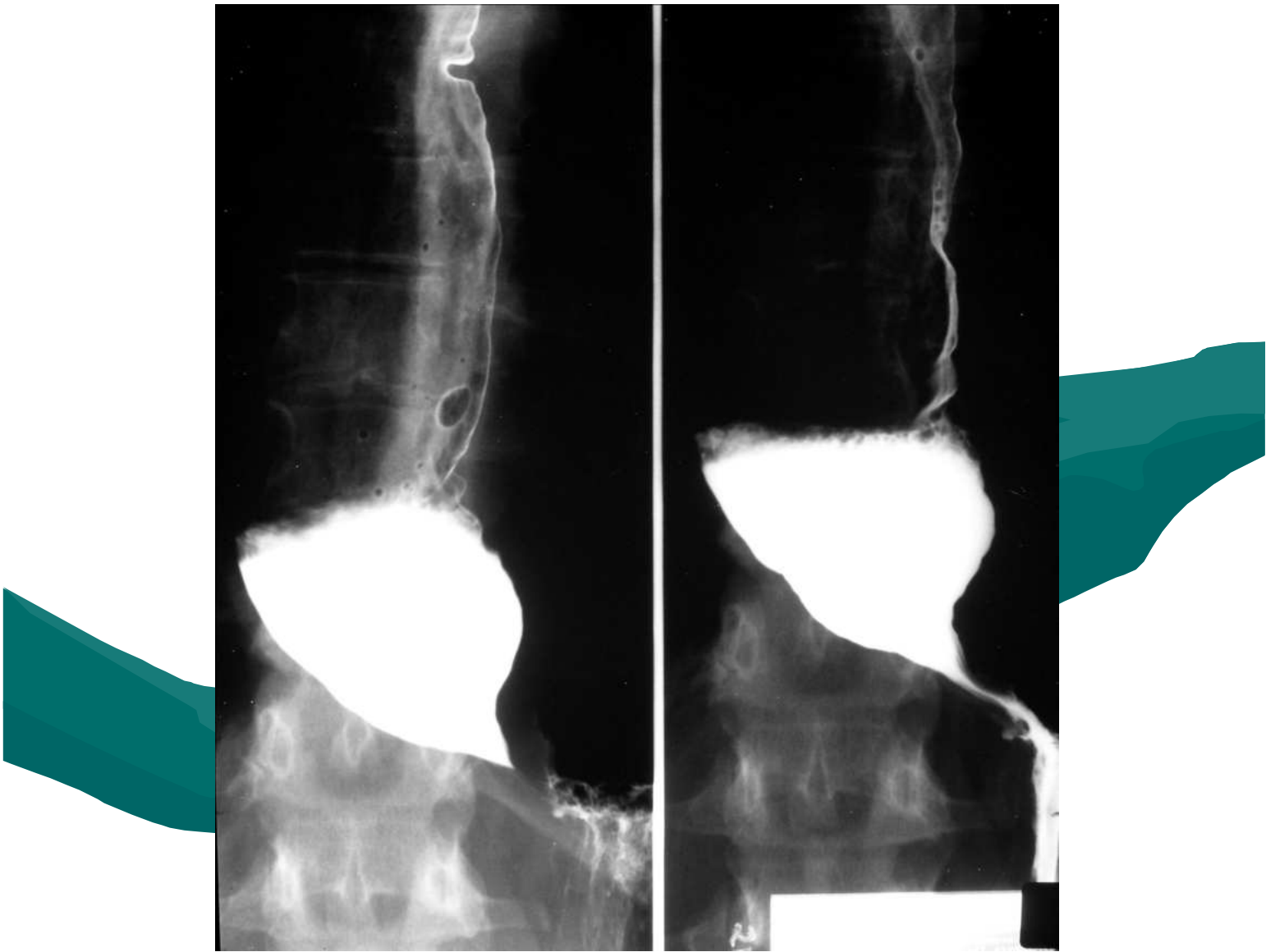
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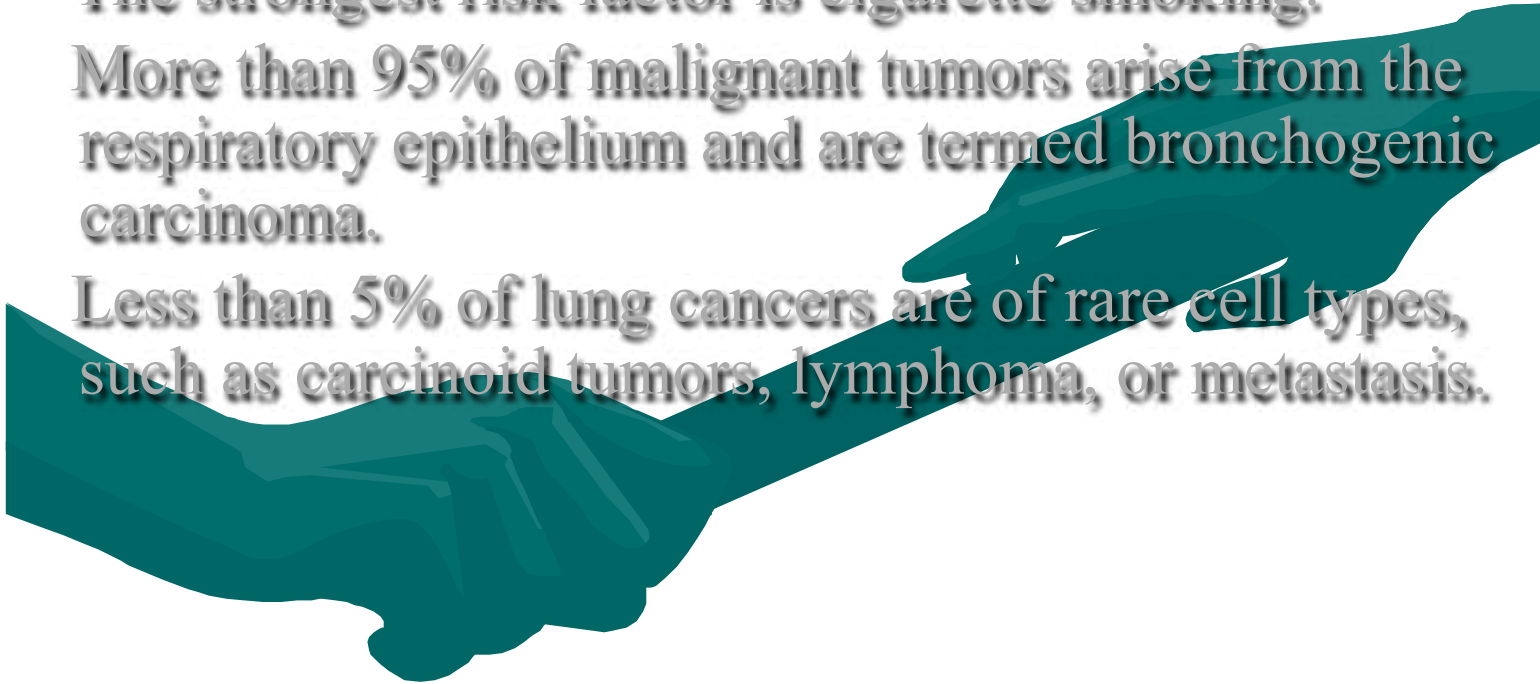
# TUMORS OF THE LUNG

Lung cancer is the commonest fatal malignancy.

The strongest risk factor is cigarette smoking.

More than 95% of malignant tumors arise from the respiratory epithelium and are termed bronchogenic carcinoma.

Less than 5% of lung cancers are of rare cell types, such as carcinoid tumors, lymphoma, or metastasis.



# Types of lung cancers

## 1- Adenocarcinoma

Is the most common type of lung cancer, making up 30-40% of all cases.

Usually arise peripherally as solitary pulmonary nodule.

The alveolar cell carcinoma is a subtype of adenocarcinoma and arise within the alveoli producing areas of consolidation and the appearance resemble bronchopneumonia.

# Types of lung cancers / 2

## 2- Squamous cell carcinoma

They typically occur in central bronchi.

Grow slowly and cavitate more often than other cell types.

## 3- Small (oat) cell carcinoma

- Are usually central in location.
- Have the fastest rate of growth.
- Typically associated with mediastinal adenopathy.

## 4- Large cell carcinoma

- Usually arise at the periphery of the lung.



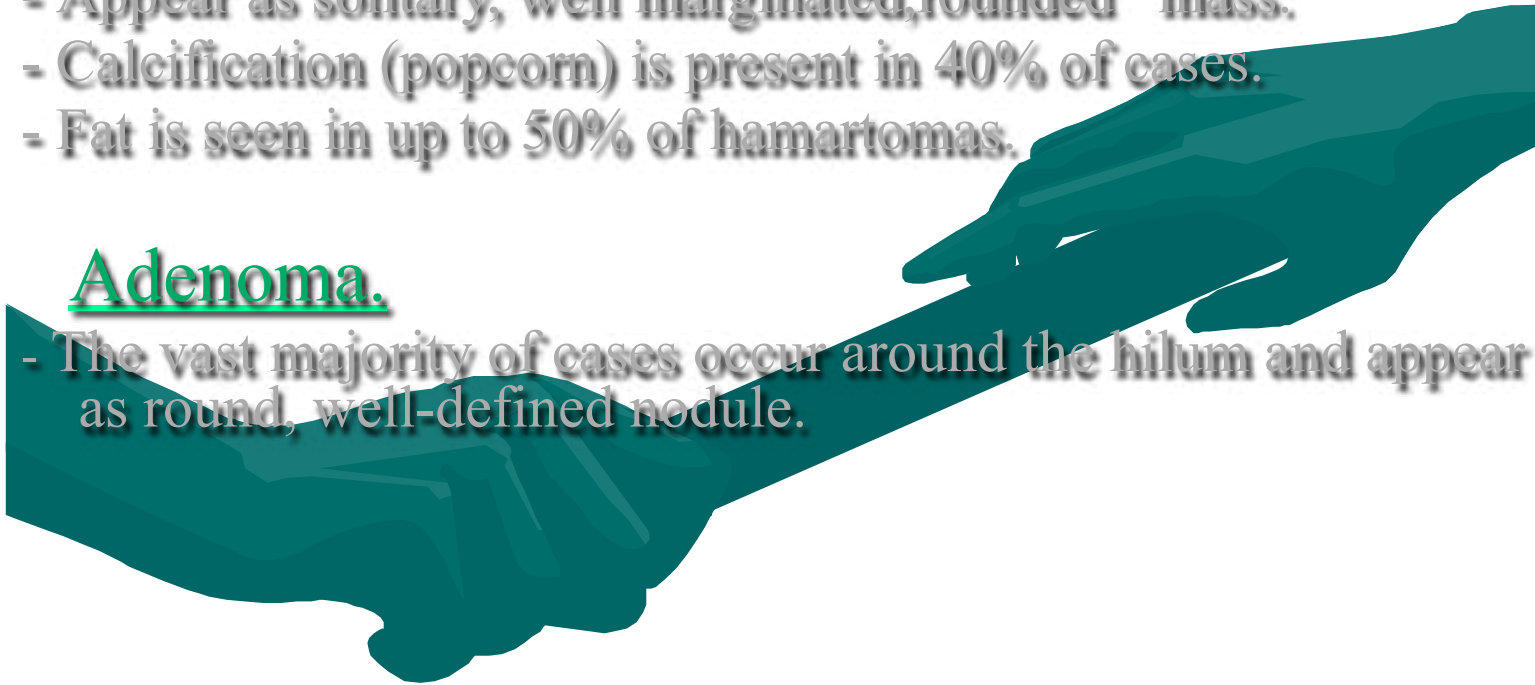
# BENIGN TUMORS OF THE LUNG

## Hamartoma.

- Is the most common benign tumor of the lung.
- Appear as solitary, well marginated, rounded mass.
- Calcification (popcorn) is present in 40% of cases.
- Fat is seen in up to 50% of hamartomas.

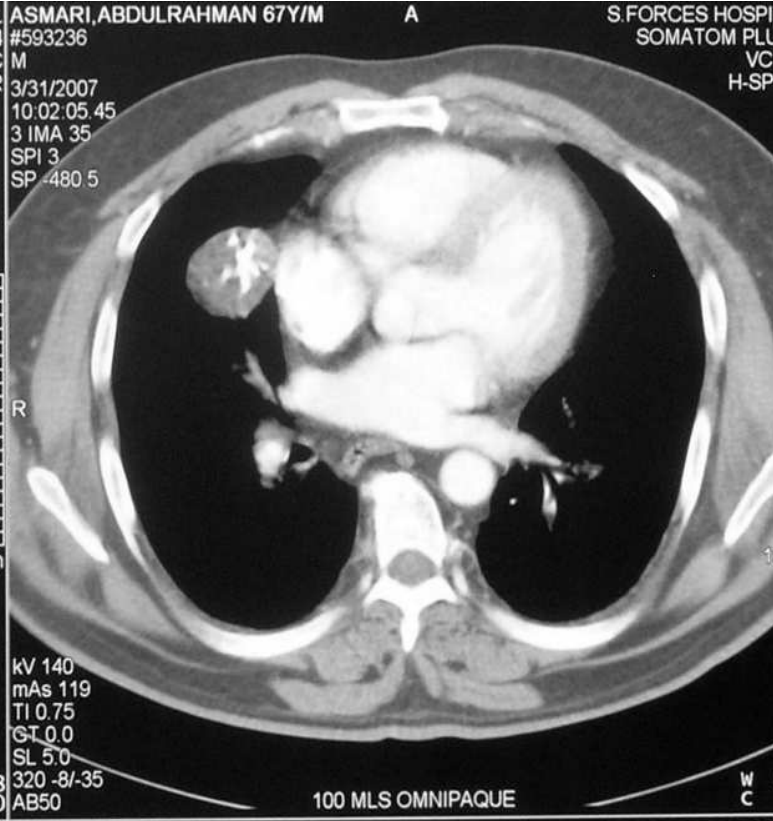
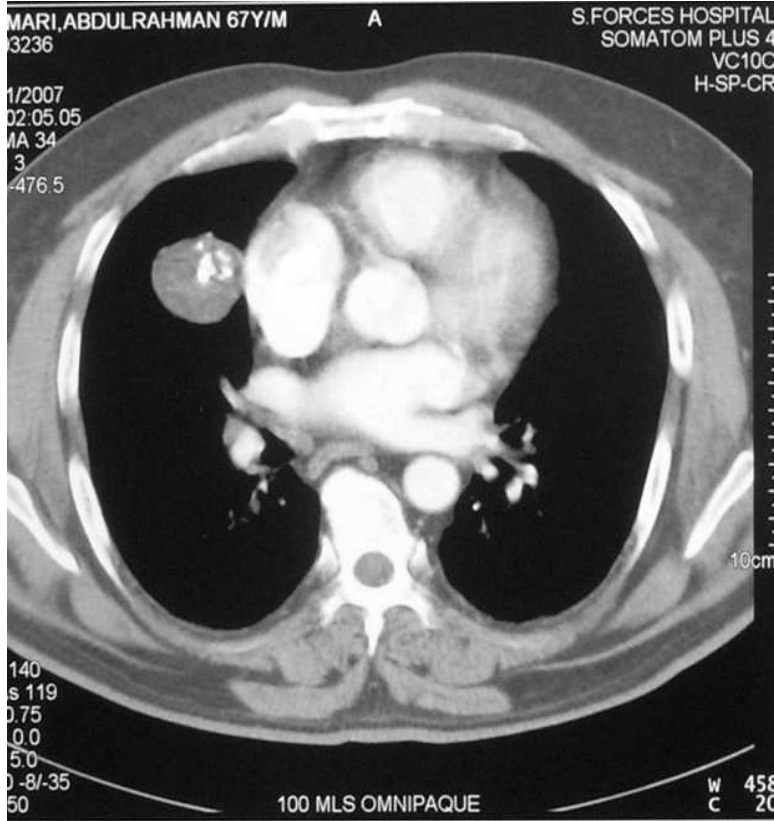
## Adenoma.

- The vast majority of cases occur around the hilum and appear as round, well-defined nodule.









# Lung metastasis

- The commonest primary tumors producing lung metastasis are breast, renal tract, thyroid, bone, and testicular tumors.
- Metastasis to the lung are usually bilateral and tend to be peripheral and more numerous at the lung bases.
- Lung metastasis are spherical in shape with a well-defined margin.







SAQER, ABDULLAH 40Y/M  
#286830

S. FORCES HOSPITAL  
SOMATOM PLUS 4  
VC10C  
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SAQER, ABDULLAH 40Y/M  
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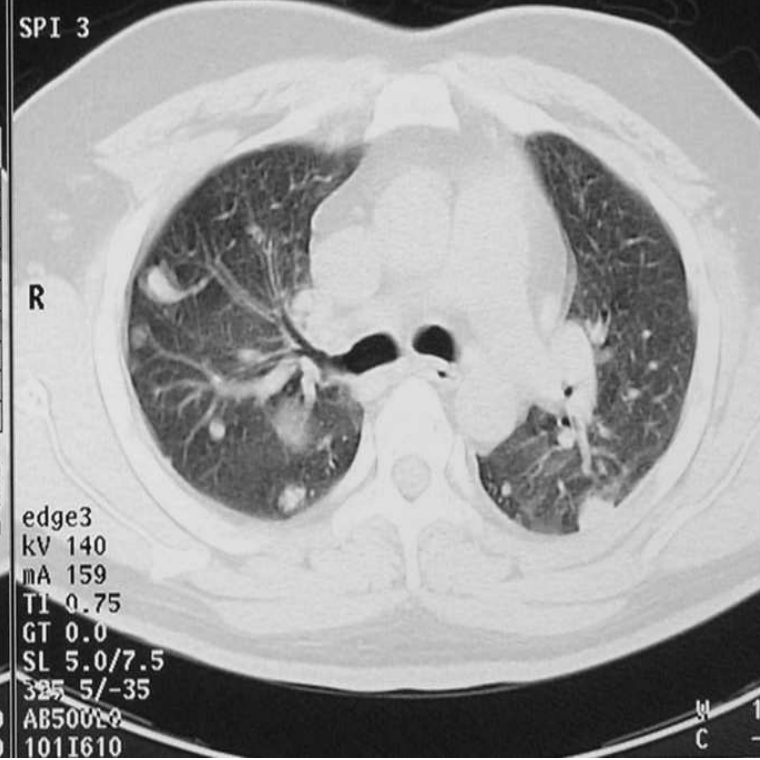
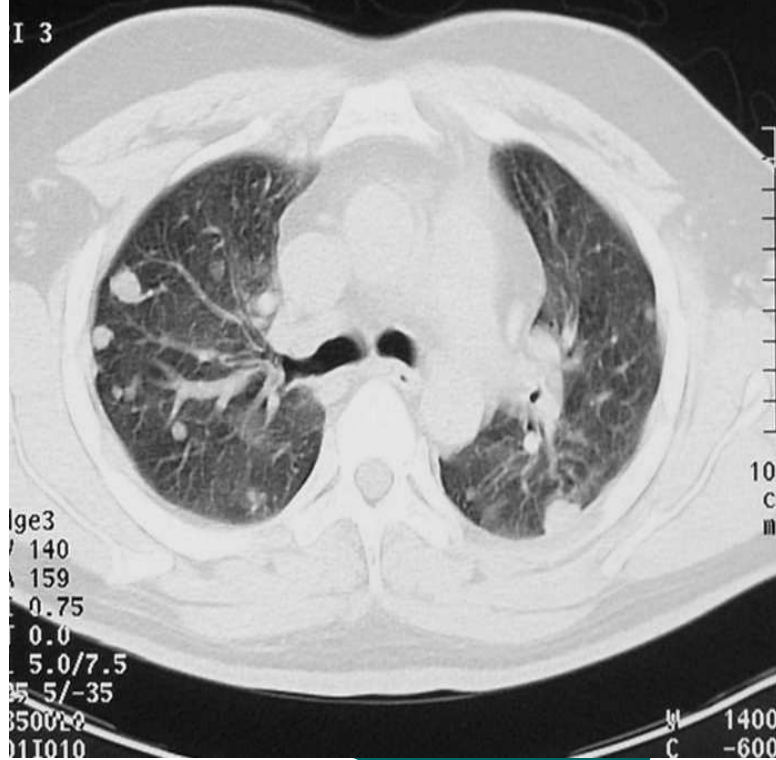
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# Chest trauma

Chest trauma can be as blunt or penetrating.

Penetrating chest trauma can injure vital organs such as the heart and lungs.

The common clinical problems associated with chest injury include pulmonary contusion, pneumothorax and hemothorax.

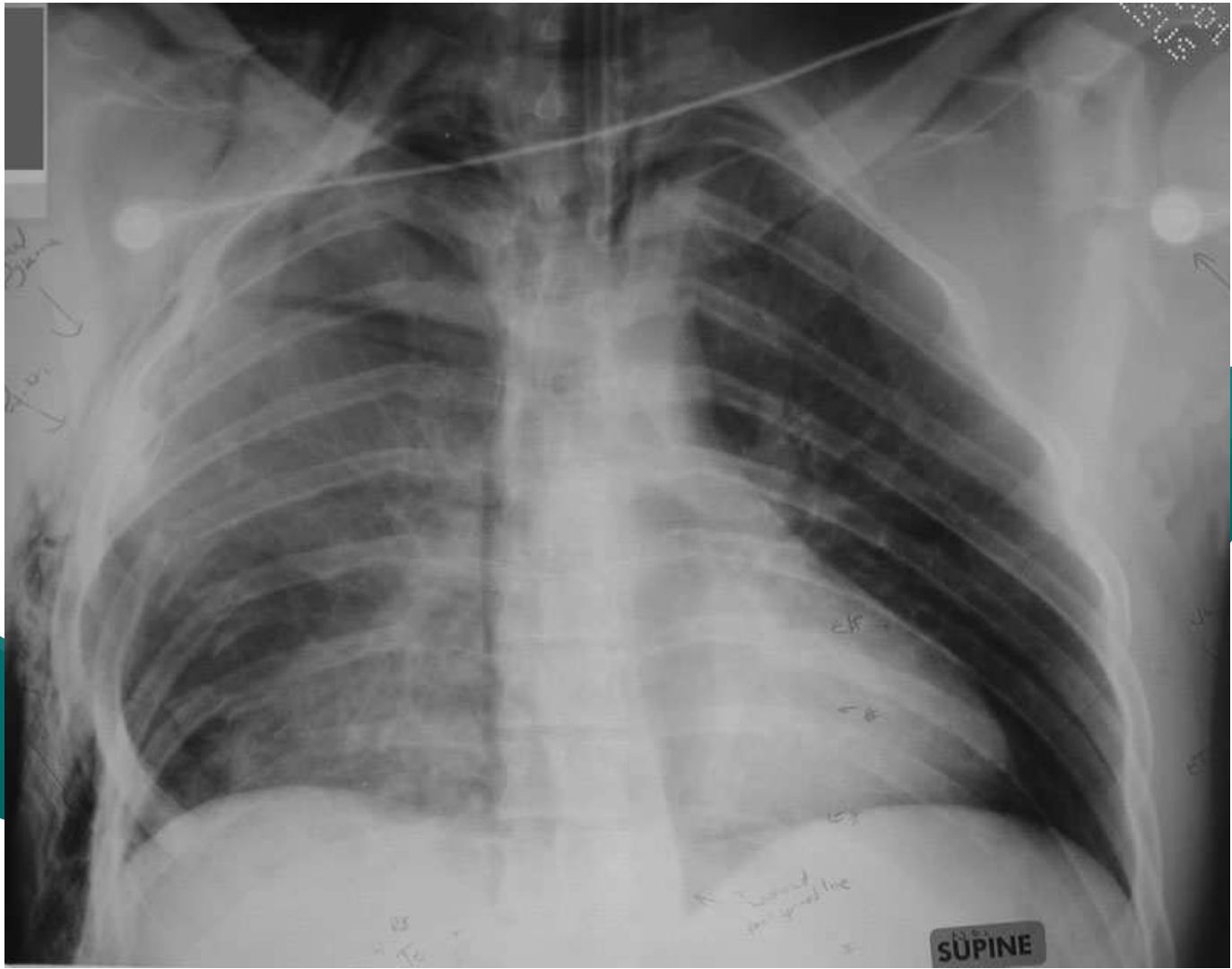
Fractures of the lower ribs may be associated with diaphragmatic tears and spleen or liver injuries.

Fractures of the upper ribs can be associated with injuries to adjacent great vessels.

# Chest trauma / 2

What is the ABCDE approach to guide the radiographic search for thoracic injury ?

- Air : extra pulmonary ( pneumothorax, subcutaneous emphysema, pneumomediastinum).
- Bones – rib fracture, thoracic spine, scapula and sternum fractures.
- Contusions and lacerations in the lung.
- Diaphragm - rupture.
- Effusions – hemothorax.









Thank You