

**Internal  
medicine**

الطب والجراحة  
بجنتة

# **CHEST X-RAY**

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# CHEST X-RAY

**Chest x-ray is the most commonly performed diagnostic x-ray examination.**

Imaging with x-rays involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body.

## **Common Uses of the procedure**

**The chest x-ray is performed to evaluate:**

- Lungs,
- Heart
- Chest wall.

**Chest x-ray is the first imaging test used to help diagnose symptoms such as:**

Persistent cough.

Hemoptysis.

Shortness of breath.

Chest pain or injury.

**Different parts of the body absorb the x-rays in varying degrees:**

- Bone absorbs much of the radiation → white
- Soft tissue, such as muscle and organs, allow more of the x-rays to pass through them → shades of gray
- Air not absorb any radiation → black

**Lung tissue absorbs little radiation and will appear dark on the image**

## **Densities**

BONE	SOFT TISSUES	WATER	FAT	AIR
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# CHEST X-RAY

## The 12-Step Program

- 1.Name
- 2.Date
- 3.Old films
- 4.What type of view(s)

pre-read

- 1.Penetration
- 2.Inspiration
- 3.Rotation
4. Angulation

Quality Control

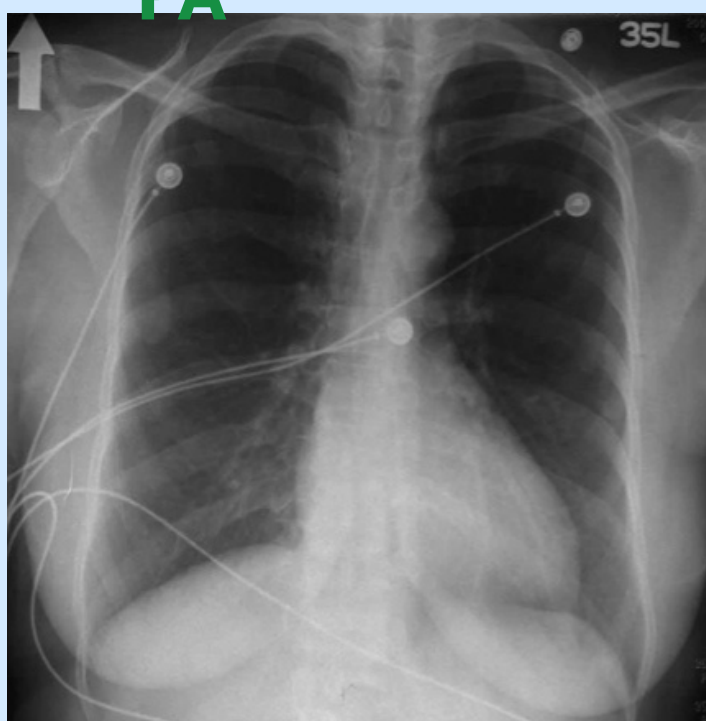
- 5.Soft tissues / bony structures
- 6.Mediastinum
- 7.Diaphragms
- 8.Lung Fields

Finding

### Pre-Reading

1. Check the name, geheck the date
  1. Obtain old films if available
  2. Which view(s) do you have?
  3. PA & lateral VieW. posteroanerior (most common)
  4. AP VieW Antepastrior → in lcu patient can't stand up
  5. Lateral Decubitus,
  6. Oblique view.
  7. Lordotic view.
  8. Kyphotic view.

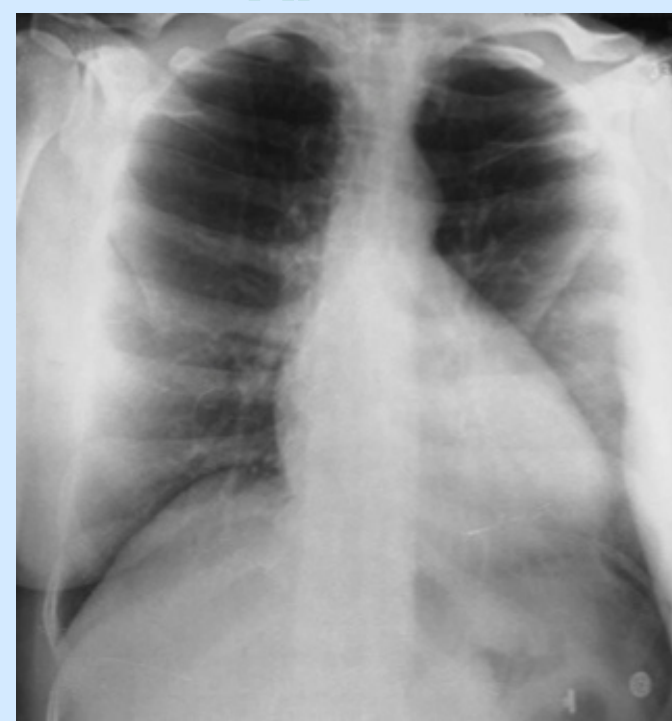
PA



medial end of clavicle lower than the lateral  
normal cardiac Size  
scapula peripherly



AP



medial and lateral end on the Same position  
→ cardio megalaly (false) لانه الصورة من قدام ف اول  
بخبط بالقلب ف ببين كبير وهو لا  
scapula over the lung Field

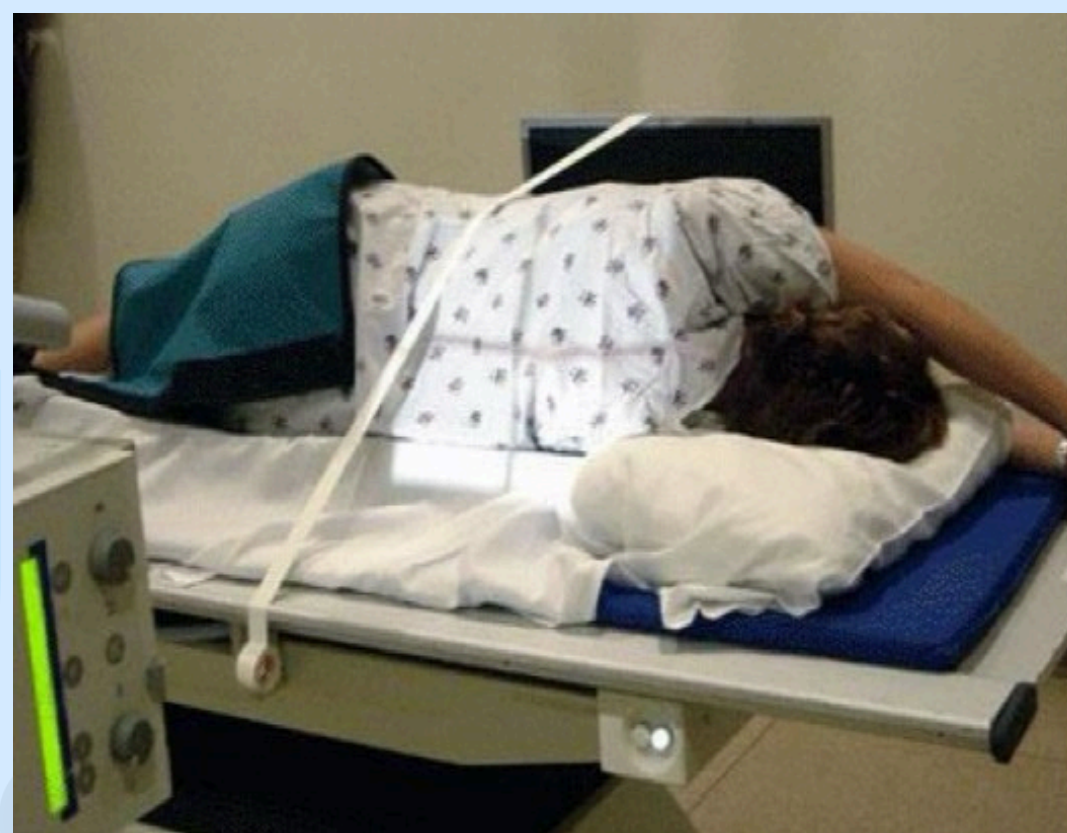
# CHEST X-RAY



In ICU pt



For localization lobe



Lateral decubitus  
important on plural  
effusion but now use U/S

## Quality Control

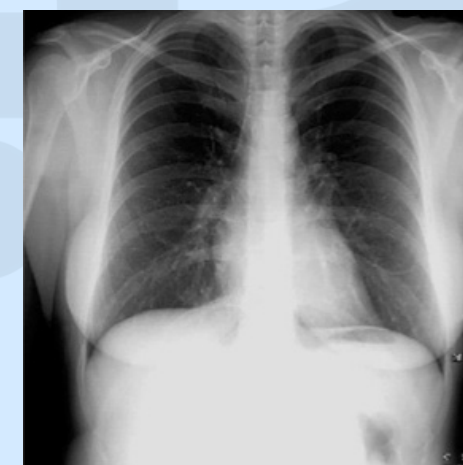
### 5. Penetration (dose of X-Ray)

#### Ideal chest x-ray film:

a. Shouldn't see ribs through the heart

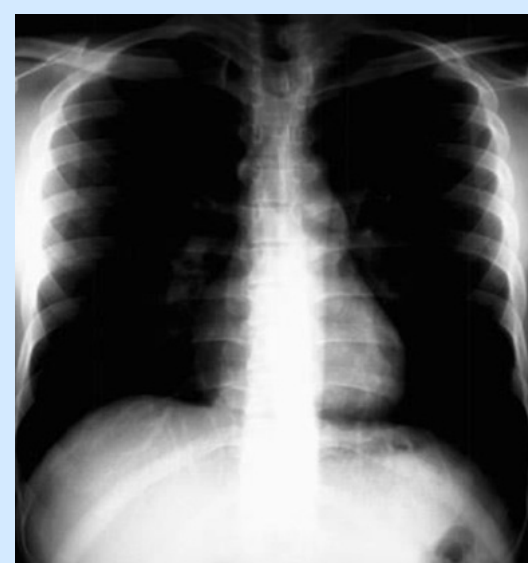
b. Barely see the spine through the heart " above heart : prominent \ on heart level : بشوفهم  
" أخف شوي "

c. Shouldn't see pulmonary vessels nearly to the edges of the lungs



Soft

(low radiation dose )  
spine not appear



Hard

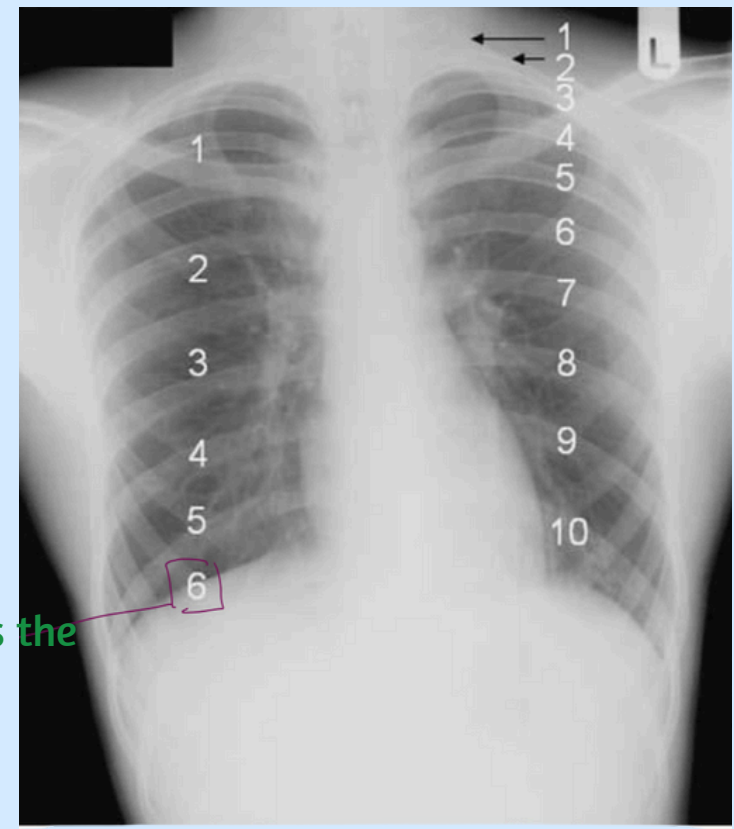
(high dose)

# CHEST X-RAY

## 6. Inspiration

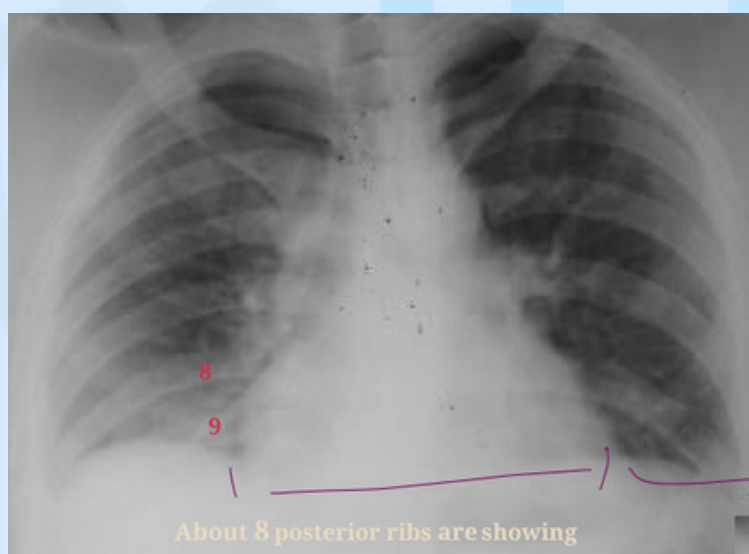
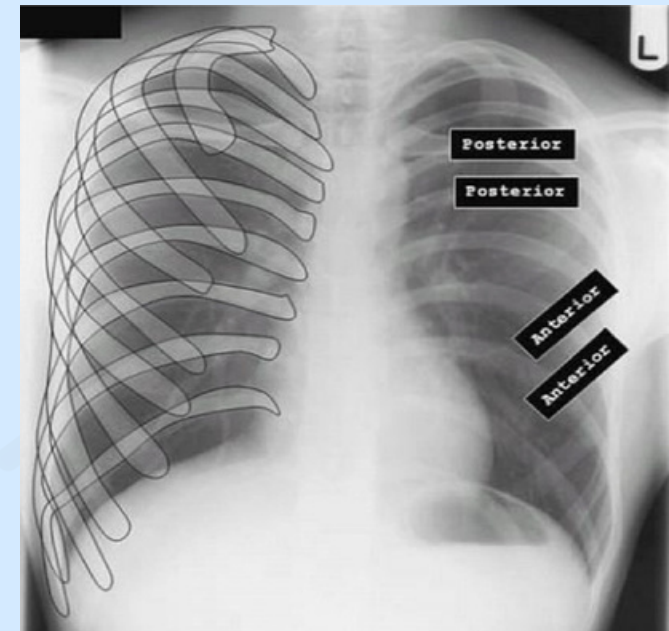
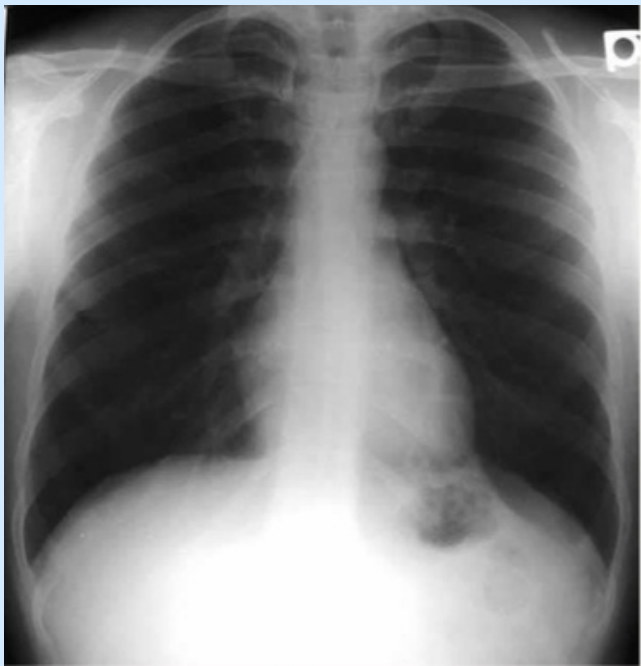
Should be able to count **10th** ribs posteriorly  
"transverse ribs" OR **6th** rib anteriorly "oblique".

● Heart shadow should not be hidden by the diaphragm



Inspiration

Expiration



Poor inspiration can crowd lung markings producing pseudo-airspace disease

Pseudo cardiomegaly



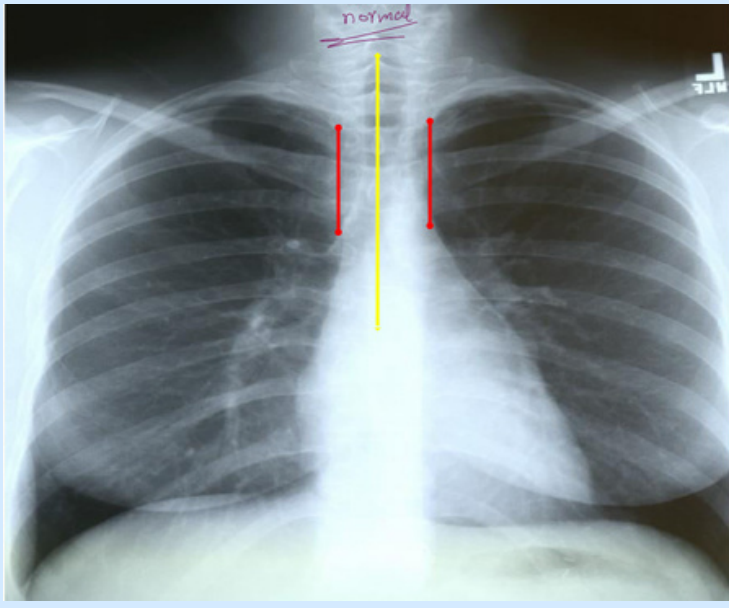
With better inspiration, the "disease process" at the lung bases has cleared

## 7. Rotation

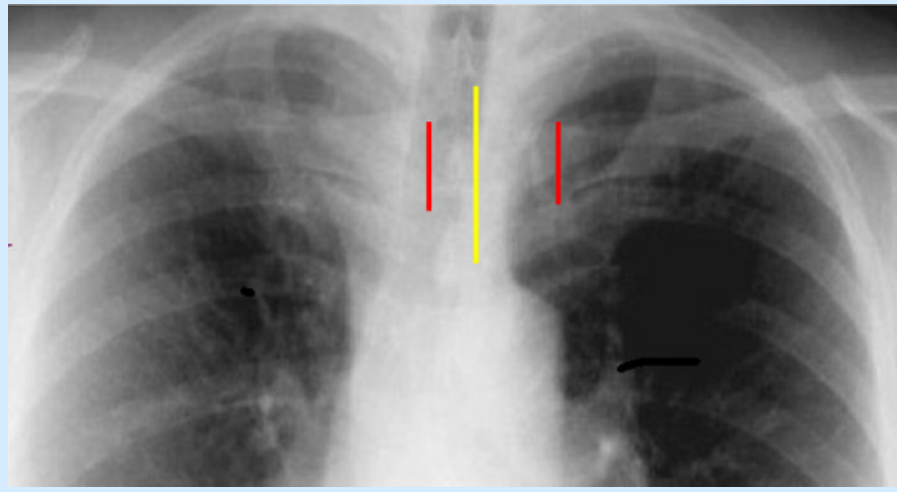
● Medial ends of bilateral clavicles are equidistant from the midline or vertebral spines



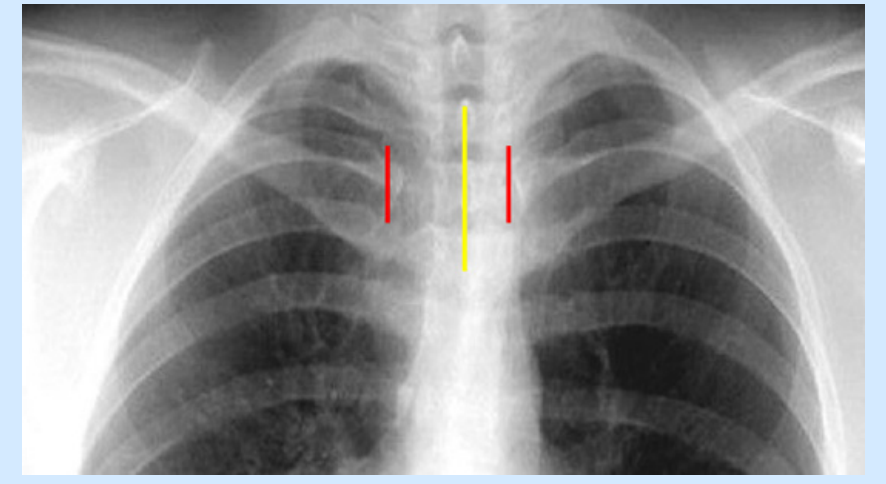
# CHEST X-RAY



Normal



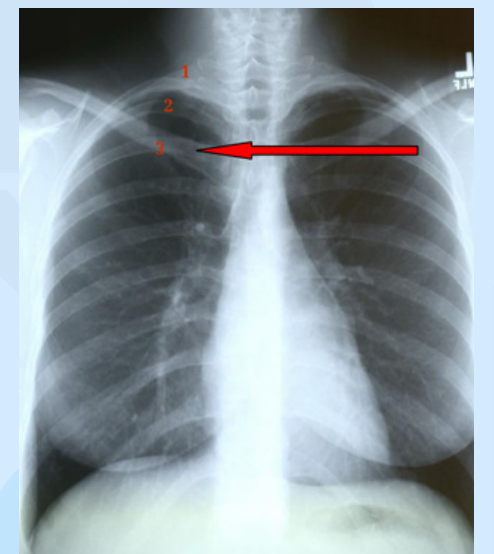
To left  
in the same side of long space



To right

## 8. Angulation

- Clavicle should lay over 3rd rib posteriorly.



## Findings

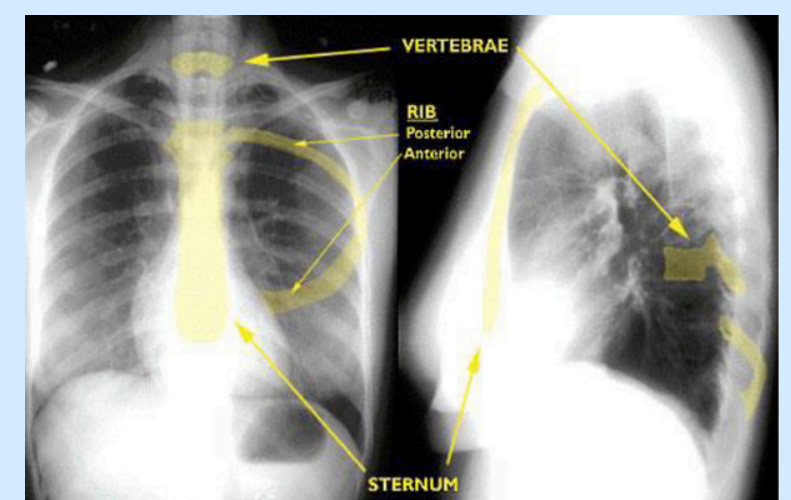
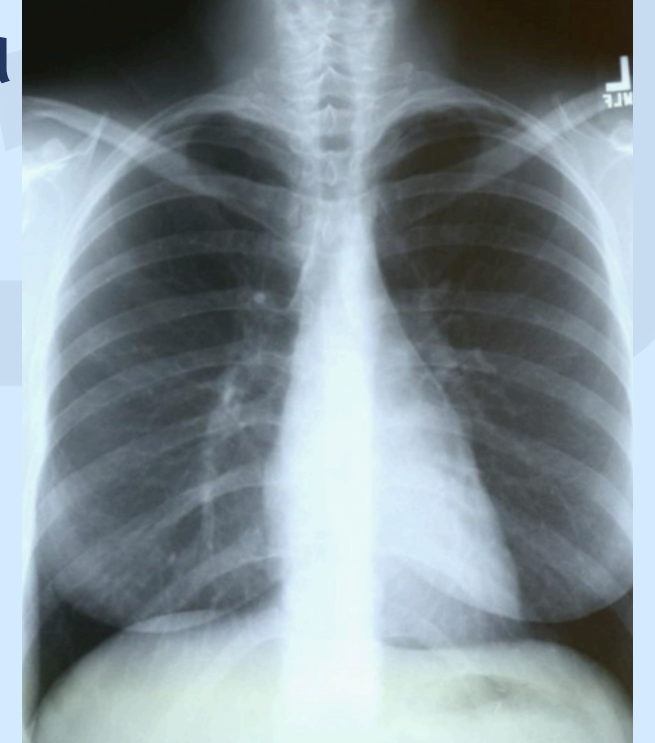
## 9. Soft tissue (Breast shadows, Supraclavicular areas, Axilla) and bony structures

### Bony structures

- Ribs
- Sternum
- Spine
- Shoulder
- girdle

### Check for

- Symmetry
- Deformities
- Fractures
- Masses
- Calcifications
- Lytic lesions

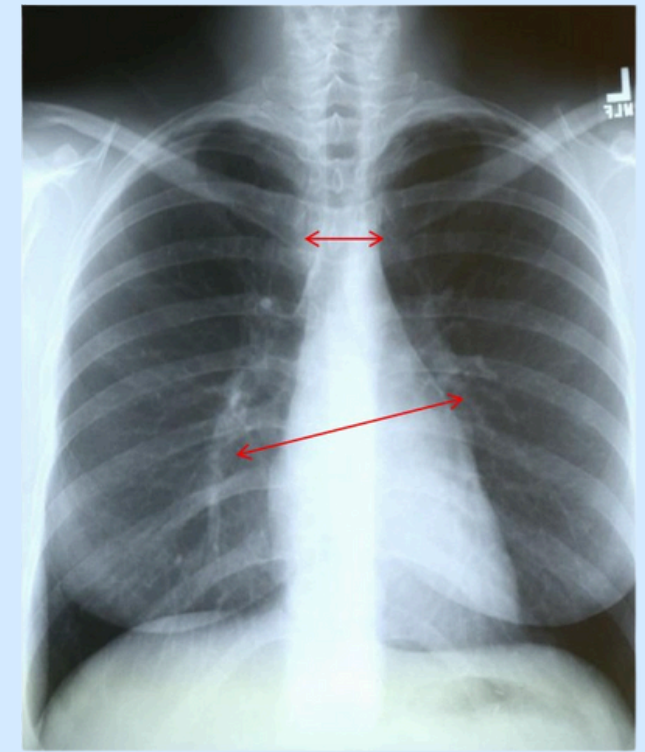


# CHEST X-RAY

## 10. Mediastinum

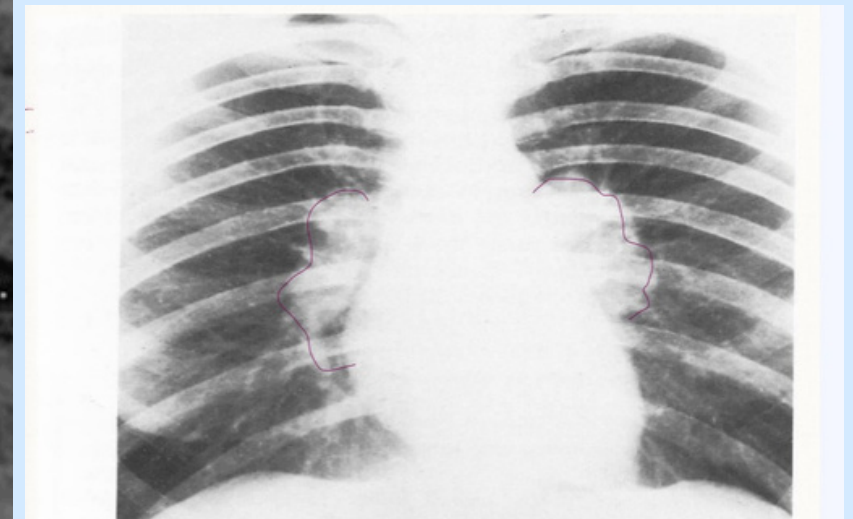
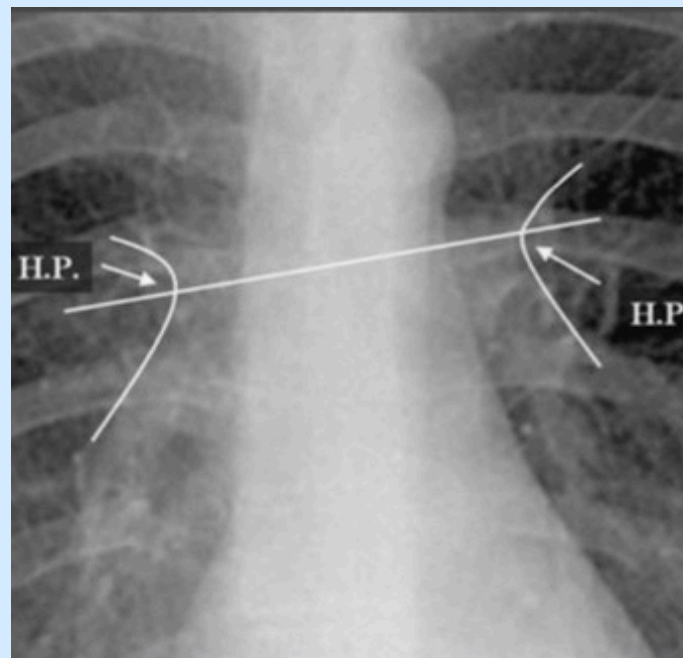
### Check for

- Upper mediastinum "on trachea level"
- Hilar contours for increase densities or deformities
- Lower Mediastinum "on heart level"



### Hilar region:

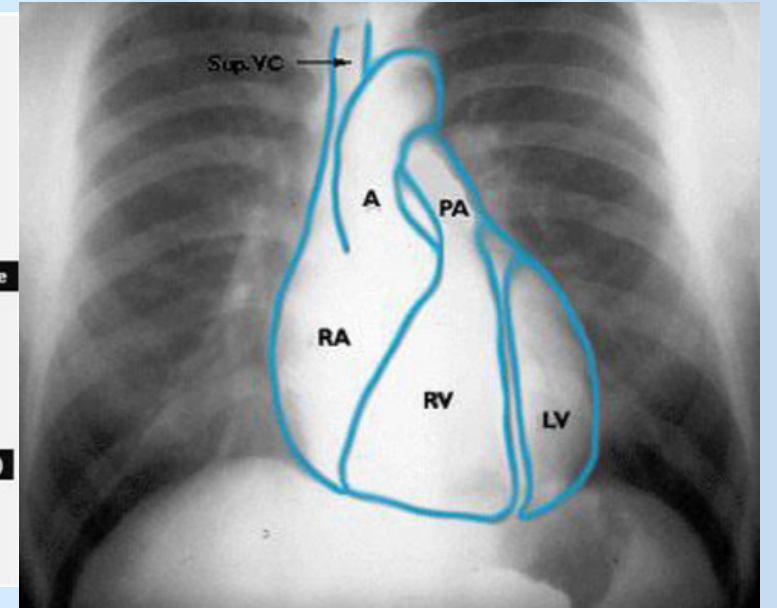
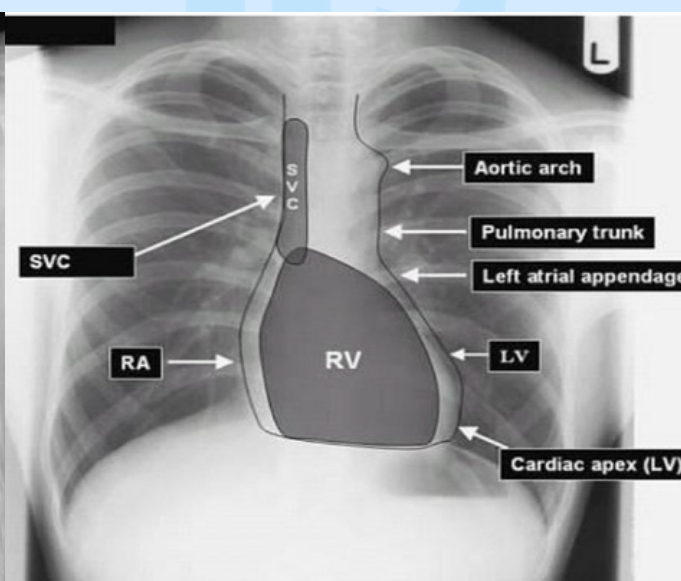
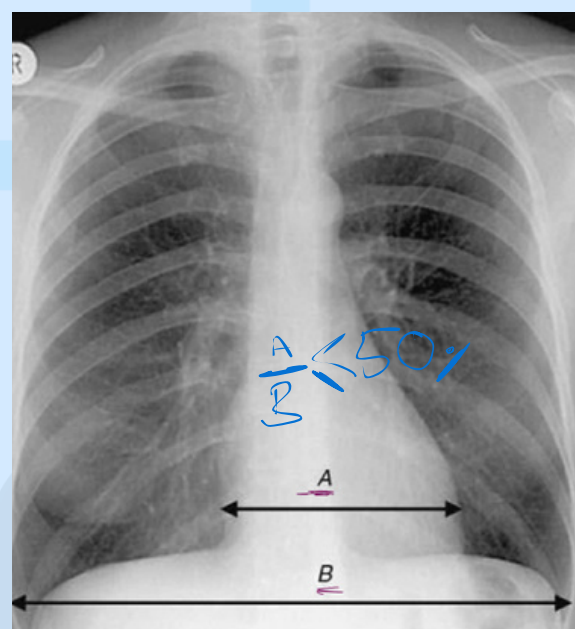
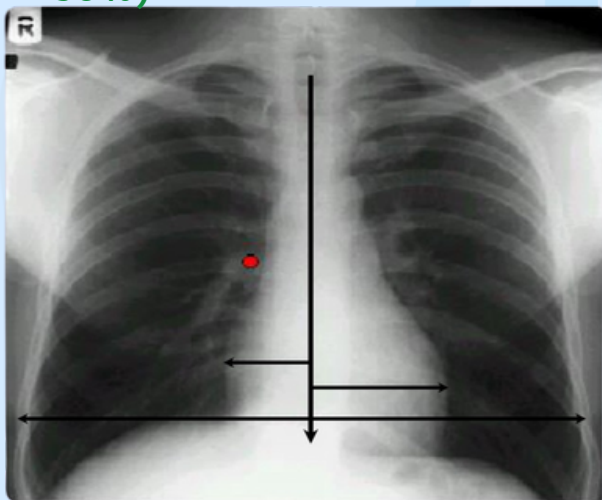
- Both hila should be of similar density.
- Both hila should be of similar density
- The left hilum "on second space" is usually superior to the right "on fourth space" by up to 1cm
- distance <7cm between them



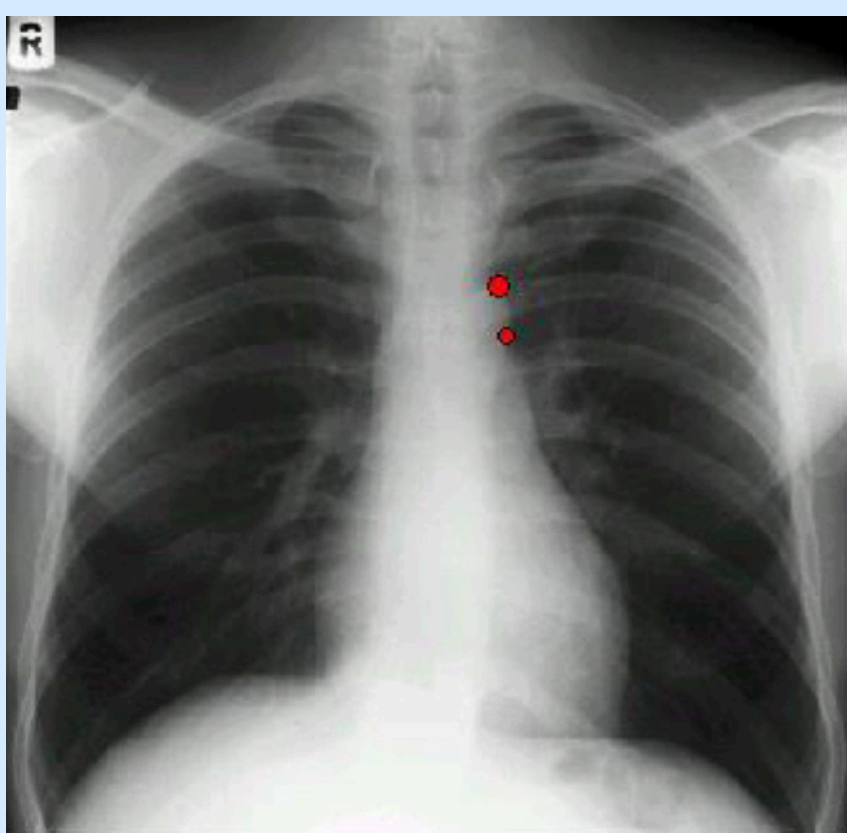
Sarcoidosis. Bilateral hilar node enlargement.

- \* Bilateral hila opacification
- D.Dx %
- lymphadenopathy
- pulmonary hypertension

- Cardiac shadow  $\leq 50\%$  of thoracic shadow (A \ B  $\leq 50\%$ )

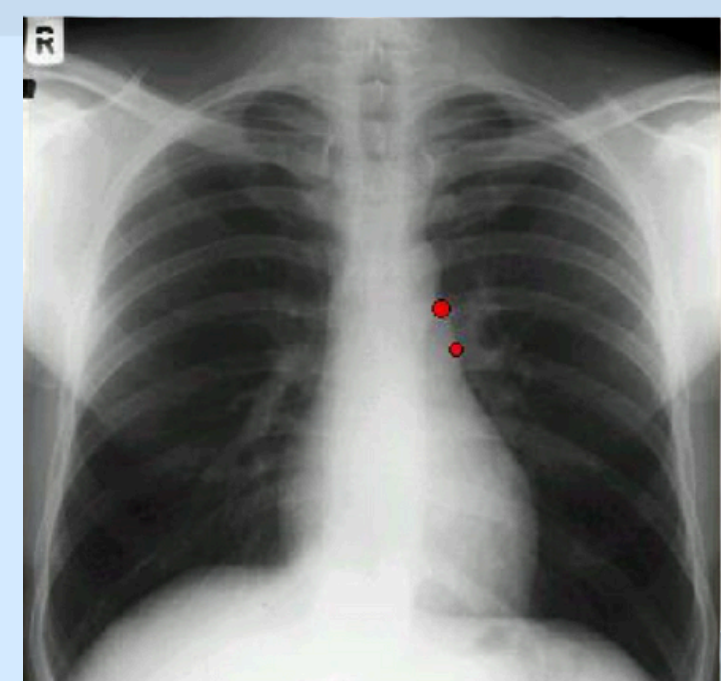


## Heart & Vessels



### Arch of Aorta (Aortic knuckle)

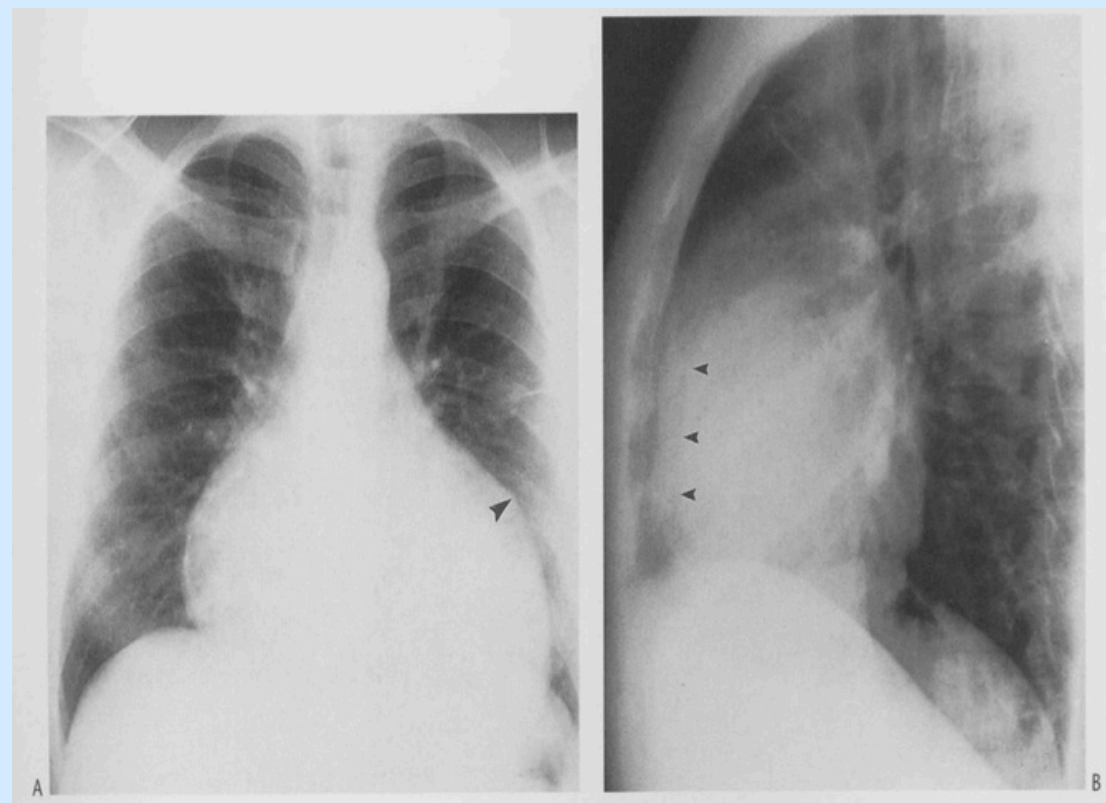
- Prominent Knuckle
- Indicate systemic hypertension
- mostly or aortic aneurysm



### Pulmonary Trunk

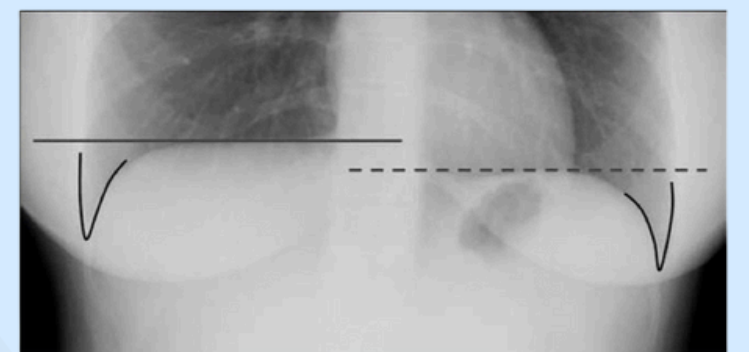
- Enlarge: pulmonary dilatation

# CHEST X-RAY



## 11. Diaphragm

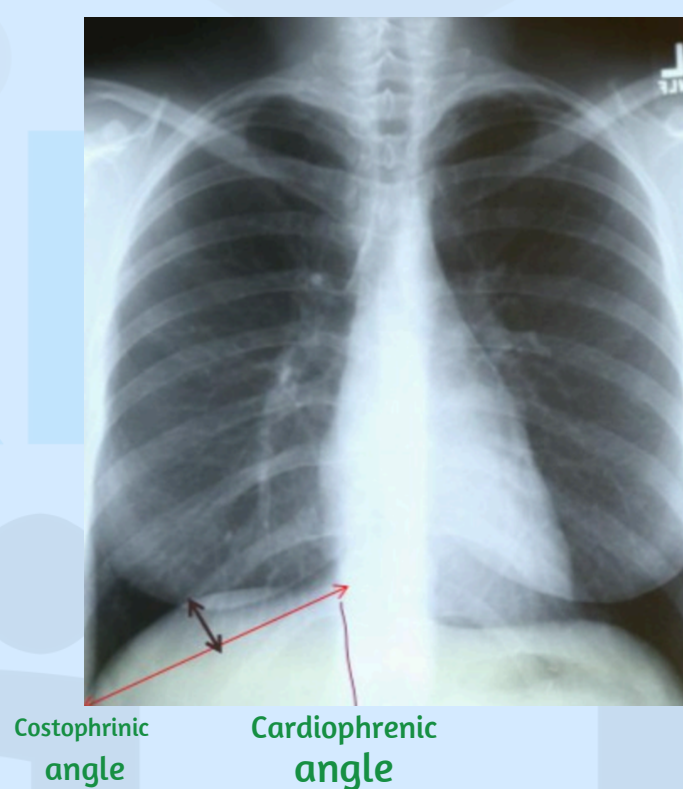
- The highest point of the right diaphragm is usually 1+ 1.5 cm higher than that of the left.
- Each costophrenic angle should be sharply outlined.



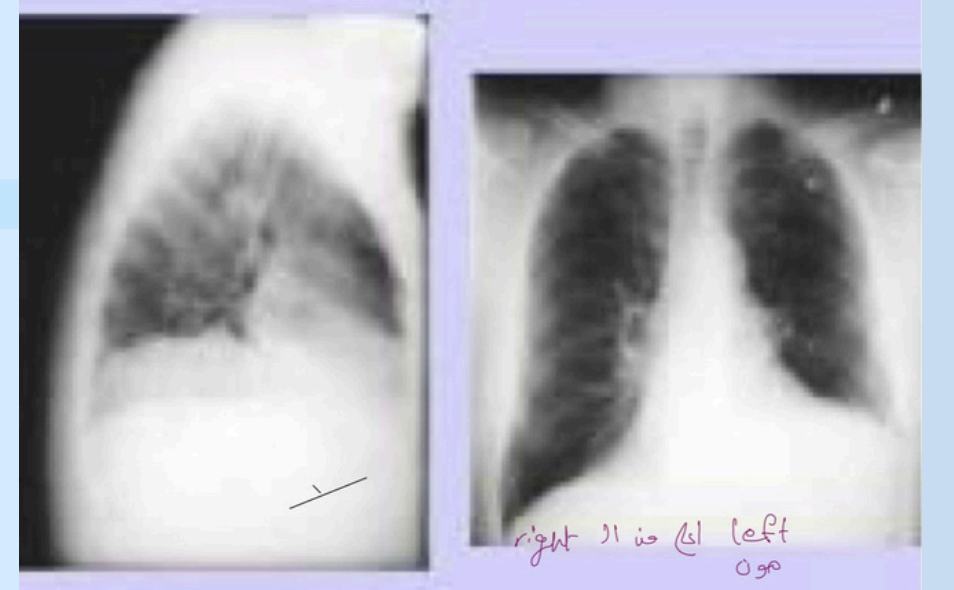
Check convexity and domes.

Check for low flat diaphragm with indentations.

Check for free air, or fluid.



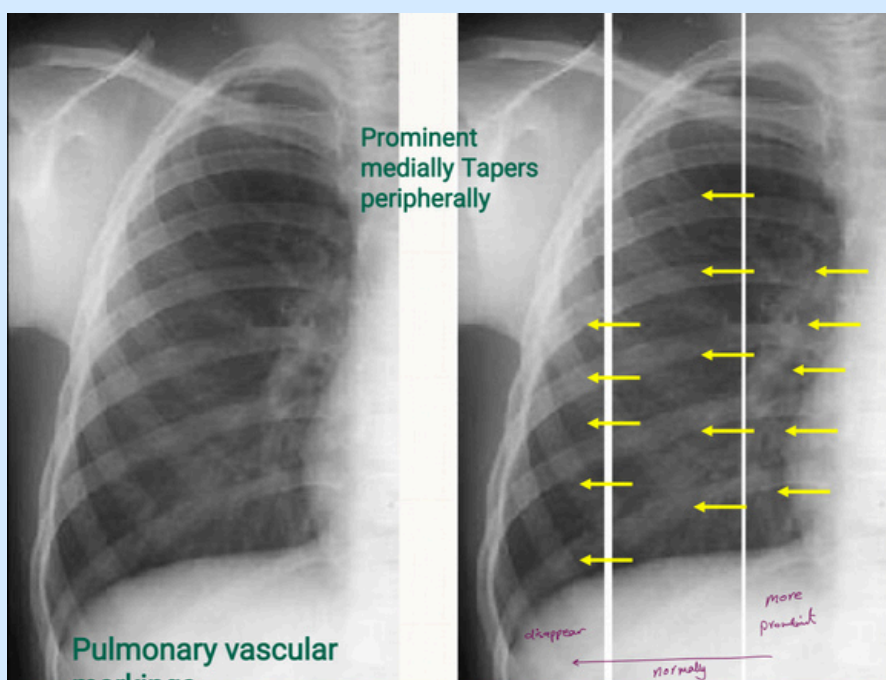
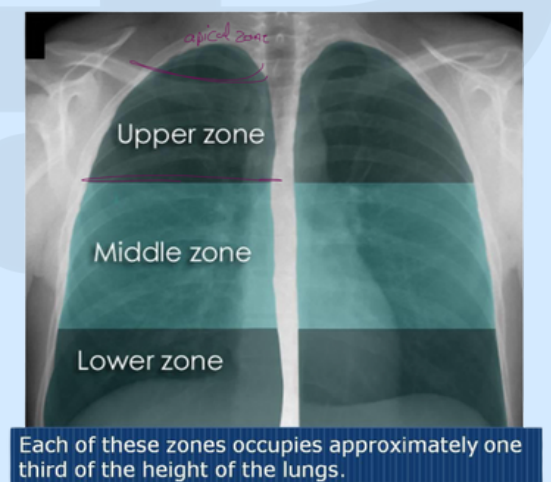
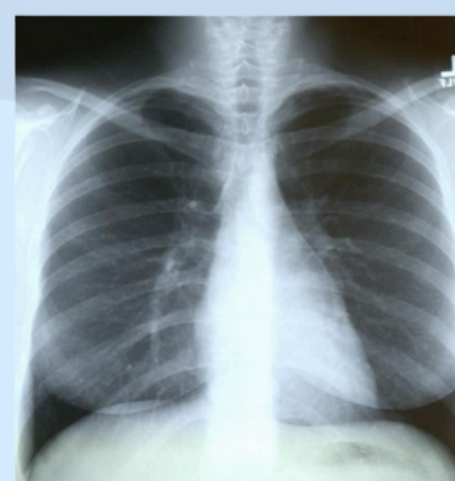
## Unilateral Left Diaphragmatic Paralysis



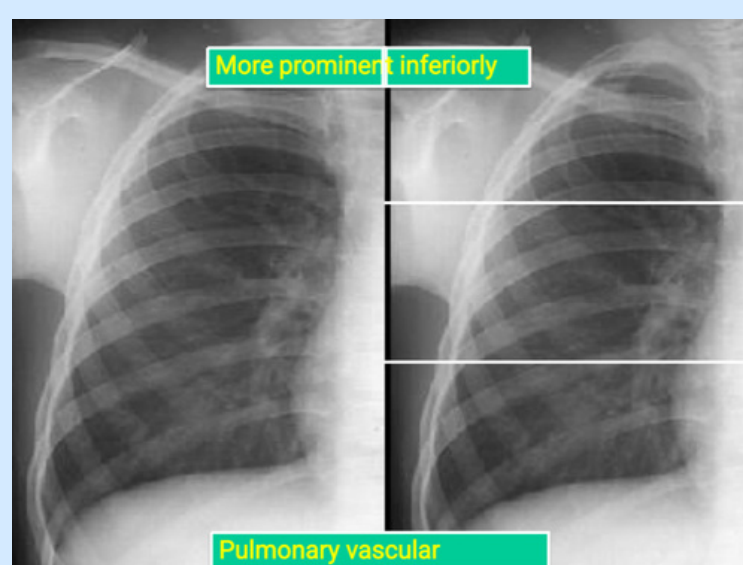
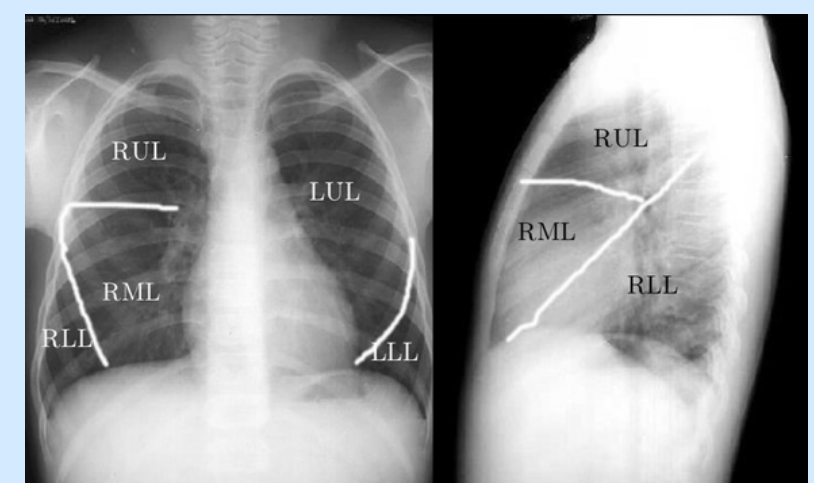
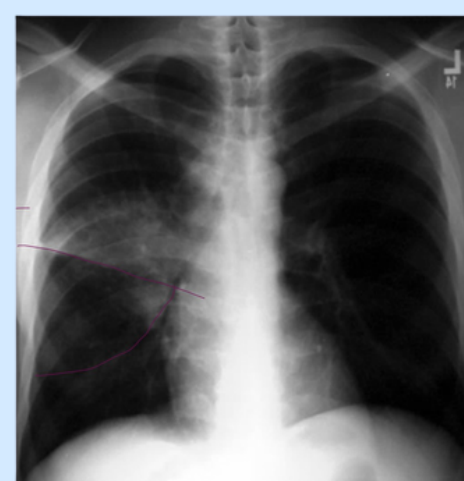
## 12. Lung Fields

Pulmonary vascular markings (BVM)

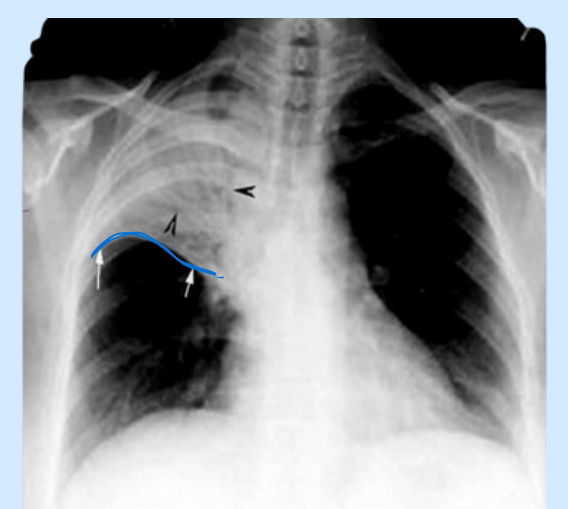
- Opacities, localized or diffuse.
- To determine location of any abnormalities
- Use radiologic lung zones.
- Use fissures to define lung lobes



Upper lobe consultation



Upper lobe  
لانه فوق ال  
fissure  
• اذا كان  
قبال  
القلب  
يكون  
middle





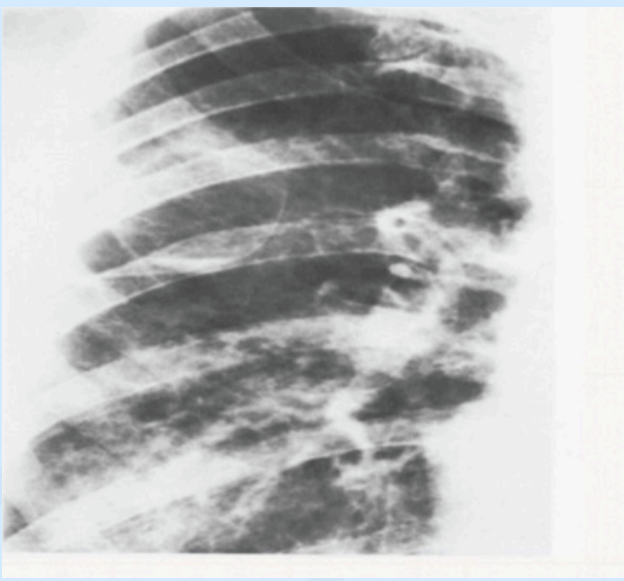
# CHEST X-RAY

## How to comment???????

- Plain x-Ray P-A view
- Site of the lesion
- Description
- Diagnosis or DD

Opacity (السحب الأبيض) (Liquid or soft tissue density)		Hypertranslucency (اللون الداكن) (Increased air density)
Diffuse	Localized	
<ul style="list-style-type: none"> <li>• Diffuse alveolar</li> <li>• Diffuse interstitial</li> <li>• Mixed</li> <li>• Vascular</li> </ul>	<ul style="list-style-type: none"> <li>• Consolidation</li> <li>• Cavitation</li> <li>• Mass</li> <li>• Fibrosis</li> <li>• Atelectasis</li> </ul>	<ul style="list-style-type: none"> <li>• Bulla</li> <li>• Localized airway obstruction</li> <li>• Diffuse airway obstruction e.g. Emphysema</li> </ul>

## Radiological description:



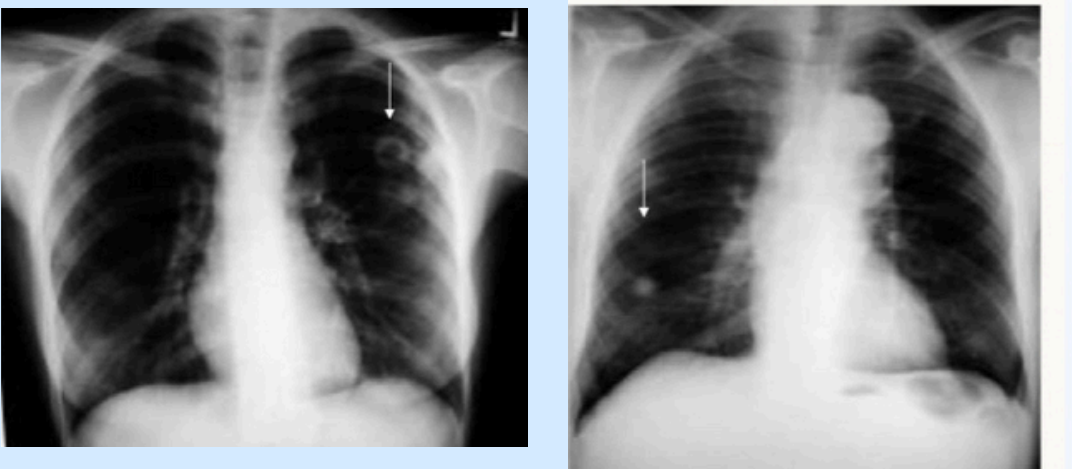
Heterogenous opacity. Variant densities



Homogenous opacity same deity

### ■ Nodule:

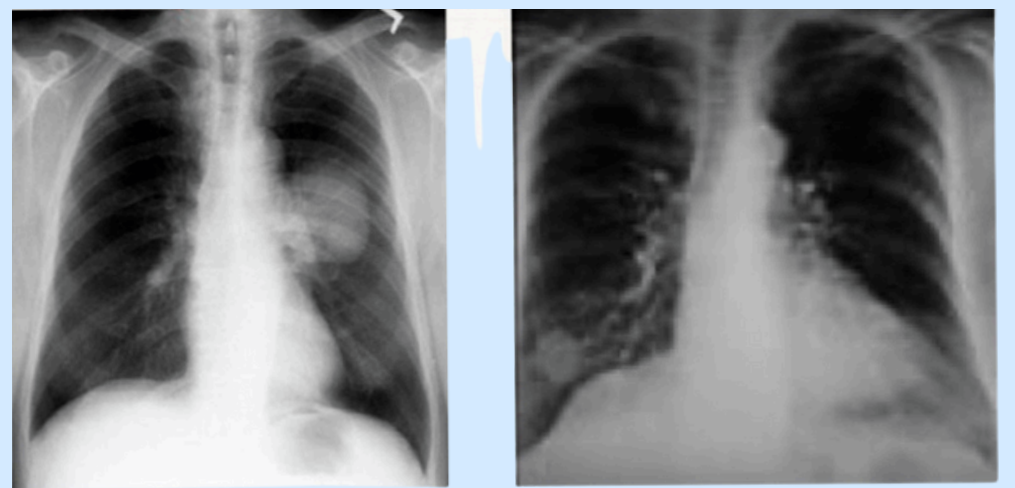
Well circumscribed pulmonary opacity (5 mm - 3 cm in diameter) and surrounded by normal lung.



### Mass:

- wel circumscribed

Pulmonary opacity 3 cm or more in diameter (larger in diameter than nodule)



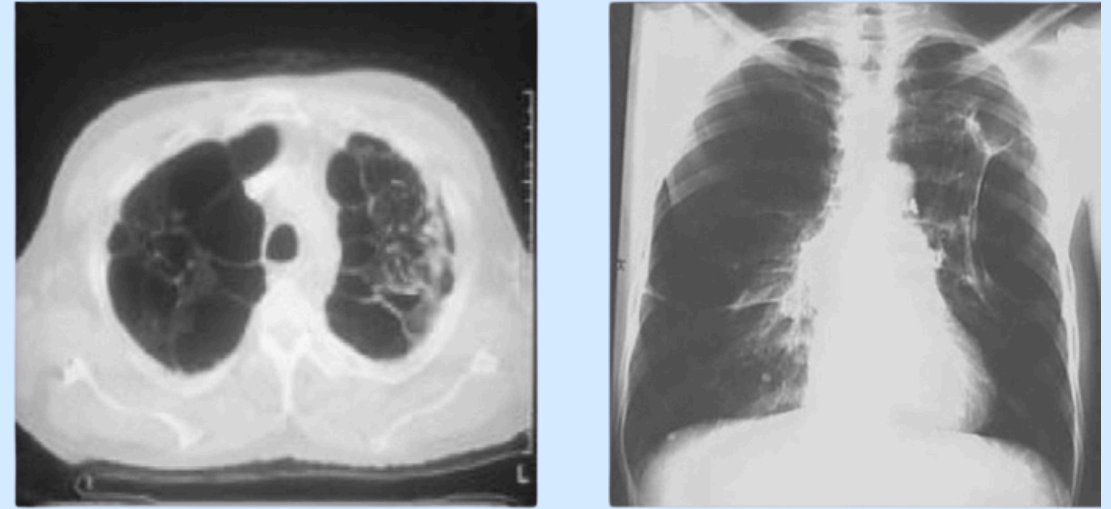
# CHEST X-RAY

- Linear shadows: 1-3 mm in thickness and 1 - 10 cm or more in length RT ( in interstitial pneumonia)  
 Band like shadows: 3-10 mm in width (thicker) LT

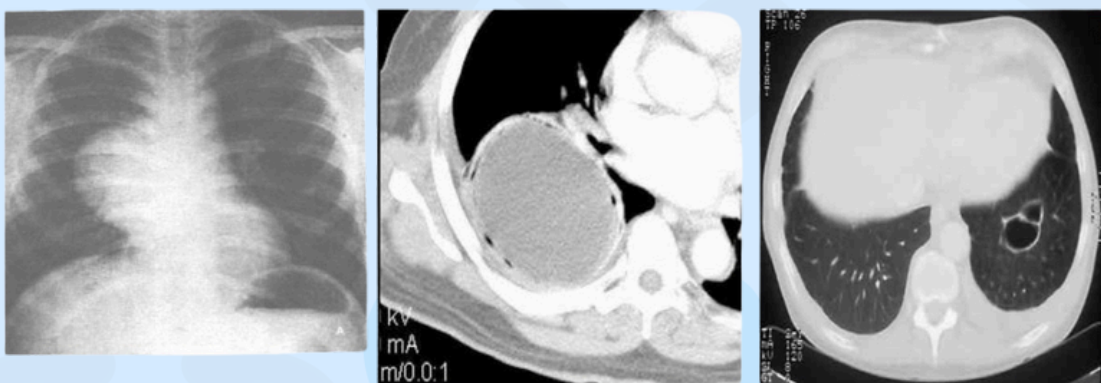


**Bulla:** Air filled space at least 1 cm in diameter and wall is hairline (<1 mm in thickness).

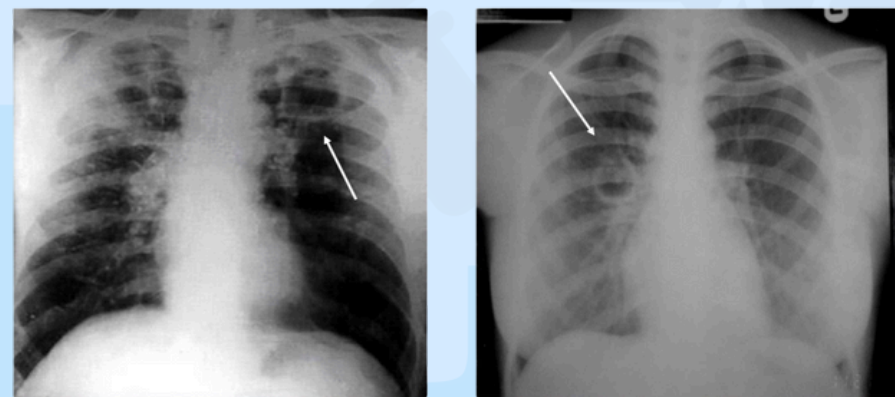
Bulla due to distuction of alveoli : appear as large black cyst with very thin wall



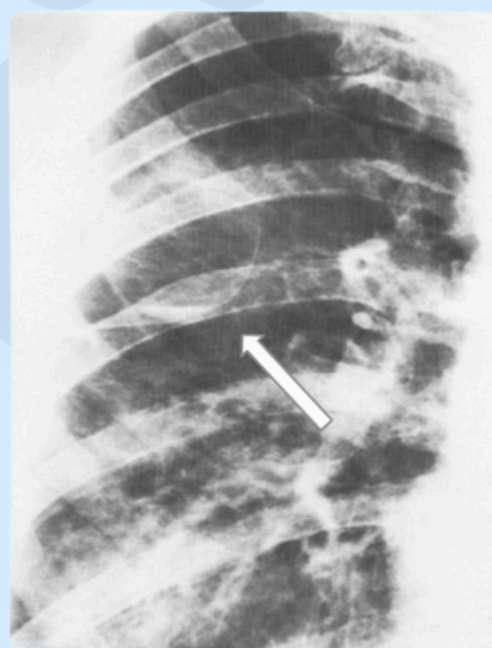
**Cyst:** Air filled or fluid filled space at least 1 cm in diameter and wall is 1 - 3 mm in thickness.



**Cavity:** Air filled space at least 1 cm in diameter with complete wall and wall thickness is 3 mm.



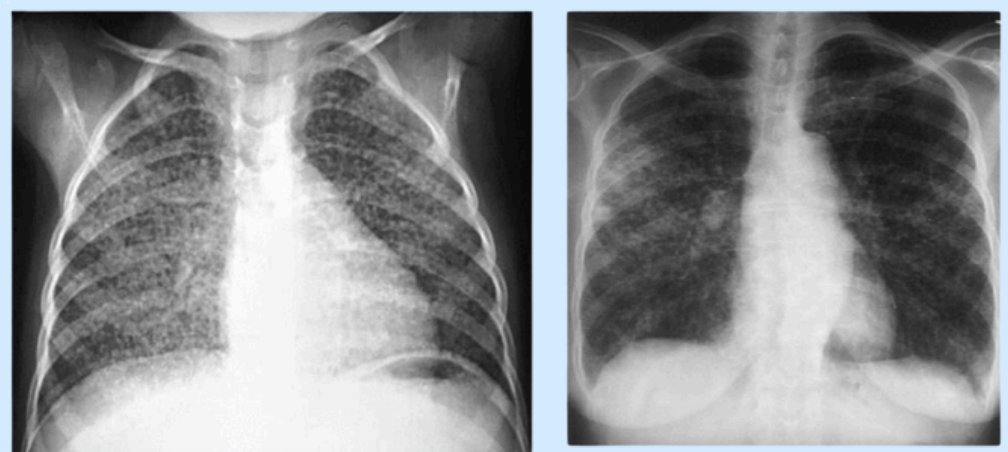
**Pneumatocele**  
 Bulla resulting from pneumonic check - valve obstruction that rapidly increases in size  
 May be lead to pneumothorax as with infection



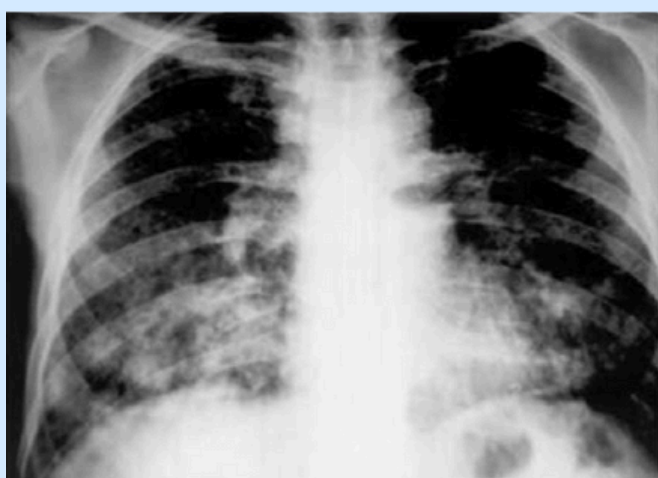
Apical zone : DDx TB

Complete or partial air filled according to thickness :  
 Bulla < Cyst < Cavity

**Miliary shadows :**  
 small discrete opacities of similar 2-5 mm in diameter  
 scatted bilateral , diffuse => Miliary TB



**Reticulonodular :**  
 mixed reticular and miliary

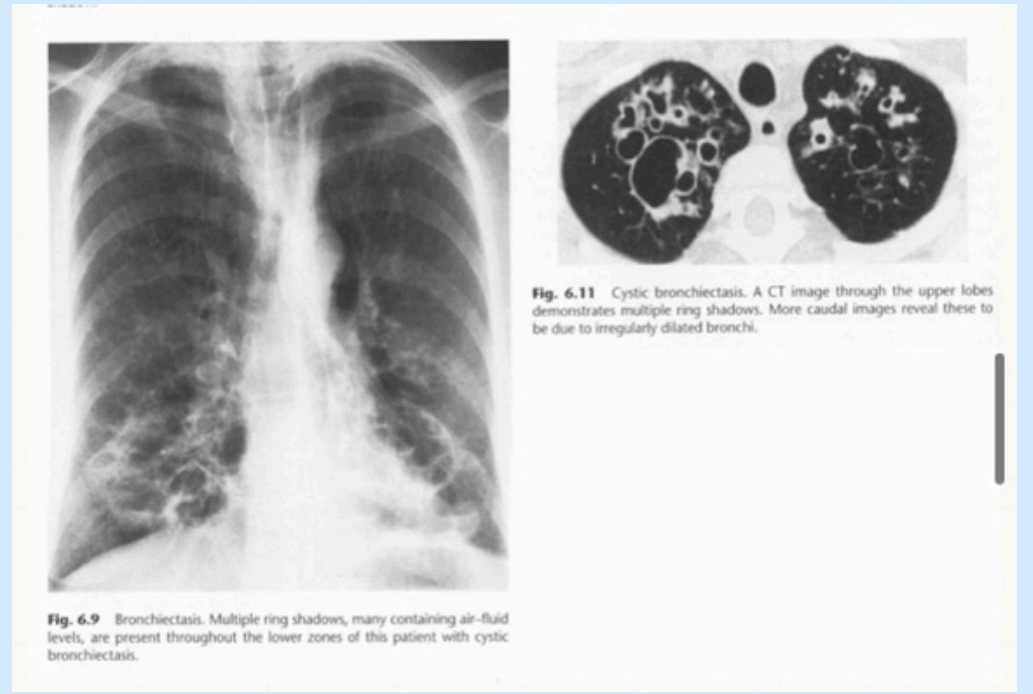
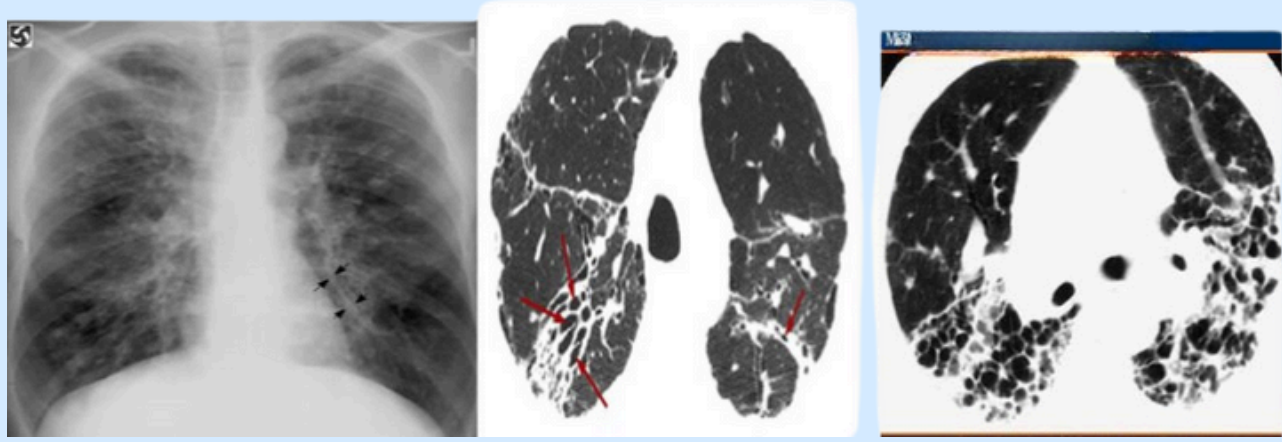


**Ritcular :**  
 linear streaks with mosaic appearance (1.5-10mm) thickness  
 in ILD + interstitial pneumonia



# CHEST X-RAY

Honeycomb shadowing  
multiple cysts 5-10mm in size  
in end stage interstitial lung disease

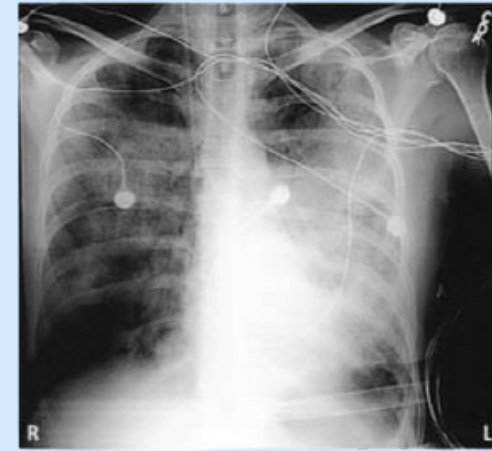


## Ground-Glass Opacity

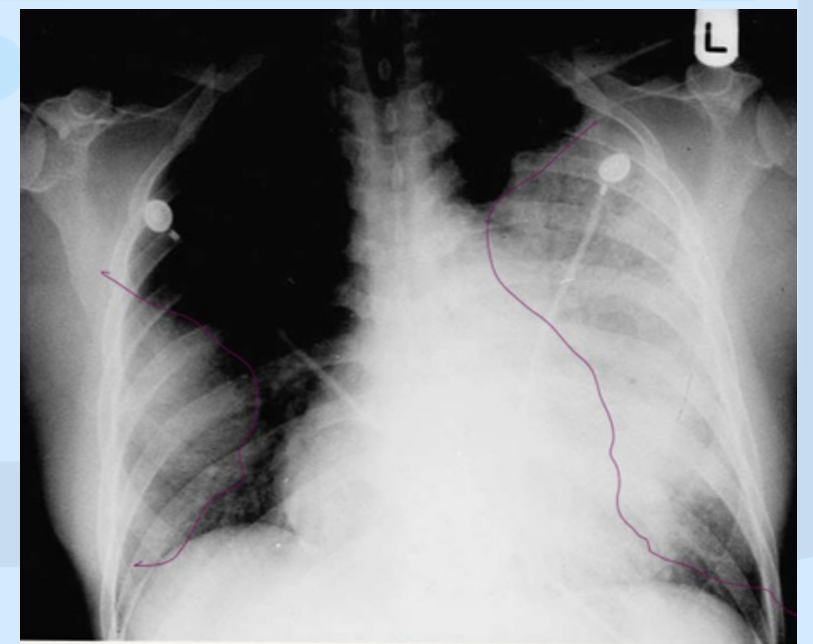
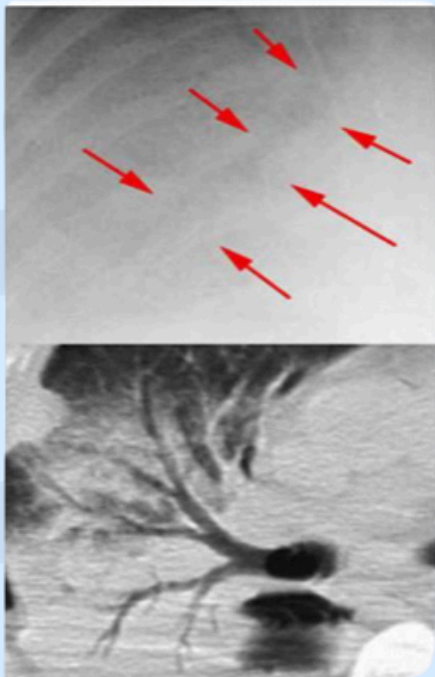
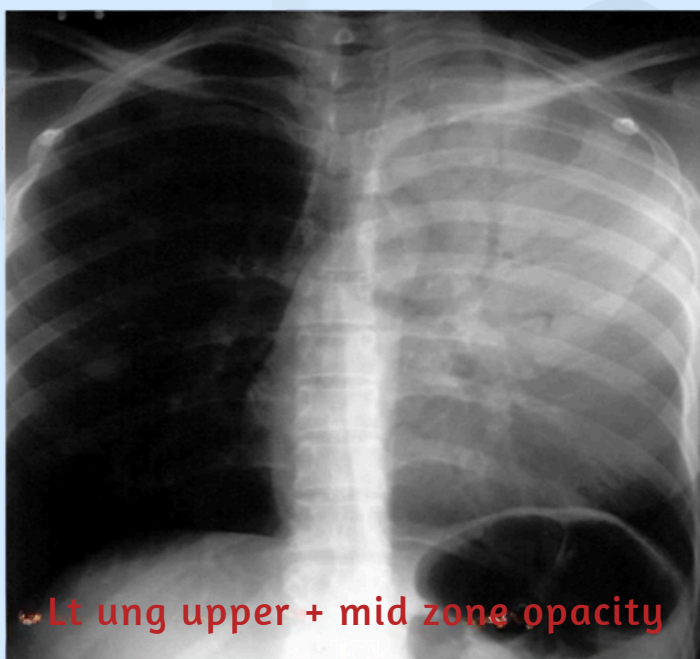
"GGO":

Fine granular pattern which obscures the normal anatomic detail of the lung with preservation of BVM. (Broncho vascular marking)

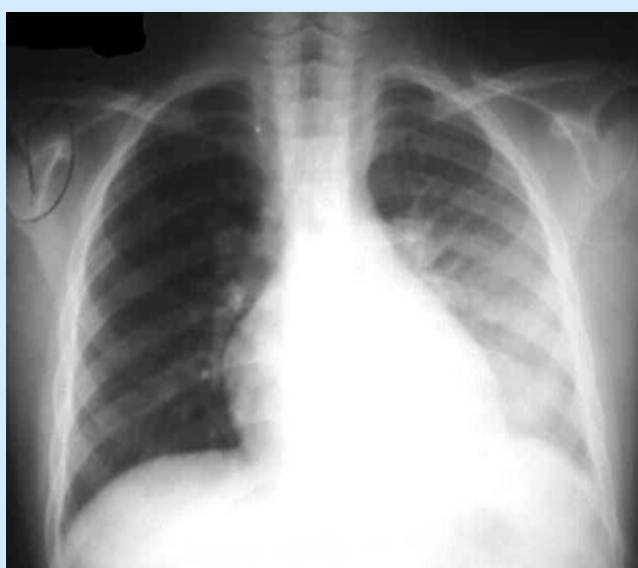
inflammation without Fibrosis



## Air-Bronchogram Sign



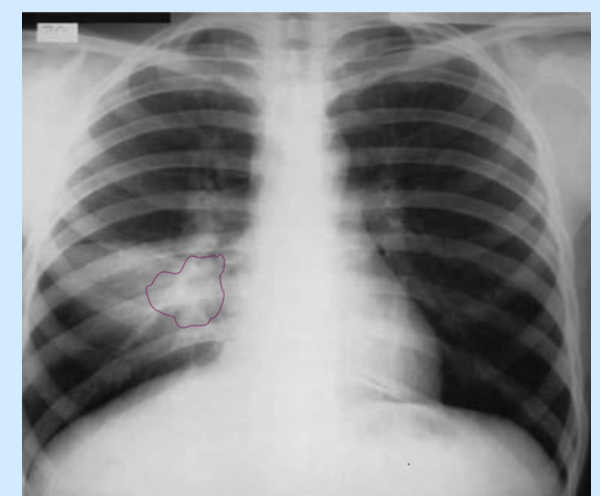
Severe pneumonia Multilobar involvement



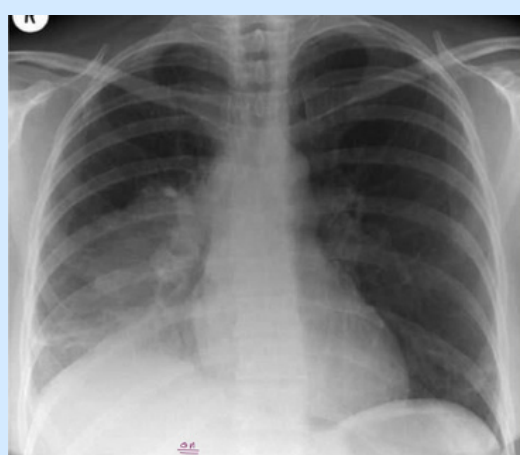
Homogeneous opacity on left middle and lower zones



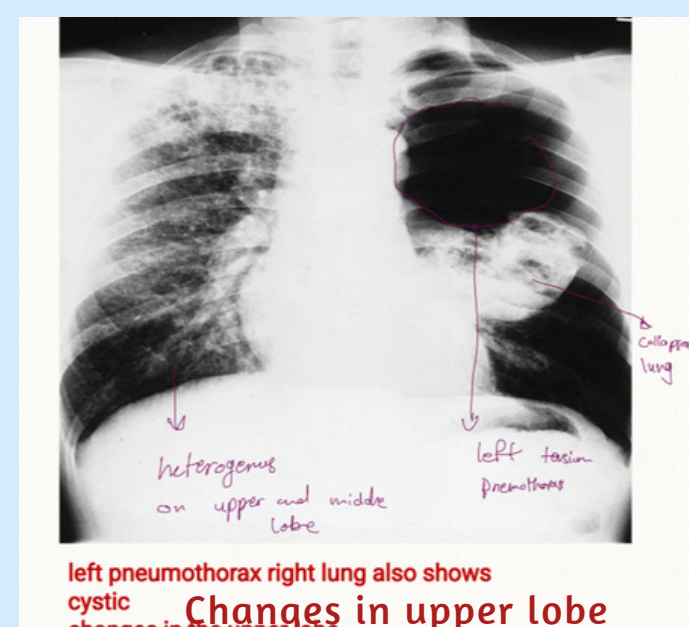
Pulmonary edema bilateral opacity with cardiomegaly



Middle lobe pneumonia



On Rt lower lobe



Changes in upper lobe

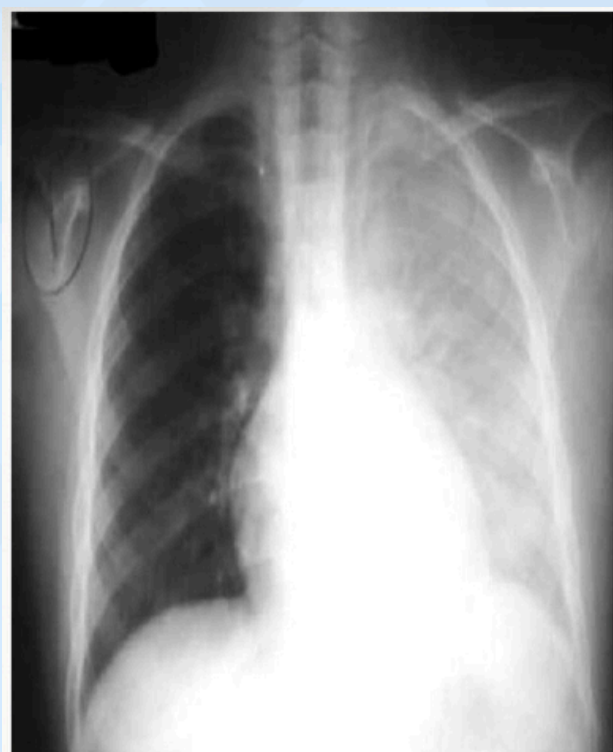
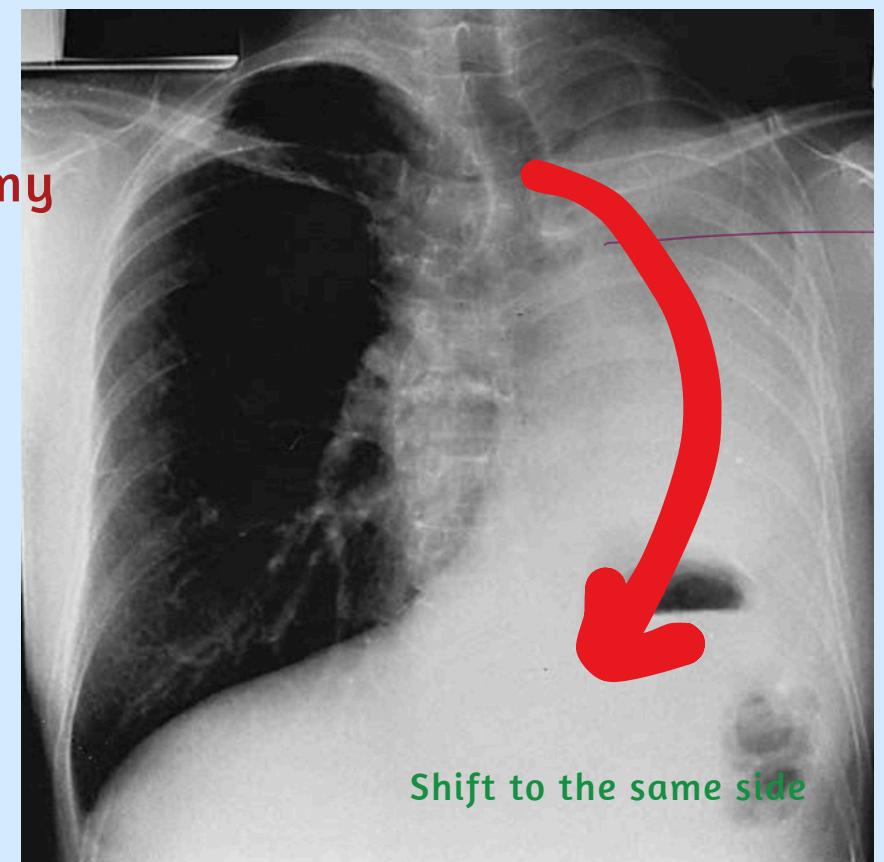
# CHEST X-RAY

Winding of superior mediastinum well - defined mass inferior and contiguous with aorta arch . Dissection of the arch of the aorta has to be excluded

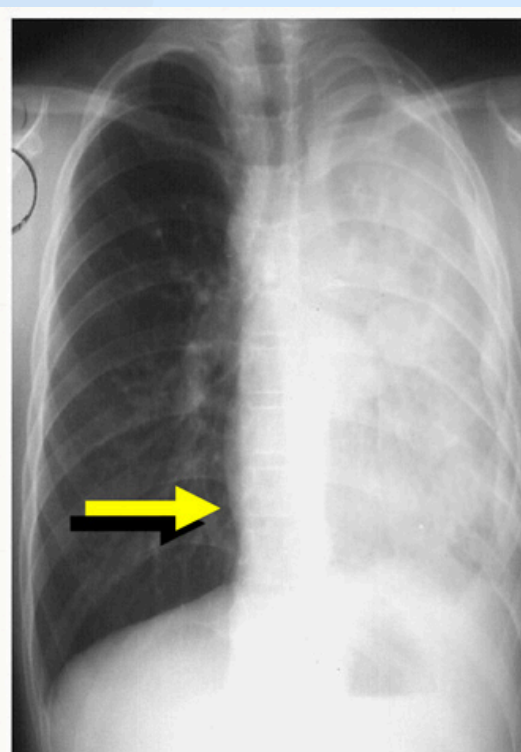


Homogeneous opacification of the left hemithorax  
Ddx :

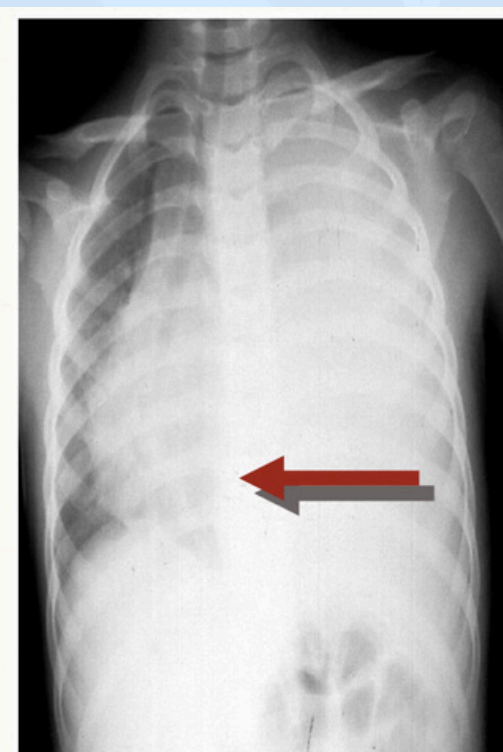
- 1.collapse
- 2.fibrosis
- 3.pneumonectomy
- 4.consolidation
- 5.effusion
- 6.mass



consolidated pneumonia  
no shift



Massive atelectasis  
"collapse , fibrosis"  
to the same side



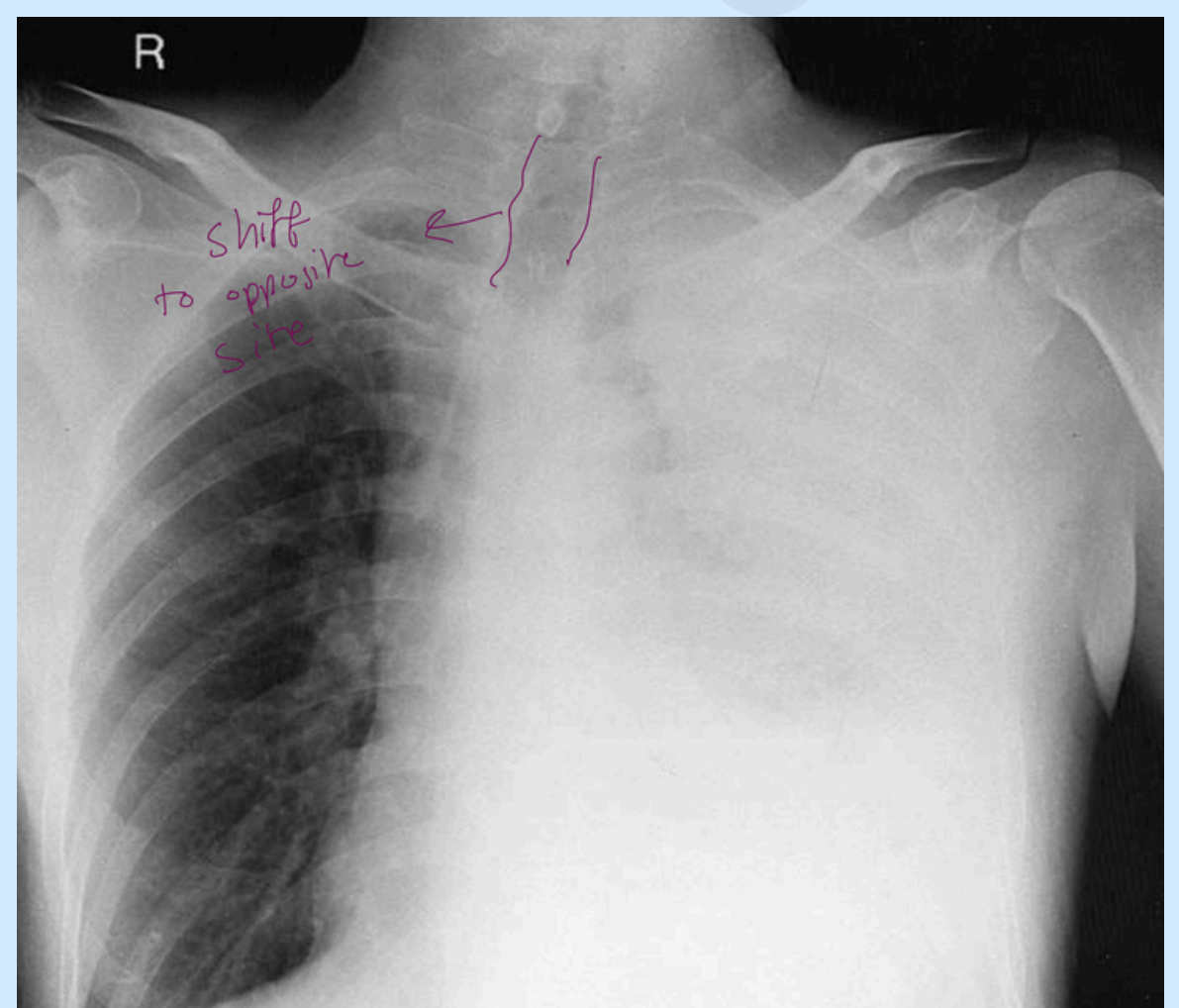
Massive pleural effusion  
to opposite side



Homogeneous opacity,rounded,well defined border , overlying the left hilum .

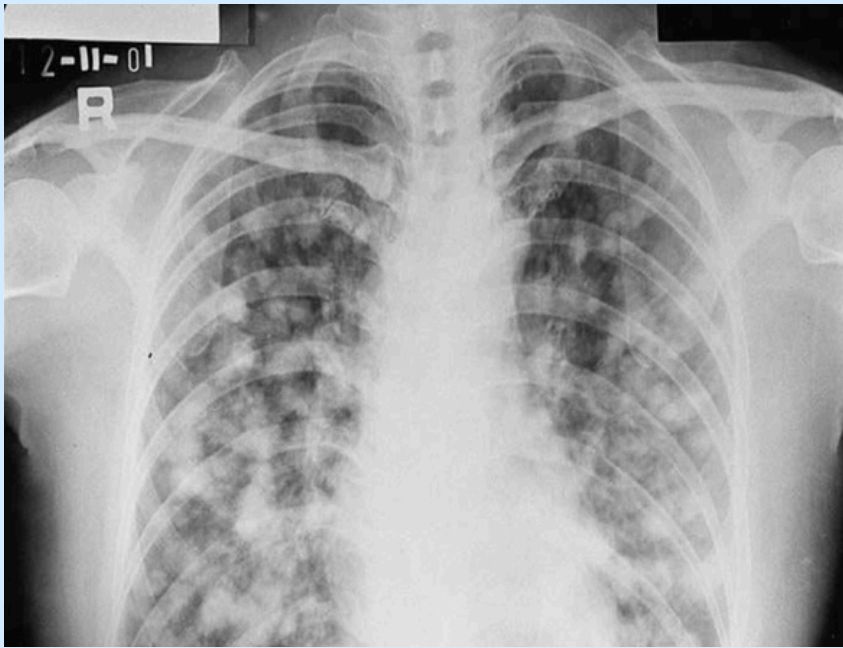
DD:

- 1.Pulmonary artery dilatation
- 2.lymphoma
- 3.medistinal mass
- 4.sarcoidosis "mostly bilateral opacification "



Effusion

# CHEST X-RAY

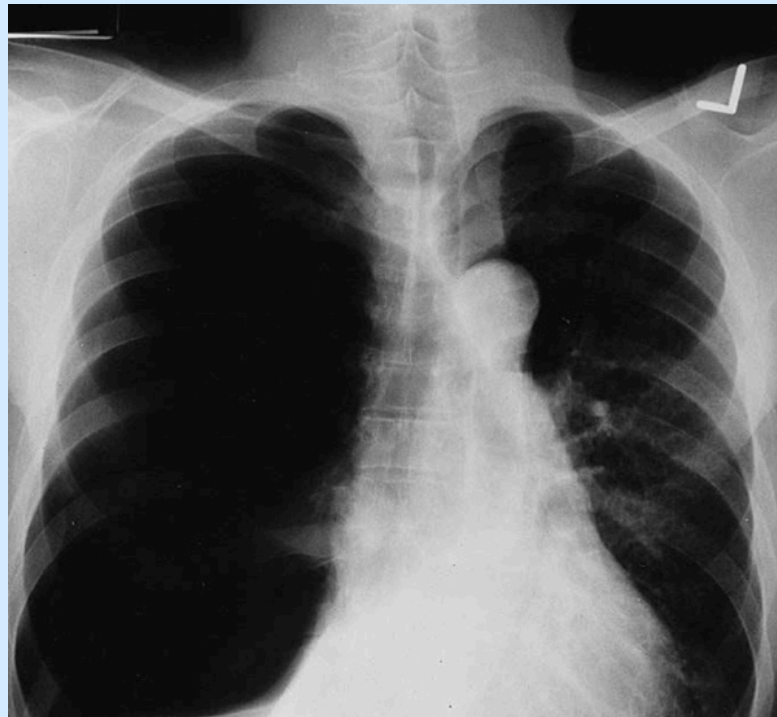


Bilateral lung nodules

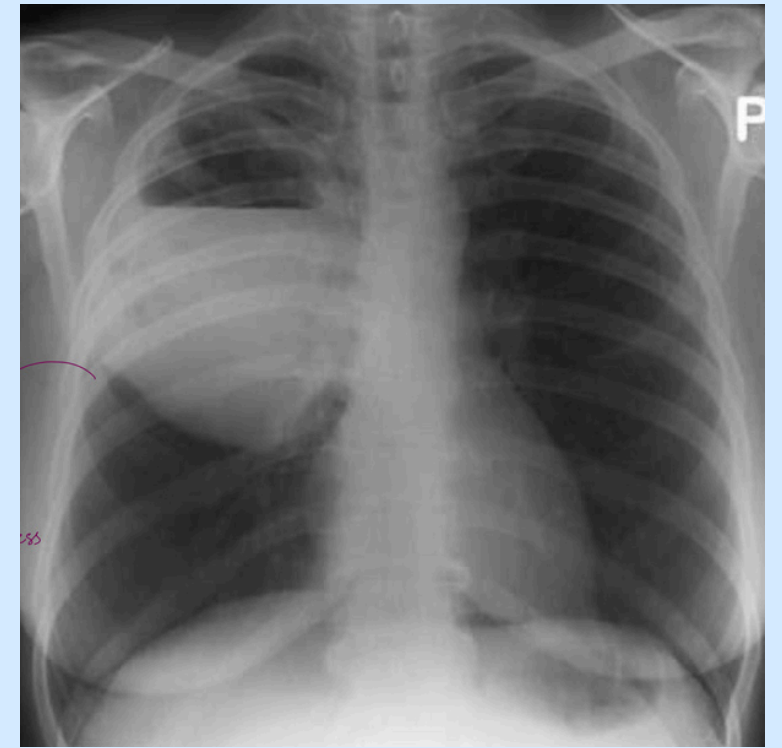
DD:

1. metastasis from CA : breast /colon/rectum/kidney
2. bronchopneumonia
3. TB
5. rheumatoid

no shift of mediastinum cuz it isn't massive effusion



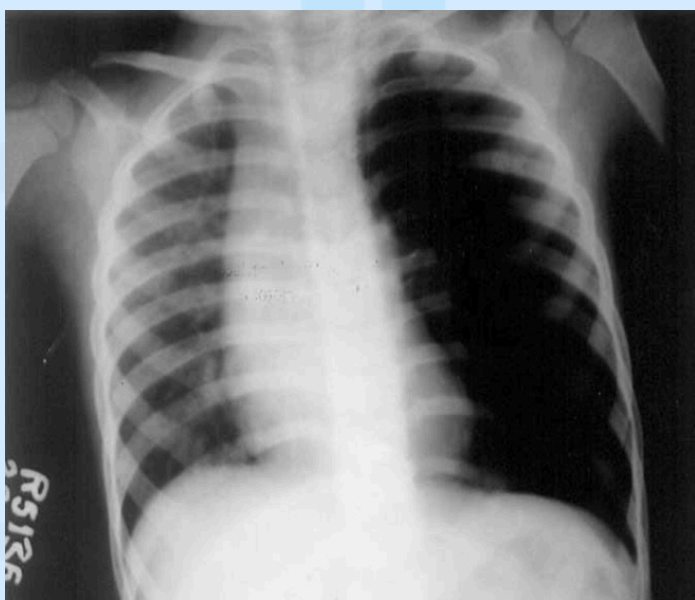
Rt pneumothorax



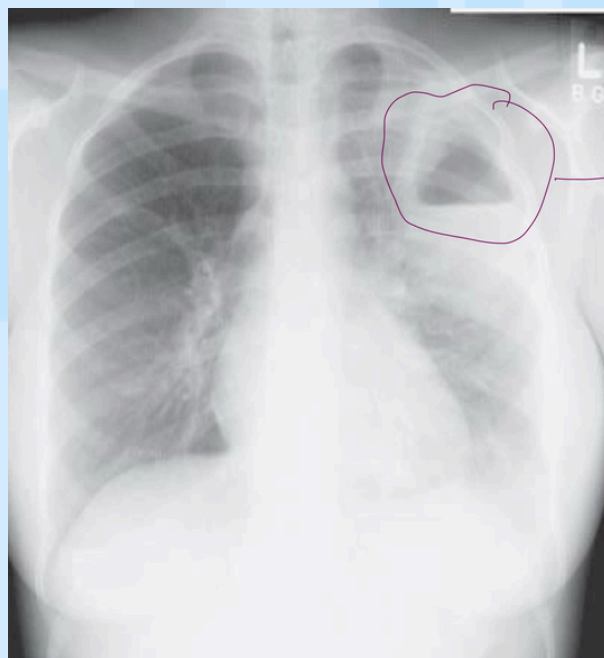
Cavity lesion " air fluid level "

DDX:

Rt lung abscess



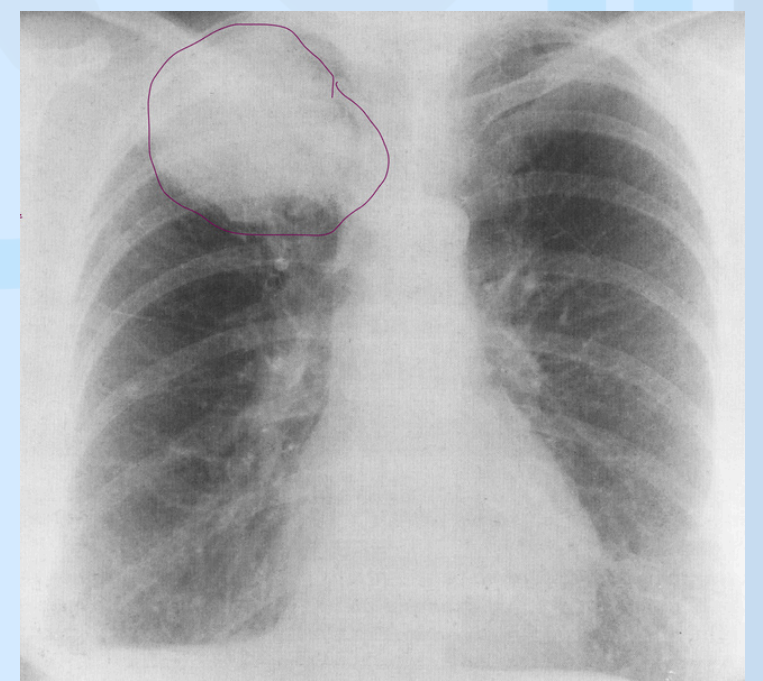
Lt pneumothorax



Cavity lesion

DDX:

Rt lung abscess



mass : pancosts tumor



Multiple nodule : large Mets



Air under diaphragm:  
perforated viscus

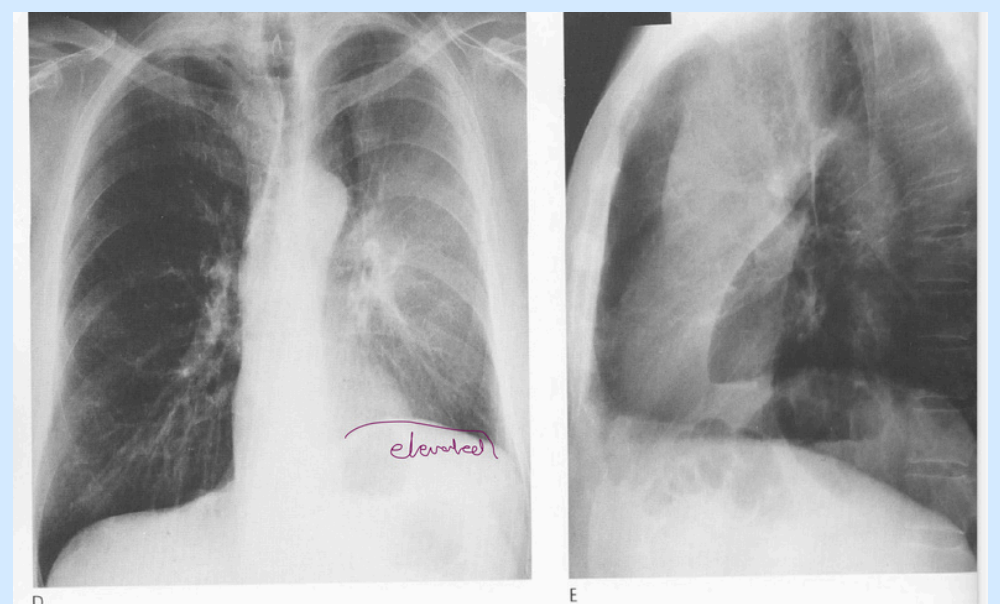
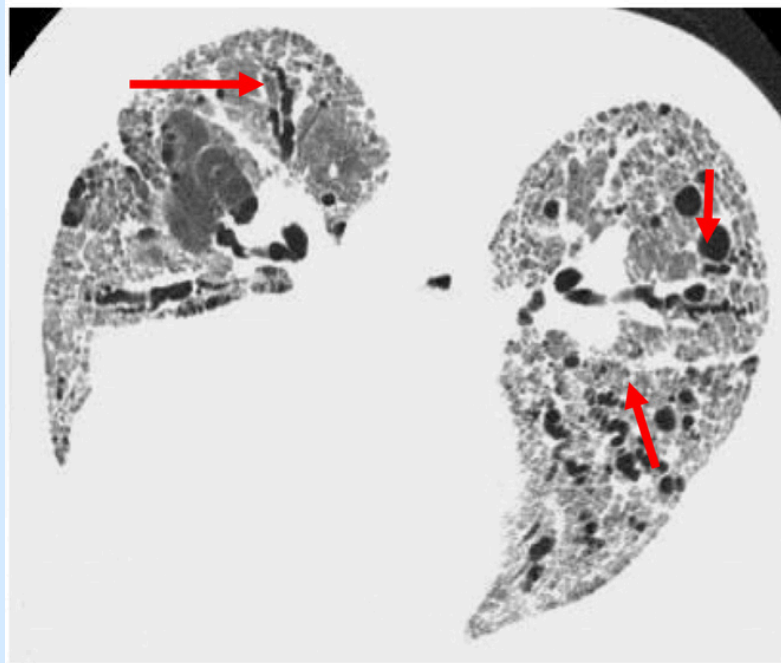


Fig. 4.3 (contd.) (D, E) A further 3 months later there is now complete collapse of the left upper lobe, and the left hemidiaphragm is elevated.

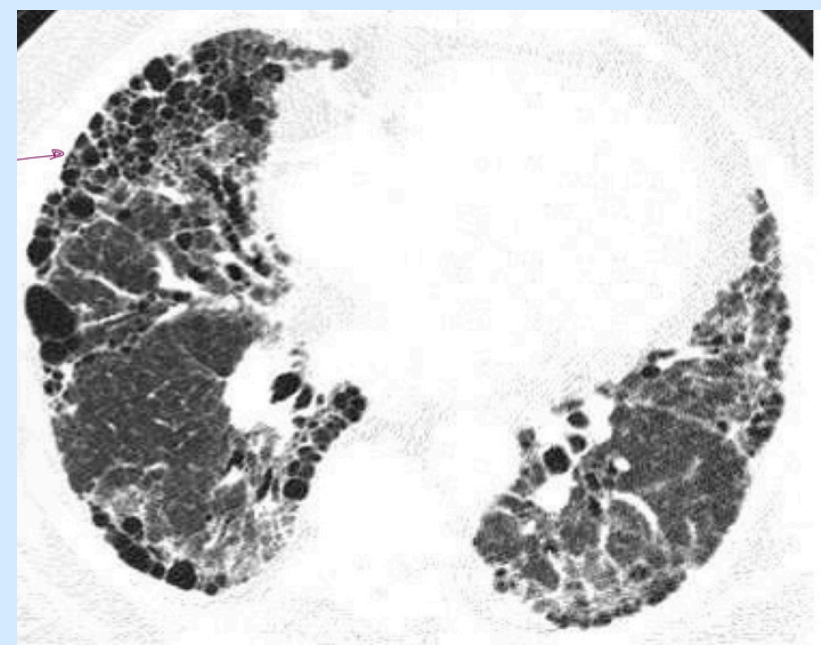
Opacification on upper lobe

# CHEST X-RAY

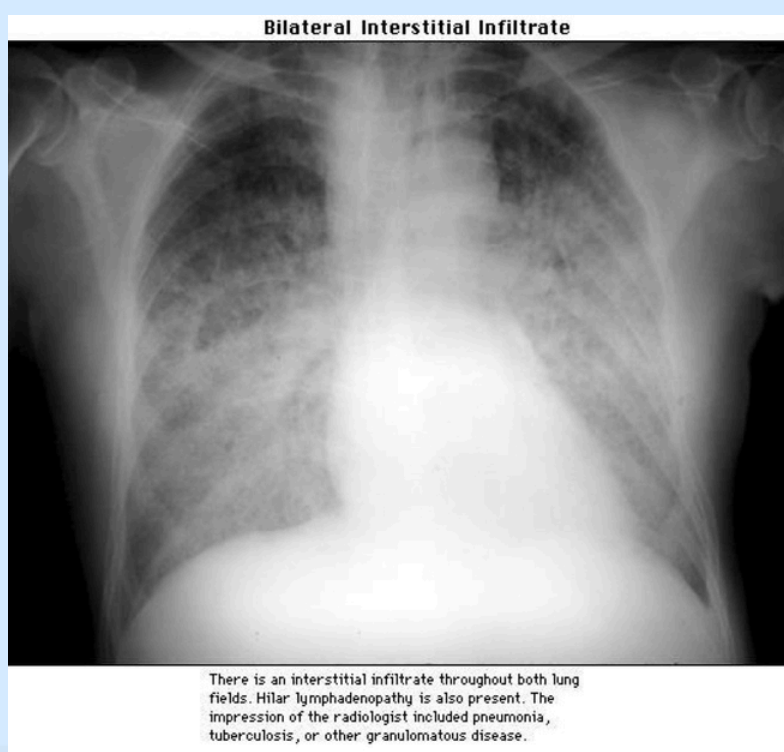
UIP: Traction Bronchiectasis



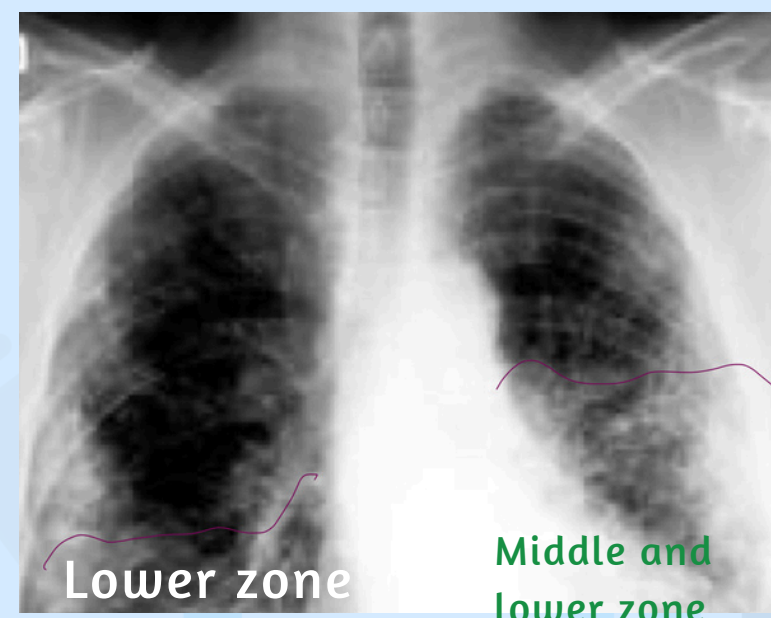
Chest radiograph shows airspace consolidation confined mainly to the peripheral lung (photographic negative shadow of pulmonary edema).



Multiple cyst



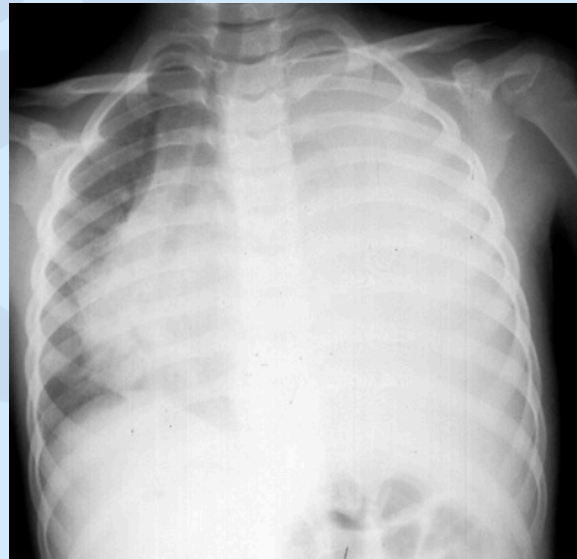
Mets or staph .pneumonia



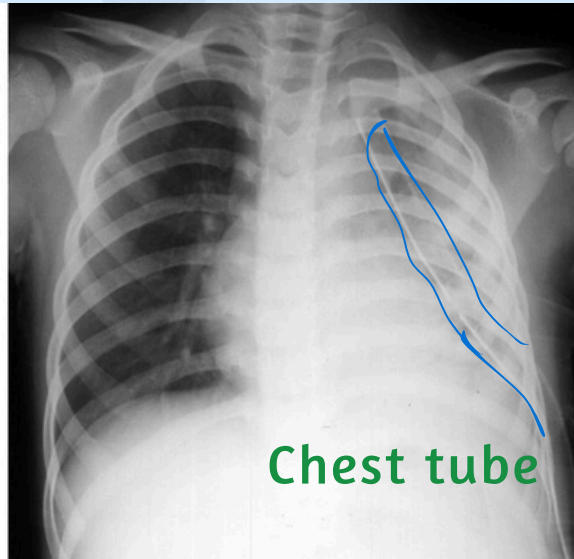
Bilateral heterogeneous opacity: pneumonia or carcinoma



Air in the wall - air crescent  
hydatid cyst  
aspergillosis : fungal infection



Lt plural effusion



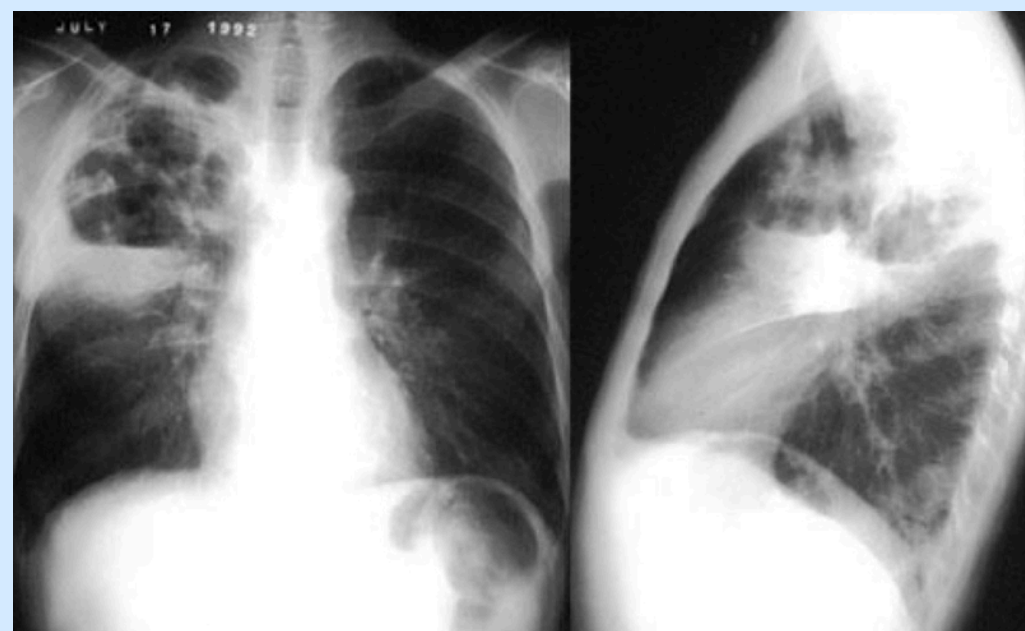
Chest tube



Bilateral nodule :lung Mets



Cardiomegaly + opacification  
ddx:  
HF  
pulmonary edema



Multiple cavity lesion :  
on upper zone == TB