

## CHEST



## Difference between PA and AP views

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>■ PA View</li> <li>■ Spine and post ends of ribs clearly seen</li> <li>■ Ribs obliquely oriented</li> <li>■ Scapulae not overlapping the thorax</li> <li>■ Clavicles are horizontal</li> <li>■ Normal sized cardiac silhouette</li> </ul> | <ul style="list-style-type: none"> <li>■ AP View</li> <li>■ not visualized clearly</li> <li>■ More horizontal</li> <li>■ They do overlap</li> <li>■ More oblique</li> <li>■ enlarged</li> </ul> |
|--|---|

## CENTRALISATION

- medial ends of both the clavicles are equidistant from the spinous processes.
- Effects of rotation:
  - \* apparent ( false ) cardiomegaly.
  - \* apparent hilar enlargement.

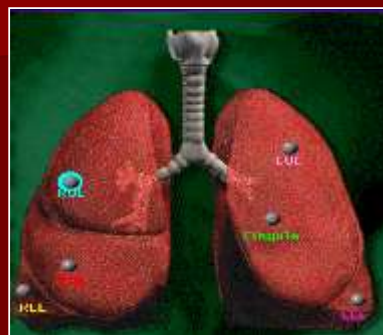
## EXPOSURE

- If first 3-4 thoracic vertebra are seen, the exposure is good.
- If > 4 thoracic vertebrae are seen, it is suggestive of an overexposed film.

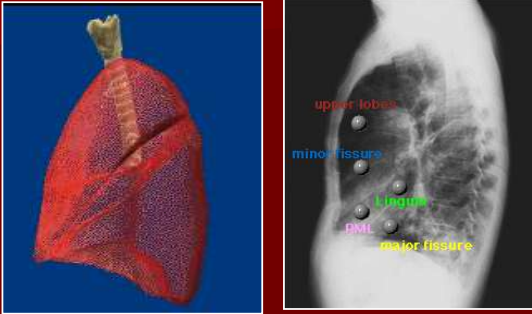
## NORMAL CXR



## NORMAL ANATOMICAL LOBES



### NORMAL ANATOMICAL LOBES



### RIGHT UPPER LOBE



### RIGHT MIDDLE LOBE



### RIGHT LOWER LOBE



### LEFT UPPER LOBE



### LEFT LOWER LOBE



## WHAT IS TO BE SEEN ?

- 1) Trachea.
- 2) lung fields.
- 3) cardiophrenic & costophrenic angles.
- 4) hila.
- 5) cardiac silhouette.
- 6) ribs.
- 7) diaphragm.
- 8) soft tissue of the neck & axilla.
- 9) free gas under diaphragm is better seen on chest PA standing view, than on abdomen standing view.

## TRACHEA

- Look whether it is centrally placed, or displaced to one side.
- Normal carinal angle is 60 degrees. It is widened in LA enlargement & enlarged subcarinal LN.
- The left main bronchus is lower, longer & slender than the right.
- Trachea may look displaced to one side if:
  - \* obliquity of the patient while the film is taken.
  - \* real displacement of the trachea, due to pulling or pushing of the trachea due to the pathology.

### TRACHEA PUSHED:

- Abnormality in the lung, on the side, opposite to the tracheal shift.  
e .g. mass, pneumothorax, pleural effusion etc.

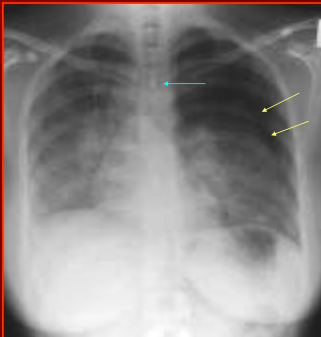
### TRACHEA PULLED:

- Abnormality in the lung, on the same side, as that of the tracheal shift.  
e.g. collapse, fibrosis

## TRACHEA IS PULLED



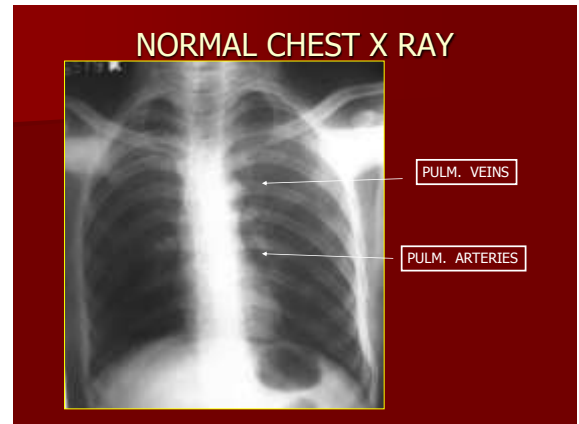
## TRACHEA IS PUSHED



## LUNG FIELDS

- Look for the normal lung parenchyma.
- The lung fields are divided in three zones only for convenience of the description of the lesion. However, they do not correspond to the anatomical lobes.
- **Upper zone:** from apex to the lower border of posterior end of fourth rib.
- **Middle zone:** from the lower border of the fourth rib to the lower border of the posterior end of seventh rib.
- **Lower zone:** below the lower border of the posterior end seventh rib.

- Look for the normal broncho-vascular pattern. (branching pattern.)
- The pulmonary arteries are more vertically oriented in both the lower zones, near the heart.
- The pulmonary veins are more vertically oriented in the upper zones.
- The bronchovascular pattern is seen upto peripheral 2/3 rd of the lung fields.



### COSTOPHRENIC ANGLES:

- On PA view, we can see the lateral CP angle.
- Normally it should be very sharp & clearly lucent.
- It is blunted in the pleural effusion, pleural thickening.

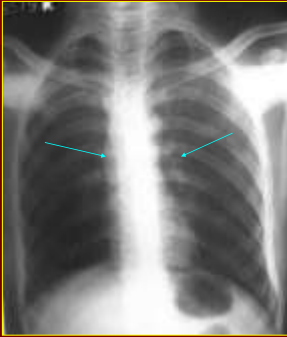
### CP angles: normal & obliterated



### HILA

- Normal radiographic pulmonary hila are formed by:
  - \* pulmonary arteries.
  - \* upper lobe pulmonary veins.
- The normal LN, normal airways, lymphatics do not contribute to the radiographic hila.
- The lower lobe pulmonary veins do not contribute in the radiographic hila, as they enter directly into the LA.
- Thus, on a radiograph, hilar prominence can be due to the following:
  - \* dilated central pulmonary arteries.
  - \* dilated upper lobe pulmonary veins.
  - \* hilar lymphadenopathy.
- Normally left hilum is higher than the right.
- For hilar evaluation, look for the following:
  - \* position.
  - \* size.
  - \* shape.
  - \* density.

### NORMAL HILA



### BILATERAL HILAR LYMPHADENOPATHY



EGS.  
IN  
TB. &  
SARCOIDOSIS

### HILAR LYMPHADENOPATHY



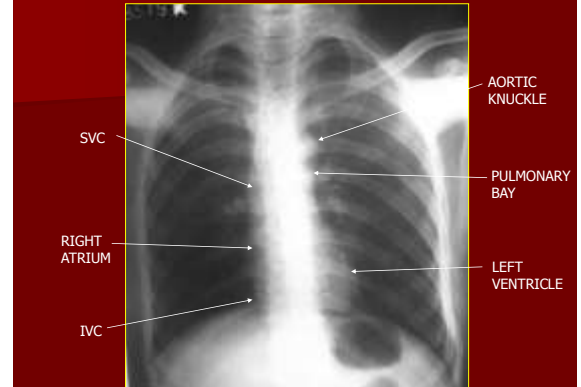
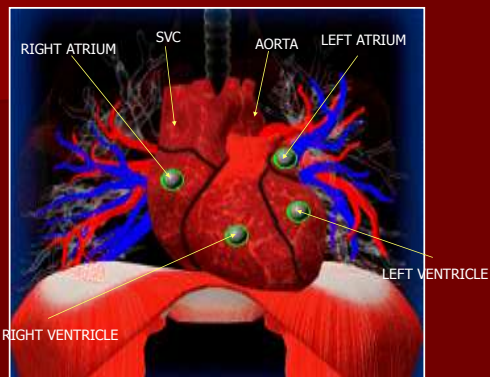
### CARDIAC SILHOUTTE.

#### LEFT CARDIAC BORDER:

- Aortic knuckle.
- Pulmonary bay.
- Left atrial appendage.
- Left ventricle.
- Cardiac Apex

#### RIGHT CARDIAC BORDER:

- SVC.
- Right atrium.
- IVC.



### ANTERIOR CARDIAC BORDER ON LATERAL VIEW:

- Right ventricle.

### POSTERIOR CARDIAC BORDER ON LATERAL VIEW.

- Left atrium.



- Look for the cardio-thoracic ratio, to exclude cardiomegaly.

- 1) Measure maximum transverse cardiac border:

- \* draw a midline, joining the spinous processes.
- \* measure the maximum transverse distance between the midline & the left cardiac border.(X)

- \* measure the maximum transverse distance between the midline & the right cardiac border. (Y)
- \* X & Y may not be achieved on the same horizontal line.

- 2) measure the maximum transverse thoracic diameter: ( A + B )

- \* similarly,measure the maximum transverse distance from the midline to the lateral thoracic wall,

- **CARDIO-THORACIC RATIO**

$$= ( X + Y ) / ( A + B )$$

- **NORMAL CARDIO-THORACIC RATIO**

- \* Adults: < 55 %.
- \* child: < 60 %
- If the CTR is increased, it suggests presence of cardiomegaly / pericardial effusion.



## RIBS

- Identify the sternal & vertebral ends of the ribs.
- Look for any fracture of the ribs in a traumatized patient.
- Look for the inferior rib notching at the posterior ends, in a case of coarctation of the aorta.
- [Look for the presence of the cervical ribs.](#)



## LEFT CERVICAL RIB



- [BIFID RIBS ARE NORMAL VARIANTS.](#)
- Crowding of ribs will occur in volume loss of the lung.
- Increased distance between the ribs will occur in emphysema.

## DIAPHRAGM

- Normally, both the hemi-diaphragms are convex upwards.
- [The right hemi-diaphragm is higher than the left hemi-diaphragm by < 2.5 cm, or < 2 intercostal spaces.](#)
- Sometimes, the left hemi-diaphragm may be at the level of the right one, or may even be slightly higher than it.
- The diaphragm may be flattened in emphysema, massive pleural effusion, large pneumothorax, phrenic nerve palsy.

- The diaphragm may be abnormally elevated by;
  - \* phrenic nerve palsy.
  - \* collapse of the lung.
  - \* massive ascitis.
  - \* large abdominal pathology.
  - \* subphrenic abscess.
  - \* diaphragmatic hernia.

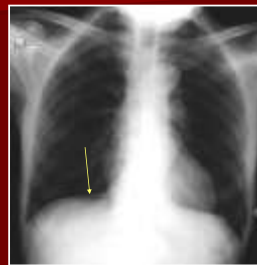
- Free gas under diaphragm is best seen in the chest film; & not in the x-ray abdomen standing.

Causes of free gas under diaphragm:

- Peptic perforation of stomach or duodenum.
- Enteric perforation, due to trauma, typhoid ulcer.
- Colonic perforation due to trauma, UC, malignancy.

- After procedures: tubal ligation, HSG, laparoscopy.
- Chiladity syndrome: colonic interposition between the diaphragm & liver or stomach.

### Free gas vs. chiladity



### SOFT TISSUES OF THE NECK & AXILLA

- Look for any calcified lymphadenopathy in the axillae & in the neck.
- Look for presence of any subcutaneous emphysema.
- Normal shadows of pectoral muscles extend beyond the confinement of the bony thorax.

- Absence of pectoral muscles, as in MRM surgery for CA breast, will produce hyperlucency.
- Normal nipple shadows may mimic a solitary pulmonary nodule. Therefore, look for bilateral symmetry.

## NORMAL NIPPLE SHADOWS MUST NOT BE CONFUSED AS PULMONARY NODULES



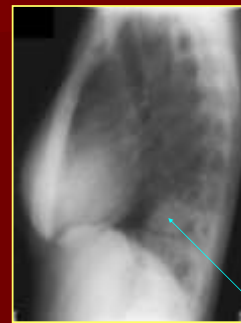
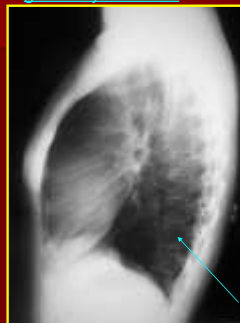
## NORMAL CXR LATERAL VIEW.

- Erect / decubitus :
  - \* diaphragm of dependent side is higher in decubitus.
- Areas of NORMAL lucency :
  - \* Retro-sternal & retro-cardiac.
- Cardiac silhouette :
  - \* anterior border is formed by right ventricle
  - \* posterior border is formed by left atrium & IVC.

## Mediastinum – *superior & inferior*[proper]

- SUPERIOR mediastinum is separated from INFERIOR mediastinum, by a line drawn from sternal angle to lower border of T 4 vertebral body
- Inferior mediastinum [classical] is divided into
  - \* anterior mediastinum – from sternum to ant. Margin of cardiac silhouette & trachea.
  - \* middle mediastinum – contains heart & trachea.
  - \* posterior mediastinum– from posterior border of cardiac silhouette & trachea.

As we go down, the vertebral density must be gradually reduced.

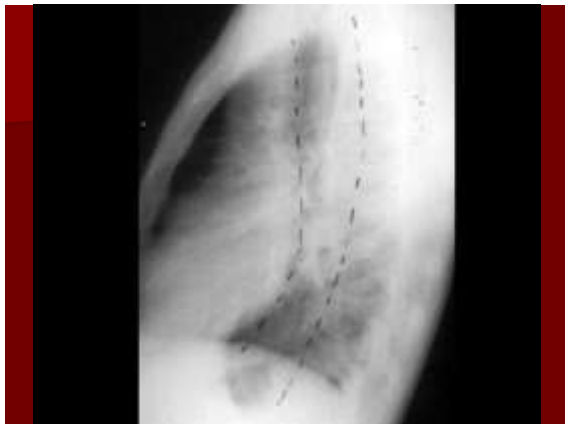


## MEDIASTINAL COMPARTMENTS

- CONVENTIONAL
- FELSON
- SUTTON
- NAIDICH
- ZYLAK [CT METHOD]
- HEITZMAN

## FELSON

- In this, anterior → pericardium & its contents.
- middle → includes trachea & extends upto a line drawn connecting a point on each vertebral body 1cm. posterior to its anterior margin.
- posterior → paravertebral gutters.



## Sutton

- Multiple areas on lateral radiographs, where common lesions occur with their differential diagnosis – best for practical use.

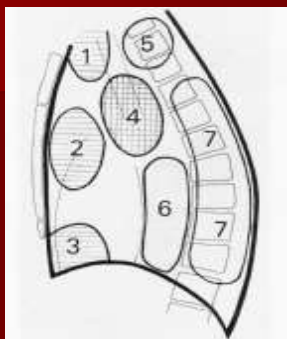
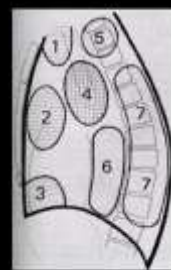


Fig. 53.9 Diagram illustrating the seven sites of the mediastinum and the differential diagnosis listed in Table 53.1.

### MEDIATINUM SUTTON'S METHOD



- I
  - Retrosternal goitre
  - Parathyroid adenoma
  - Tortuous innominate vessels
  - Lymph nodes
- II
  - Thymoma
  - Teratoma / dermoid
  - Lymph nodes
- III
  - Pericardial cyst
  - Foramen of Morgagni hernia
  - Fat pad
  - Lipoma

### MEDIATINUM SUTTON'S METHOD



- IV
  - Bronchogenic cyst
  - Tracheal tumors
  - Lymph nodes
  - Pulmonary artery lesions
- V
  - Esophageal lesions
  - Vertebral lesions
- VI
  - Hiatus hernia
  - IVC & aorta lesions
  - Varices
- VII
  - Vertebral / paravertebral lesions

## ZYLAK

- ANTERIOR --- PREVASCULAR Space.
- MIDDLE --- VASCULAR Space.  
[pericardium & its contents, great veins, & the ant. Aorta & its branches].
- POSTERIOR --- POSTVASCULAR Space.

## Basic rules for localizing a chest lesion

### ■ SILHOUETTE SIGN

- When two isodense structures are in anatomical contiguity with each other, their interface is obscured.

- Any lesion in ant. Segment of RUL obliterates the ascending aorta

- Lesion in left middle lobe will obliterate the heart border

## Other helpful features:

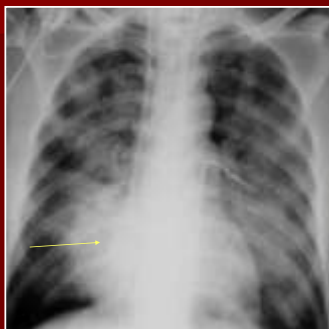
### ■ LOCATION ON X RAY

- Extreme apex of lung
- Lateral costophrenic angle
- Right upper lung whose lower border is made by minor fissure
- Right midlung with sharp upper border made by minor fissure
- Lesion eroding sternum and spine
- Well defined opacity seen through cardiac shadow

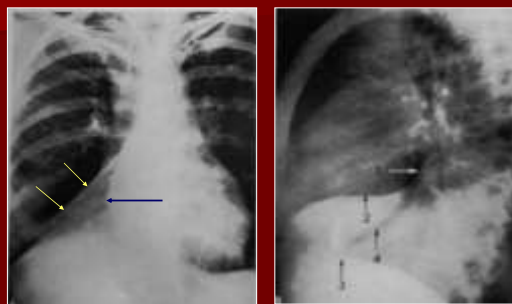
### ■ REAL LOCATION

- Apical seg
- Lat./ant basal seg
- RUL
- RML
- Indicates extrapleural ext.
- LLL collapse

## THE LESION IS SILHOUTTING WITH THE RIGHT CARDIAC BORDER



## THE LESION IS NOT SILHOUTTING WITH THE RIGHT CARDIAC BORDER



The lesion is not silhouetting with the left cardiac border



## RESPIRATORY SYSTEM

- 1) CONSOLIDATION.
- 2) COLLAPSE.
- 3) PLEURAL EFFUSION.
- 4) D/D of opaque hemithorax.
- 5) MASS & SPN.
- 6) PNEUMOTHORAX.
- 7) HYDROPNEUMOTHORAX.
- 8) TUBERCULOSIS.
- 9) EMPHYSEMA.

## CONSOLIDATION

- Inhomogenous radiopacity, with airbronchogram within it.
- Borders may be sharply defined, if the consolidation is confined to the lobar or segmental boundaries.
- Presence of the Airbronchogram suggests that:
  - \* the lesion is intra-parenchymal.
  - \* the bronchus, supplying that lobe or segment is patent.



## COLLAPSE

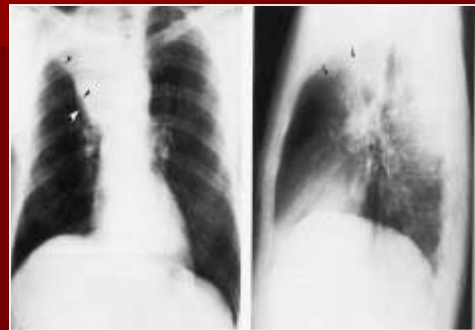
- 1) HOMOGENOUS RADIOPACITY.
- 2) CROWDING OF THE BRONCHO-VASCULAR MARKINGS.
- 3) DISPLACEMENT OF THE HILA, FISSURES, DIAPHRAGM, MEDIASTINUM.
- 4) COMPENSATORY OVER-INFLATION OF THE OPPOSITE LUNG OR THE OTHER LOBES.

### ■ Direct roentgen signs of collapse:

- Displaced septa
- Loss of aeration
- Crowding of the vessels and bronchi

- Indirect signs of collapse
- Unilateral elevation of hemidiaphragm
- Deviation of trachea
- Shift of heart
- Narrowing of rib cage
- Compensatory overinflation
- Hilar displacement

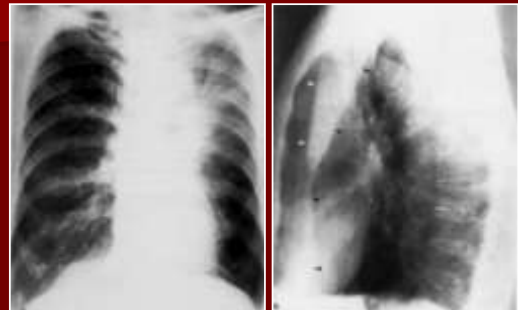
## COLLAPSE OF RUL.



## COLLAPSE OF LINGULAR LOBE



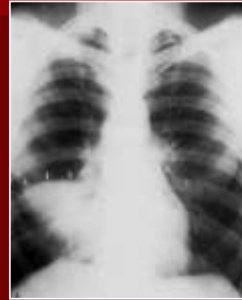
## COLLAPSE OF LUL.



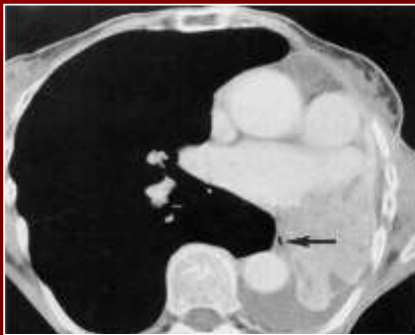
### TRACHEAL SHIFT IN COLLAPSE



### COLLAPSE OF RML WITH INFERIOR DISPLACEMENT OF MINOR FISSURE



### CT SCAN OF COLLAPSE



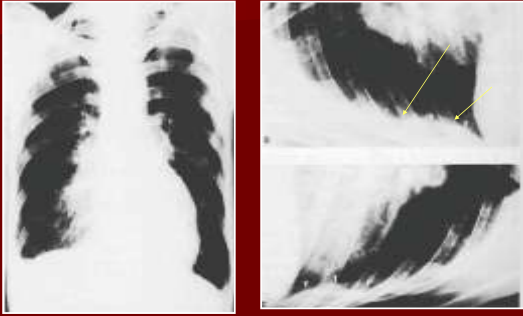
### PLEURAL EFFUSION

- 1) homogenous radiopacity obliterating the CP angle, & diaphragm.
  - 2) concave upper border.
  - 3) no broncho-vascular markings.
- How to detect a very small quantity of pleural effusion ?
- \* 15 min Lateral decubitus film.

### RIGHT PLEURAL EFFUSION



### RIGHT PLEURAL EFFUSION IN ERECT & DECUBITUS POSITIONS



### D/D of opaque hemithorax

- Mediastinum shifted to opposite side:
  - \* massive pleural effusion
  - \* diaphragmatic hernia.
- Mediastinum shifted to same side:
  - \* massive collapse of the lung.
  - \* massive fibrosis
  - \* post pneumonectomy.
- Mediastinum central:
  - \* massive consolidation

### Opaque hemithorax with trachea pulled towards the same side



### Opaque hemithorax with the mediastinum pushed to opp. side



### Opaque hemithorax with the mediastinum in center.



## MASS

- PLEURAL / PARENCHYMAL / MEDIASTINAL ?

### PLEURAL MASS :

- Peripheral location.
- Broad based towards the pleura.
- No broncho-vascular markings within the mass.
- Wide angle with the lung parenchyma.
- Sharp medial border.

## Pleural mass



## MEDIASTINAL MASS

- Broad base towards mediastinum.
- Obtuse angle with the mediastinum.
- Sharp lateral borders.
- No broncho-vascular markings.



## MEDIASTINAL MASS



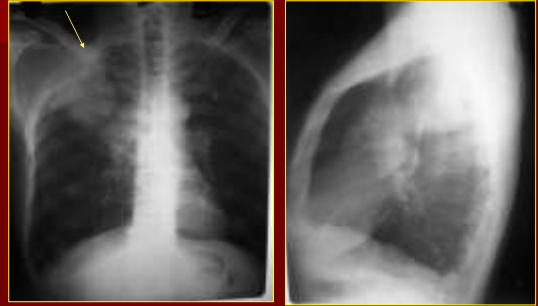
## MEDIASTINAL MASS



## PARENCHYMAL MASS

- Surrounded by the lung parenchyma all around.
- May contain broncho-vascular markings.
- Spiculated borders favor malignancy.

## PERIPHERAL PARENCHYMAL MASS:



## SOLITARY PULMONARY NODULE

The D/D may include the following:

- Primary malignancy of the lung.
- Metastasis.
- Tuberculoma.
- Hydatid cyst.
- AV malformation.
- Hamartoma.

## SPN



## SPN.



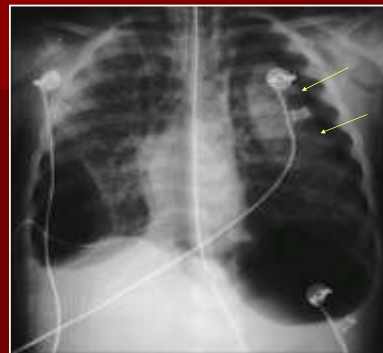
## Pulmonary metastasis

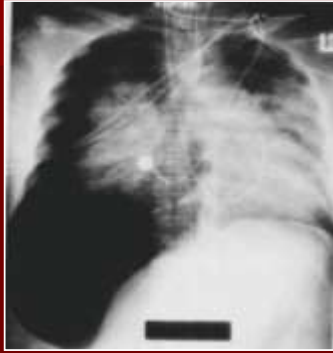




### PNEUMOTHORAX.

- Radiolucency in the CP angle,
- No broncho-vascular markings.
- Razor-sharp medial border.
- There may be associated changes, as under:
  - \* collapse of the underlying lung.
  - \* mediastinal displacement.
  - \* diaphragmatic displacement.

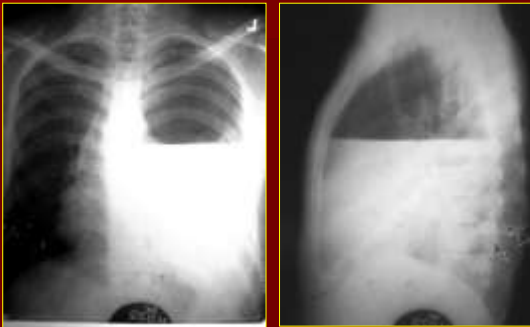




## HYDROPNEUMOTHORAX

- Air fluid level.
- Razor sharp border of the collapsed lung.

## HYDROPNEUMOTHORAX



## EMPHYSEMA

- Hyperluculent lung field.
- Widening of the rib space.
- Flattening of the diaphragm.
- More than 7 visible anterior ends of the ribs.
- Tear drop shaped heart.

## EMPHYSEMA



## LUNG ABSESS

- Air- fluid level.
- Thick wall.
- Surrounding consolidation.

## Lung abscess



## Lung abscess



## D/D of miliary opacities

- Miliary opacities are < 2 mm sized, multiple, opacities of uniform sizes & shapes homogenously distributed in both the lung fields.

D/D of miliary opacities are as under:

- Miliary tuberculosis.
- Pnemoconiosis
- Histoplasmosis.
- Miliary metastasis in thyroid, pancreas, breast malignancies.

## MILLIARY MOTTLING.

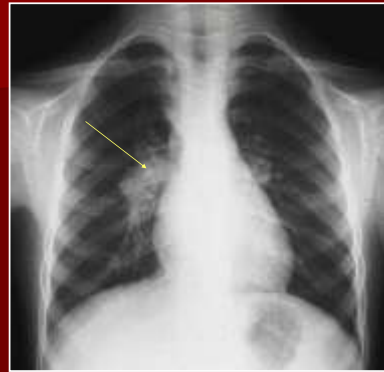


## Miliary mottling



## Primary pulmonary tuberculosis

- Occurs in children, who are infected with the tuberculous bacilli for the first time, or who have been given the BCG vaccine.
- Characterized by GHOHN'S COMPLEX, which is made up of :
  - \* Ghohn's focus: an area of consolidation.
  - \* typically unilateral hilar lymphadenopathy, on the same side as that of the consolidation.



## POST PRIMARY TUBERCULOSIS

- Defined as the development of the disease in a patient, who had previous subclinical / clinical infection; or who had been vaccinated with the BCG vaccine.

### KEY FEATURES OF POST-PRIMARY TB:

- Predominant involvement of the apices of the lungs by:
  - \* consolidation.
  - \* cavitation.
  - \* fibrosis.
  - \* volume-loss.
- NO HILAR LYMPHADENOPATHY.
- Pleural involvement in the form of effusion or empyema.
- Bronchiectasis ( if present ) is typically in the upper lobes.

## POST PRIMARY TB

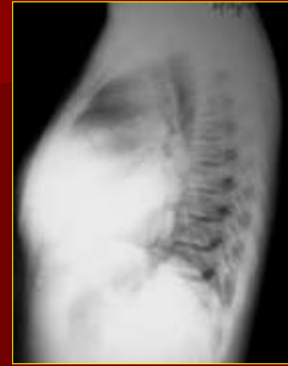


## CARDIO-VASCULAR SYSTEM

### LV CARDIOMEGALY.

- Displacement of the apex of the heart downwards & outwards.
- Wide angle between the apex of the heart & the left hemidiaphragm.
- In lateral view, the retrocardiac space is obliterated.

## LV CARDIOMEGALY



## RV CARDIOMEGALY.

- Only outwards displacement of the apex of the heart. Thus the apex is lifted from the diaphragm.
- Narrow angle between the apex of the heart & the left hemidiaphragm.
- Associated changes in the lung (+/-).
- In lateral view, reduced retrosternal space.

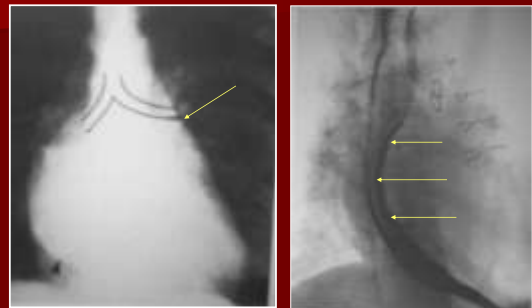
## RV CARDIOMEGALY.



## LA ENLARGEMENT:

- Straightening of the left cardiac border.
- Double density within the cardiac shadow, giving rise to the "chamber-in-chamber" appearance.
- On lateral view, prominent posterior cardiac border, which on barium swallow, produces an extrinsic impression on the anterior wall of the oesophagus.
- Associated changes of PVHT (+/-).

## LA ENLARGEMENT



**RA ENLARGEMENT:**

- Displacement of the right cardiac border away from the spine.
- In lateral view, prominent antero-superior part of the heart, reducing the retrosternal space.

**RA ENLARGEMENT****Global cardiomegaly****D/D of global Cardiomegaly.**

- Multi-valvular heart disease.
- Cardiomyopathy
- Pericardial effusion.

**PERICARDIAL EFFUSION.**

- Increased cardio-thoracic ratio.
- Obliteration of the angle between the SVC & RA.
- Obliteration of the angle between aortic knuckle & LV.
- Normal cardio-phrenic angle.
- There may be reduced pulmonary vascularity, if the pericardial effusion is marked.
- On fluoroscopy, there is reduced movement & pulsatility of the heart.



## PERICARDIAL EFFUSION



## PULMONARY OEDEMA

- Batwing shaped opacity.
- Multiple patchy confluent opacities.
- Middle & lower zone involvement in a mobile patient.

## BATWING PATTERN OF PULMONARY OEDEMA



## Pulmonary oedema



**THANK YOU.....**