
بسم الله الرحمن الرحيم

Pediatric chest X-ray

Learning Outcomes

1) Have a working background knowledge

2) Have a systematic approach to reading PA chest films

3) Recognise and comment on major abnormalities

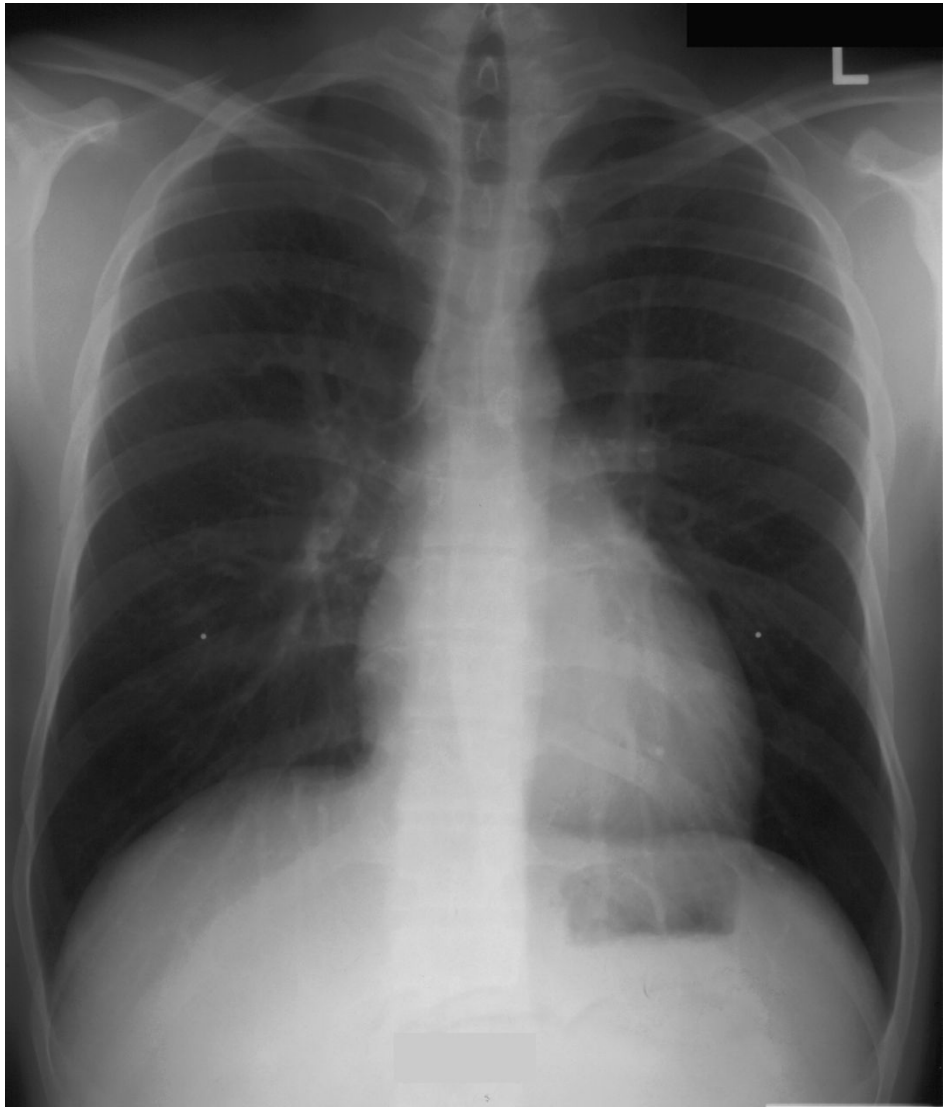
4) Present your findings

Verify Right and Left sides

1-Cardiac shadow is mainly in the left side.

2-Gastric gas is seen under the left copula.

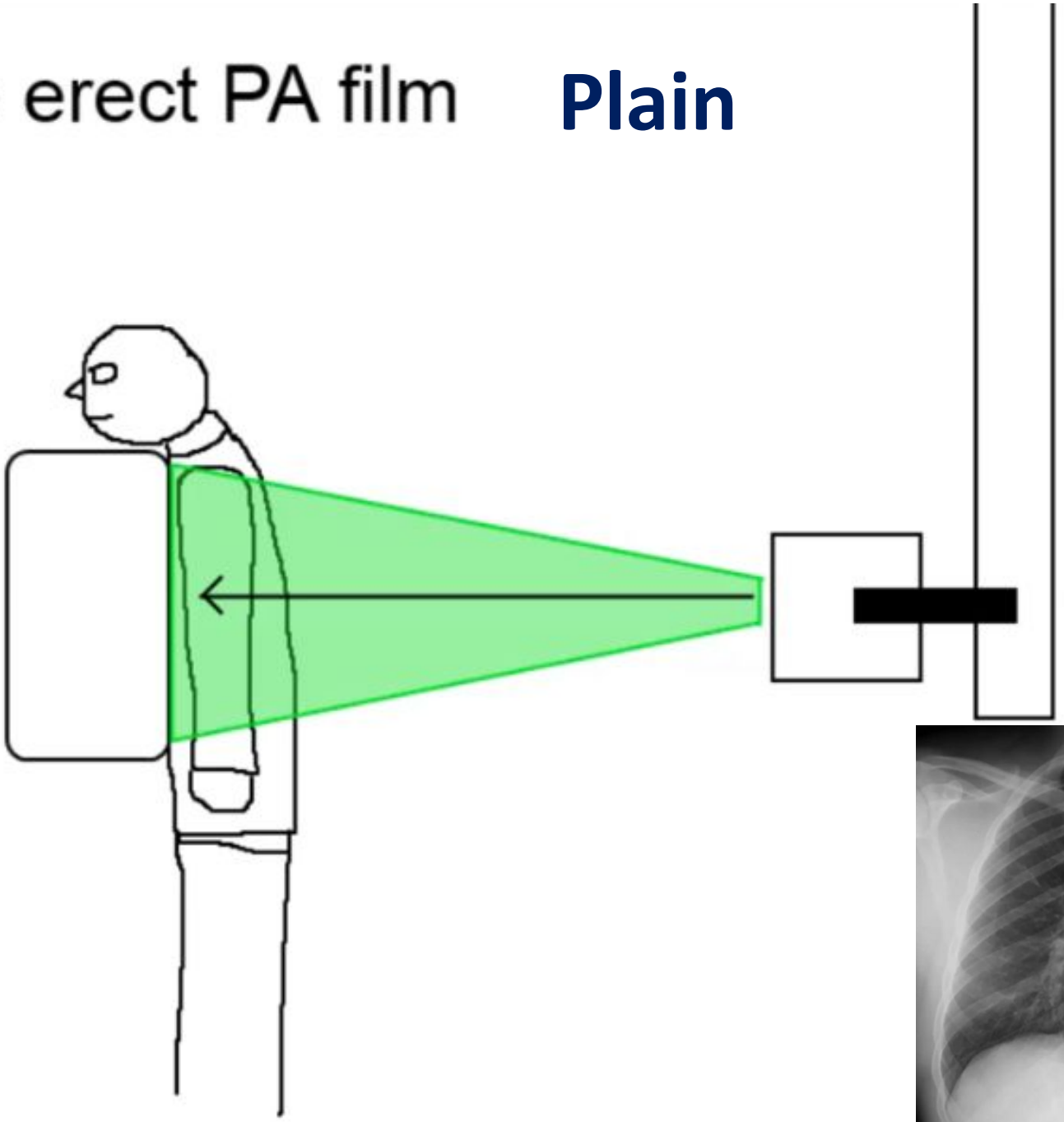
3- liver shadow is seen under the right copula.



Gastric bubble should be on the left

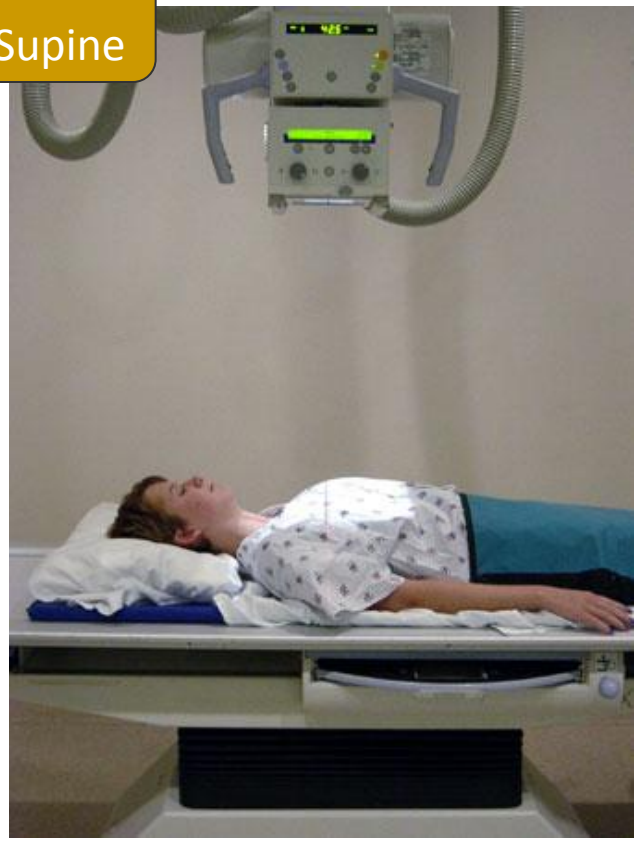
- Plain X-ray chest and heart, PA view
- Centralization of the patient (Patient is more or less centralized, not centralized)
- Position of trachea (Trachea is central or shifted to right or left side)
- Mention the abnormal radiological findings
- Radiological diagnosis

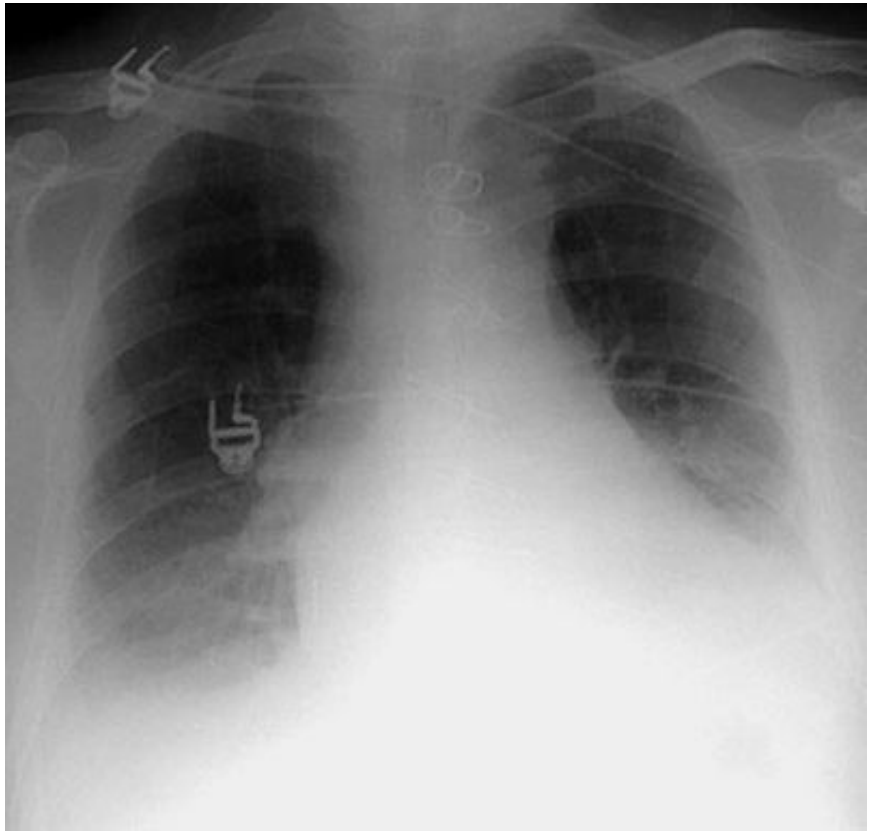
The erect PA film **Plain**



Supine AP film

Supine

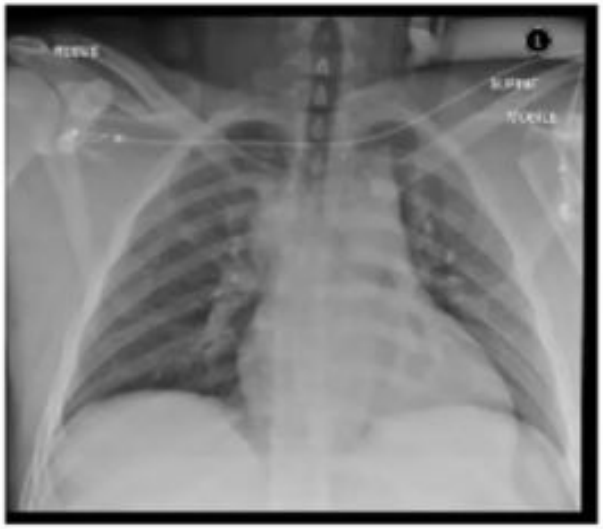




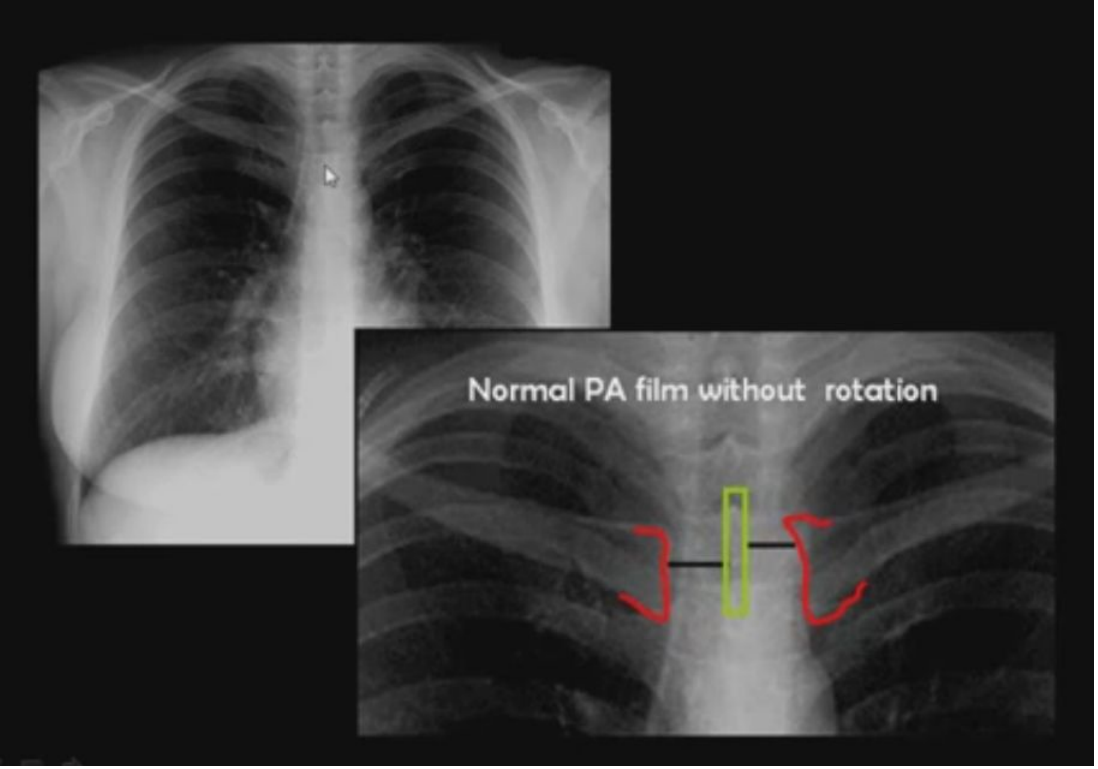
Left
Lateral

PA (postero-anterior)

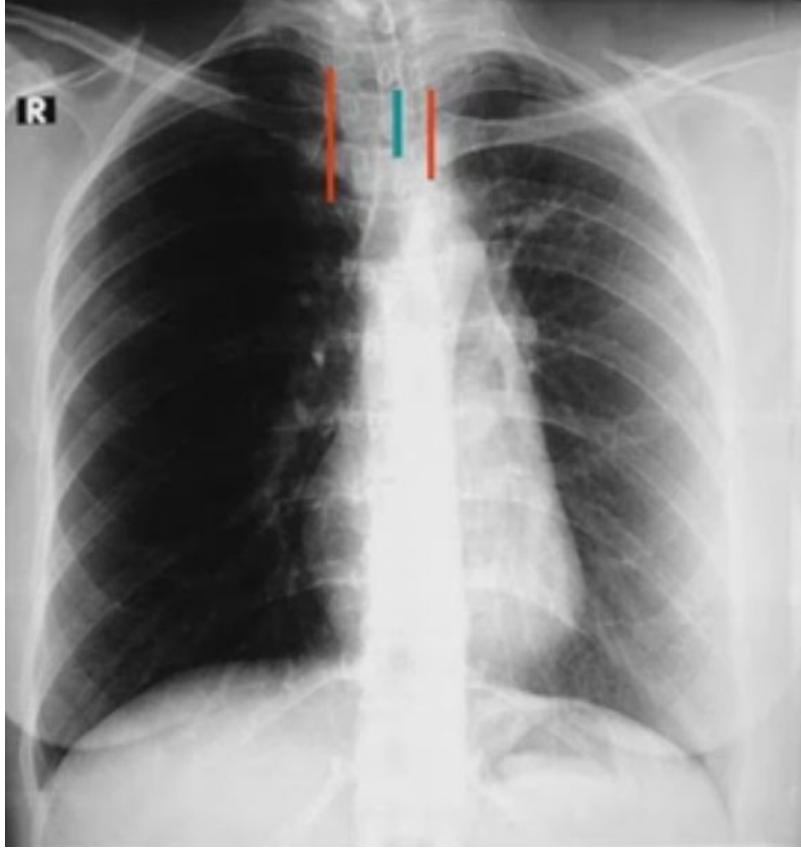
Lateral



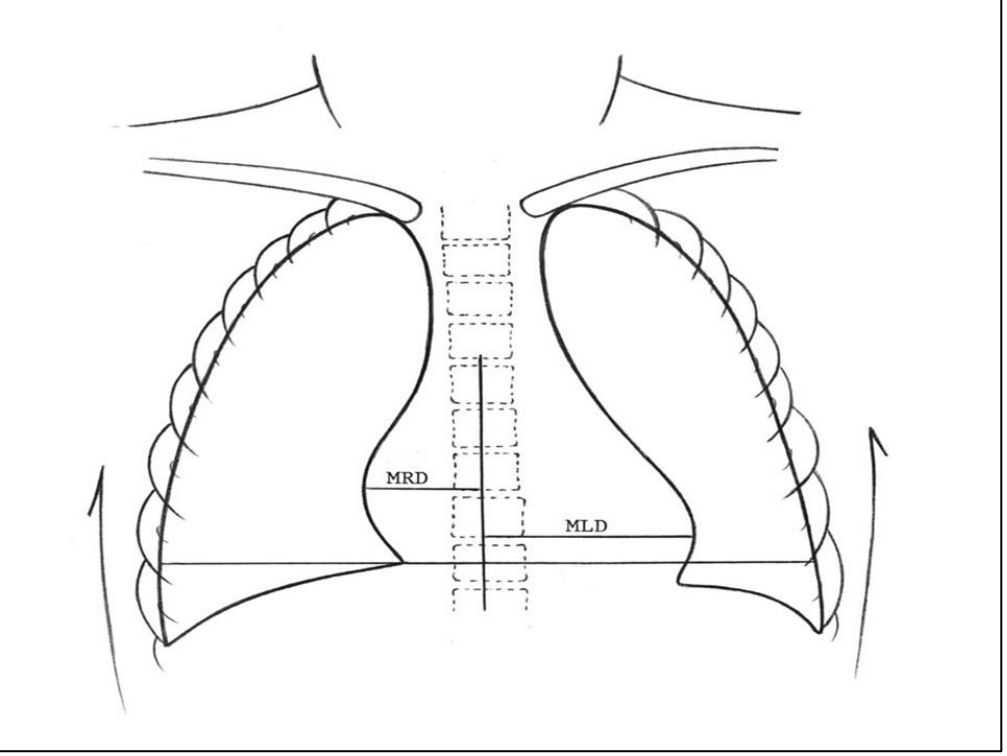
AP (antero-posterior)

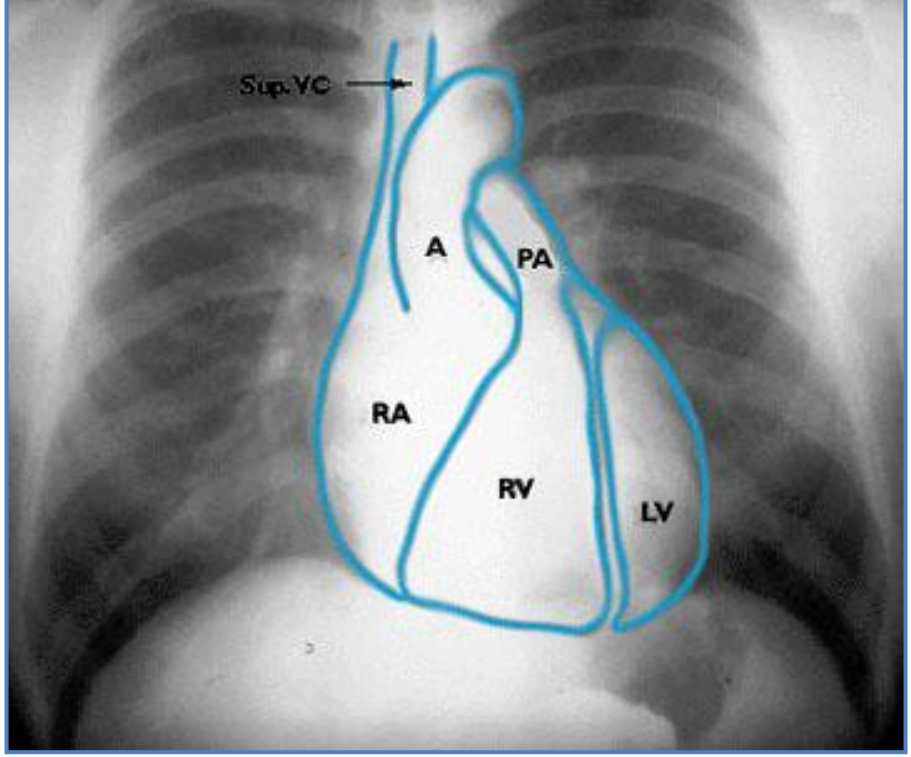


Check centralization of patient



Rotation





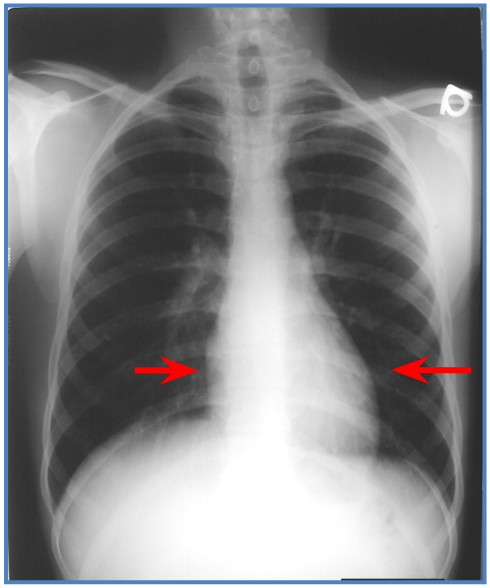
Cardiac silhouette

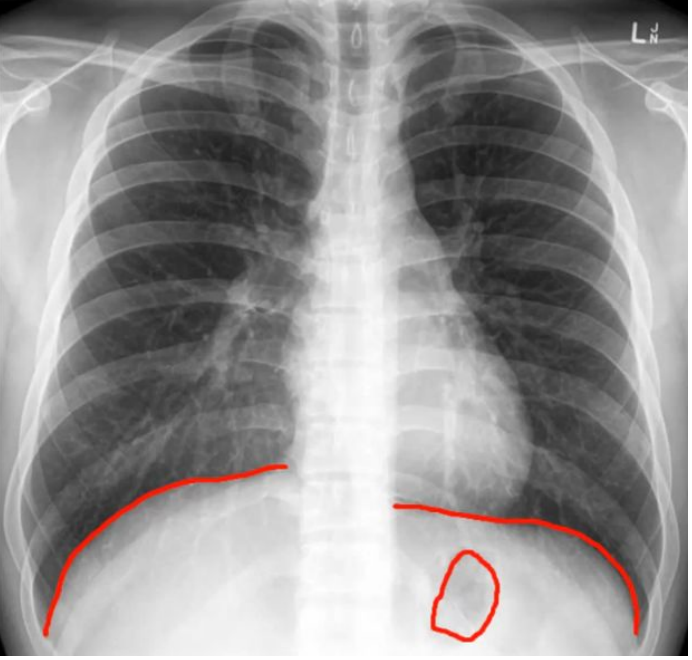
Edges of the heart

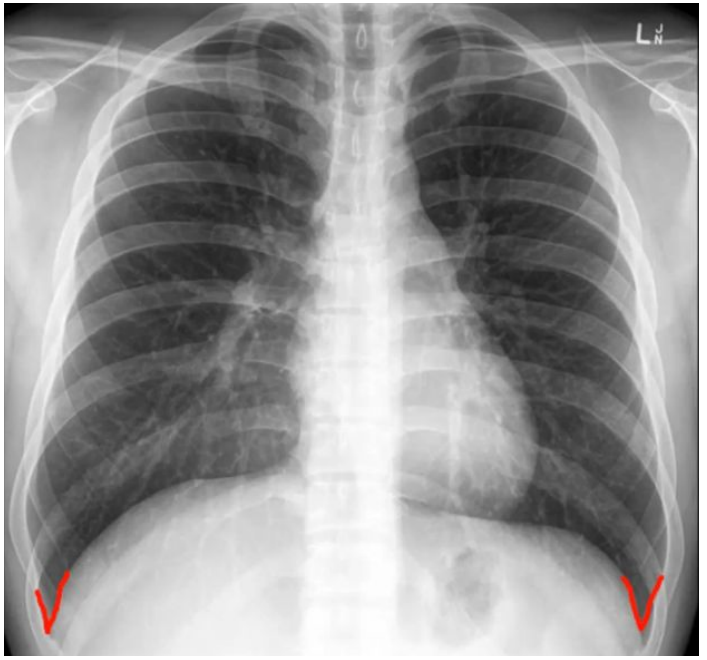
: **Cardiac** -

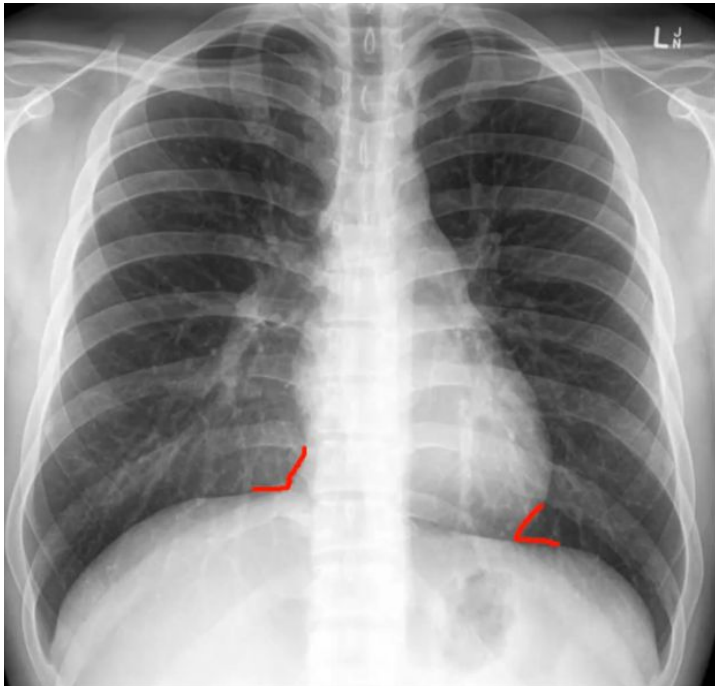
.Site , size, configuration

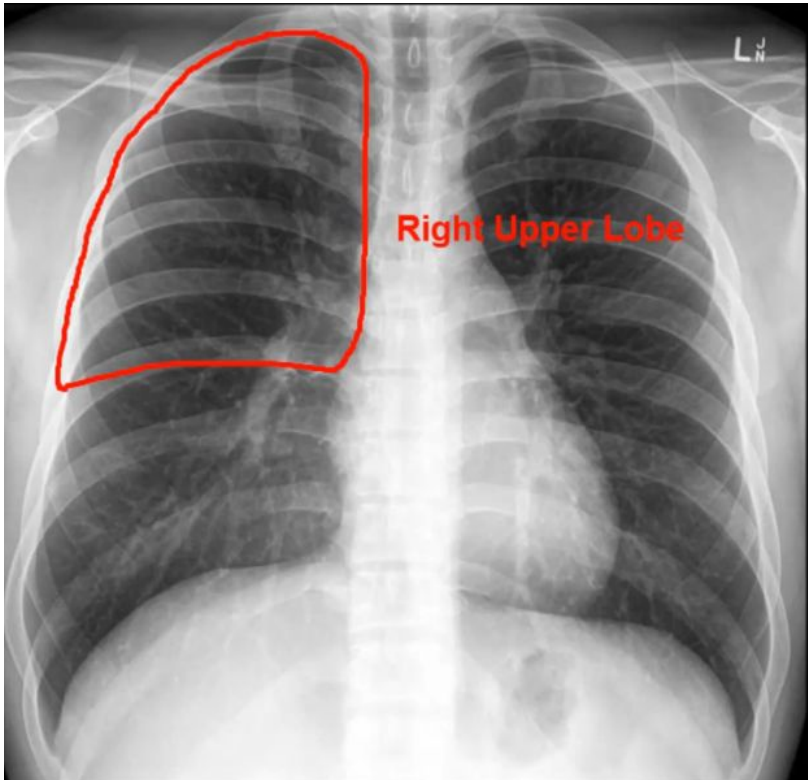
.Pulmonary vasculature -

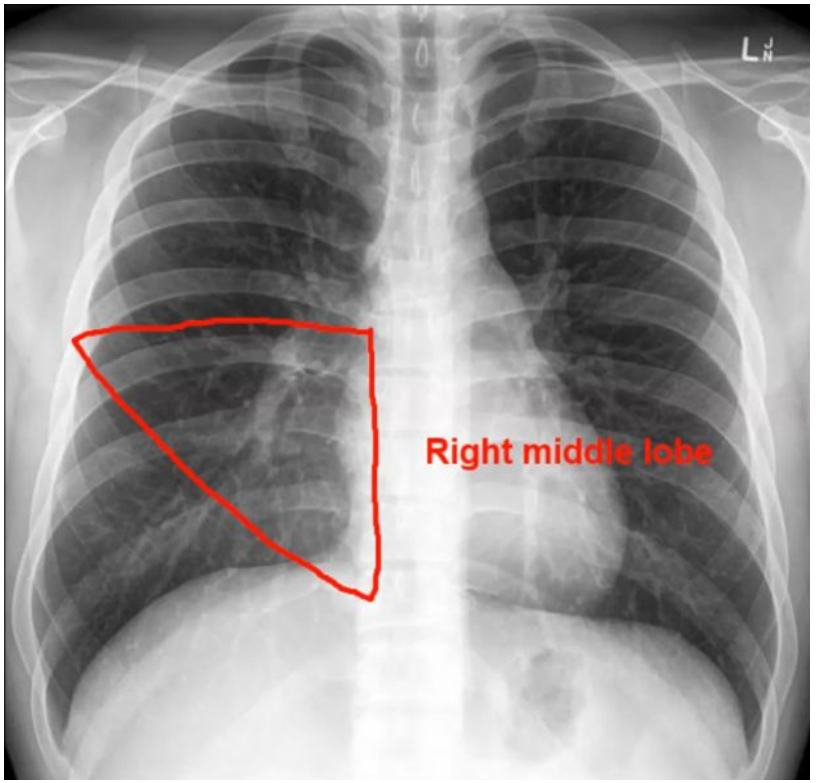


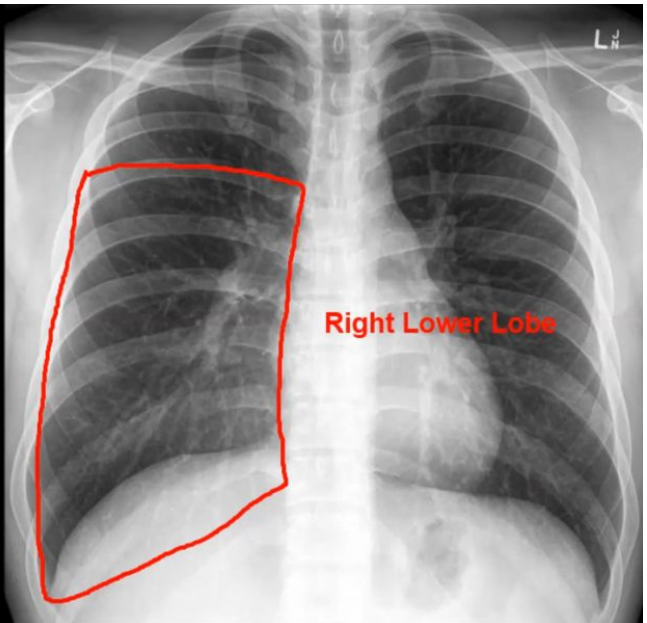


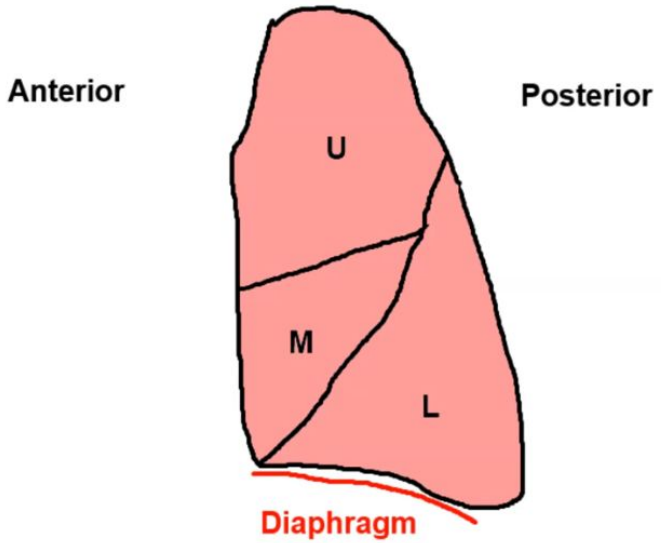


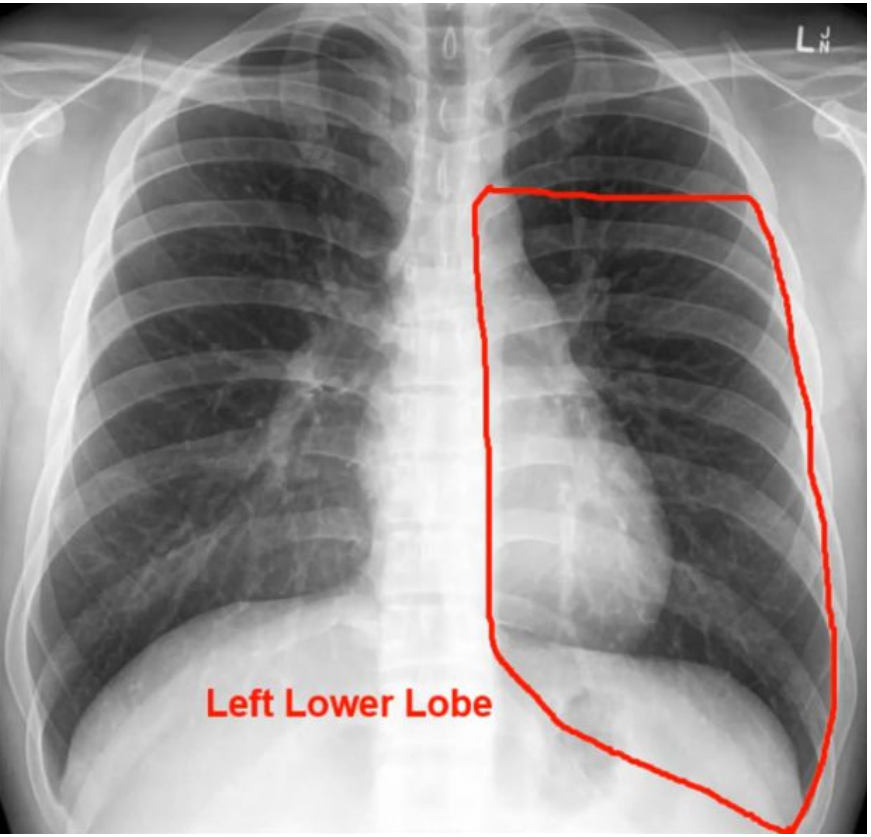


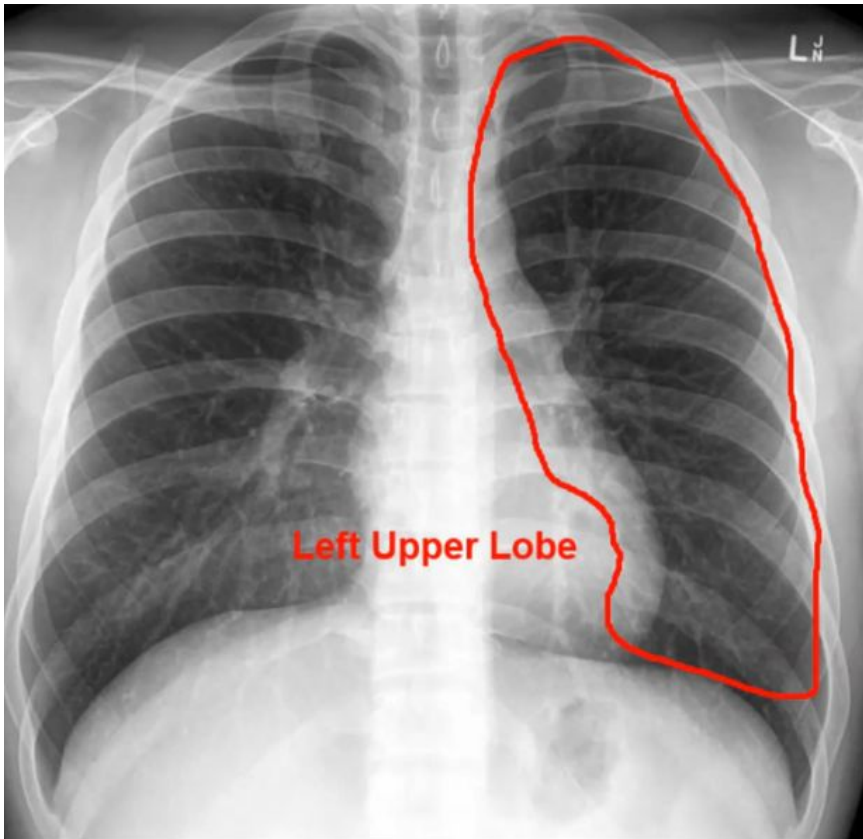

Right Upper Lobe

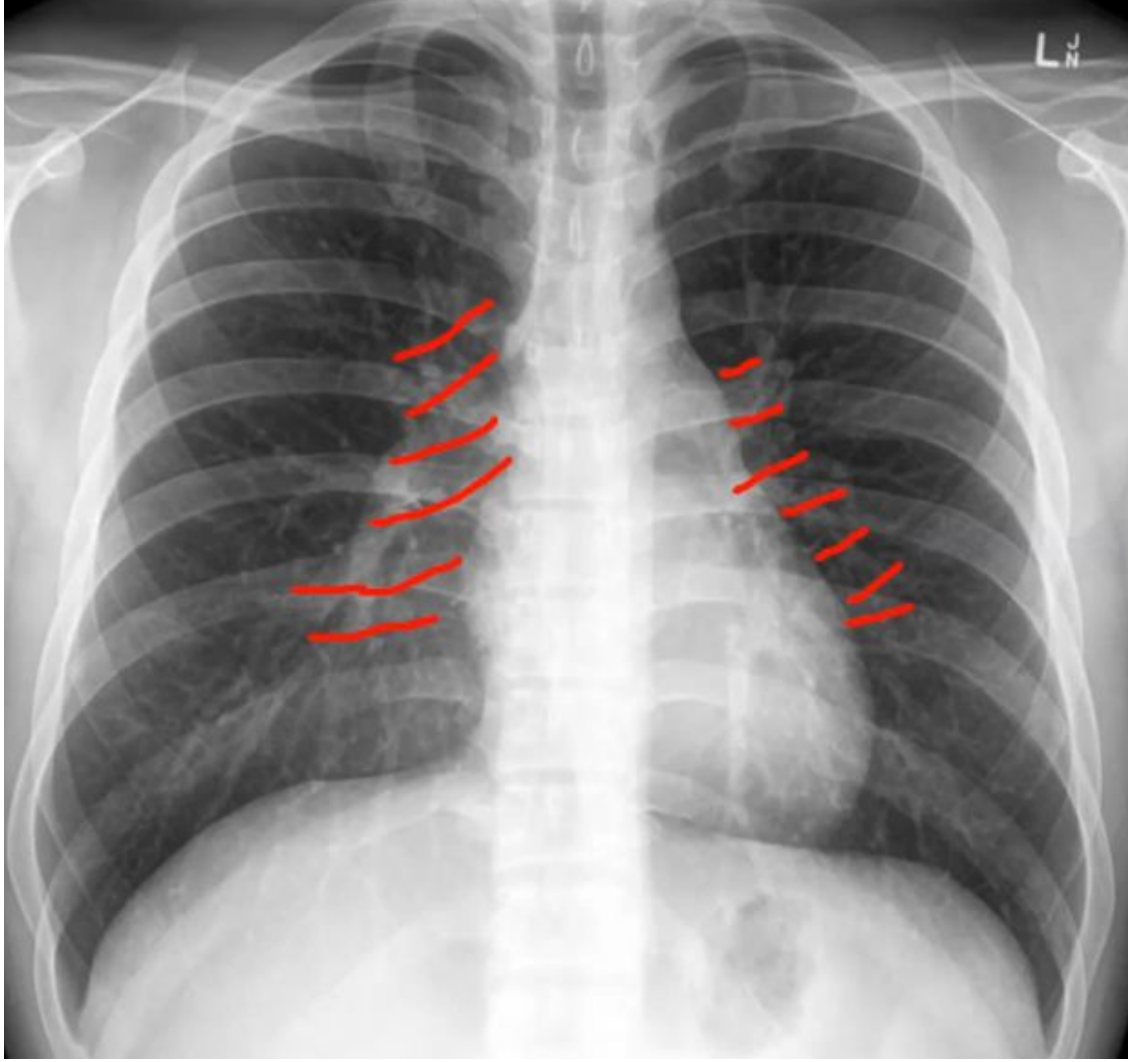

Right middle lobe


Right Lower Lobe

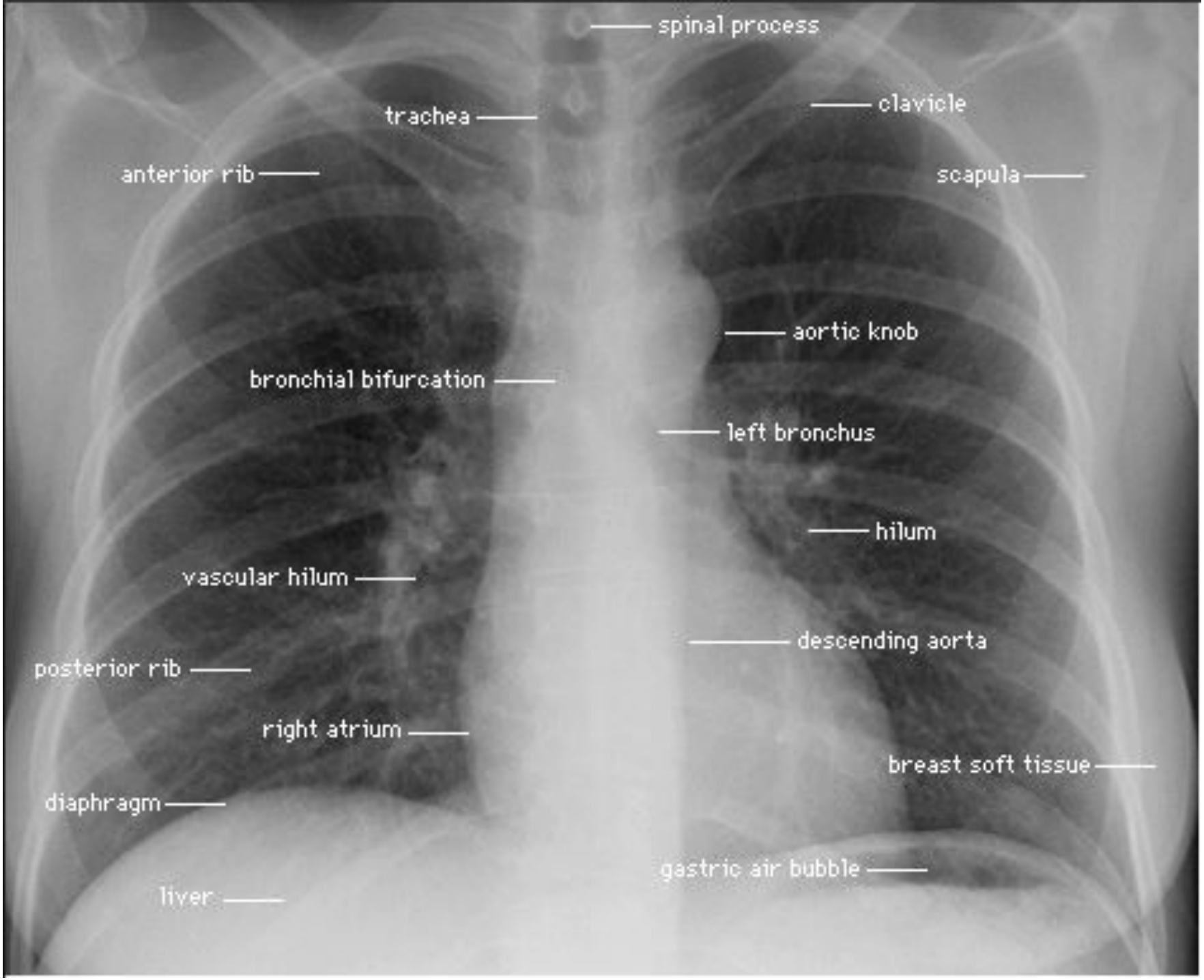

Anterior
Posterior
U
M
L
Diaphragm


Left Lower Lobe


Left Upper Lobe



Hilum


spinal process
trachea
clavicle
anterior rib
scapula
aortic knob
bronchial bifurcation
left bronchus
hilum
vascular hilum
descending aorta
posterior rib
right atrium
breast soft tissue
diaphragm
gastric air bubble
liver

Look for the abnormalities

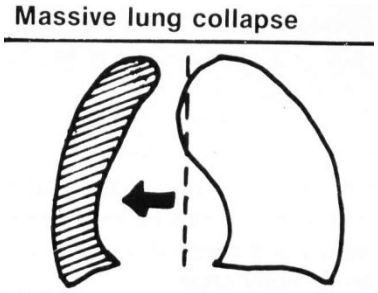
Mediastinal shift

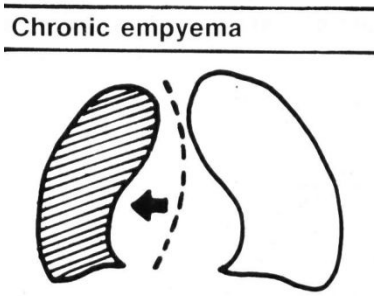
1. To the same side of the lesion

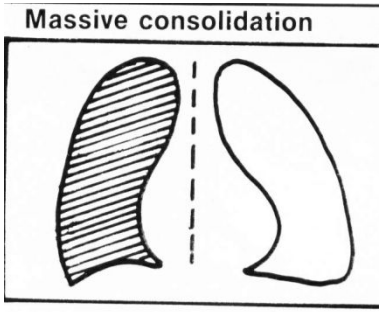
- Massive lung collapse
- Pulmonary fibrosis

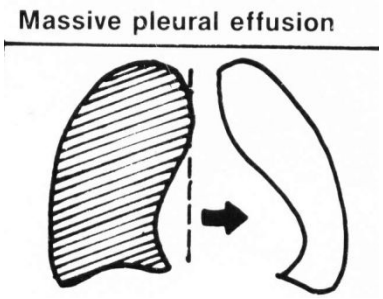
2. To the opposite side of the lesion

- Pleural effusion
- Pneumothorax and hydropneumothorax
- Unilateral obstructive emphysema
- Diaphragmatic hernia



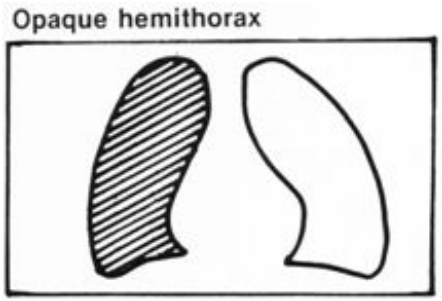




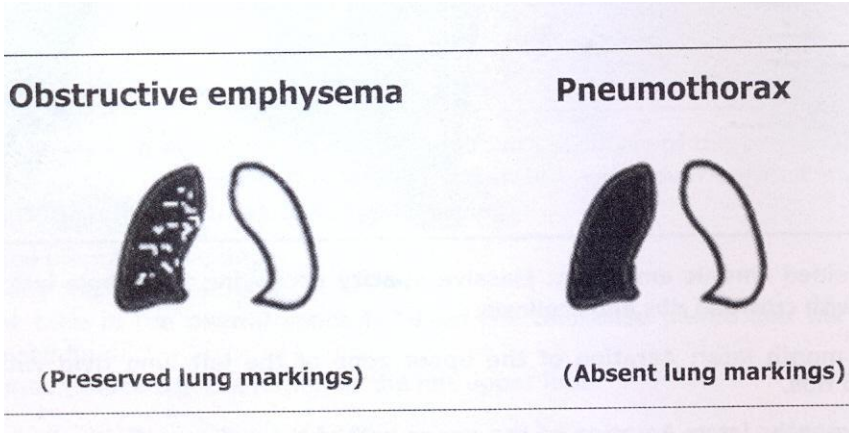


Abnormalities in lung fields

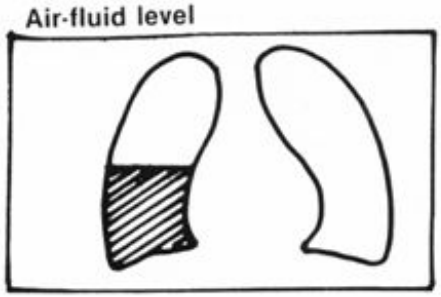
- **Opaque hemithorax**
- Massive consolidation
- Massive pleural effusion
- Massive lung collapse
- Pleuropulmonary fibrosis



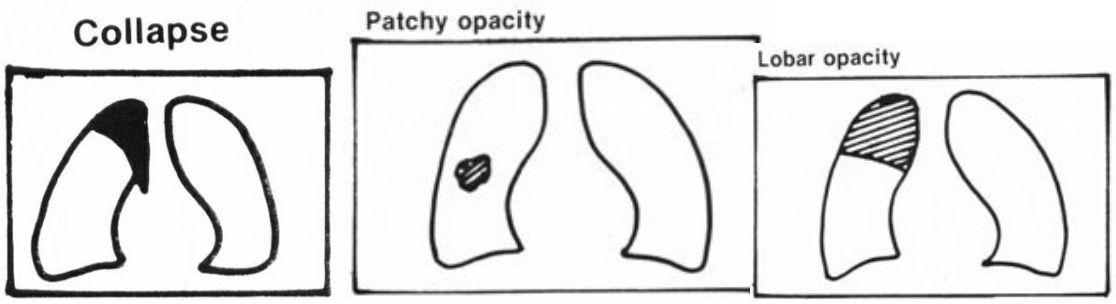
- **Hypertransradiant hemithorax**
- Obstructive emphysema
- Pneumothorax



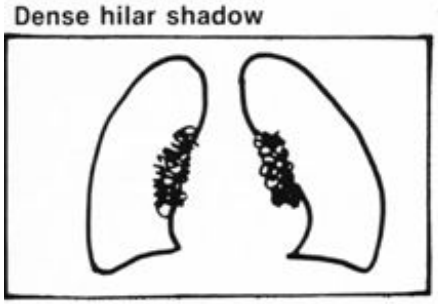
- **Air-fluid level**
- Lung abscess
- Hydropneumothorax



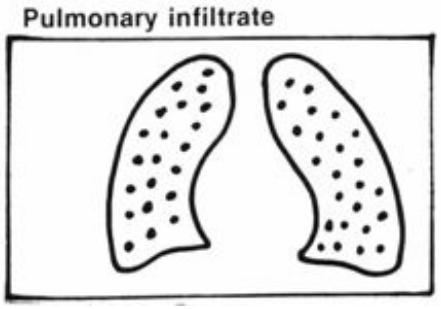
- **Partial unilateral opacity**
- Lobar consolidation
- Lobar collapse
- Solitary patch or nodule



- **Dense hilar shadow**



- **Pulmonary infiltrate**
- Miliary infiltrate
- Recticulonodular infiltrate
- Patchy or fluffy infiltrate
- Parahilar peribronchial infiltrate
- Hazy or opaque infiltrate



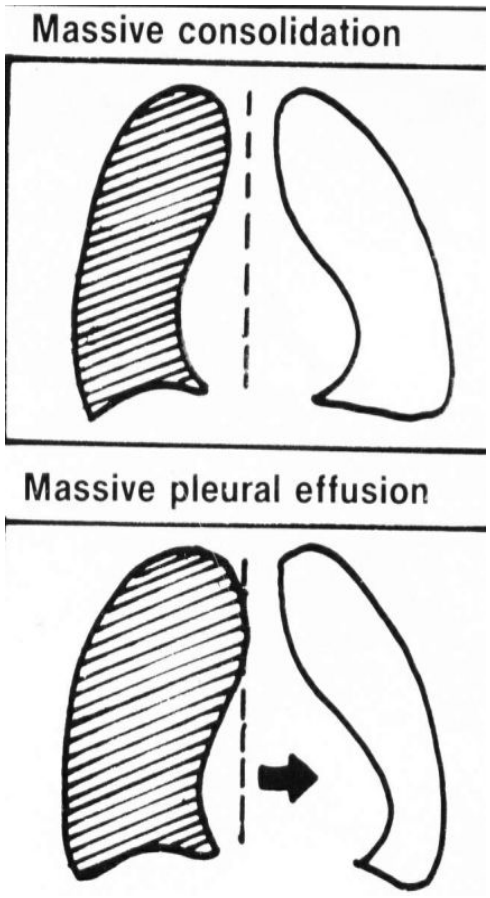
1- Opaque hemithorax

1. Massive consolidation (pneumonia)

- The opacity is homogenous and not very dense (ribs can be visualized and no obliteration of CFA).
- The mediastinum is central with no shift to either side (normal size hemithorax).
- Normal bony cage.

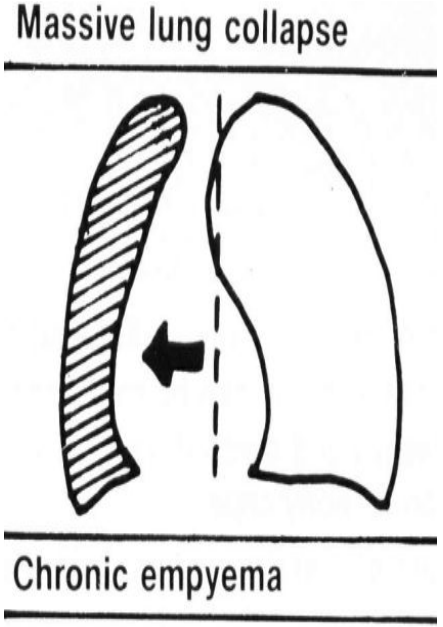
2. Massive pleuraL effusion

- The opacity is homogenous and usually very dense (ribs can not be easily visualized with obliteration of CFA).
- The mediastinum is shifted to the opposite side of the lesion.
- Normal bony cage. Some separation of ribs on the affected side may be seen.



3. Massive lung collapse

- The opacity is homogenous and usually very dense (ribs can not be easily visualized with obliteration of CFA).
- The mediastinum is shifted to the same side of the lesion.
- Normal bony cage. Some crowding of ribs on the affected side may be seen.



4. Chronic empyema (Pleuro-pulmonary fibrosis)

- The opacity is homogenous or heterogenous and usually dense.
- The mediastinum is usually shifted to the same side of the lesion.
- Marked crowding of ribs on the same side. Scoliosis of the spine with its concavity towards the affected side is also present.

1. Massive consolidation (pneumonia)

Massive consolidation (pneumonia) of the Rt. Lung (lobar pneumonia)

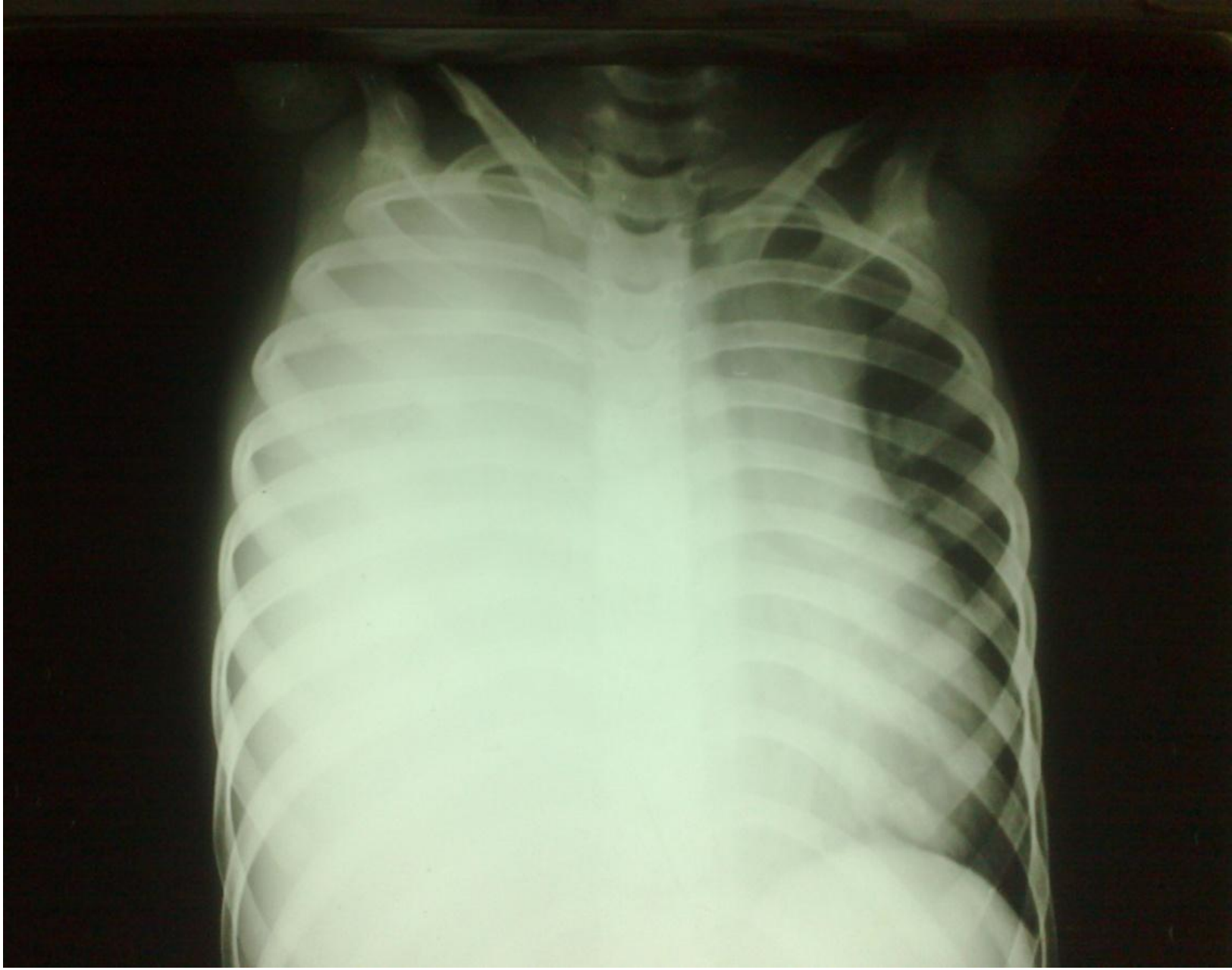
Homogenous opacity occupying the whole Rt. Hemithorax. The opacity is not very dense (ribs can be visualized and no obliteration of CFA). The mediastinum is central. Normal bony cage.

Massive Rt. sided consolidation and left compansatory emphysema

Staphylococcal, streptococcal, hemophilus influenza, klebsiella and pneumococcal.

2. Massive pleuraL effusion

Rt. sided massive pleural effusion



Dense homogeneous opacity occupying the whole Rt. hemithorax and obliterating the right costophrenic angle, no bronchovascular markings are visible. The mediastinum is markedly shifted to the left side. Normal bony cage.

Causes of pleural effusion

- **Empyema (purulent pleurisy)**
- Bacterial pneumonias (Staphylococcal, Hemophilus influenza).
- Ruptured lung abscess, mediastinitis, and chest surgery.

- **Serofibrinous pleurisy**
- Bacterial pneumonias and tuberculous effusion.
- Malignancy: Lymphoma, Neuroblastoma, and metastases.
- Rheumatic diseases

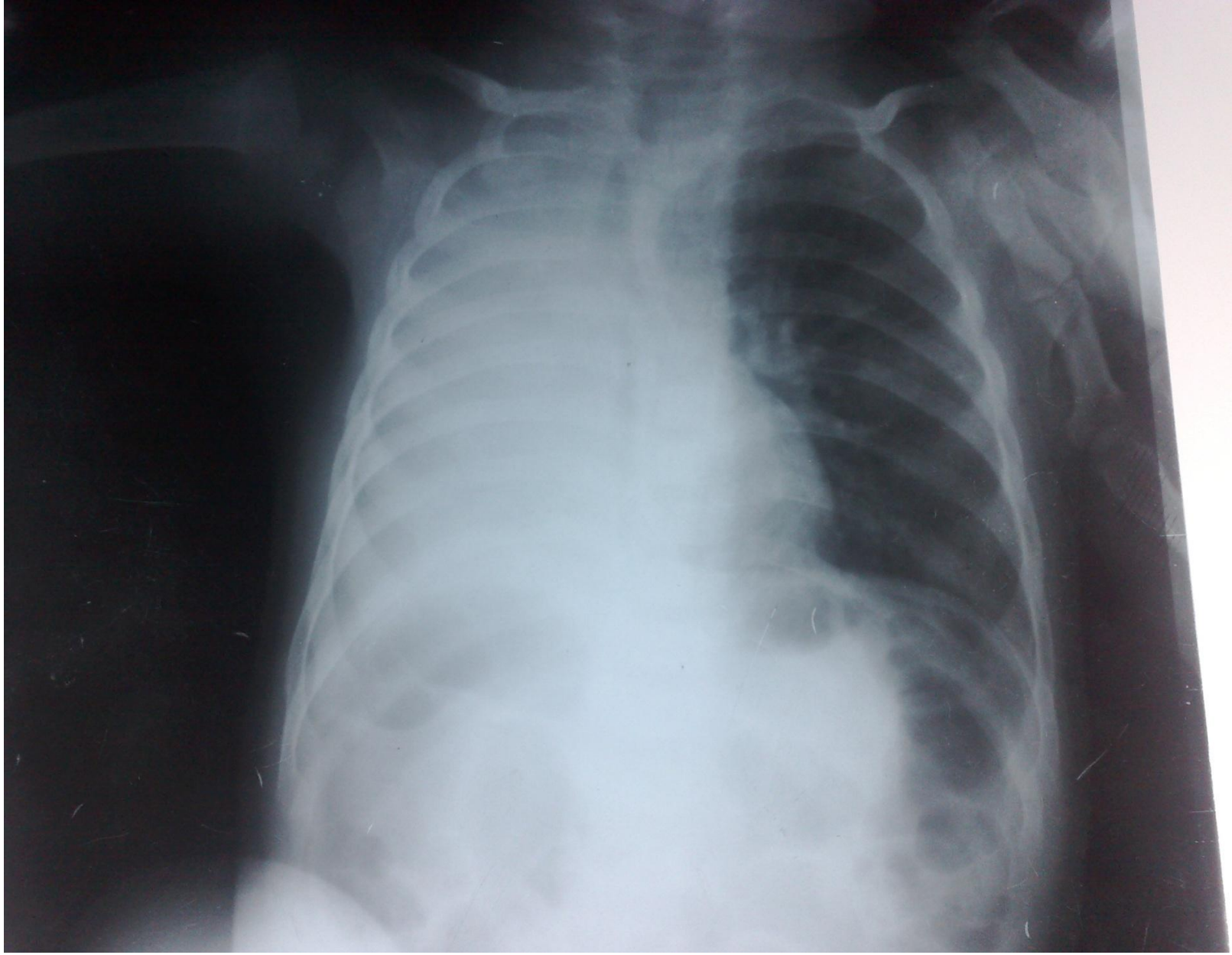
- **Hydro thorax**
- Heart failure, Renal failure, Nephrotic syndrome

- **Hemothorax**
- Trauma, Tumours

- **Chylothorax**
- Chest surgery

3. Massive lung collapse

Massive collapse of the Rt. lung



Dense homogenous opacity occupying the whole Rt. Hemithorax. The ribs can not be easily visualized with obliteration of CFA. The mediastinum is shifted to the same side of the lesion (Rt. Side). Normal bony cage. Some crowding of ribs on the Rt. side.

Massive lung collapse

It results from total obstruction of the main Rt. or Lt. bronchus.

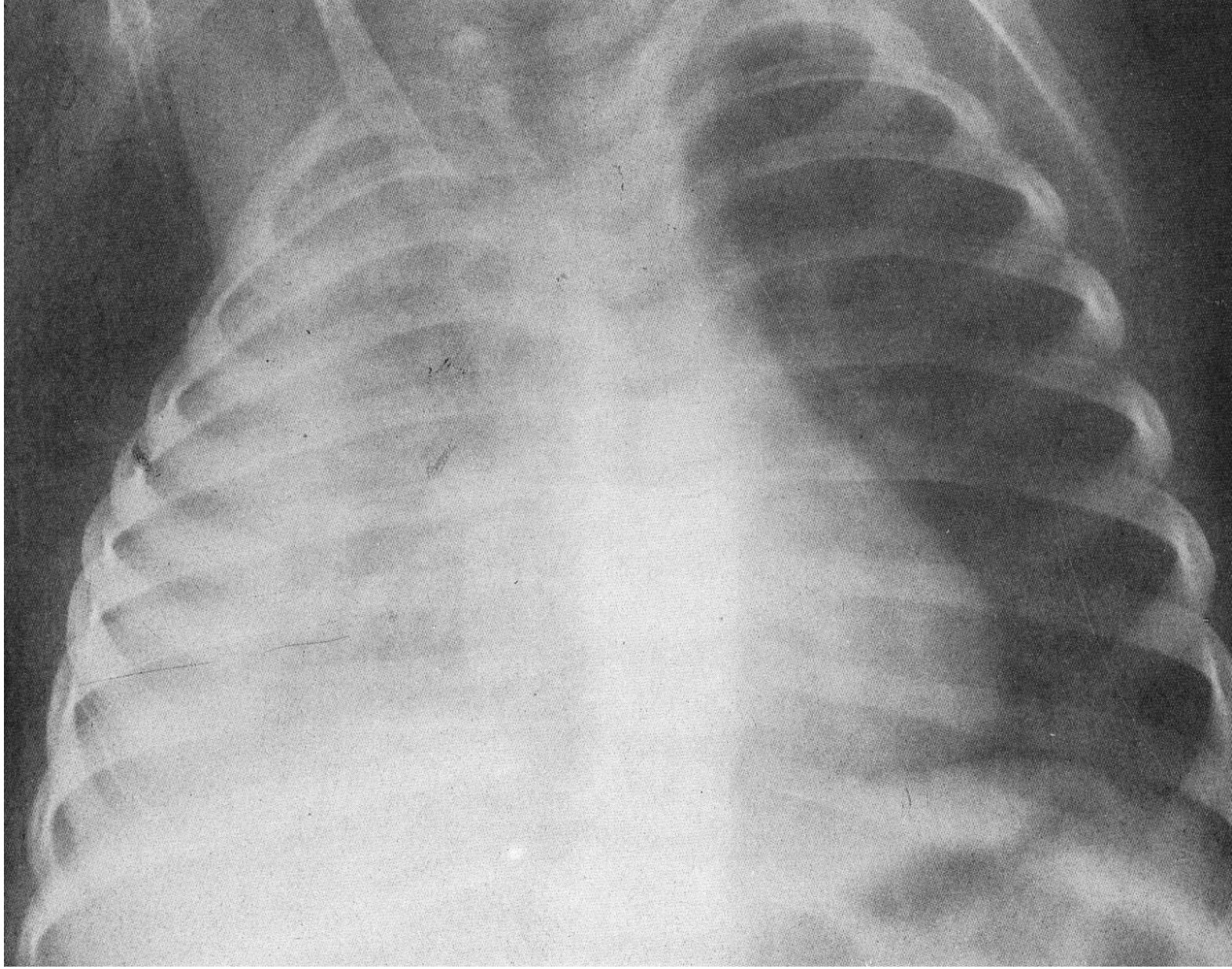
Causes:

1- FB inhalation.
2- Respiratory paralysis.
3- Postoperative chest surgery.
4- Wrongly placed ETT.

4. Chronic empyema (Pleuro-pulmonary fibrosis)

.

Rt. Sided chronic empyema (Pleuro-pulmonary fibrosis)



Massive heterogenous opacity occupying the whole right hemithorax which is more dense in the lateral third denoting pleural involvement with obliteration of CPA. Slight mediastinal and tracheal shift to the same side (to right). Marked crowding of ribs on the right side with scoliosis of vertebral column denoting pleural fibrosis. The ribs on the left side are widely separated with hypertranslucent left lung field (compensatory emphysema).

2- Hypertranslucent hemithorax

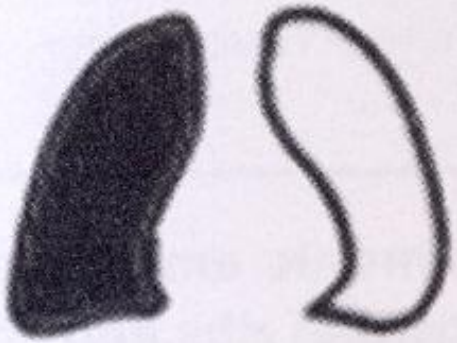
A-Obstructive emphysema

B-Pneumothorax

Obstructive emphysema

(Preserved lung markings)

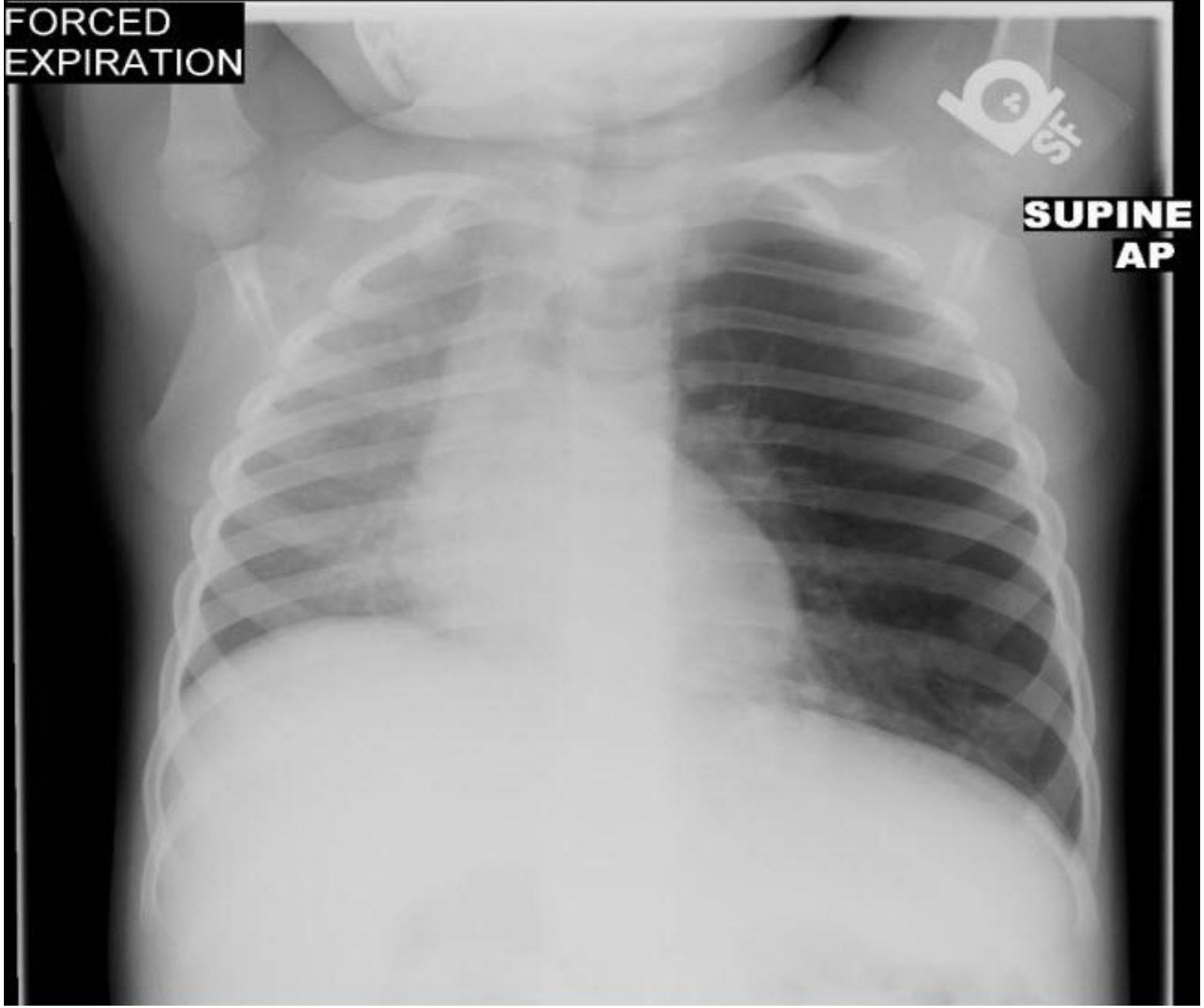
Pneumothorax



(Absent lung markings)

A-Obstructive emphysema

Obstructive emphysema of the left lung



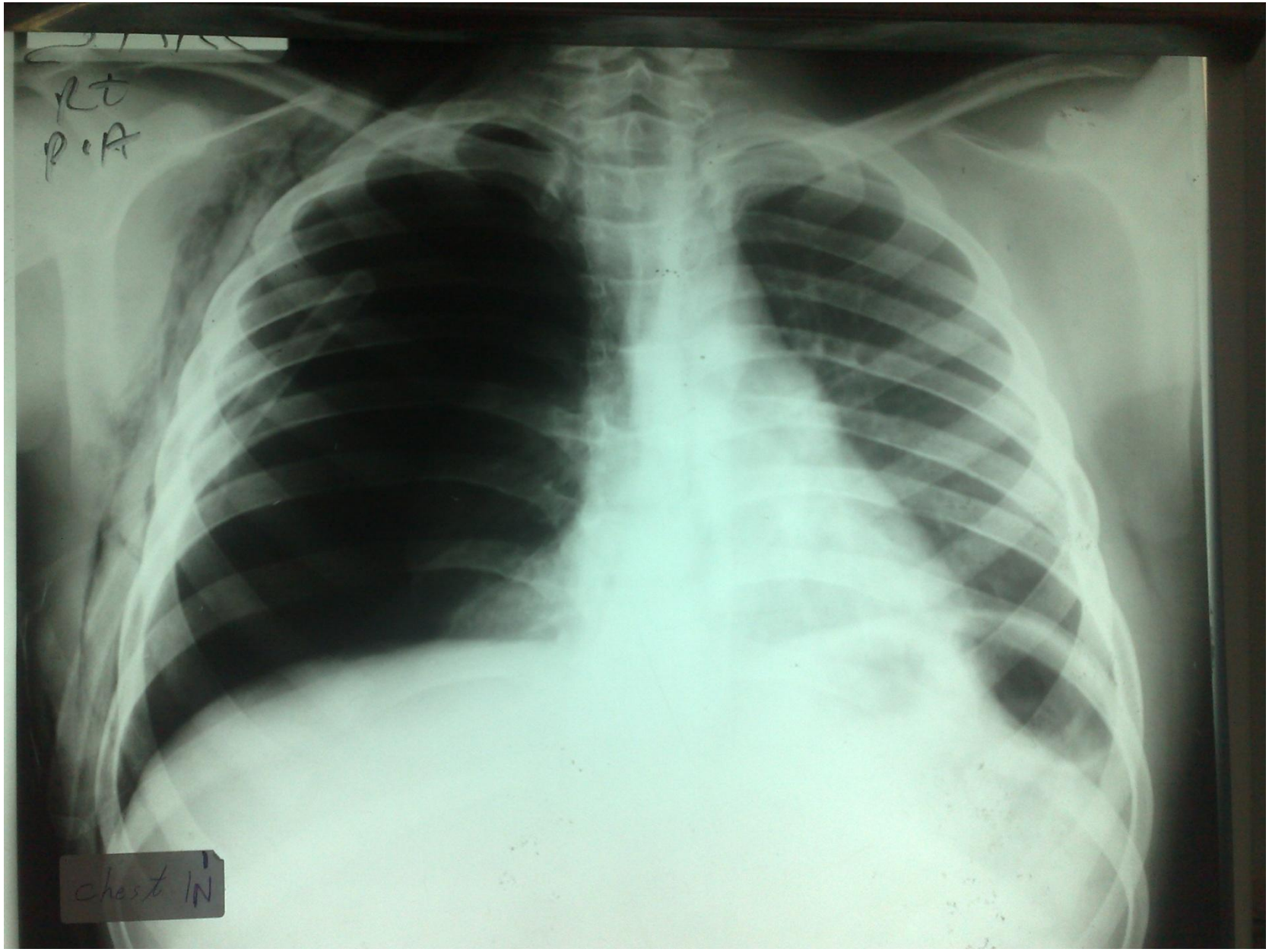
Hypertranslucency of the whole Lt. hemithorax with preserved bronchovascular markings. The hyperinflated lung crosses the mediastinum and is herniated into the Rt. side. The mediastinum is shifted to the to the Rt. Side.

Obstructive Emphysema

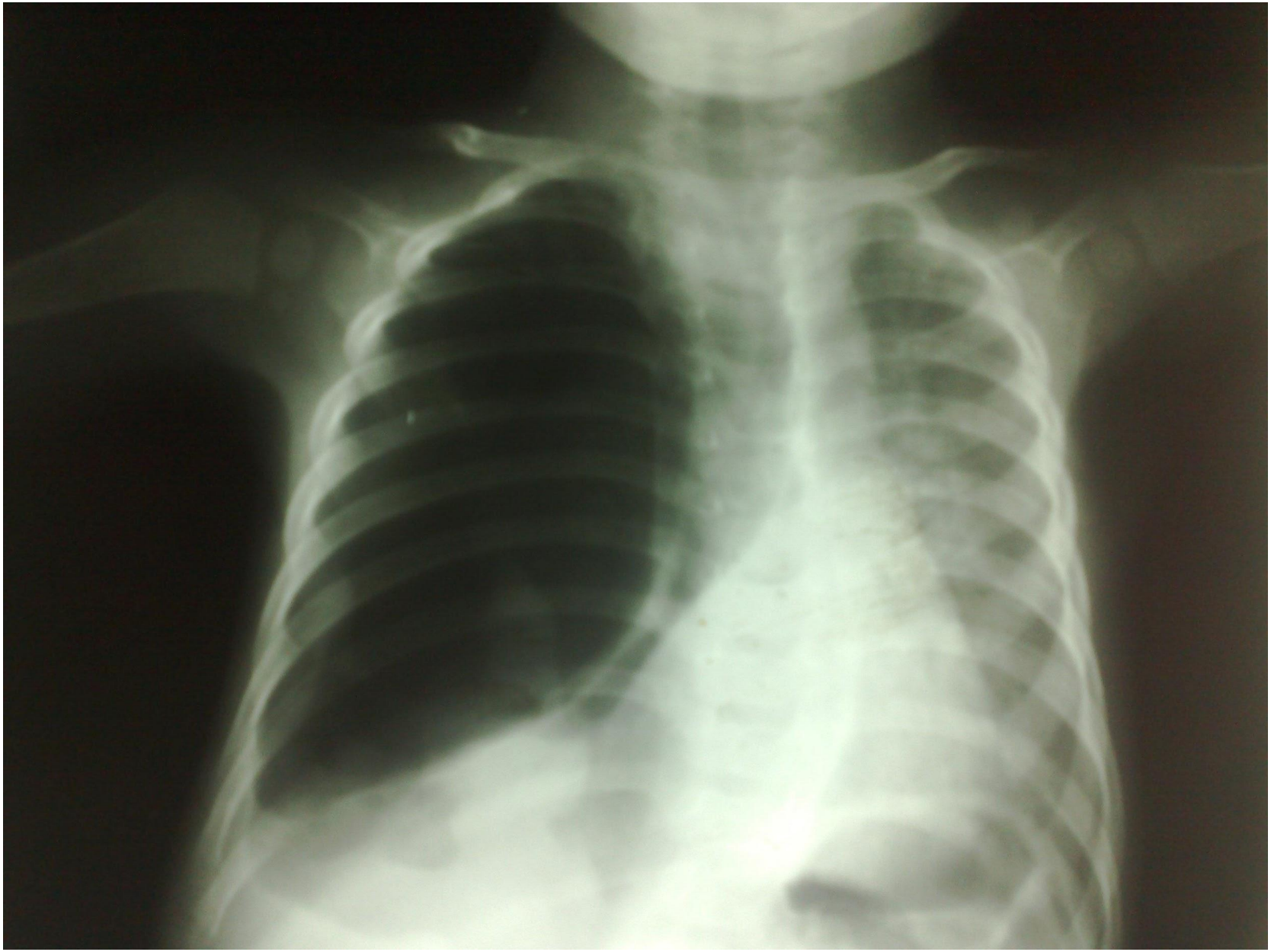
-It results from partial (incomplete) obstruction of a bronchus which creates a valve type of obstruction.
-It can be generalized or localized to one lung.
-Causes of localized obstructive emphysema:
1- In acute conditions: F.B. or viscid secretions.
2- in chronic conditions : T.B. of tracheobronchial LNs.

B-Pneumothorax

Rt. Sided Pneumo-thorax With Rt. Inter-cos tal tube



Hypertranslucency of the whole Rt. Hemithorax with abscent bronchovascular markings with some herniation across the mediastinum. The Rt. Lung is completely collapsed against the mediastinum. The mediastinum is shifted to the Lt. side.



Causes of pneumothorax (free air in pleural space):

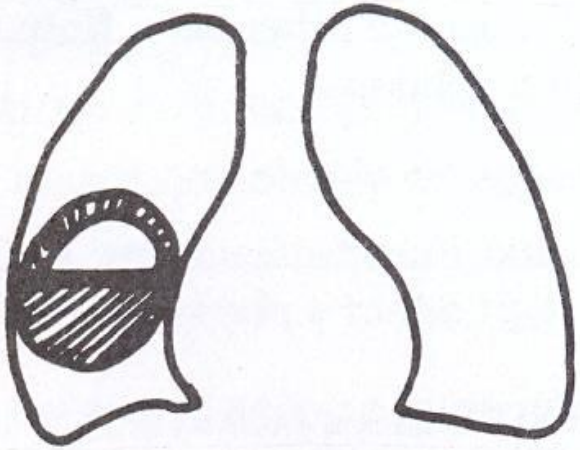
1-Iatrogenic: as a complication of mechanical ventilation or chest surgery (commonest).

2-Spontaneous : with acute conditions as acute bronchiolitis, bronchial asthma, pertussis and interstitial pneumonias.

3-Air-fluid level

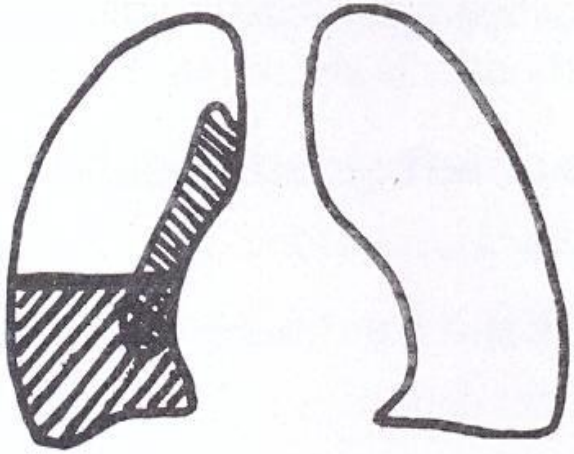
- **A- Lung abscess**
- **B- Hydropneumothorax**

Lung abscess



Air-fluid level is limited
to the abscess cavity
No mediastinal shift

Hydropneumothorax

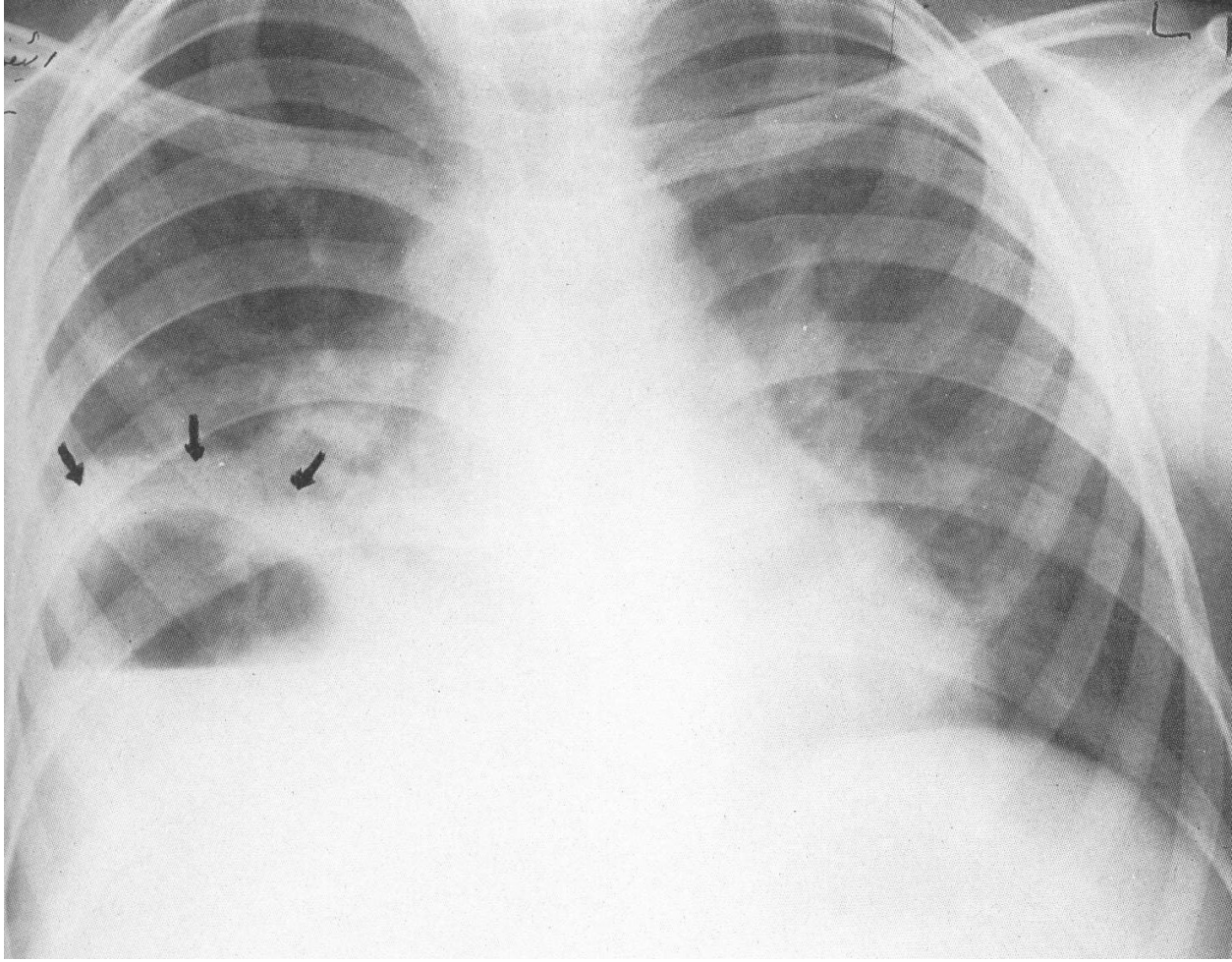


Air-fluid level is involving the whole
hemithorax with lung compression
Mediastinal shift to the other side

- **A- Lung abscess**

Lung abscess

Solitary lung abscess of)
(the right lower lobe



Dense homogenous opacity in the lower zone of the right lung field (clear costophrenic angle) with horizontal upper level (fluid level) and hypertranslucent area devoid of lung markings above it (air). Note the following :

1. The hypertranslucent area is not reaching to the apex of the right lung but surrounded by a dense opacity (wall of the abscess).
2. The fluid level is not involving the whole hemithorax.
3. The lung is not collapsed against the mediastinum.
4. The mediastinum is not shifted to the other side.

Lung Abscess

- **It results from suppurative destruction of lung parenchyma and formation of a cavity containing purulent material.**
- **It occurs with aspiration of infected material or with bacterial pneumonias.**

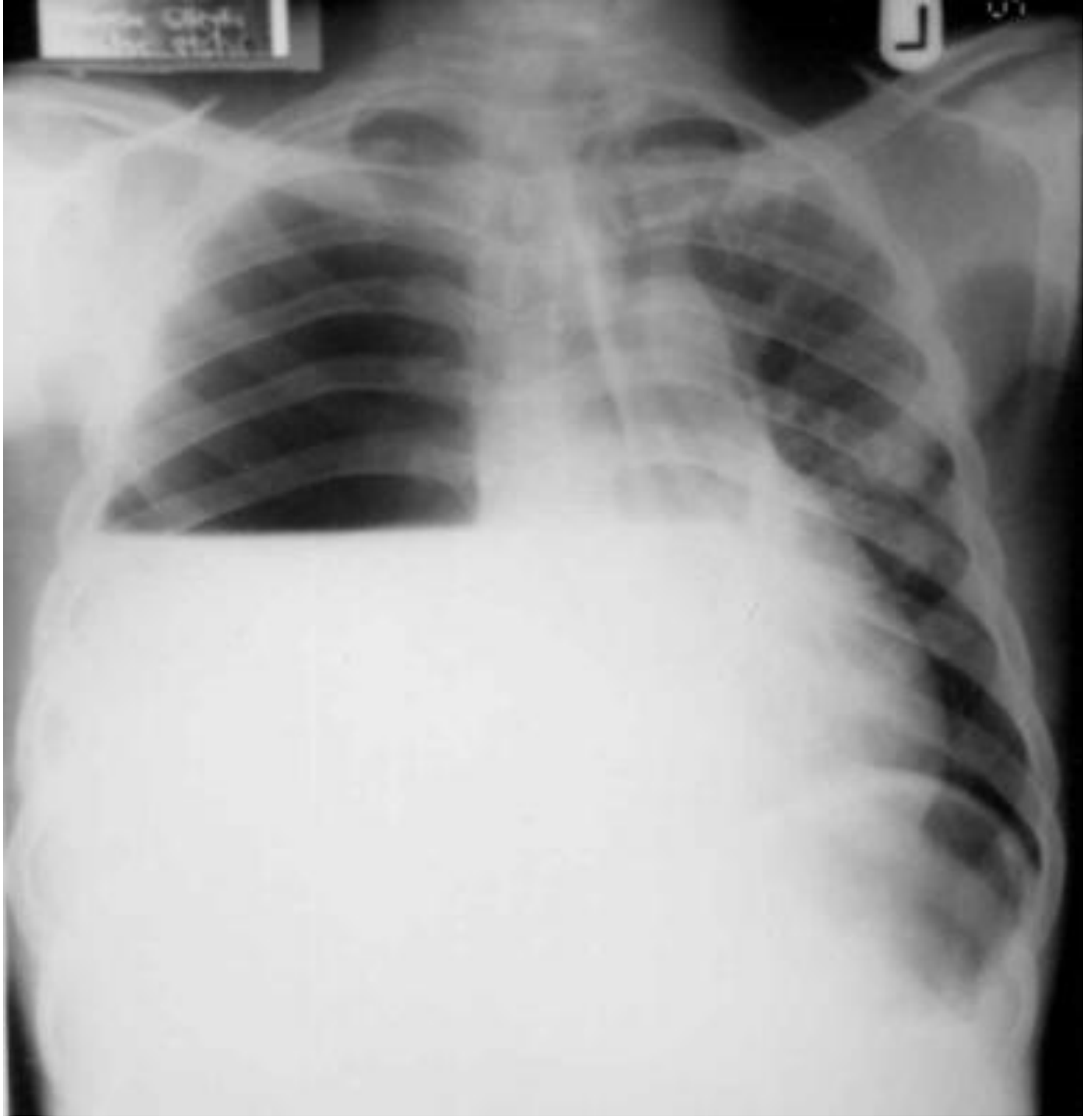
- **B- Hydropneumothorax**

*** Plain x-ray of a chest and heart, posteroanterior view.**

- **The patient is not centralized.**
- **The mediastinum is markedly shifted to the Rt side.**

*** There is dense homogeneous opacity obliterating the left costophrenic angle and occupying the lower ⅔ of the left hemithorax, with horizontal fluid level, and the upper ⅓ of the left hemithrax is occupied by a jet black colour (hypertranslucent) without bronchovascular markings with collapsed lt. lung.**

**** The radiological diagnosis: Lt sided hydropneumothorax.**

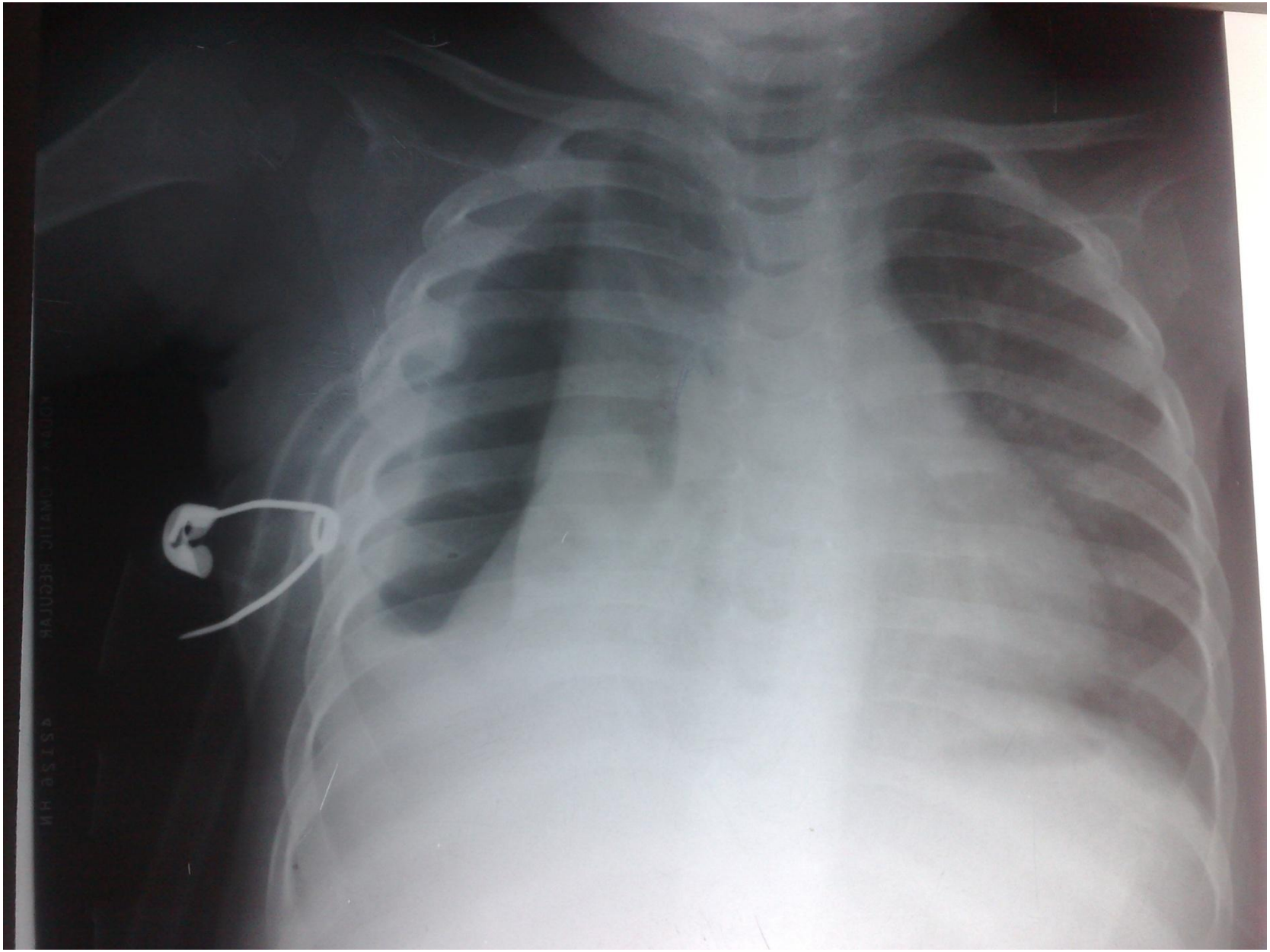


Hydropneumothorax

- **It occurs mostly with cases of pleural effusion due to one of 2 causes:**

  -Iatrogenic introduction of air into the pleural space during diagnostic aspiration (thoracocentesis).

  -Bronchopleural fistula allowing air entry from a bronchus into the pleural space.



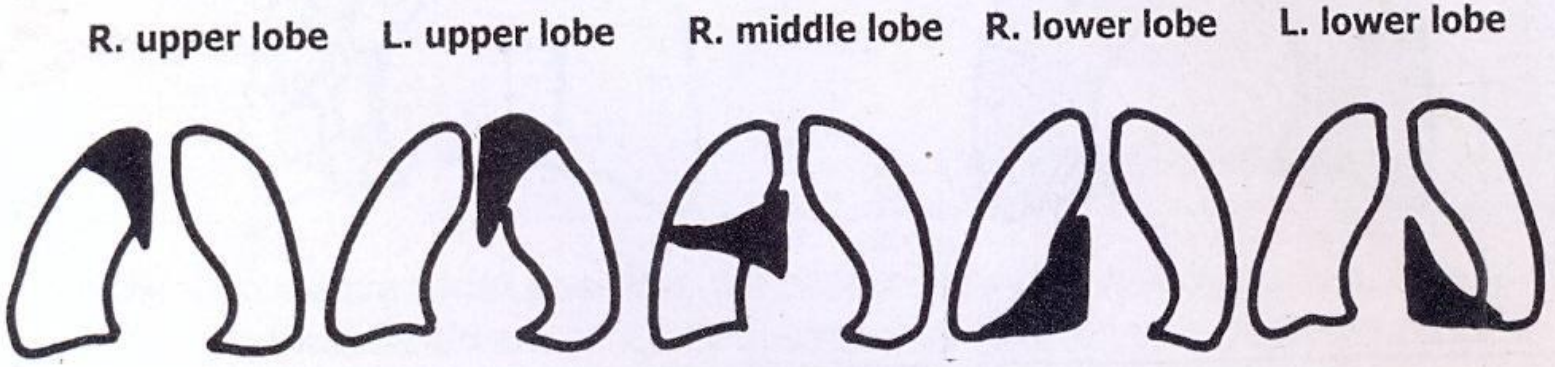
Failure of expansion of the collapsed lung in spite of the closed intercostal drainage suggests .the diagnosis of bronchopleural fistula

4-Partial unilateral opacity

- **Lobar consolidation (pneumonia)**
- **Lobar collapse (atelectasis)**
- **Solitary patch or nodule**

Lobar Consolidation

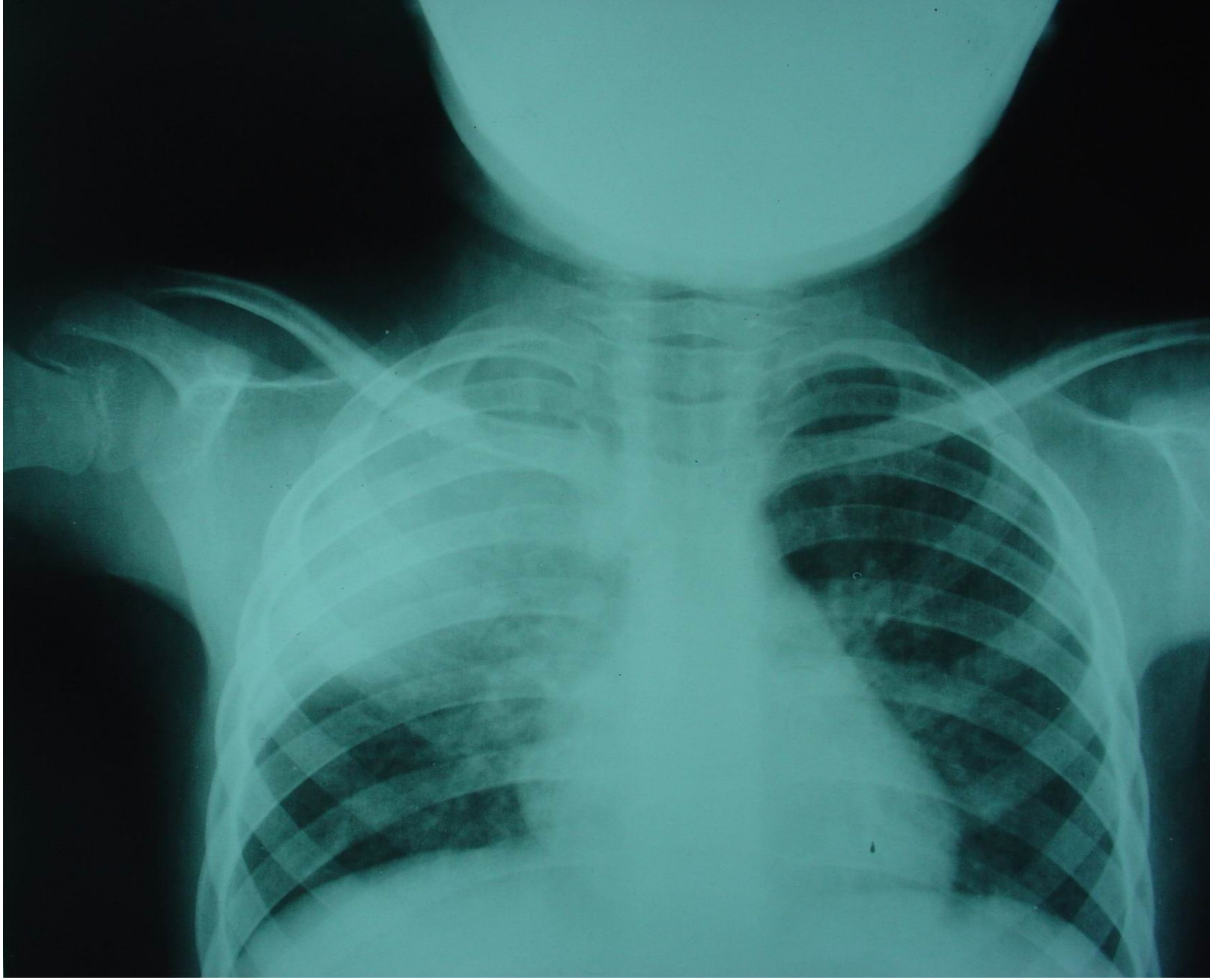
Lobar Collapse



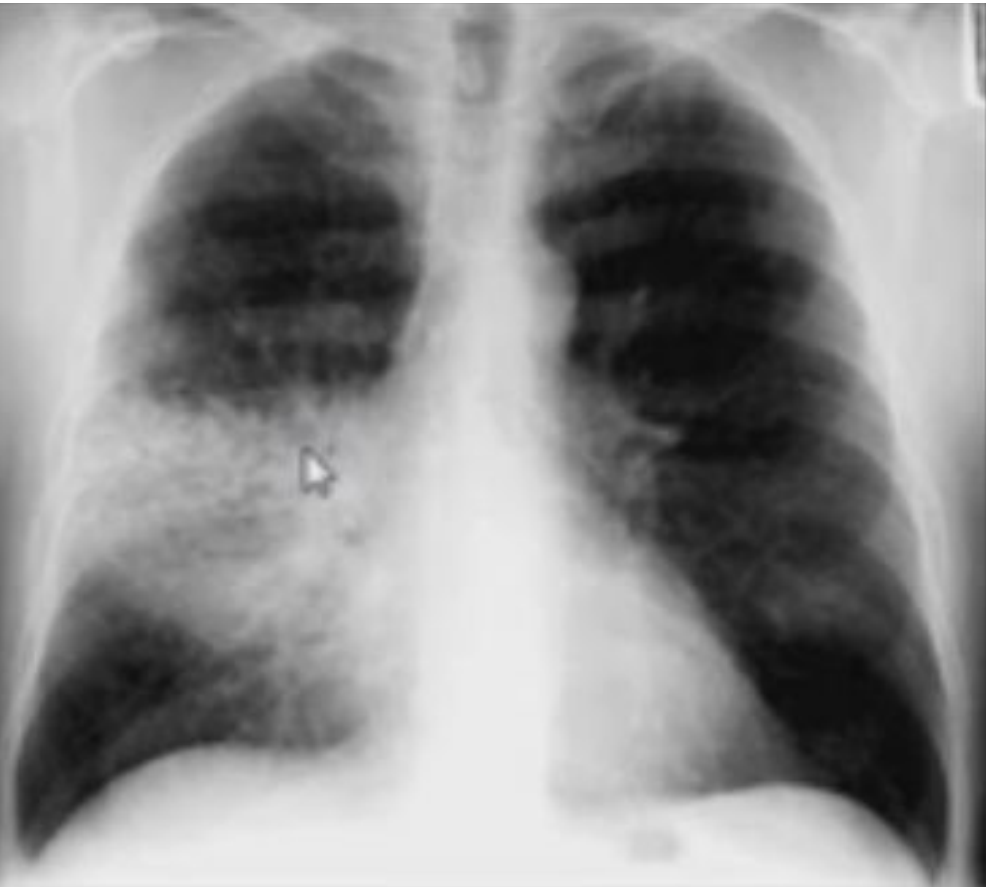
4-Partial unilateral opacity

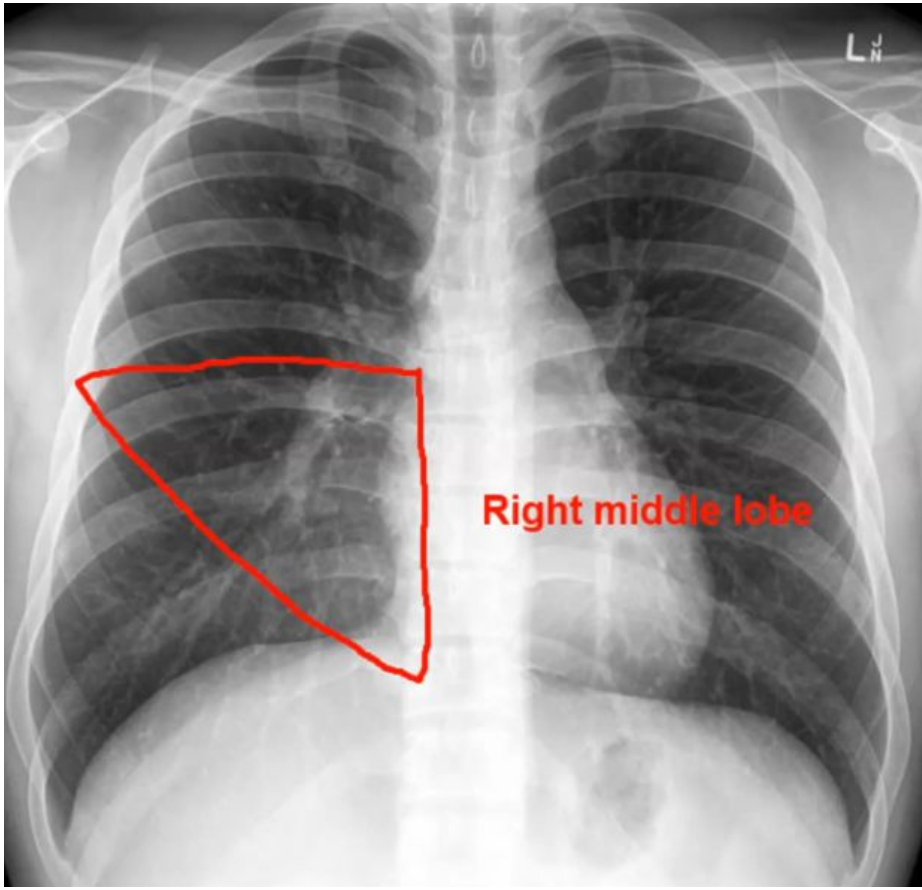
- **A--Lobar consolidation (pneumonia)**

Rt. Upper lobe pneumonia

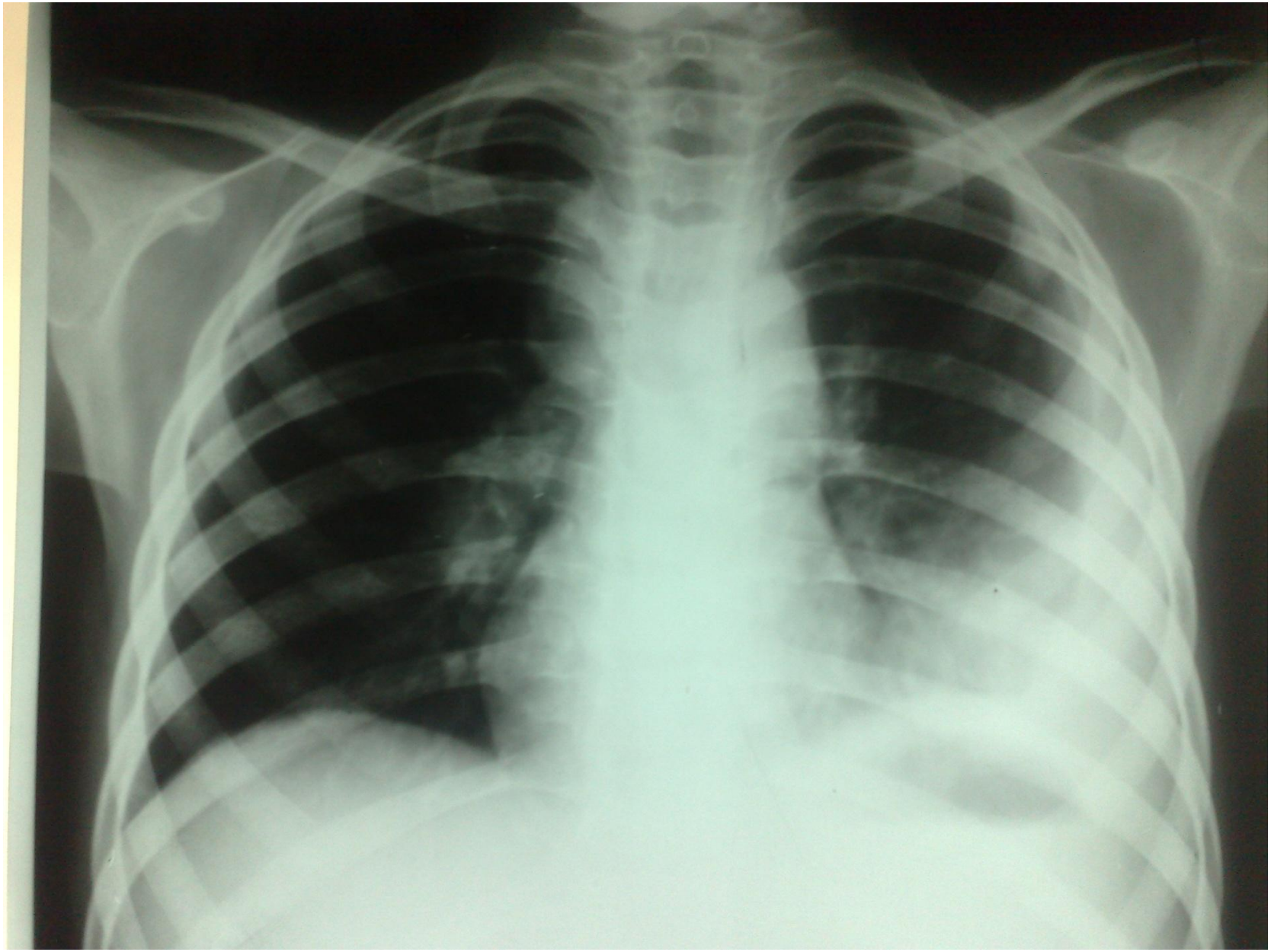


Homogenous opacity occupying the upper zone of Rt. Hemithorax. The opacity is not very dense and ribs can be visualized with clear CPA. Central mediastinum and normal bony cage.





Silhouette sign



Right middle and lower lobe consolidation

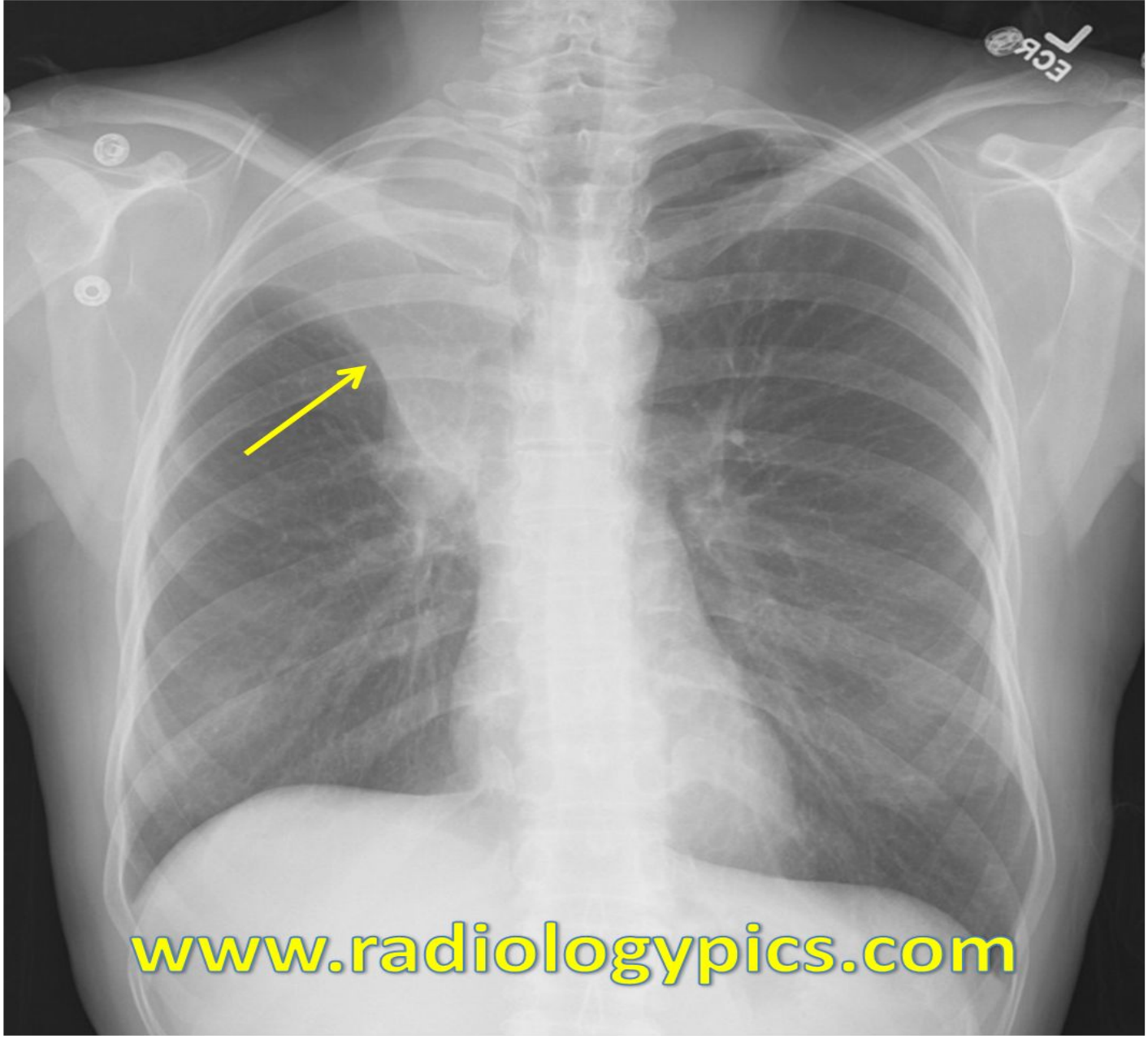
Dense homogeneous opacity occupying the Lower zone of Rt. hemithorax and obliterating the right costophrenic angle, with concave upper border raising to the axilla. The mediastinum is shifted to the left side.

Normal bony cage **(Rt. side moderate pleural effusion).**

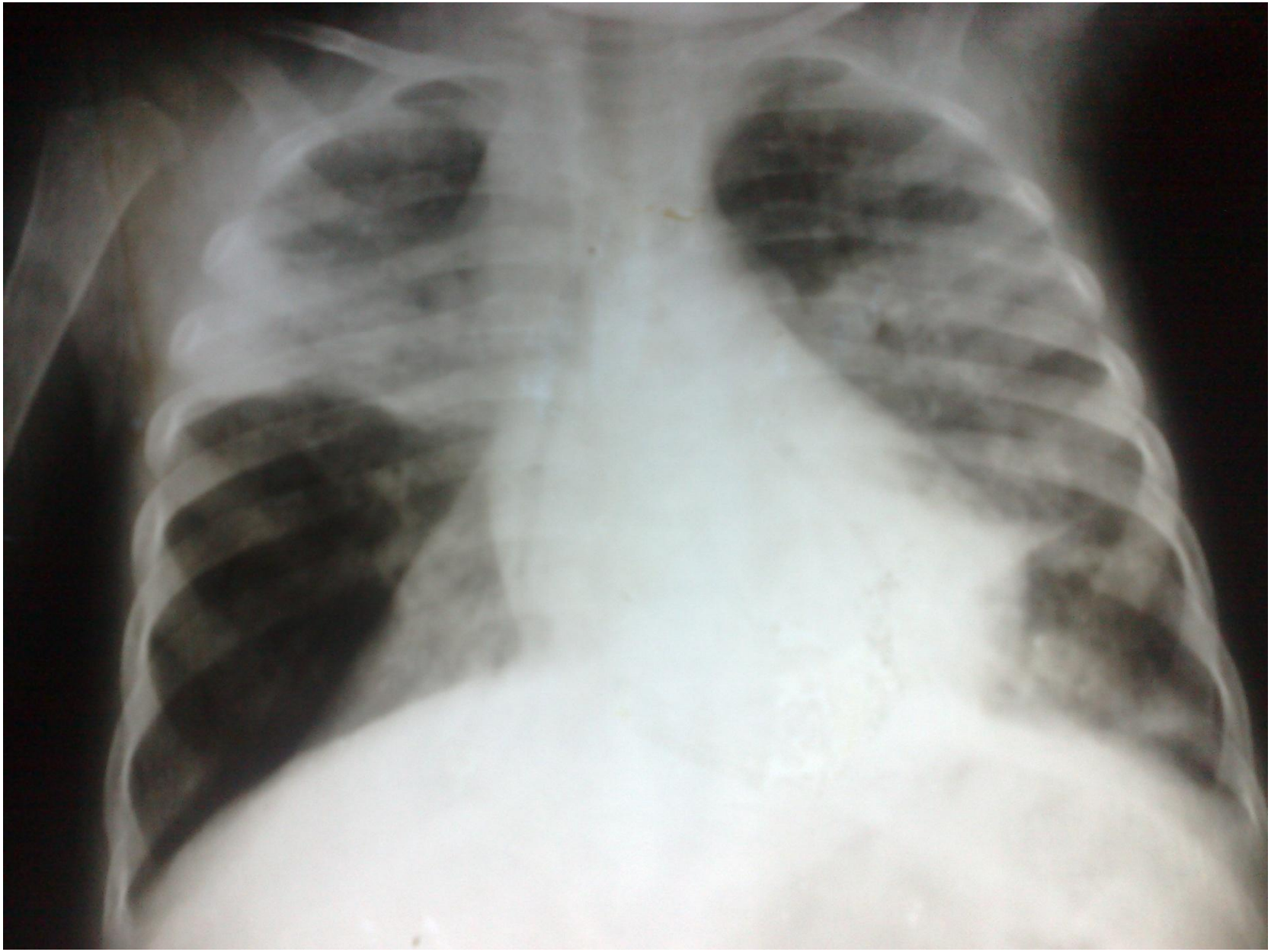
4-Partial unilateral opacity

- **B- Lobar collapse (atelectasis)**

Rt. Upper lobe collapse



Homogenous opacity in the apical region of the right hemithorax. The opacity is dense and triangular with concave lower border and its base towards the hilum.



4-Partial unilateral opacity

- **C- Solitary patch or nodule**

Solitary nodular shadow in the middle zone of the right lung field. The outline is rounded and well defined (Solitary nodule for D.D)

Solitary nodule

- **Common causes**
- Tuberculous granuloma {commonest}
- Round or spherical pneumonia (mostly pneumococcal)
- Fungal granuloma
- Solitary metastatic nodule (usually more than one nodule)

- **Rare causes**
- Small abscess
- Small bronchogenic cyst.
- Hamartoma
- Healed (posl-traumatic) hematoma.

Patch of homogenous opacity in the Rt. Middle lung region For .D.D

.N.B. The opaque area has an ill-defined irregular outline

Solitary patch

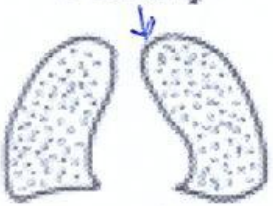
- **Patchy pneumonia** is the commonest cause of radiological solitary patch. The illness is almost always bacterial and pneumococcal infection is the main cause.

- **Patchy atelectasis** is the second main cause of solitary patch. The condition mainly occurs in the course of illness of lower respiratory infections especially with acute bronchiolitis.

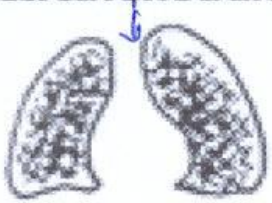
5-Pulmonary infiltrate

- Miliary infiltrate
- Recticulonodular infiltrate
- Patchy or fluffy infiltrate
- Parahilar peribronchial infiltrate (most common)
- Hazy to opaque infiltrate (most serious)

Miliary

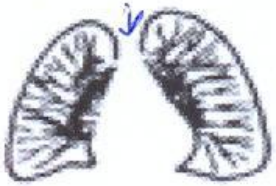


Reticulonodular

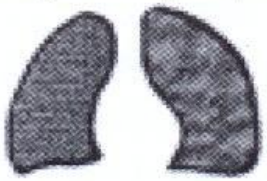


Patchy or fluffy

Parahilar



Hazy to opaque



A- Miliary infiltrate

Miliary infiltrate: Fine dots of uniform size widely distributed throughout the whole lung fields (interstitial)

Causes of miliary infiltrate

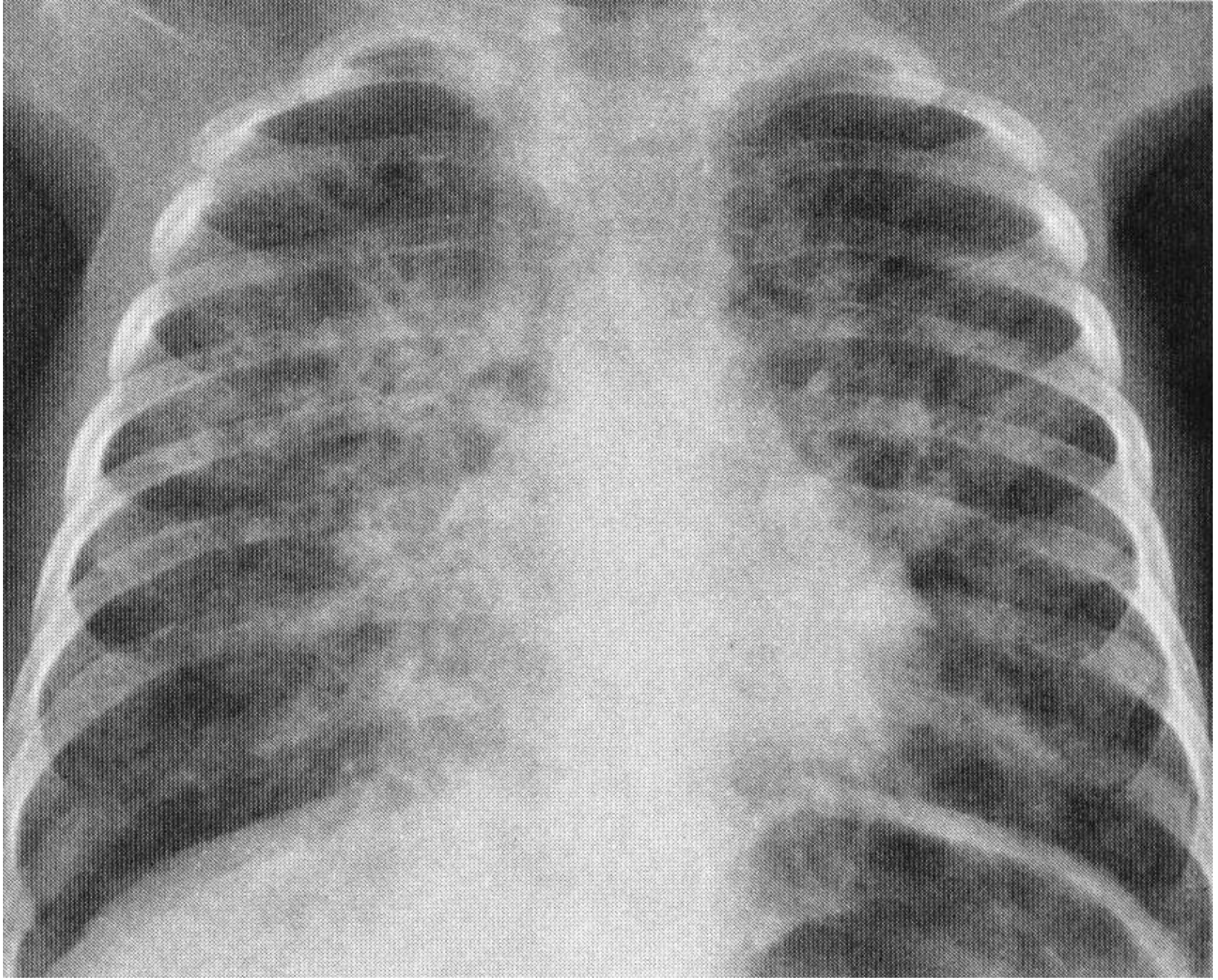
1-Infectious conditions

- Miliary tuberculosis (commonest)
- Viral interstitial pneumonias
- Pulmonary fungal infections.

2- Noninfectious conditions

- Idiopathic pulmonary hemosiderosis
- Histiocytosis
- Metastatic diseases to the lung as Leukemia and lymphoma.

B- Recticulonodular infiltrate



Reticulonodular infiltrate : fine nodular-like densities distributed throughout both lung fields and more prominent centrally (honey comb infiltrate)

Causes of reticulonodular infiltrate

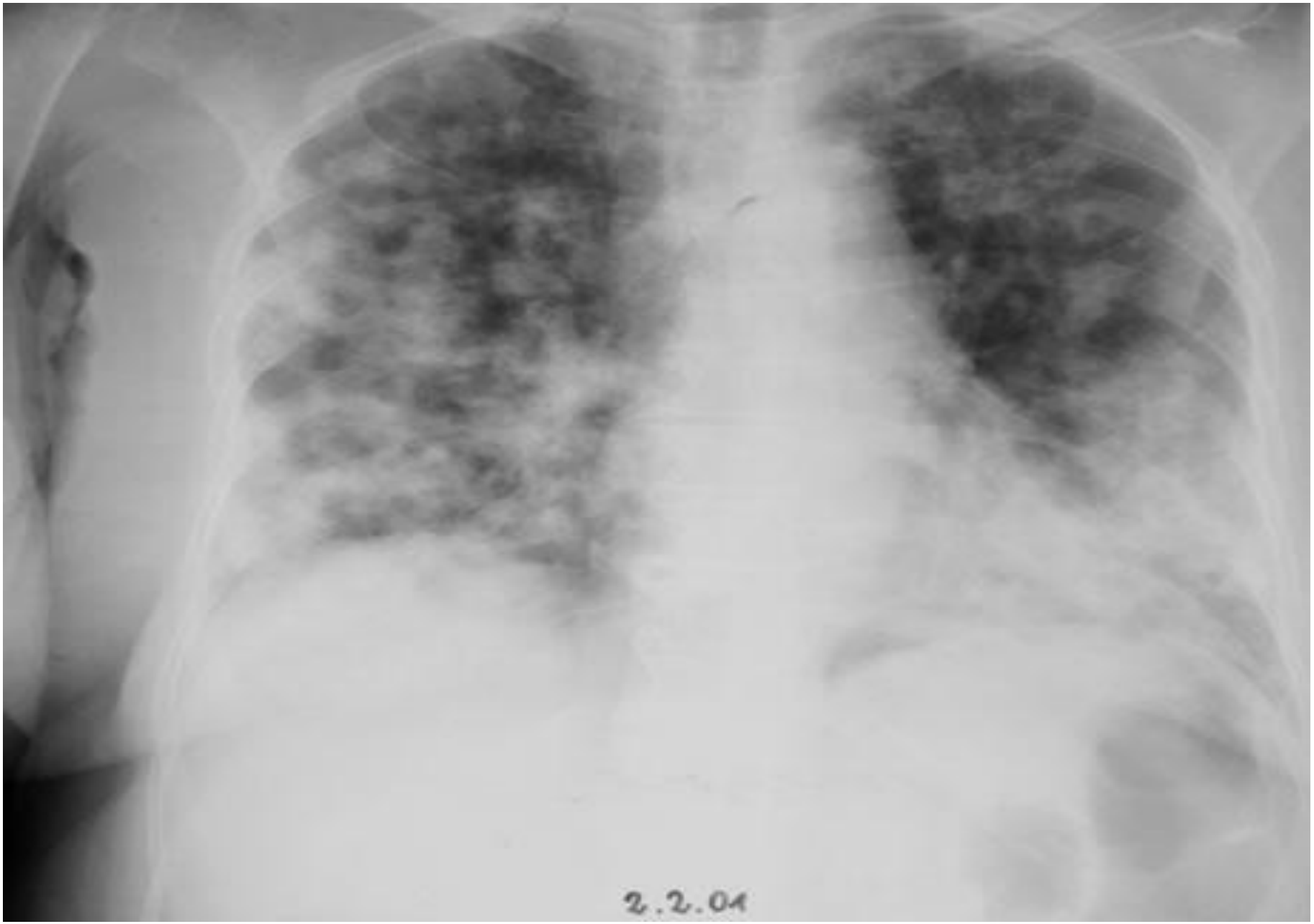
1-Infectious conditions

- Viral interstitial pneumonia (commonest)
- Mycoplasma pneumonia
- Pneumocystis carinii pneumonia
- Pulmonary fungal infections.

2- Noninfectious conditions

- Histiocytosis
- Idiopathic pulmonary hemosiderosis
- Pulmonary lymphangiectasia

C- Patchy or fluffy infiltrate



Patchy or fluffy infiltrate: of ill-defined margins distributed throughout both lung fields (alveolar)

Causes of patchy / fluffy infiltrate

1-Infectious conditions

- **Bacterial bronchopneumonia (commonest), staphylococcal and hemophilus influenza**
- **Aspiration pneumonias**
- **Pulmonary fungal infections**

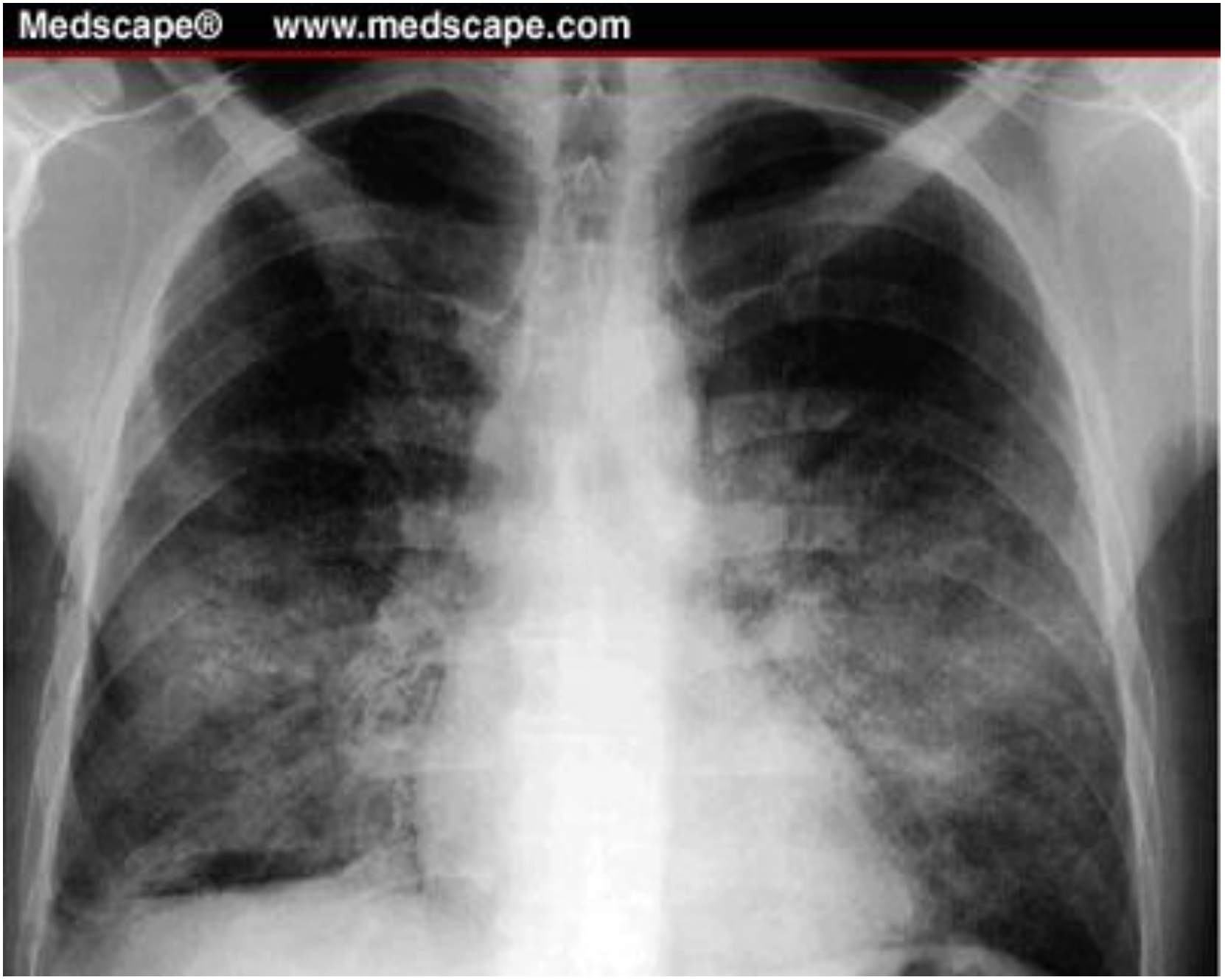
2- Noninfectious conditions

- **Pulmonary hemorrhage**
- **Near drowning**

Staphylococcal pneumonia

- Multiple patchy parenchymal consolidations.
- Progress rapidly.
- Cavity and pneumatocoele formation.
- Pleural effusion is common.
- Pneumothorax can occur.

D-Parahilar peribronchial infiltrate (most common)



Parahilar peribronchial infiltrate: streaks radiating towards the periphery of both lung fields and associated with hilar .lymphadenopathy

Causes of parahilar peribronchial infiltrate

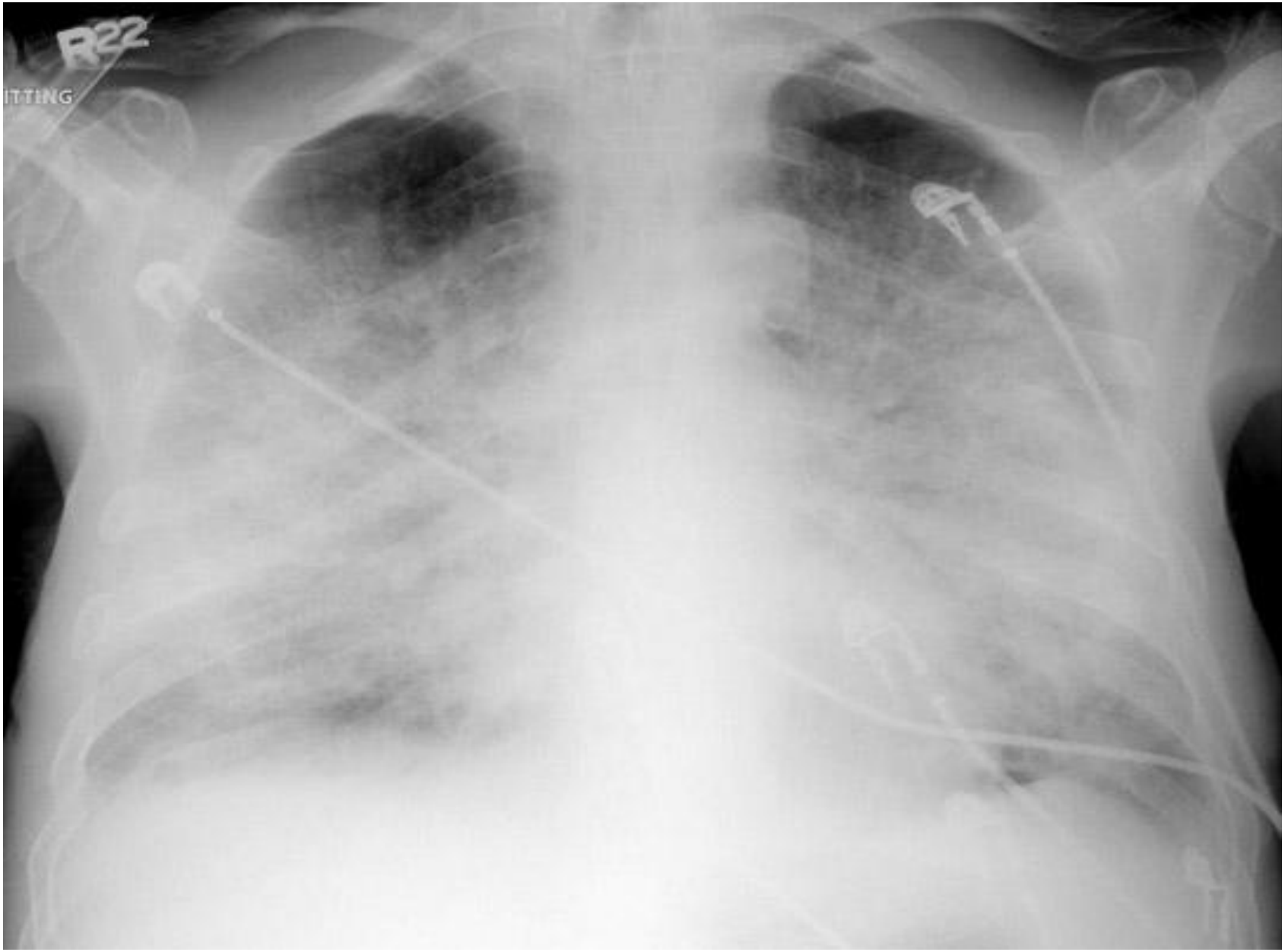
1-Infectious conditions

- Viral lower respiratory infections as bronchitis (commonest)
- Bronchial asthma especially when associated with viral respiratory infections

2- Noninfectious conditions

- Interstitial pulmonary fibrosis
- Cystic fibrosis

E- Hazy to opaque infiltrate (most serious)



<u>Hazy to opaque infiltrate:</u> diffuse dense homogeneous opacity of both lung fields with the .cardiac shadow cannot be easily visualized (interstitial infiltrate with alveolar exudation)

Causes of hazy to opaque infiltrate

- **Pulmonary edema (commonest):**

  -Cardiac causes: myocarditis, CHD with Lt. to Rt. shunt

  -Non-cardiac causes: ARF, iatrogenic fluid overload, fulminant pneumonia or ARDS and neurogenic Pulmonary edema

- **Pneumocystis carinii & viral interstitial pneumonia**
- **Pulmonary hemorrhage/hemosiderosis**

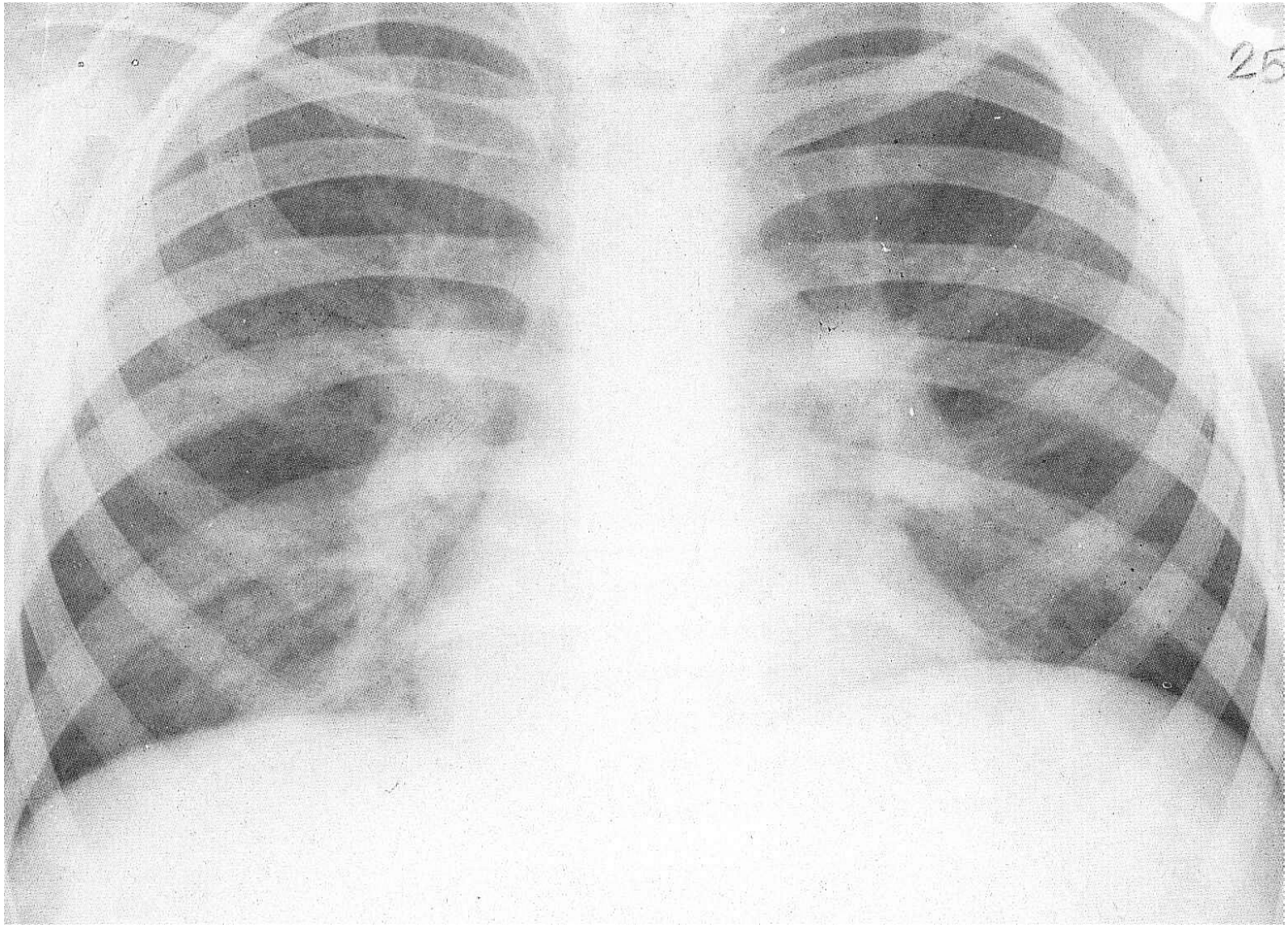
6- Dense Hilar Shadow

Hilar lymphadenopathy

- **Bilateral:**
- Viral lower respiratory infections
- Chronic aspiration
- Malignancies as Lymphoma or leukemia
- **Unilateral:**
- Tuberculosis of trachiobronchial LNs
- Mycoplasma pneumonia

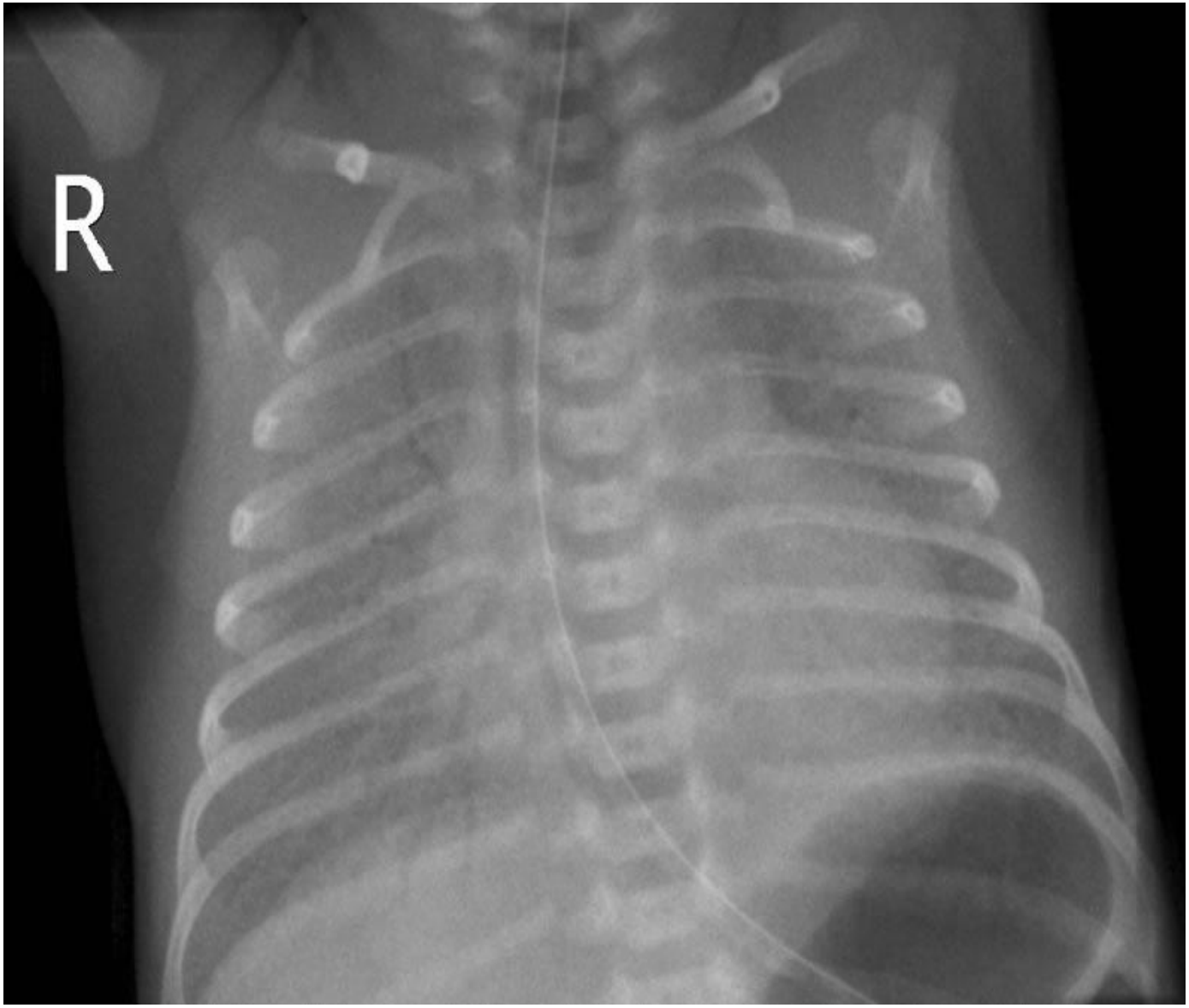
Pulmonary Hypertension

- Dense hilar shadow and large convex pulmonary segment



•Bilateral dense hilar shadow. • Lung fields are clear apart from the slightly increased bronchial markings. • Normal cardiac size and pulmonary artery (no pulmonary hypertension).

Picture of isolated bilateral hilar lymphadenopathy.

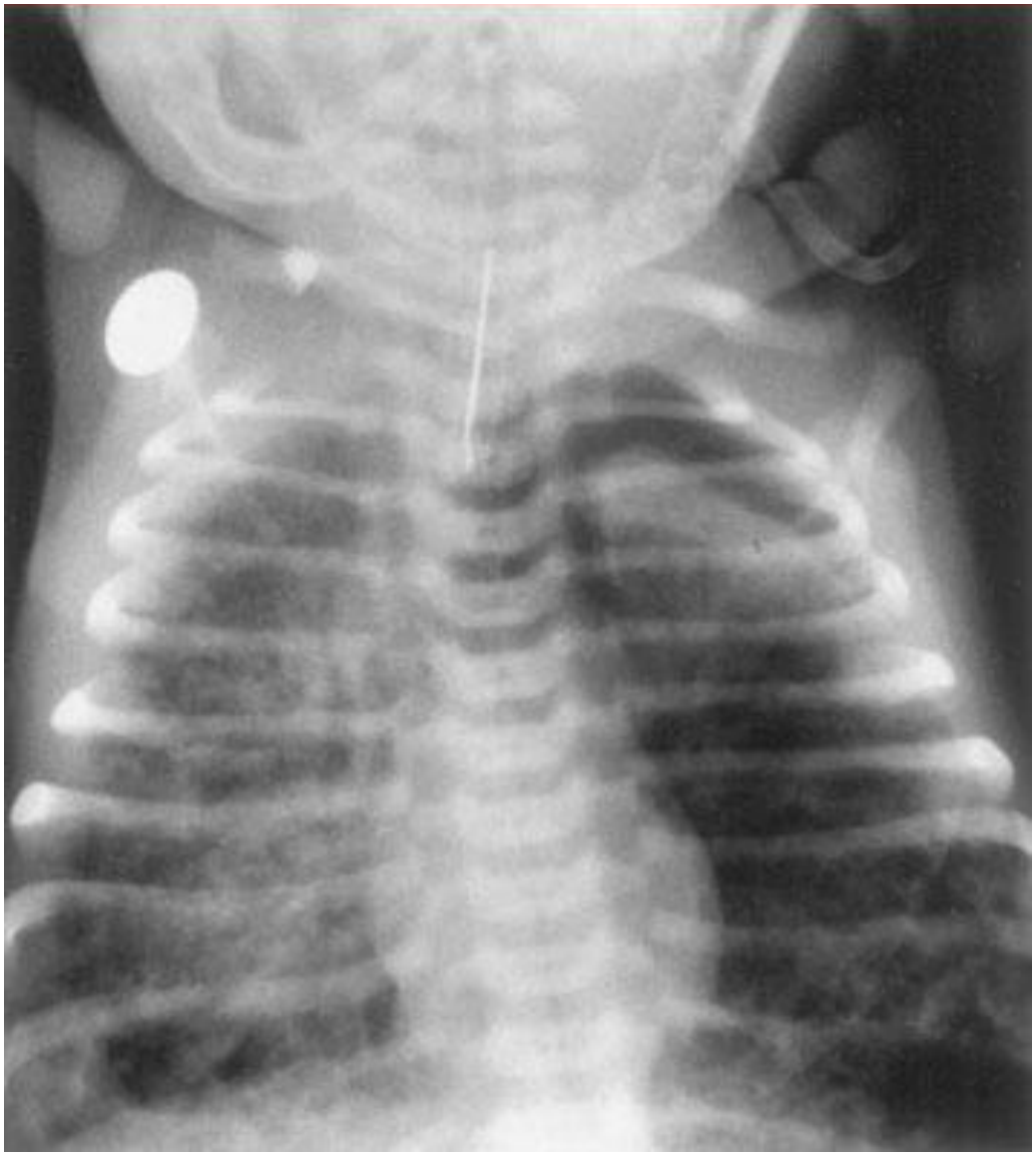


Mild to moderate RDS

Fine granular opacities widely distributed throughout both lung fields (ground glass appearance) with air bronchogram. Commonest cause of RD esp. in preterm.

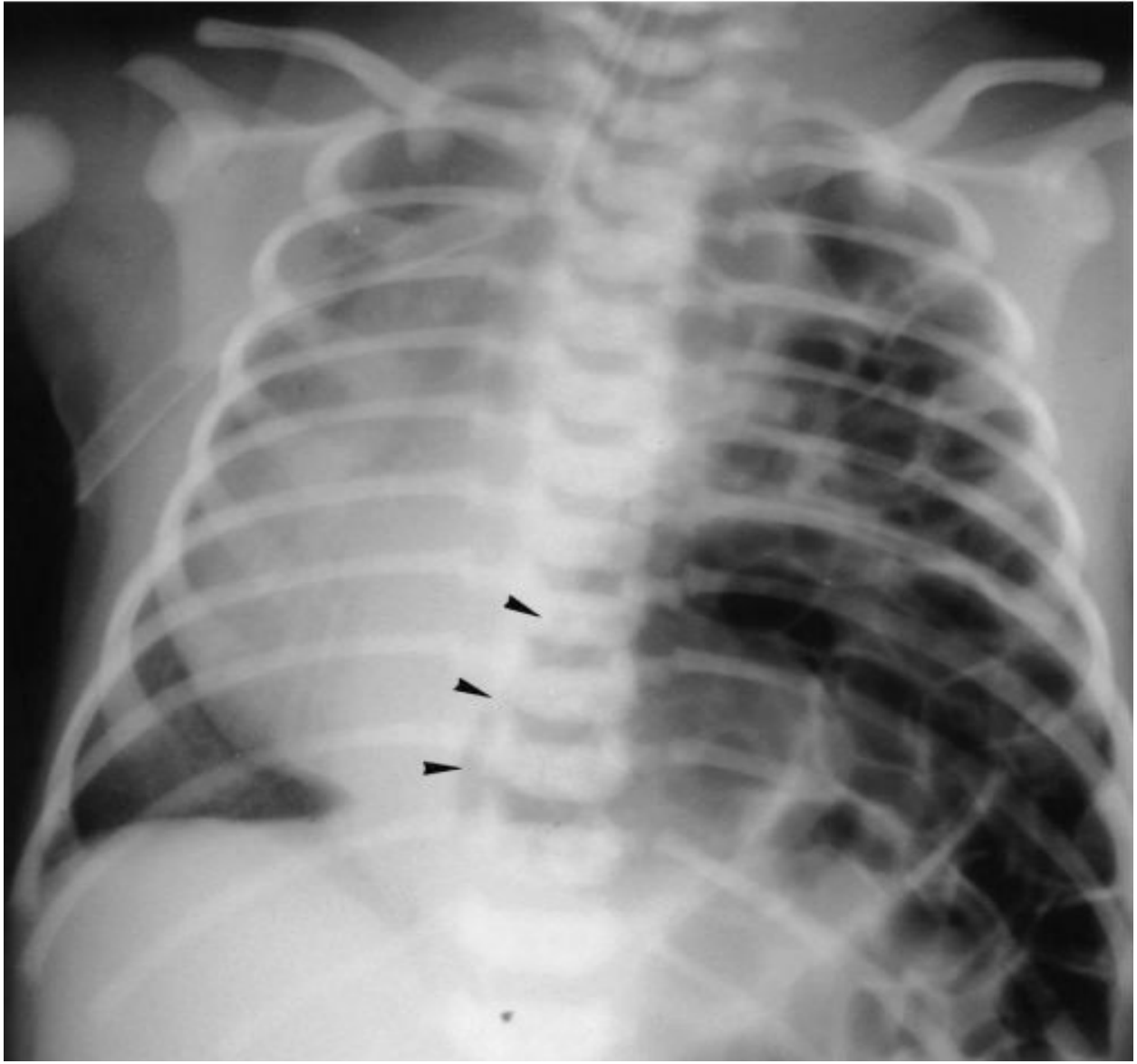
Severe RDS (white lungs)

Complete opacification of both lung fields (white lungs). The cardiac shadow is blended with the lung opacity and cannot be easily visualized. ETT & MV due to RF.

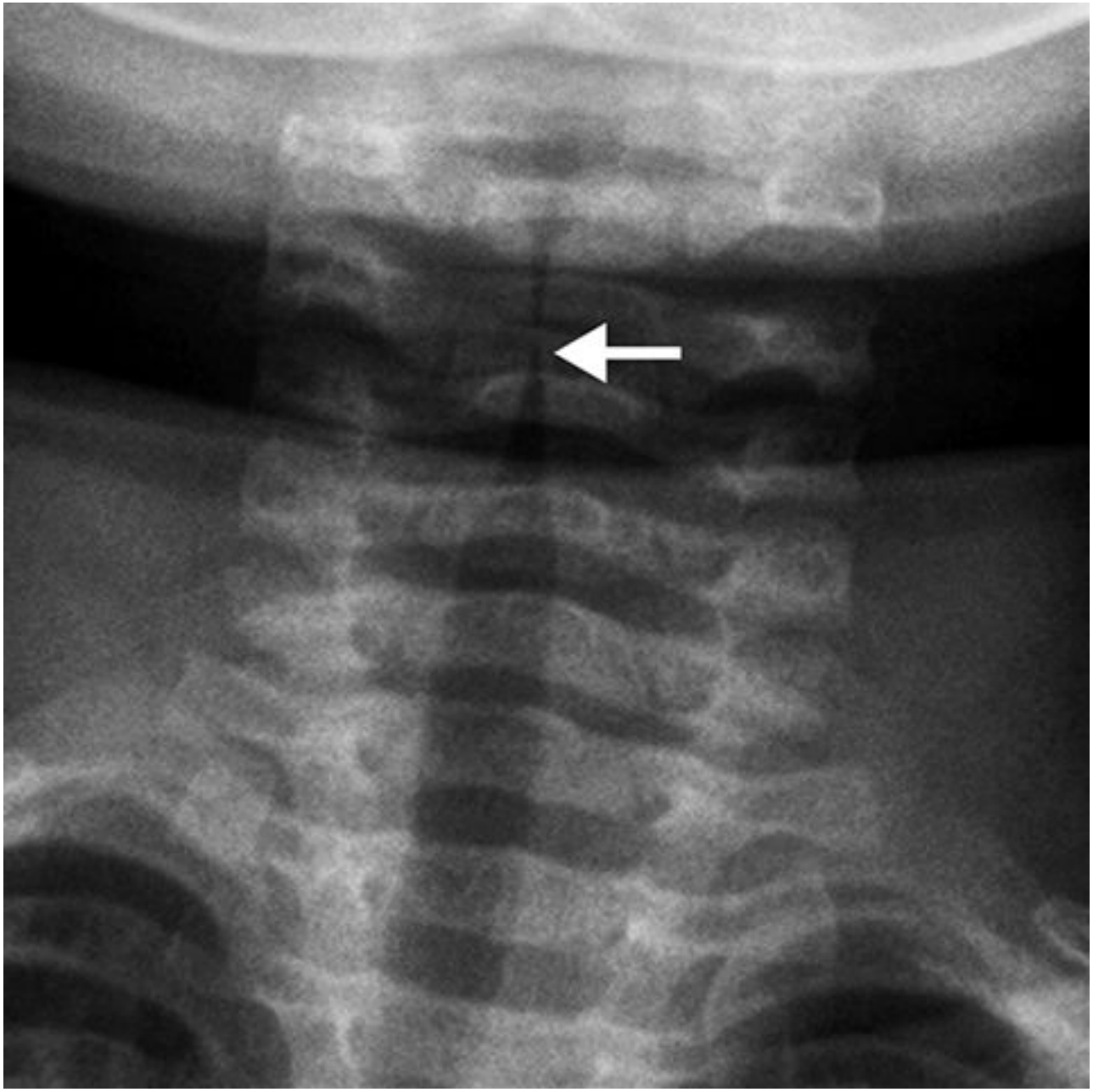


MAS with pneumothorax

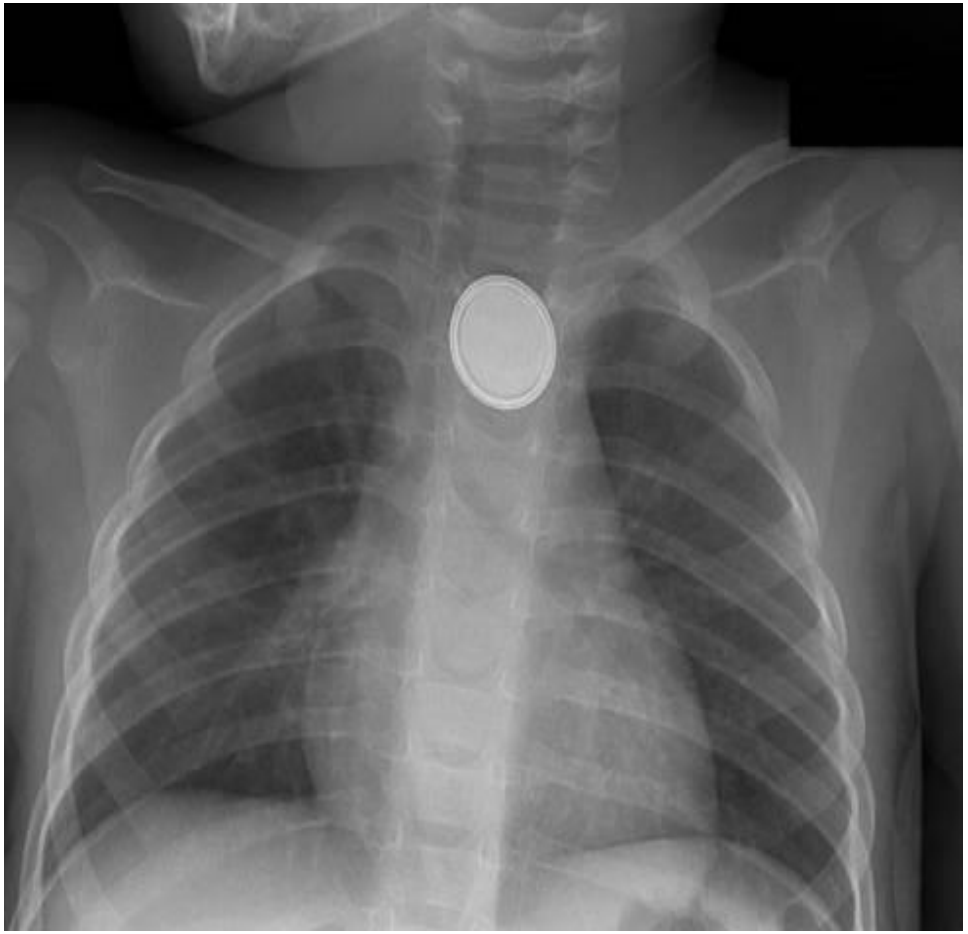
Lt. Sided Congenital Diaphragmatic Hernia



Multiple cysts of variable sizes (air –filled bowel) occupying the whole left hemithorax and pushing the trachea and the mediastinum to the other side. The free right costophrenic angle indicates that the opacity above it is the displaced heart (to right). Stomach is intrathoracic (arrowheads). Right side pneumothorax has been drained.




L




Thank you
سبحانك اللهم و بحمدك نشهد ان لا اله الا انت نستغفرك و نتوب اليك