

Interesting X-Rays



By

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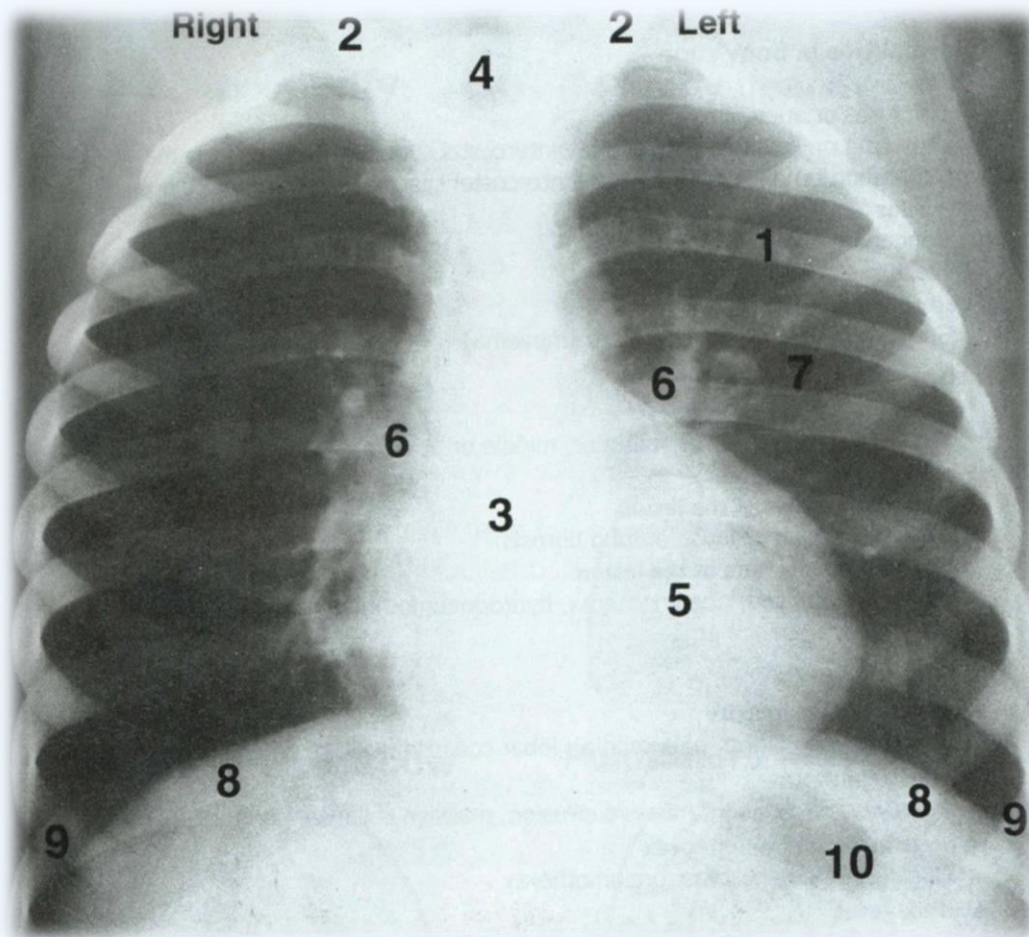
Chief Of Pediatrics/Neonatal-Perinatal Medicine

Al-Rahba/ Johns Hopkins

UAE

CHEST

Normal Chest x-ray

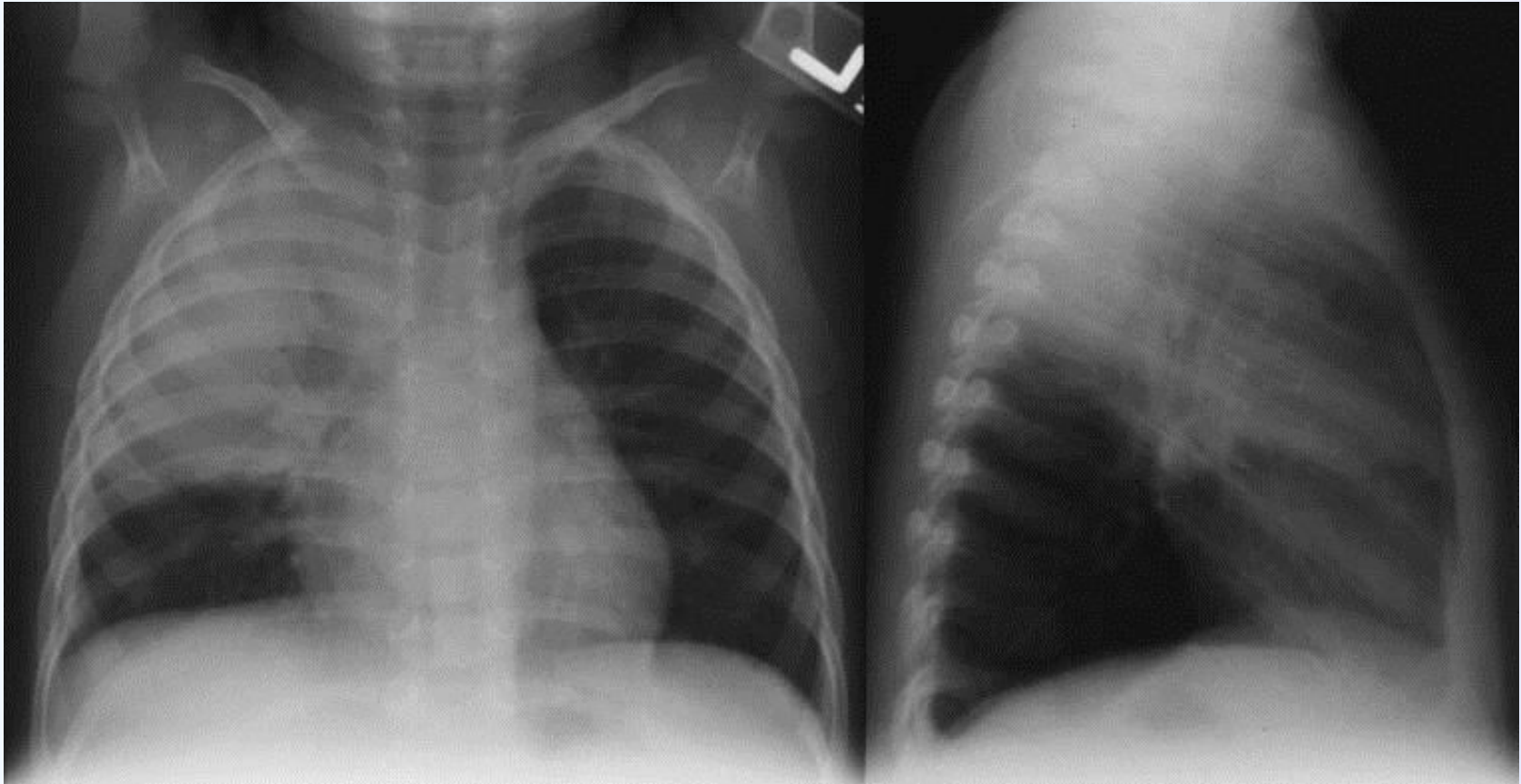


1. Ribs.
2. Clavicles.
3. Vertebral column.
4. Tracheal air column.
5. Cardiac shadow.
6. Hilar shadow.
7. Lung fields.
8. Diaphragmatic cupulae.
9. Costophrenic angle.
10. Gastric gas.

Plain chest x-ray, posteroanterior view, upright position showing:

- -Normal bony cage(Ribs, clavicles and vertebral column).
- -Normal trachea and mediastinum.
- -Normal lung fields.

Right Upper Lobar Consolidation



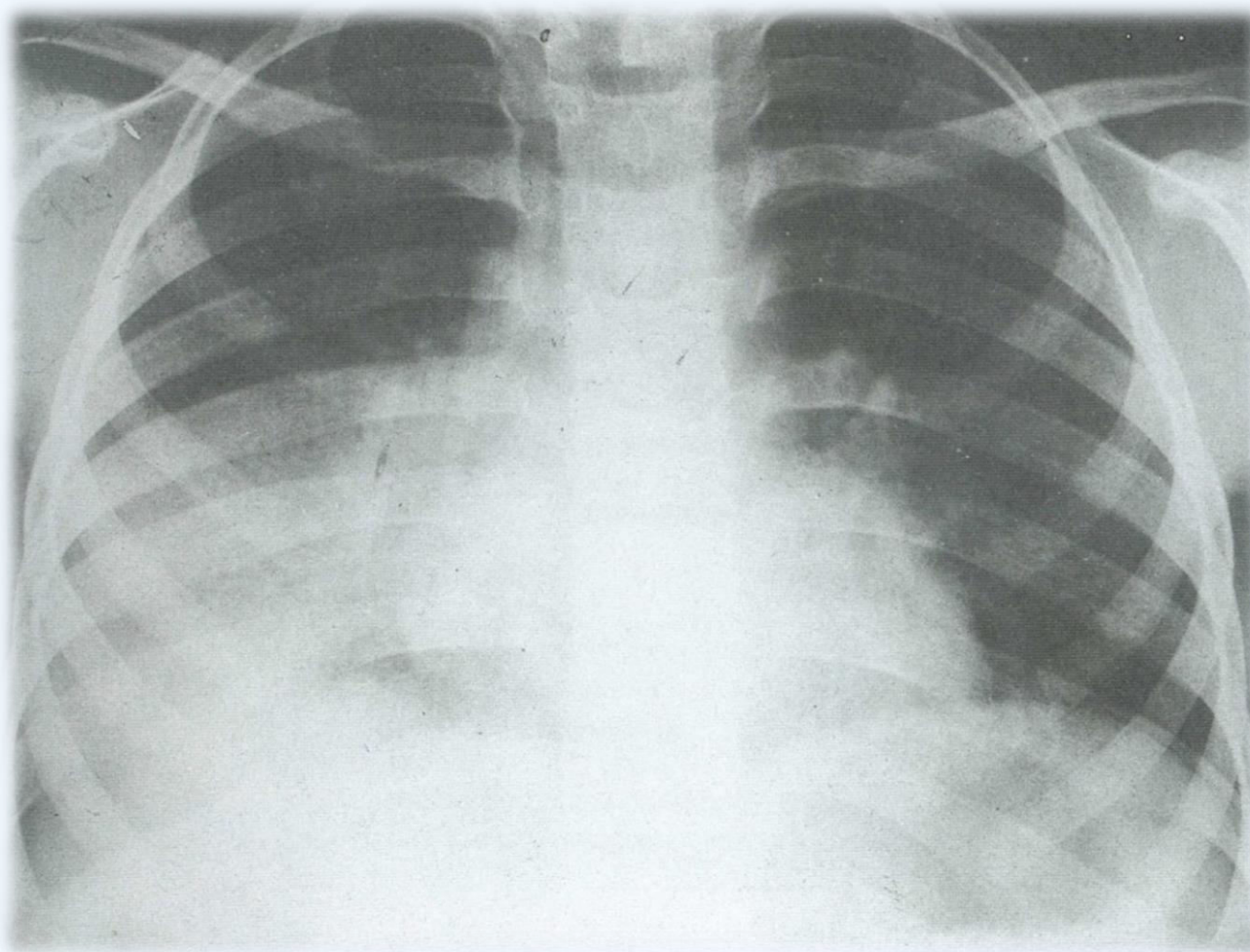
- **Homogenous opacity occupying the upper half of the right hemithorax.**
- **Note that the opacity is not very dense and ribs can be visualized.**
- **Central mediastinum and normal bony cage.**

What Are The Causes Of Labor Pneumonia?

Lobar pneumonia can be bacterial, mycoplasma or tuberculous:

- **1. Bacterial pneumonia:** It is the commonest cause. Pneumococcal pneumonia is the most common , but in children under 4 years, hemophilus influenza is commoner. Other organisms as staphylococcus, streptococcus and klebsiella come next.
- **2. Mycoplasma pneumonia:** It is considered in school age children, especially when the illness is associated with severe cough and without respiratory distress.
- **3. Tuberculous pneumonia:** It is considered in unvaccinated children, especially with history of contact to an adult with chronic cough.

Right Lower Lobe Pneumonia



- Homogenous opacity occupying the lower half of the right hemithorax.
- The opacity is not very dense and ribs can be visualized.
- Central mediastinum and normal bony cage.

How To Differentiate Between Different Bacterial Agents?

Differentiation depends on both clinical and radiological findings.

1. Pneumococcal pneumonia:

1. It is the commonest cause above the age of 4 years. Cavitation is rare and pleural effusion is uncommon.

2. Hemophilus influenza pneumonia:

1. It is the commonest cause below the age of 4 years. It has insidious onset and prolonged course over weeks.

3. Staphylococcal pneumonia:

1. Most cases occur below the age of one year. It has an abrupt onset and rapid progressive course. Pleural effusion is very common.

4. Streptococcal pneumonia:

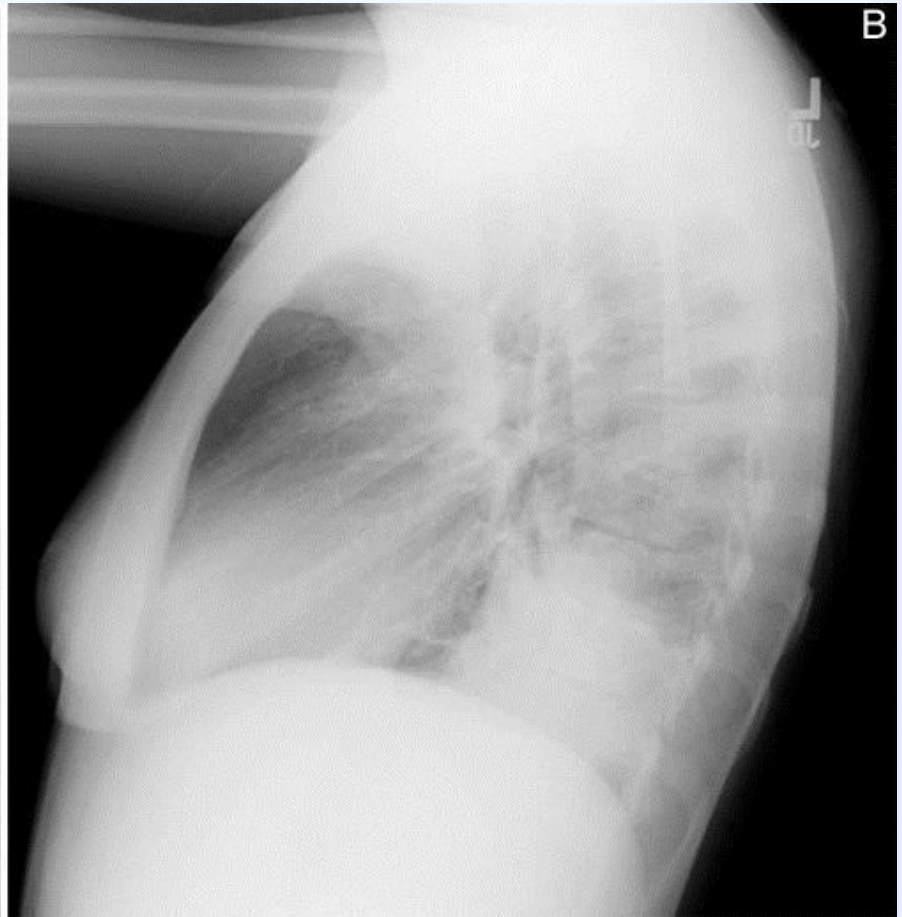
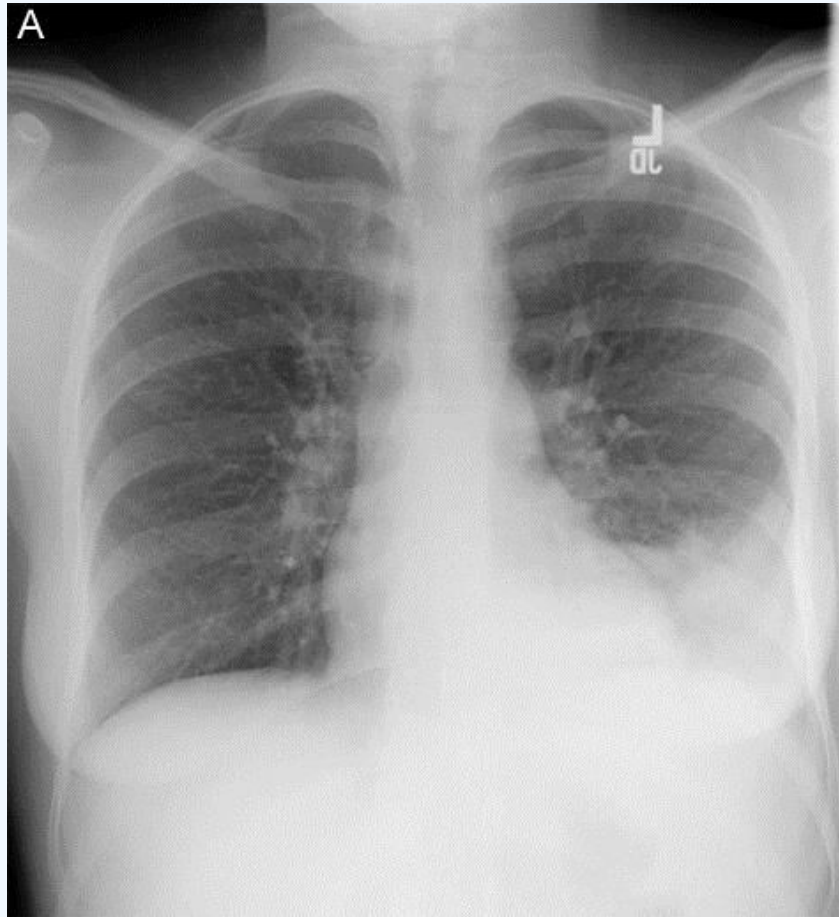
1. It occurs in children between 3-5 years.

5. Klebsiella pneumonia:

1. It has a tendency to cavitation and lobar enlargement.

Precise differentiation depends on isolation of the causative organism.

Left Lower Lobe Pneumonia



- Homogenous opacity occupying the lower half of the left hemithorax. The opacity is not very dense and ribs can be visualized. When the opacity is very dense, associated pleural effusion should be considered.
- Central mediastinum and normal bony cage.

How To Treat Bacterial Pneumonia?

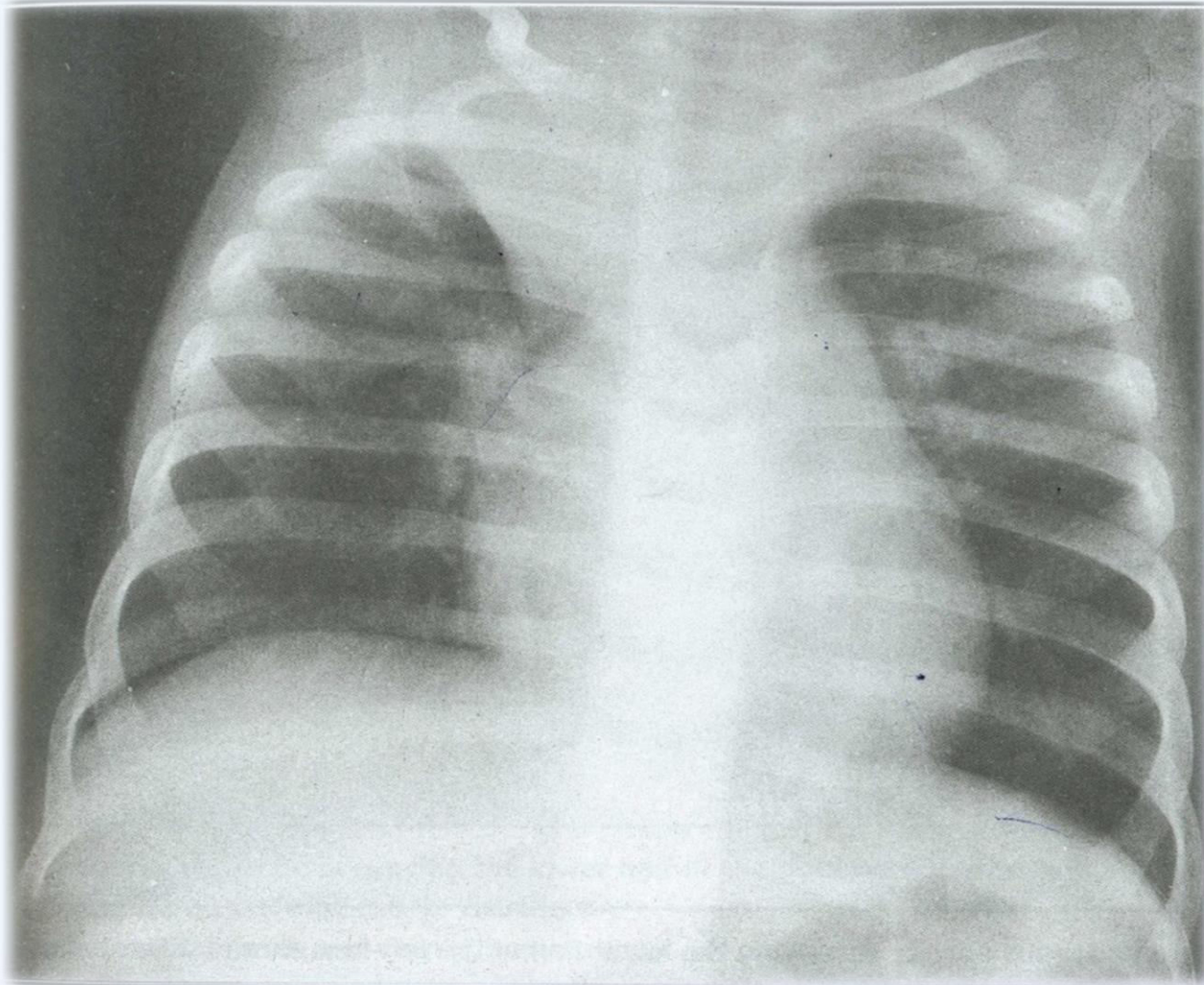
- All patients with bacterial pneumonia should be hospitalized and receive parenteral combined antibiotic therapy to cover both gram-positive and gram-negative organisms.

Right Upper Lobar Collapse (Atelectasis)



- **Homogenous opacity in the apical region of the right hemithorax. The opacity is dense and triangular with concave lower border.**

Right Upper Lobar Collapse (Atelectasis)



- **Homogenous opacity in the apical region of the right hemithorax. The opacity is dense and triangular with concave lower border.**

What Are The Causes Of Lobar Collapse?

Lobar collapse occurs due to complete obstruction of the main bronchus of the affected lobe. The causes of this obstruction are the following:

- **1. Viscid secretions or mucous plugs:**
 - It is the most common cause and it usually occurs with respiratory infections as pneumonia, bronchiolitis and whooping cough.
- **2. Endobronchial foreign body:**
 - It is considered when the onset of illness is abrupt with cough and choking. Labor collapse is usually detected by x-ray.
- **3. Others causes:**
 - Endobronchial granuloma (as T.B) or tumor could be responsible. External compression of the bronchus by enlarged lymph nodes may be the cause.

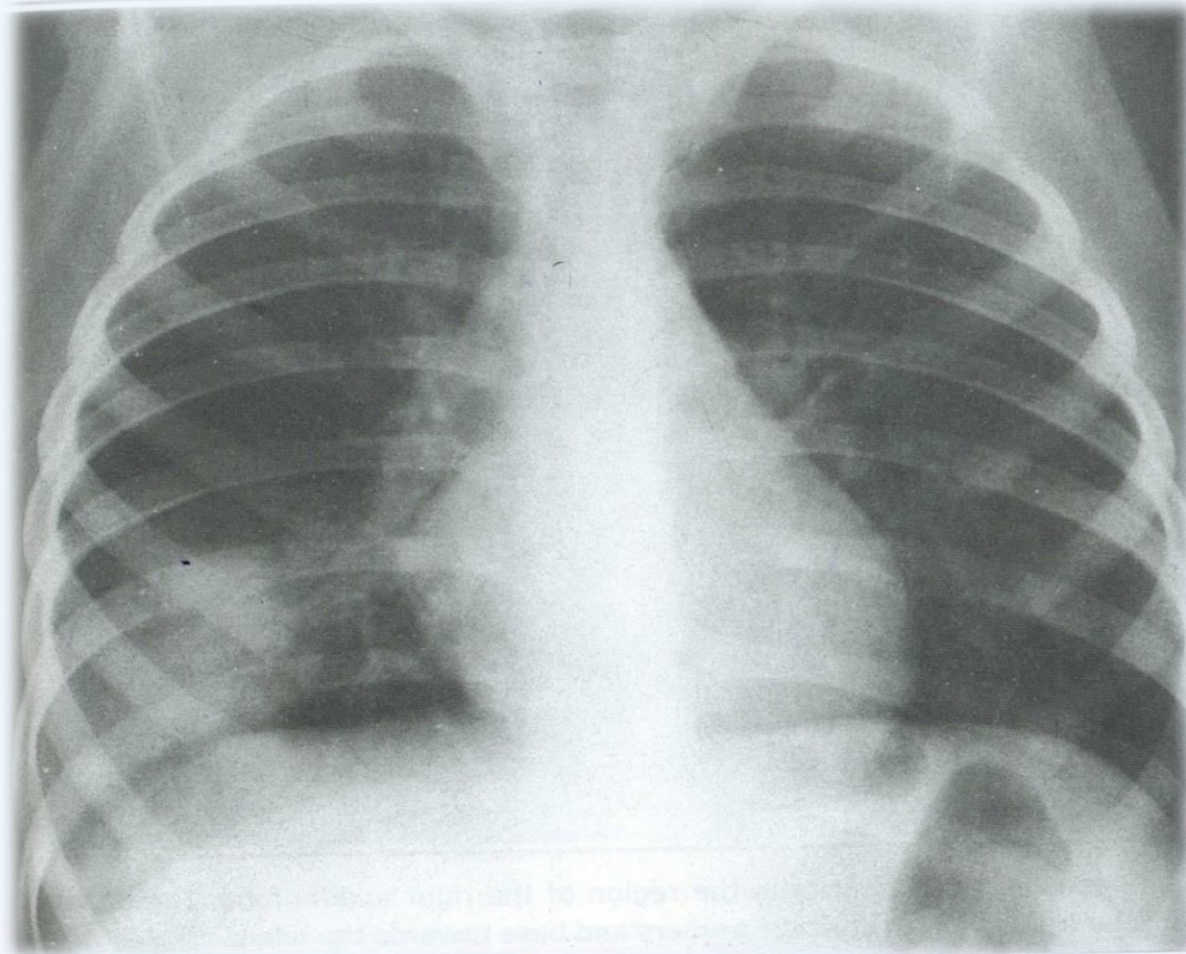
Solitary Patch Or Nodule Round Pneumonia(or Pneumonitis) Of The Right Lower Lobe.



- **Patch of homogenous opacity in the right lower lung region. The opaque area has an round outline.**

Solitary Patch Or Nodule

Patch Pneumonia(or Pneumonitis) Of The Right Lower Lobe.



- Patch of homogenous opacity in the right lower lung region. The opaque area has an ill-defined irregular outline.

What Are The Causes Of Solitary Patch?

Patchy pneumonia and segmental collapse are the 2 main causes of solitary patch.

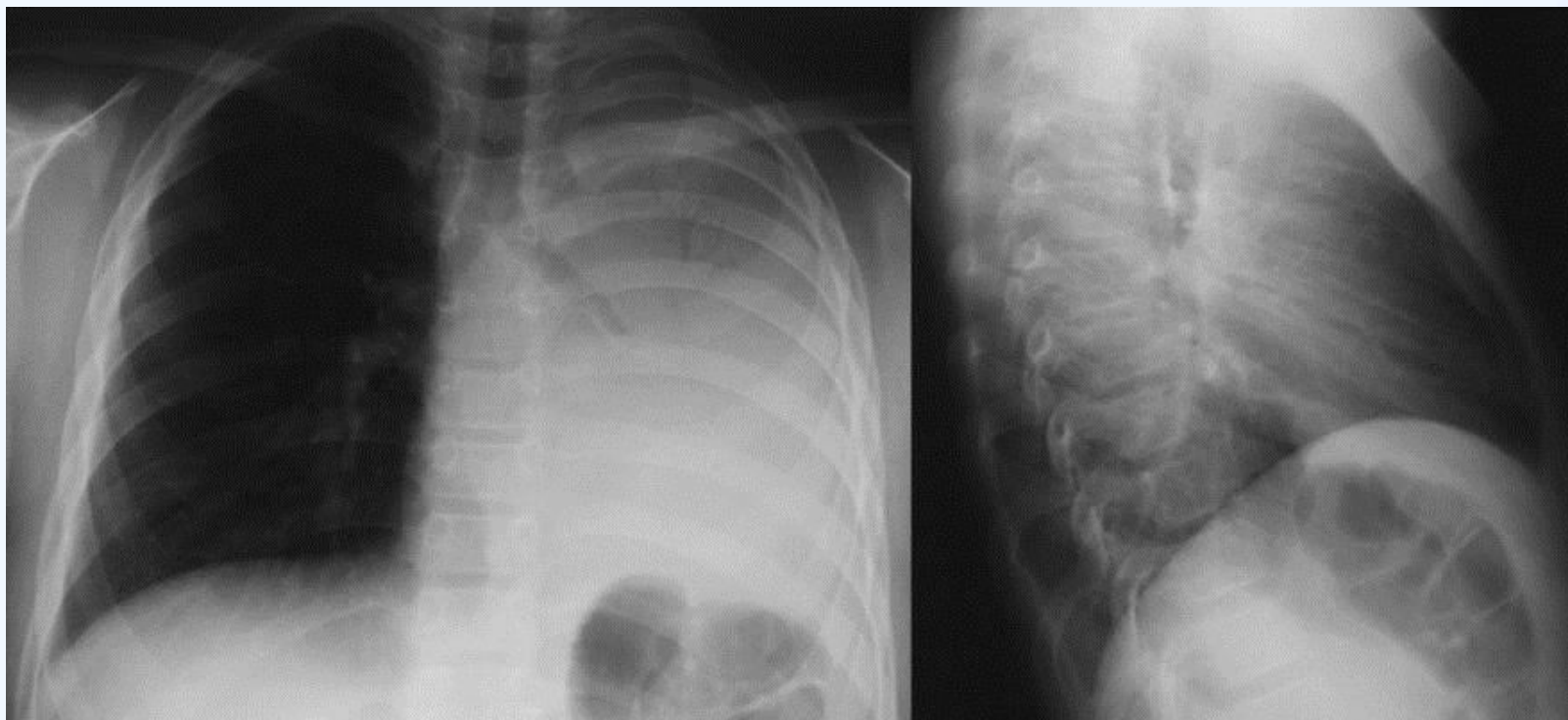
1. Patchy pneumonia:

1. It is the most common cause. The condition may occur at any area but lower lobes are more affected. Clinically, fever and cough are present but respiratory distress is usually absent. The illness is usually bacterial and pneumococcal infection is the main cause.

2. Segmental collapse:

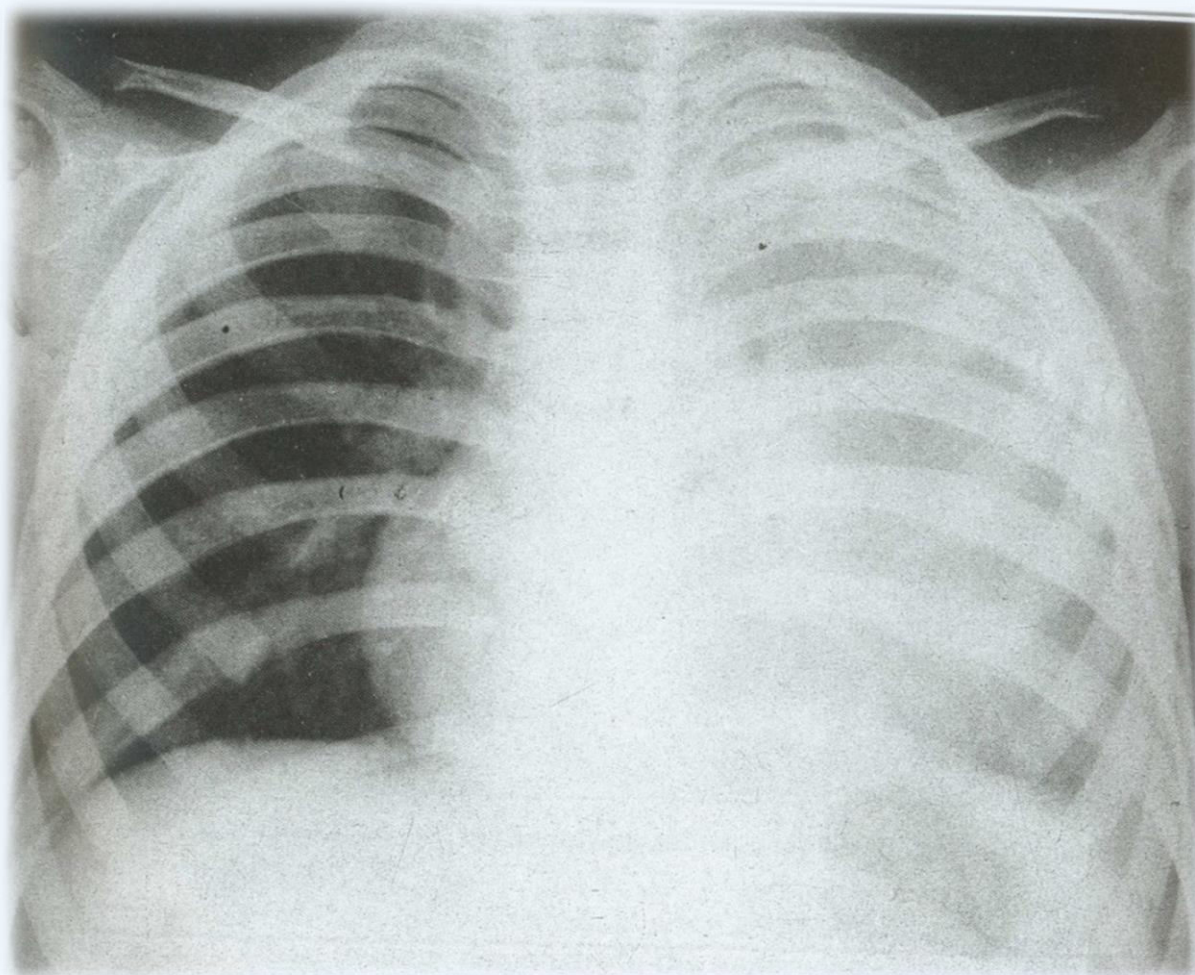
1. It usually occurs in the course of illness of lower infections as acute bronchiolitis (30% of cases of acute bronchiolitis are associated with lobar or segmental collapse).

Massive Collapse Of The Left Lung



- **Homogenous opacity occupying the whole left hemithorax. Note that the opacity is not very dense and ribs can be visualized.**
- **Mediastinal shift to the same side of the lesion (left).**
- **Normal bony cage.**

Massive Consolidation Of The Left Lung

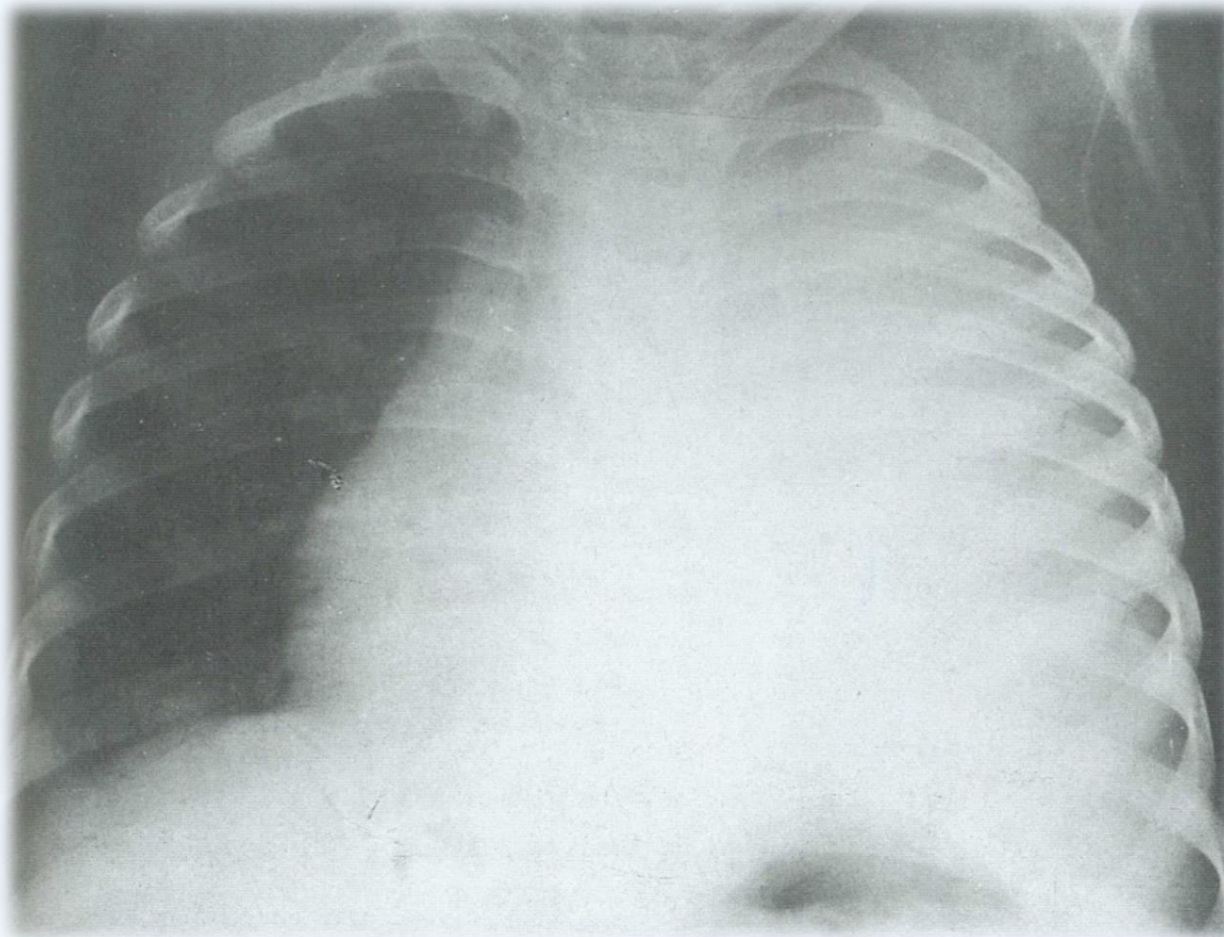


- **Homogenous opacity occupying the whole left hemithorax. Note that the opacity is not very dense and ribs can be visualized.**
- **Central mediastinum and normal bony cage.**

What Are The Causes Of Massive Consolidation?

- Massive consolidation of one lung is always bacterial in origin.
- **Clinically**, the patient is usually febrile and the manifestations of respiratory distress are well evident.
- The illness is frequently complicated with pleural effusion, which may be sero-fibrinous pleurisy or pure pus (empyema).
- **Radiologically**, the opacity is usually not very dense and the ribs can be visualized.
- When the opacity is very dense, associated pleural effusion should be considered.

Massive Left Sided Pleural Effusion



- **Dense homogenous opacity occupying the whole left hemithorax.**
- **Tracheal and mediastinal shift to the other side of the lesion (to right).**
- **Normal bony cage.**

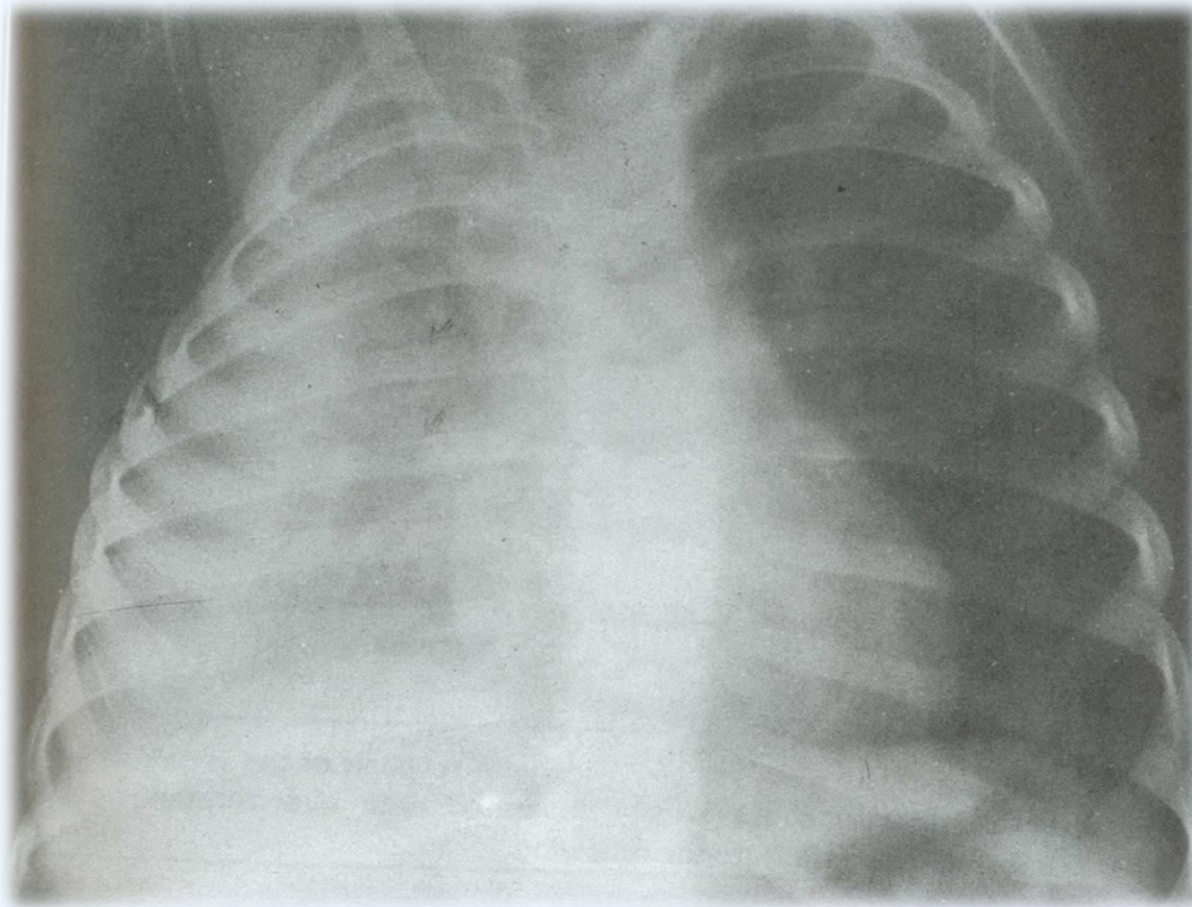
What Are The Causes Of Pleural Effusion?

- **1. Empyema (purulent pleurisy):**
 - Bacterial pneumonias (especially staphylococcal, and hemophilus influenza) are the main causes. Other causes include ruptured lung abscess, mediastinitis and chest surgery.

- 2. Sero-fibrinous pleurisy:**
 - 2. Bacterial pneumonias and tuberculous effusion are the main causes. Malignancies as lymphoma and neuroblastoma should be considered.

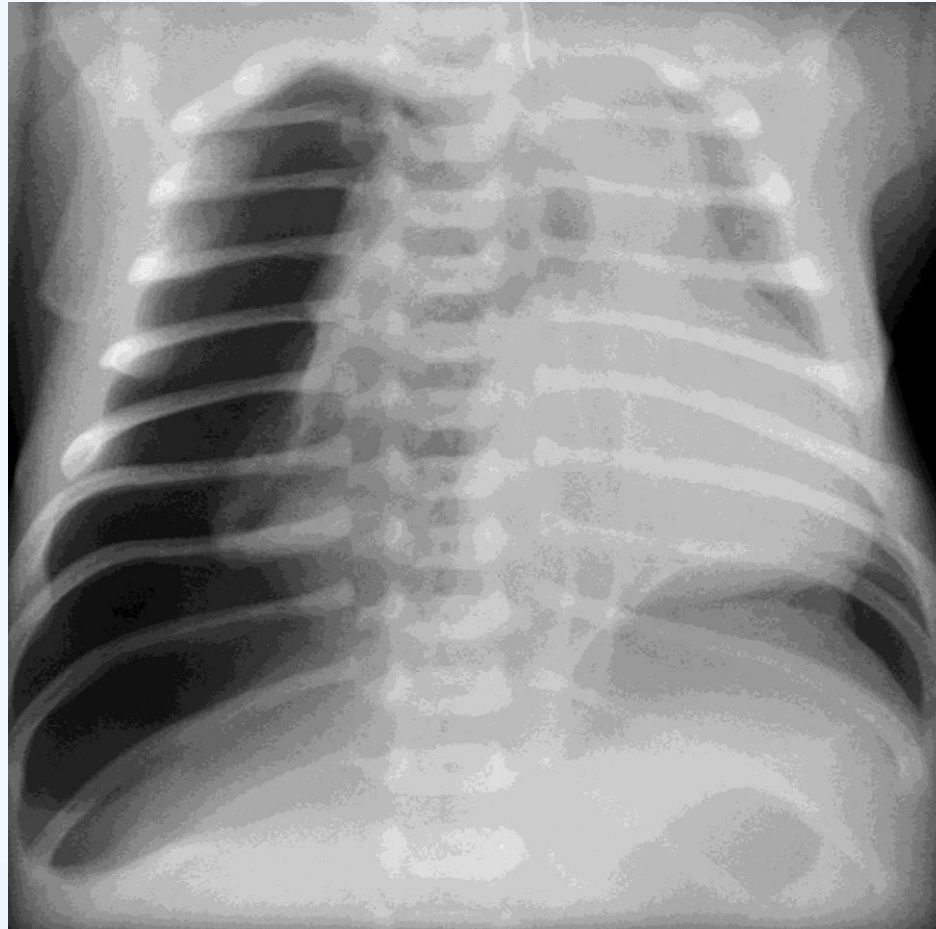
- 3. Other types of effusion:**
 - 2. Hydrothorax (in nephrotic syndrome and heart failure), hemothorax (trauma, tumours) and chylothorax (chest surgery) are less common.

Right Sided Chronic Empyema (Pleuropulmonary Fibrosis)



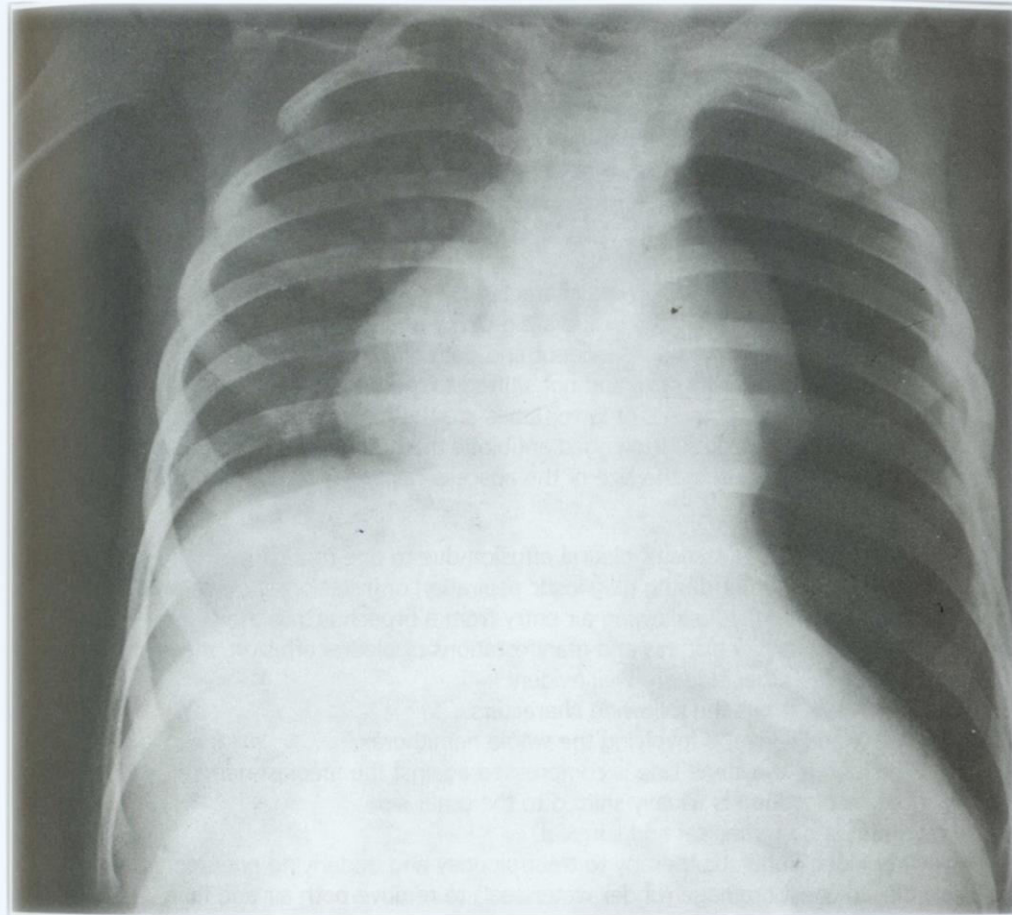
- **Massive opacity occupying the whole right hemithorax, which is denser in the lateral third denoting pleural involvement.**
- **Slight mediastinal and tracheal shift to the same side(to right).**
- **Marked crowding of ribs in the right side with scoliosis of the vertebral column denoting pleural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

Right Sided Pneumothorax



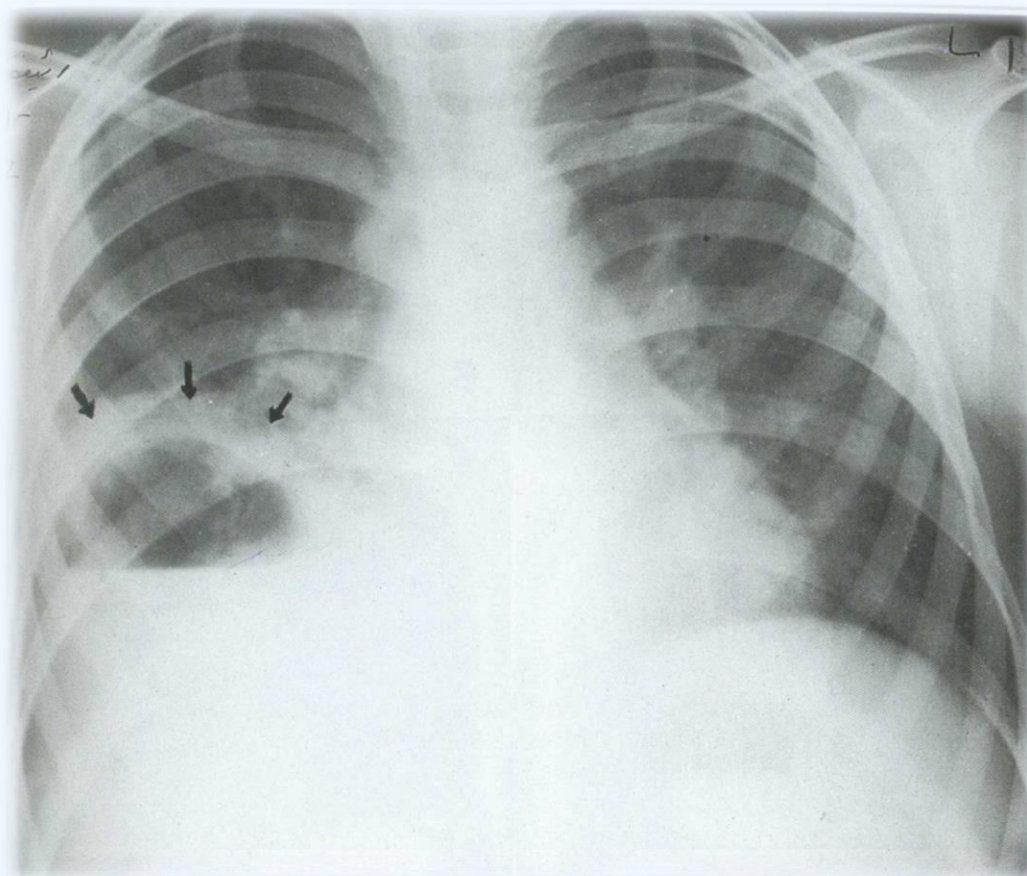
- **Hypertranslucency of the whole right hemithorax with absent bronchovascular markings (denoting free air in the right pleural space)**
- **The right lung is completely collapsed against the mediastinum.**
- **The trachea and mediastinum are markedly shifted to the other side. Note that there is no cardiac shadow to the right of the vertebral column.**

Left Sided Pneumothorax



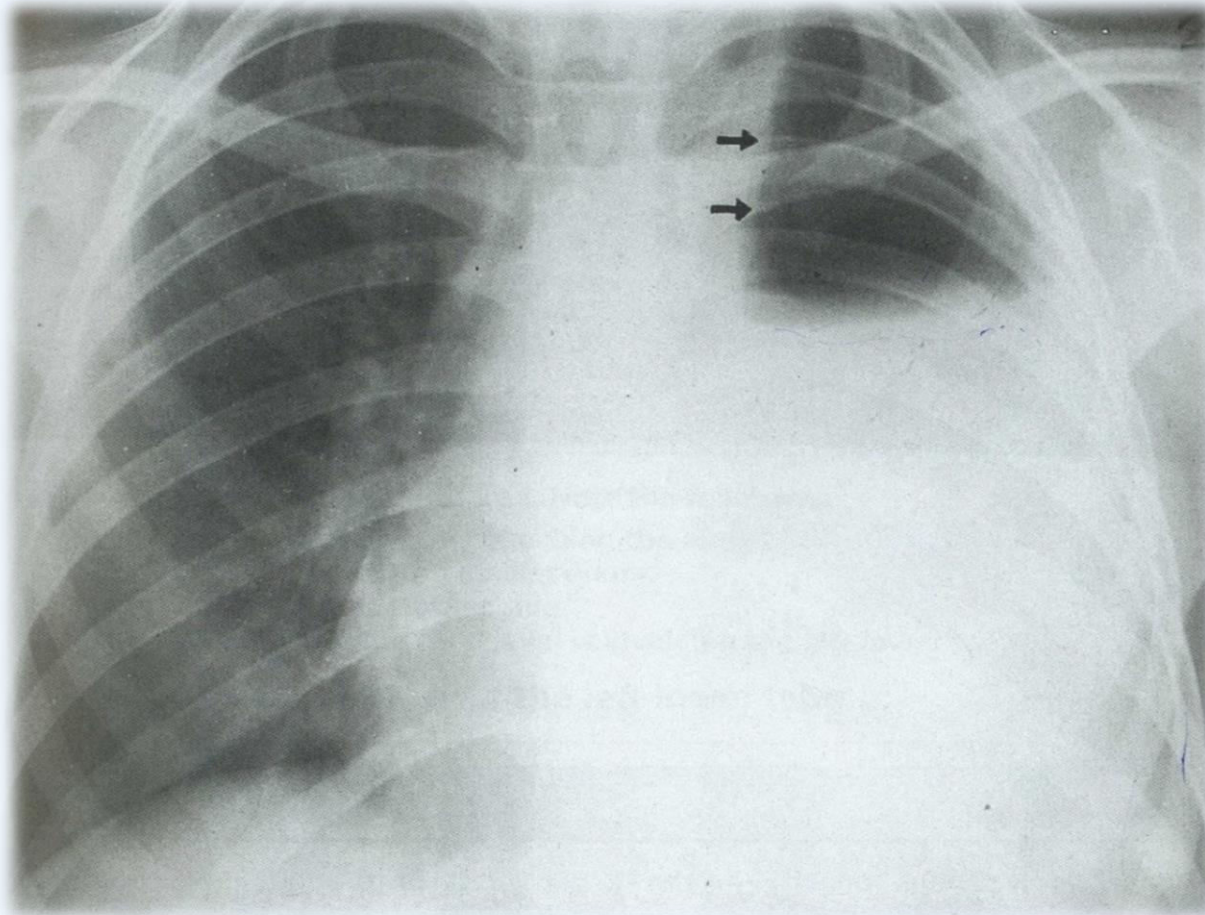
- **Hypertranslucency of the whole left hemithorax with absent bronchovascular markings (denoting free air in the left pleural space).**
- **The left lung is completely collapsed against the mediastinum.**
- **The trachea and mediastinum are markedly shifted to the other side. Note that the cardiac shadow is shifted to the right of the vertebral column.**

Large Lung Abscess In The Right Lower Lobe



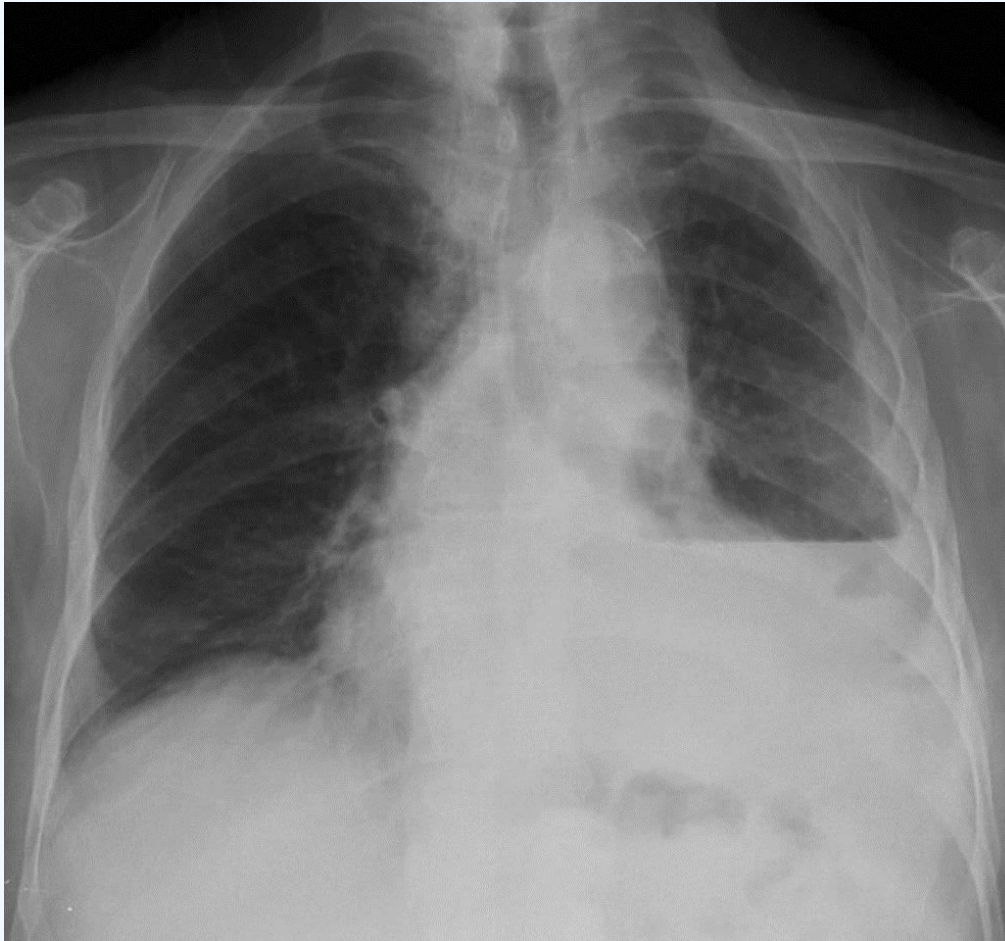
- **Dense homogenous opacity in the lower zone of the right lung field with horizontal upper level (fluid level) and hypertranslucent area devoid of lung markings above it (air).Note the following:**
 1. **The hypertranslucent area is not reaching to the apex of the right lung but surrounded by a dense 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.**

Left Sided Hydropneumothorax



- **Dense homogenous opacity in the lower 2/3 of the left hemithorax with horizontal upper border (fluid level), and hypertranslucency of the upper third without evident lung markings (air). The left lung is completely compressed against the mediastinum (arrows).**
- **Tracheal and mediastinal shift to the other side (to right).**

Left Sided Hydropneumothorax



- **Dense homogenous opacity in the lower 2/3 of the left hemithorax with horizontal upper border (fluid level), and hypertranslucency of the upper third without evident lung markings (air). The left lung is completely compressed against the mediastinum .**
- **Tracheal and mediastinal shift to the other side (to right).**

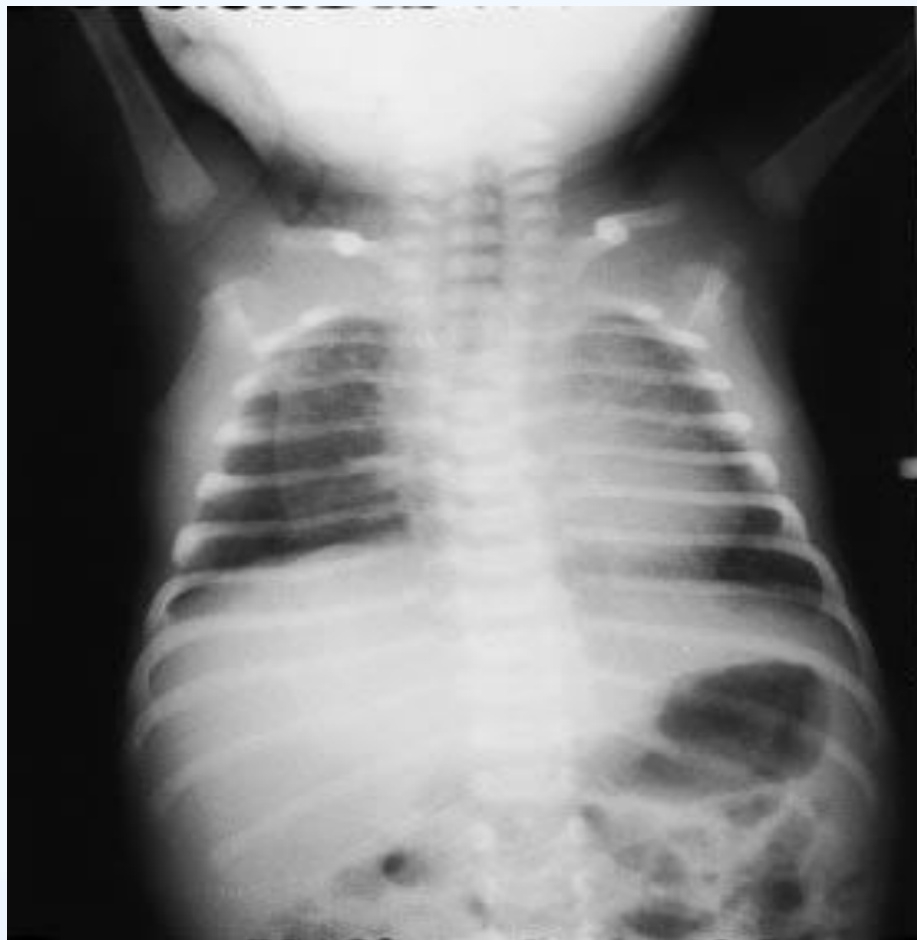
CHEST

NEW BORN

Normal Chest X-ray

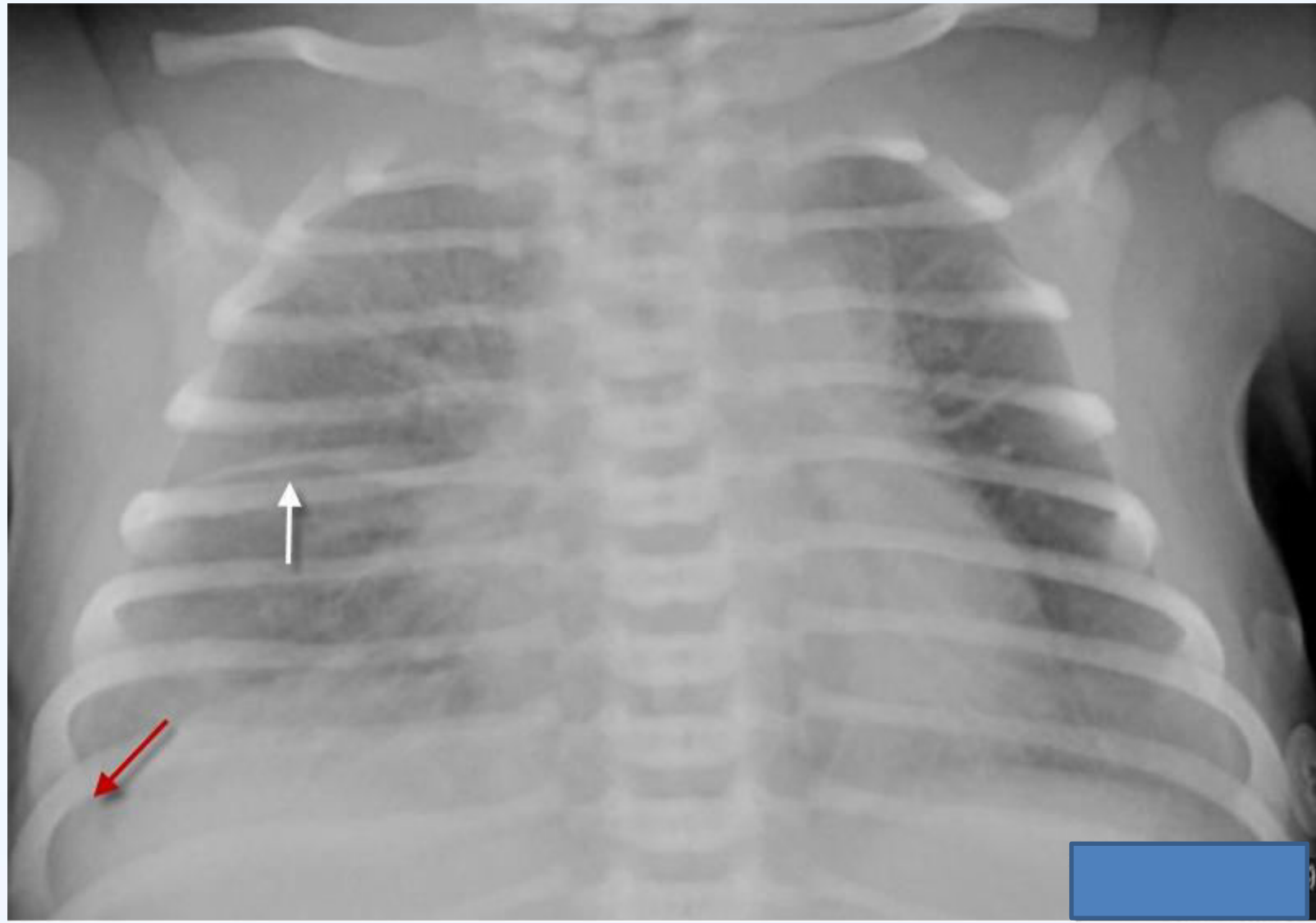


Skin Fold



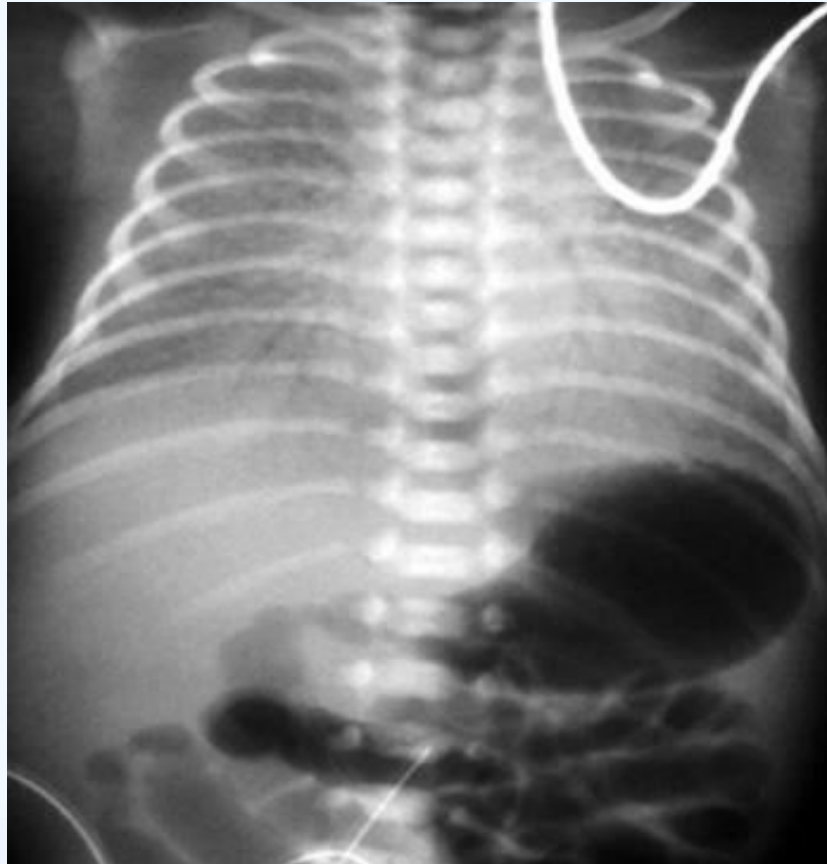
This is an example of a skin fold seen on a radiograph of the right chest. Despite the abnormal appearance of the radiograph, the infant was asymptomatic.

TTN



Hyaline Membrane Disease

Fine Granular Or Ground Glass Appearance



- **Fine granular opacities widely distributed throughout both lung fields (ground glass appearance).**
- **Note: A premature baby + severe respiratory distress within 2 hours after birth.**

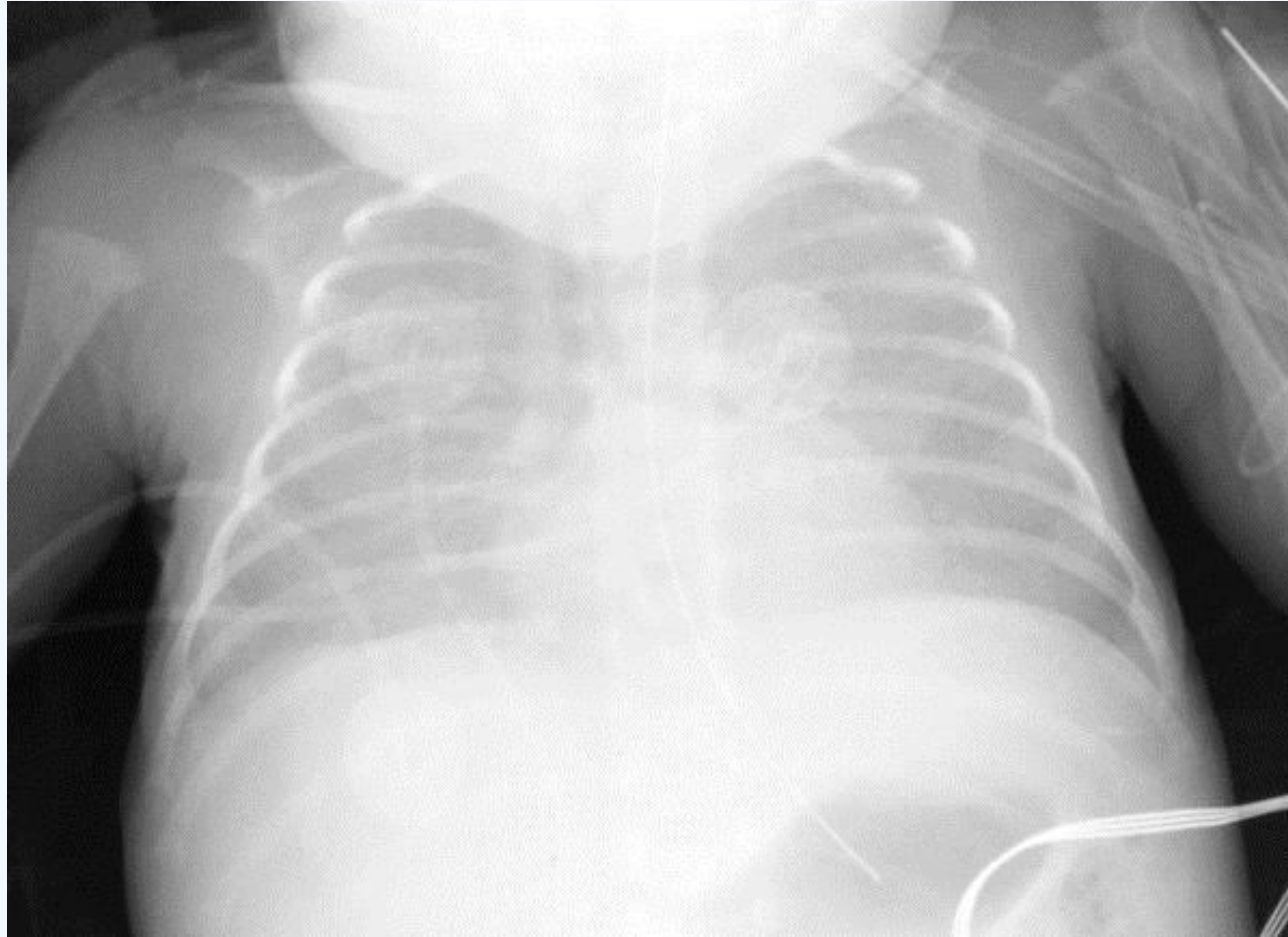
Hyaline Membrane Disease

Fine Granular Or Ground Glass Appearance



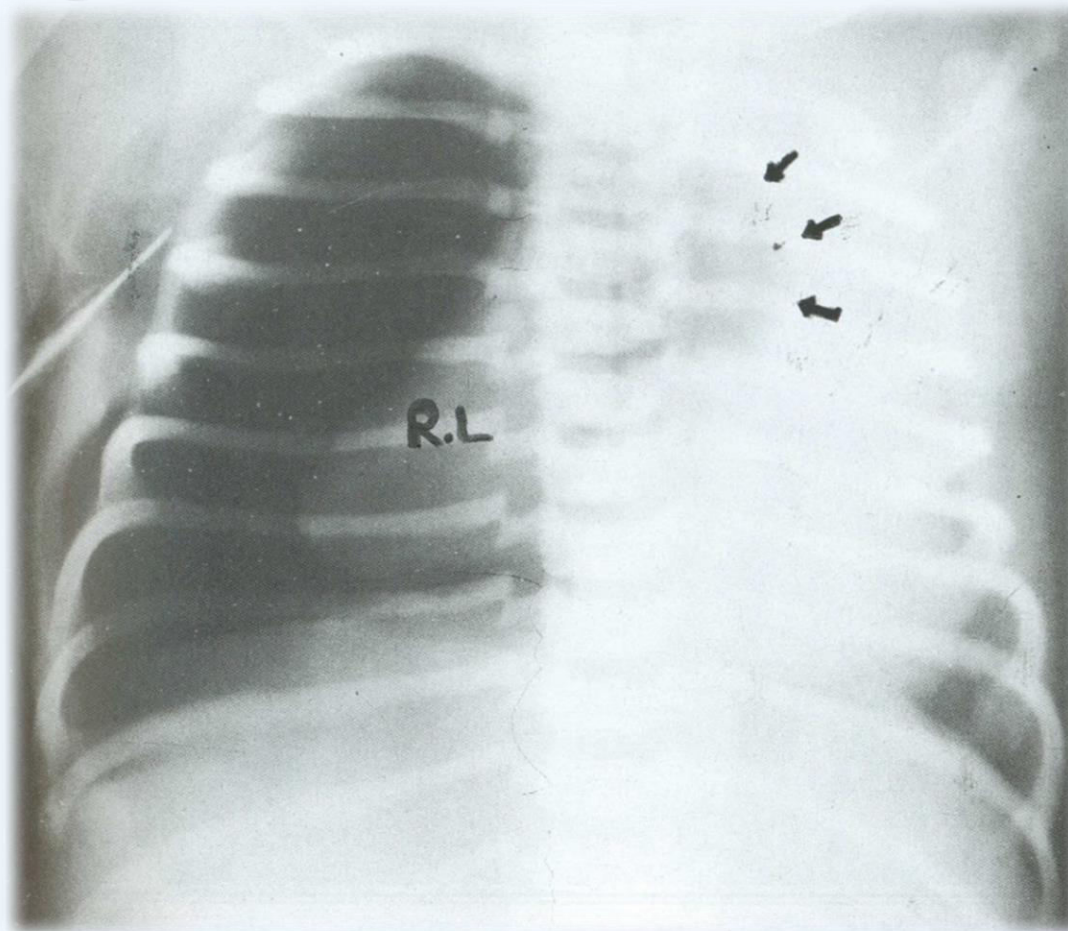
- **Fine granular opacities widely distributed throughout both lung fields (ground glass appearance).**
- **Note: A premature baby + severe respiratory distress within 2 hours after birth.**

Severe Hyaline Membrane Disease(White Lungs)



- **Complete opacification of both lung fields(white lungs). The cardiac shadow is blended with the lung opacity and cannot be easily visualized.**
- **Note: A premature baby + severe respiratory distress + cyanosis at birth.**

Right Sided Pneumothorax

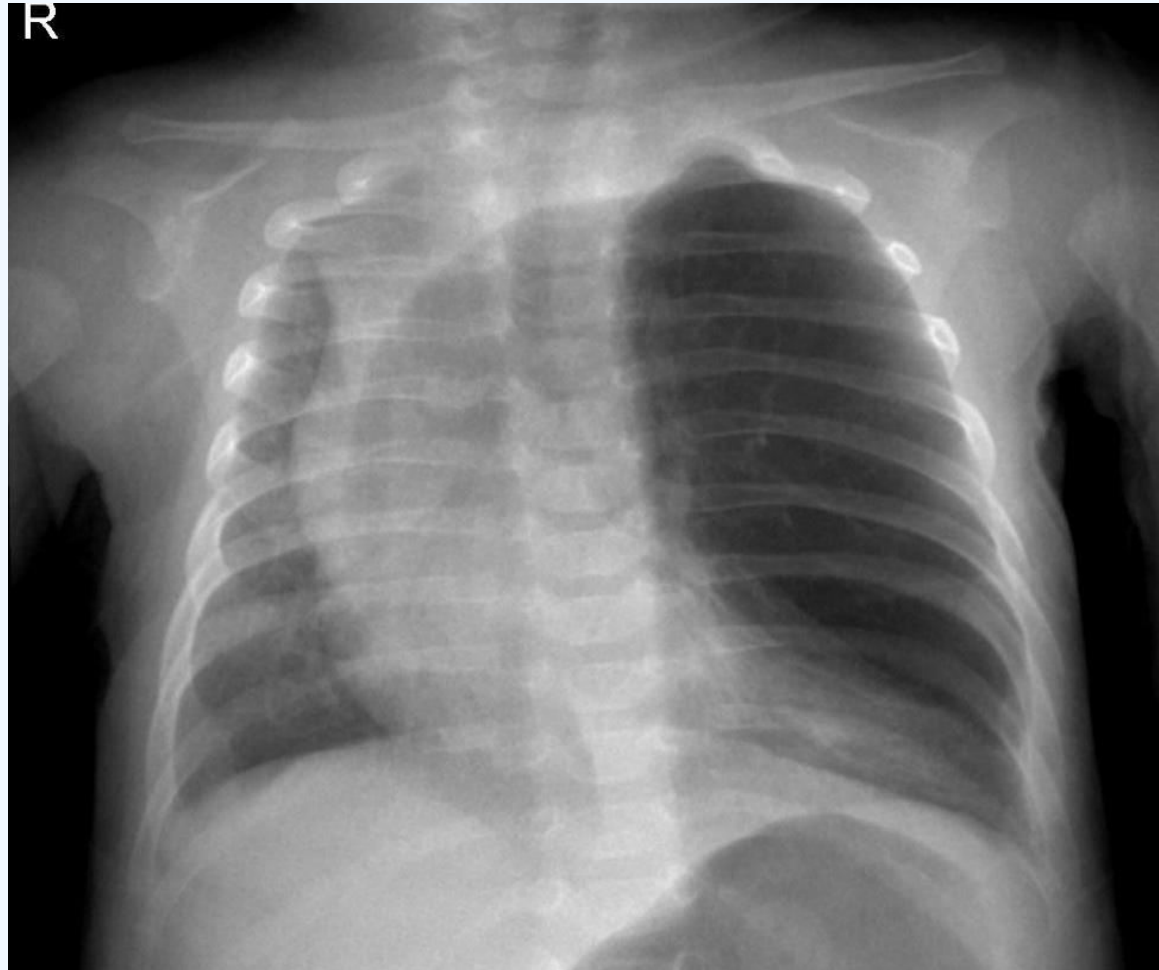


- **Hypertranslucency of the right hemithorax with no bronchovascular markings (free air) with some herniation into the left side (arrows).**
- **The right lung (R.L) is completely collapsed (compression collapse).**
- **Note: A premature baby + pneumothorax during the course of severe hyaline membrane disease.**

Bi-Lat Pneumo

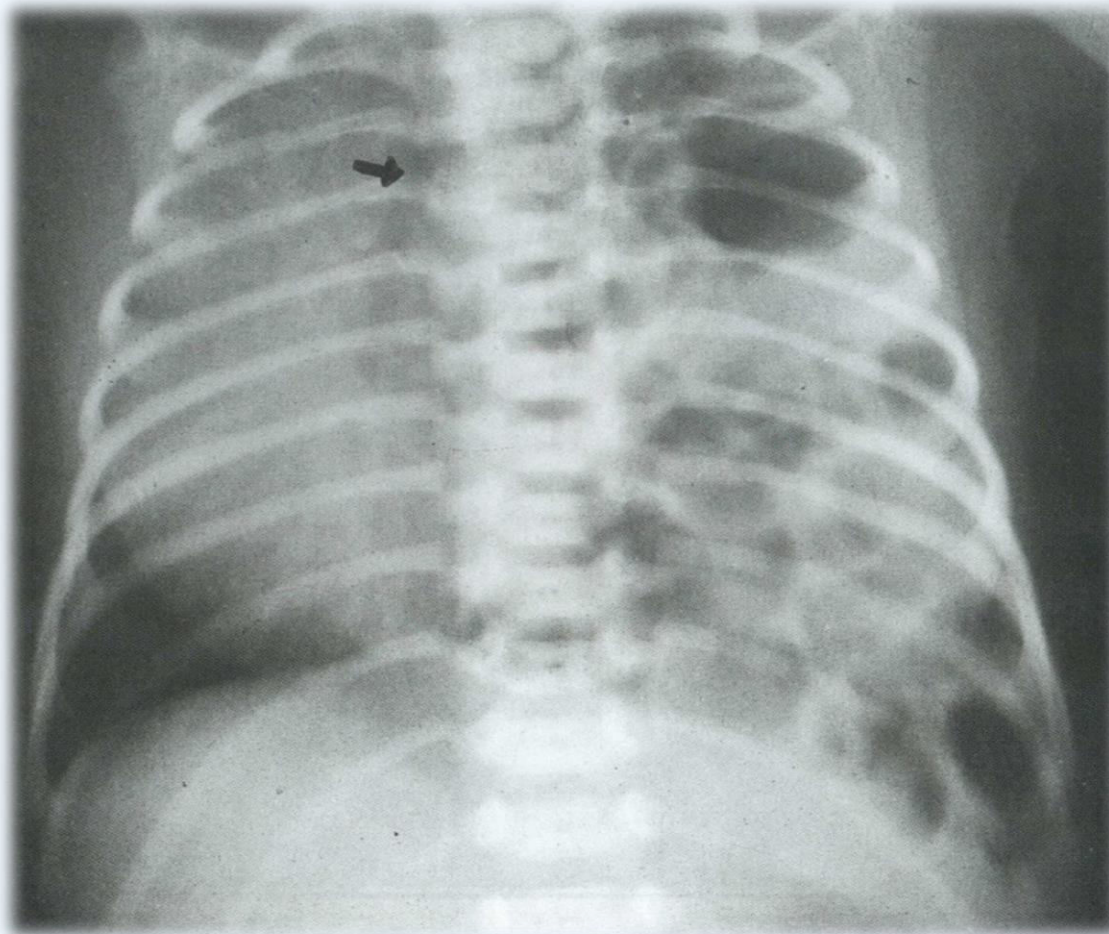


Left Sided Congenital Lobar Emyphysema



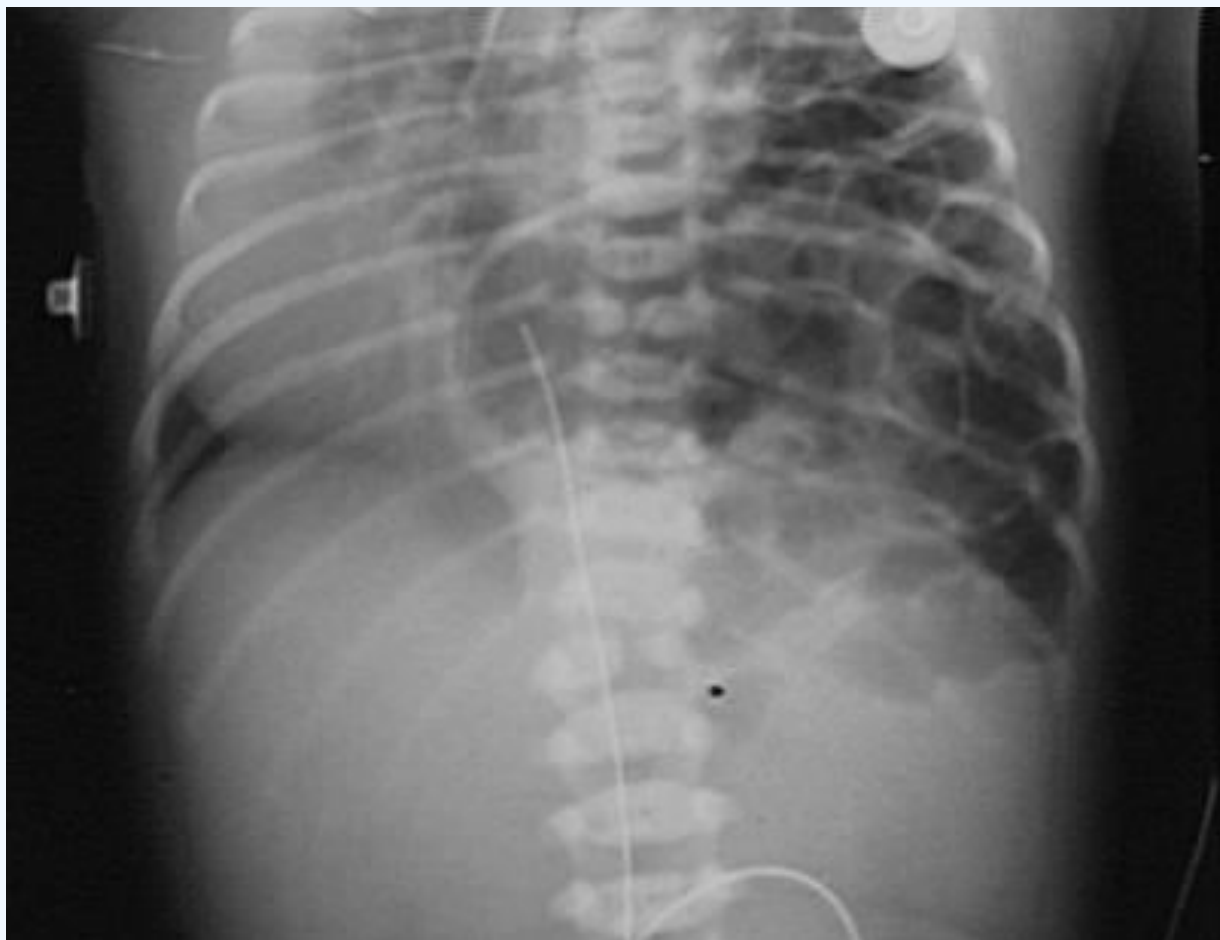
- **Hypertranslucency of the left hemithorax with preserved bronchovascular markings (hyperinflated lung) and some herniation into the right side.**
- **Mediastinal shift to the other side (to right).**
- **Note: A newborn with respiratory distress 2 months after birth.**

Left Sided Congenital Diaphragmatic Hernia



- **Multiple cysts of variable sizes (air-filled bowel) occupying the whole left hemithorax and pushing the trachea (arrow) and mediastinum to the other side.**
- **The free right costophrenic angle indicates that the opacity above it is the displaced heart (to right).**

Left Sided Congenital Diaphragmatic Hernia

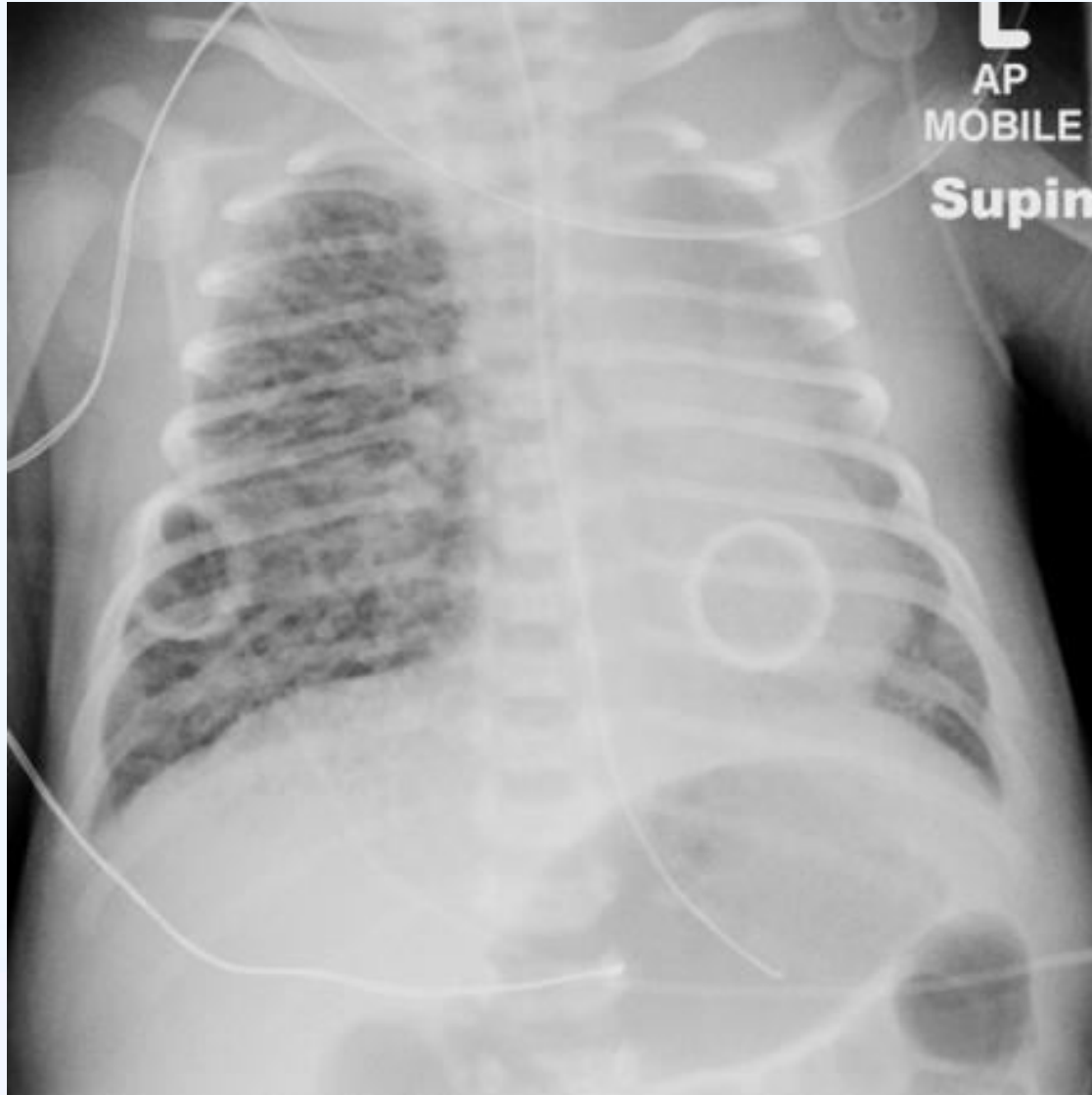


- **Multiple cysts of variable sizes (air-filled bowel) occupying the whole left hemithorax and pushing the trachea and mediastinum to the other side.**
- **The free right costophrenic angle indicates that the opacity above it is the displaced heart (to right).**

Chronic Lung Disease



PIE



RDS-BPD

• Day 12

Day 22



Seven Darwfs of Neonatal Radiology

RDS

TTN

Pneumonia

Pulm Edema

Atelectasis

Severe BPD

PIE



Grainy

Streaky

Patchy

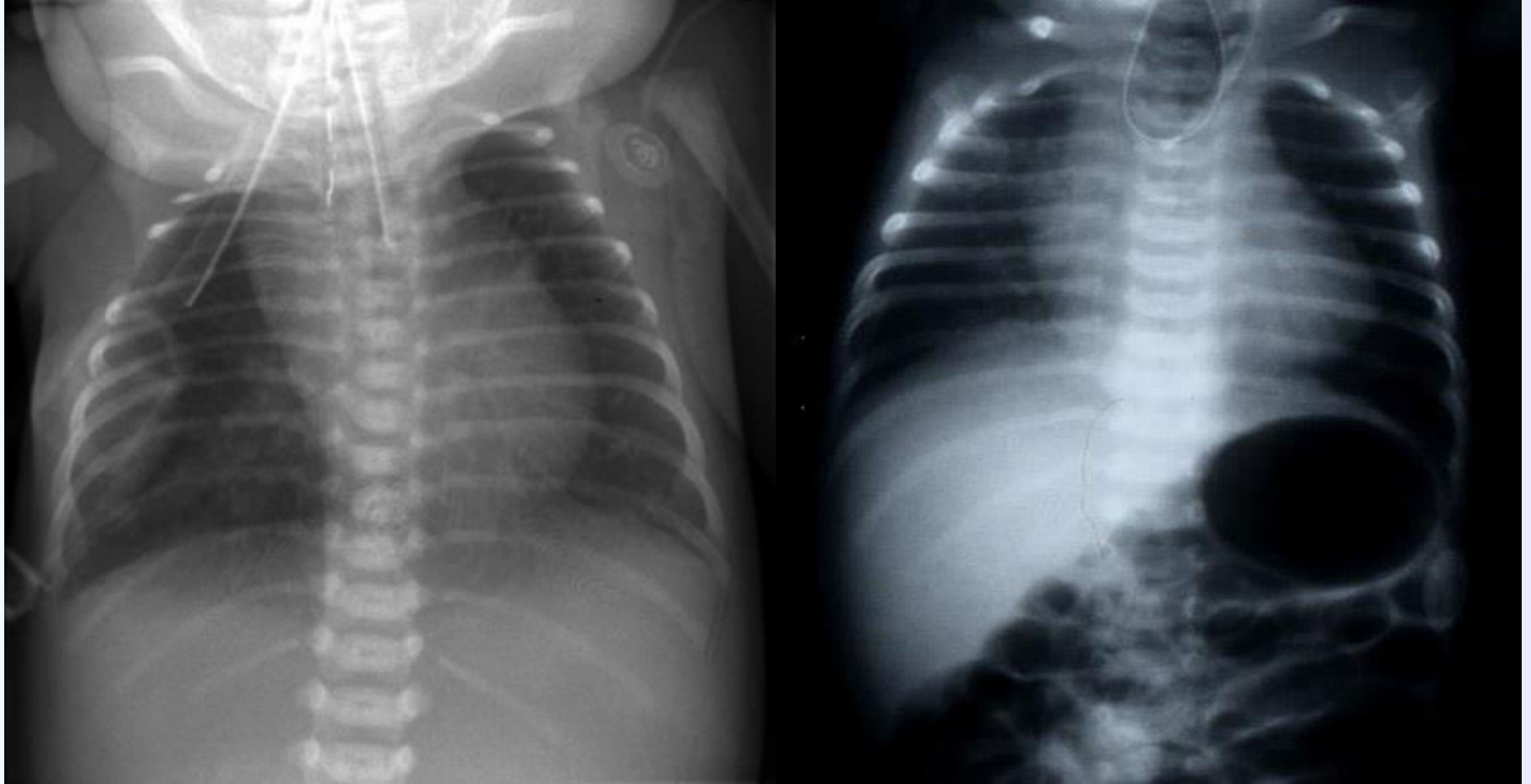
Fluffy

Hazy

Bubbly

Dotty

Esophageal Atresia



HEART AND MEDIASTINUM

Normal Heart X-ray

Right boarder

S.V.C: Superior Vena Cava.

A.A: Asecending aorta.

R.A: Right Atrium.

Left boarder

A: Aortic knuckle.

P: Pulmonary Artery.

W: Waist of the heart.

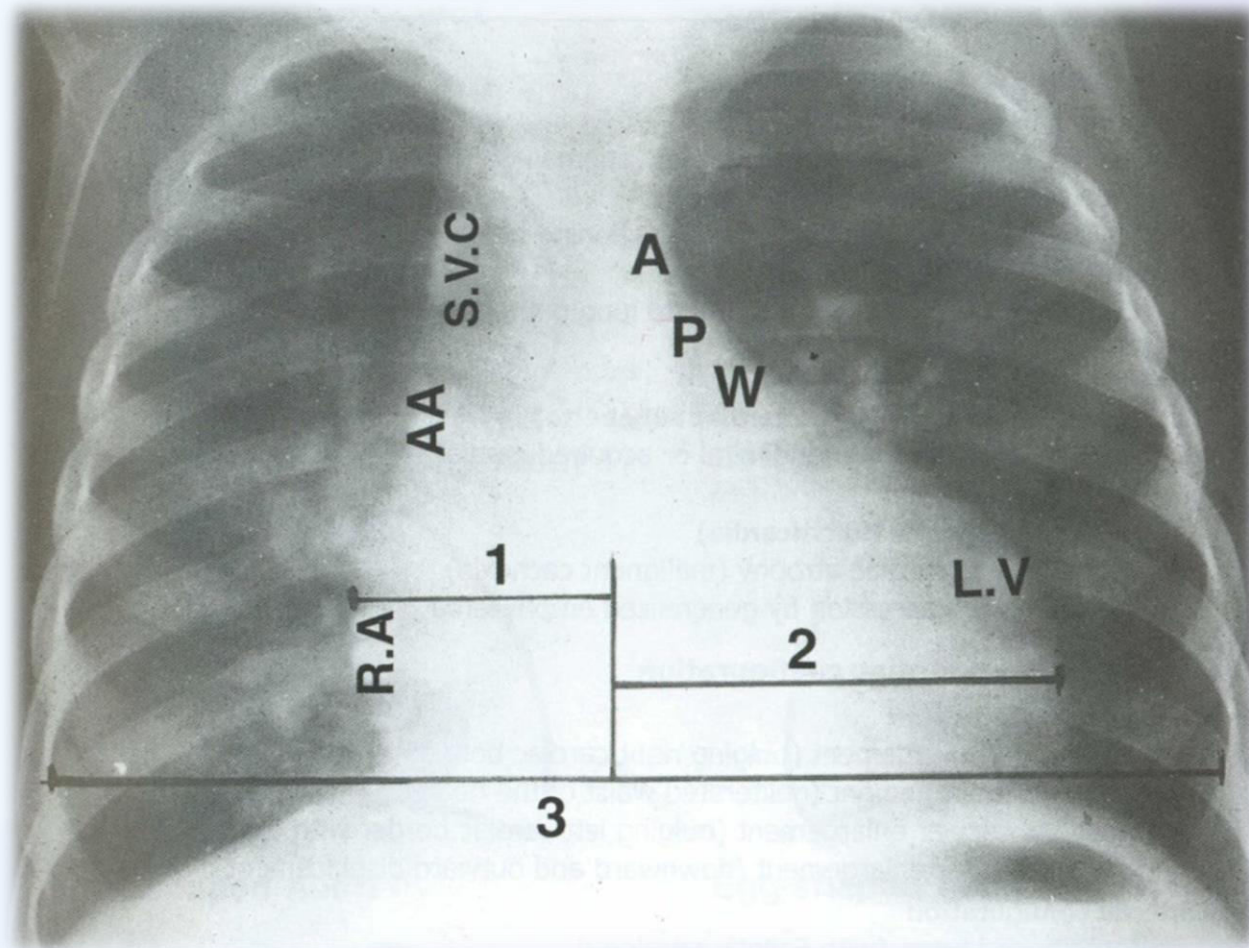
L.V: Left Ventricle.

Cardiothoracic ratio

Maximal cardiac width(lines 1+2)

Maximal thoracic width (line 3)

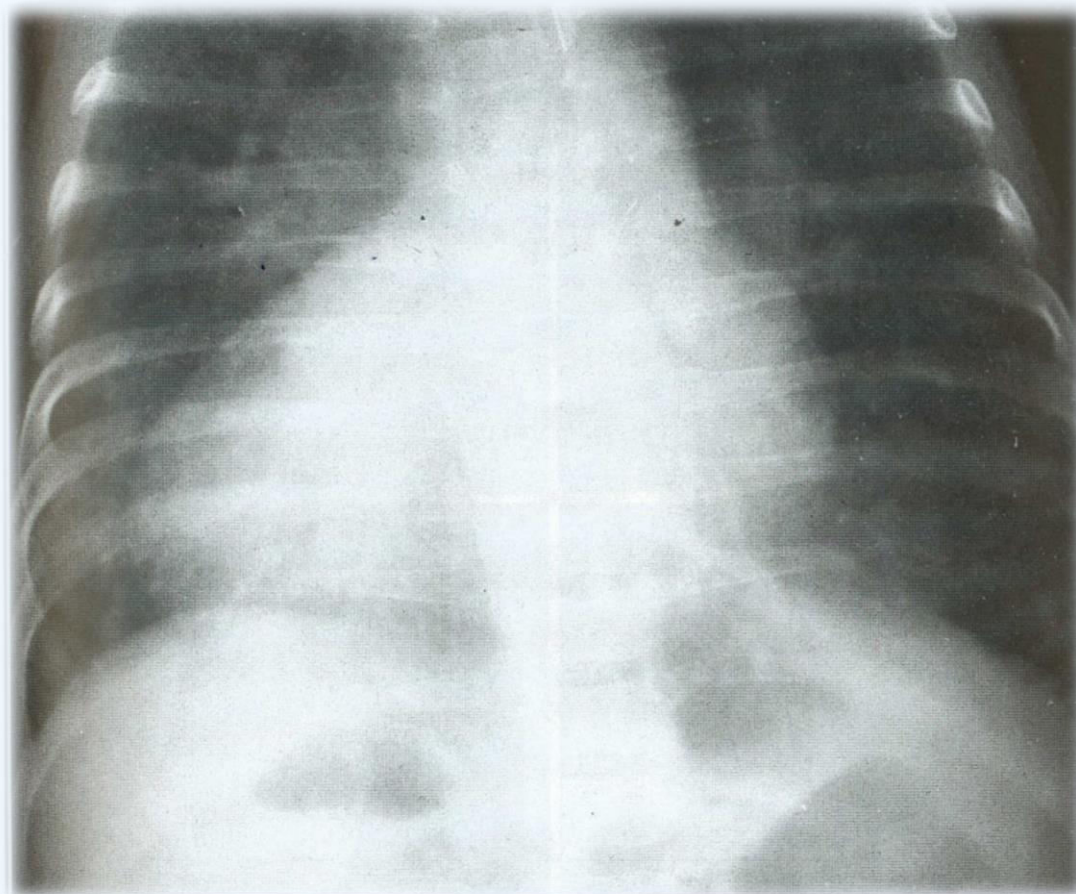
Normal C/T ratio (about 50%)



Plain chest x-ray, posteroanterior view, upright position showing:

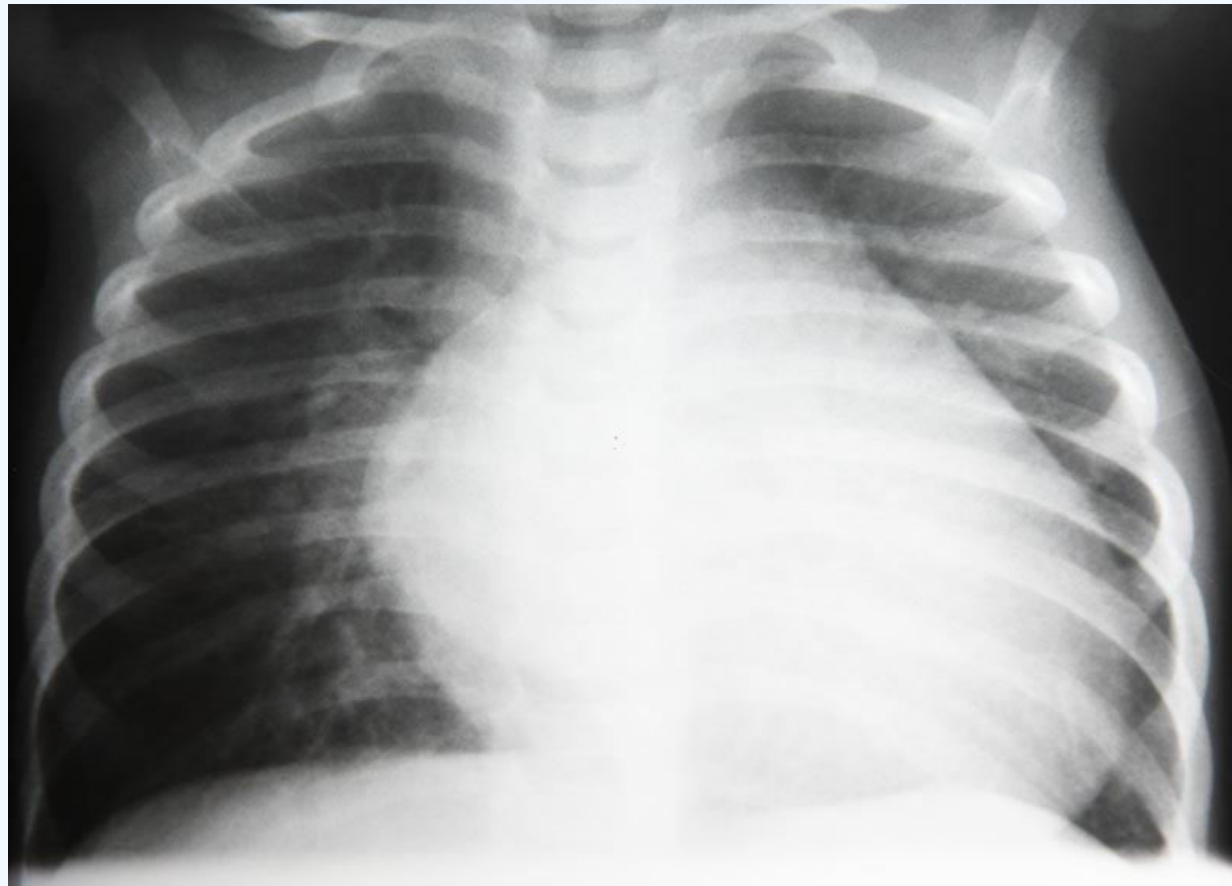
- Normal cardiac site.
- Normal cardiac size(normal C/T ratio).
- Normal cardiac configuration (right border, left border and base).
- Normal pulmonary vasculature.

Isolated Dextrocardia



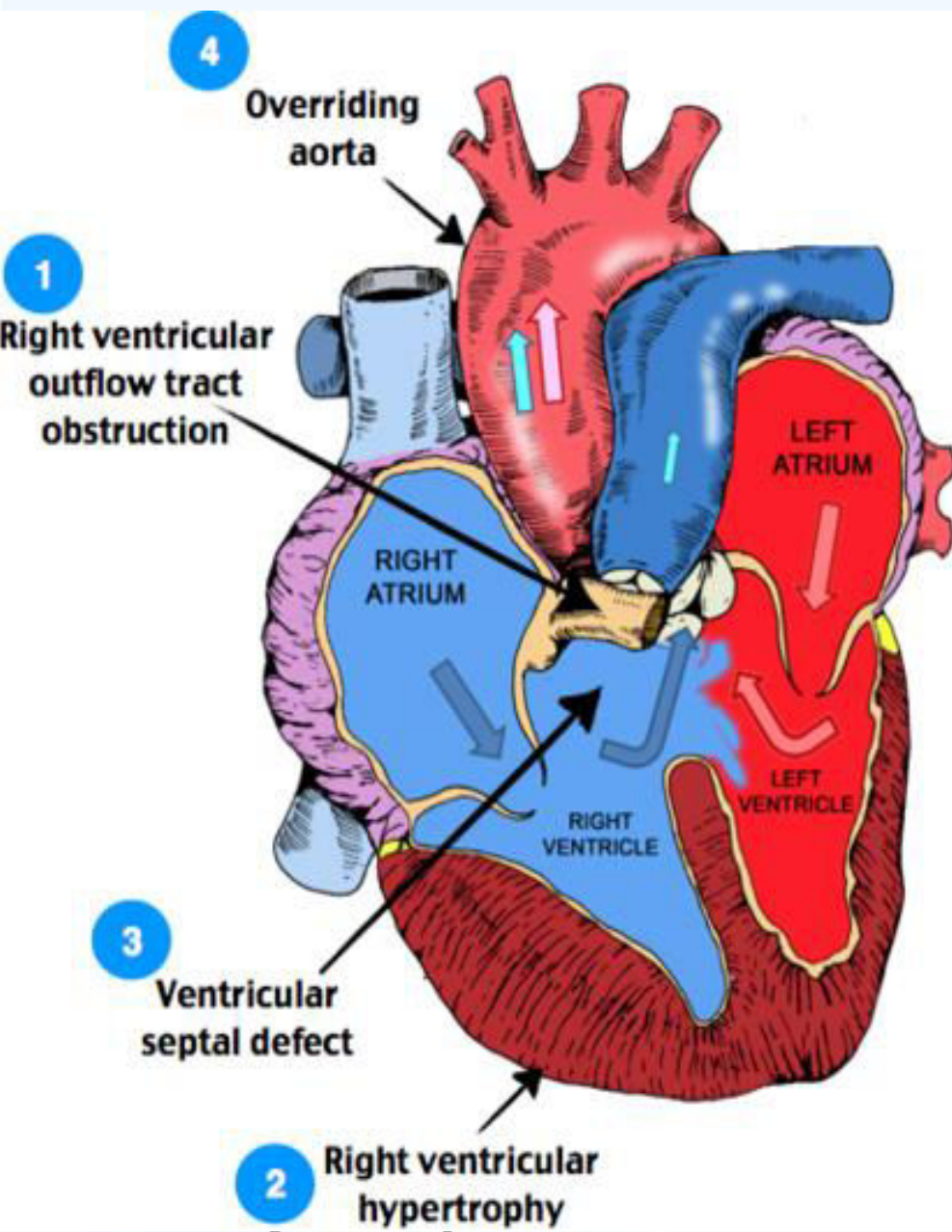
- Abnormal position of the heart (the heart lies mainly to the right). The left cardiac border (made of the left ventricle) is to the right while the right cardiac boarder (made of the left atrium) is to the left.
- Note also the mild to moderate cardiac enlargement, which suggests an associated cardiac anomaly.
- The liver shadow and the gastric gas are in their normal position.

Generalized Cardiac Enlargement (Globular heart)



- **Huge enlargement of the cardiac shadow(C/T ratio is 70%).**
- **The heart is rather globular in shape and the enlargement is generalized with no distinctive chamber enlargement.**
- **Picture of either generalized cardiomegaly or pericardial effusion.**
- **Echocardiography is essential for differentiation.**

Boot-Shaped Heart (Fallot's tetralogy)



Tetralogy of Fallot

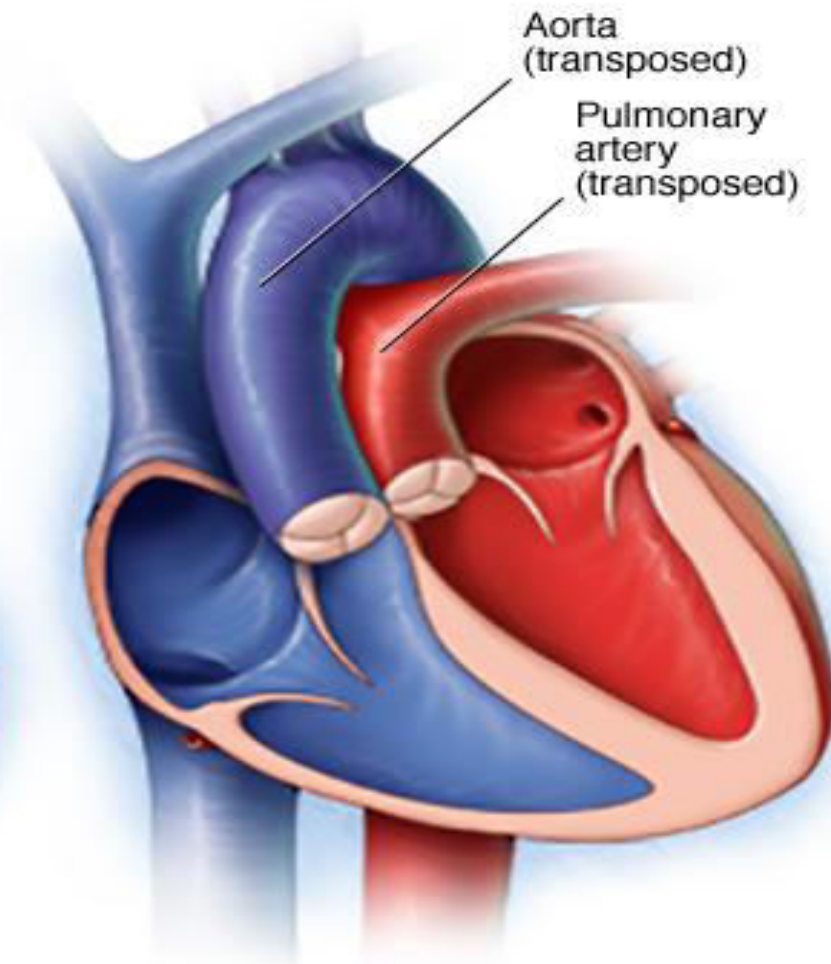
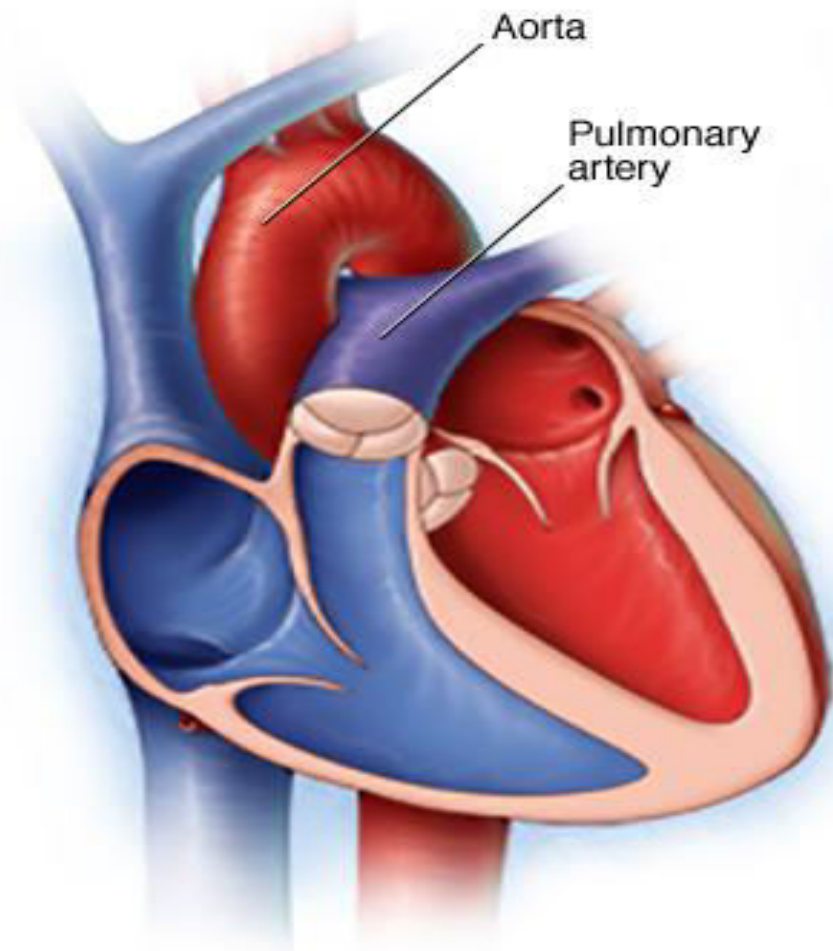
1. Right ventricular outflow tract obstruction
2. Right ventricular hypertrophy
3. Ventricular septal defect
4. Overriding aorta

- The **most common** cyanotic congenital heart defect
 - **Cyanosis** can present any time during infancy
 - CXR: **Boot-shaped heart**
 - Single loud **S2**
 - **Harsh systolic murmur** (pulm stenosis)
-
- Associated w/**crying** and **feeding**
 - Due to worsening **pulm outflow obstruction**
 - **Squatting** helps to counteract "Tet spells"
 - Squatting **increases systemic vascular resistance**

Egg-Shaped Heart (Transposition of great arteries)

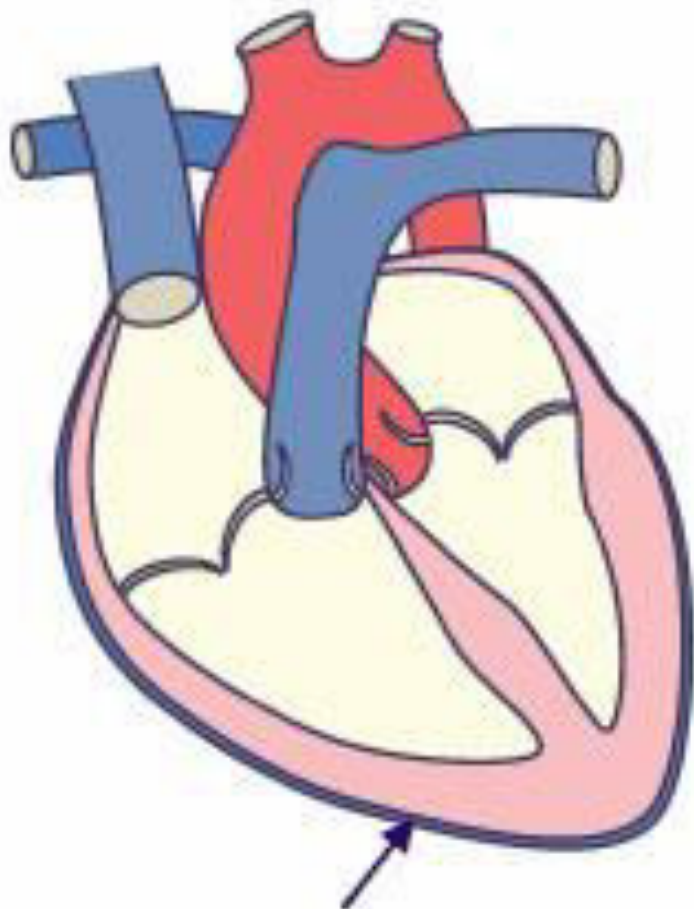
Normal heart

Heart with transposition
of great arteries



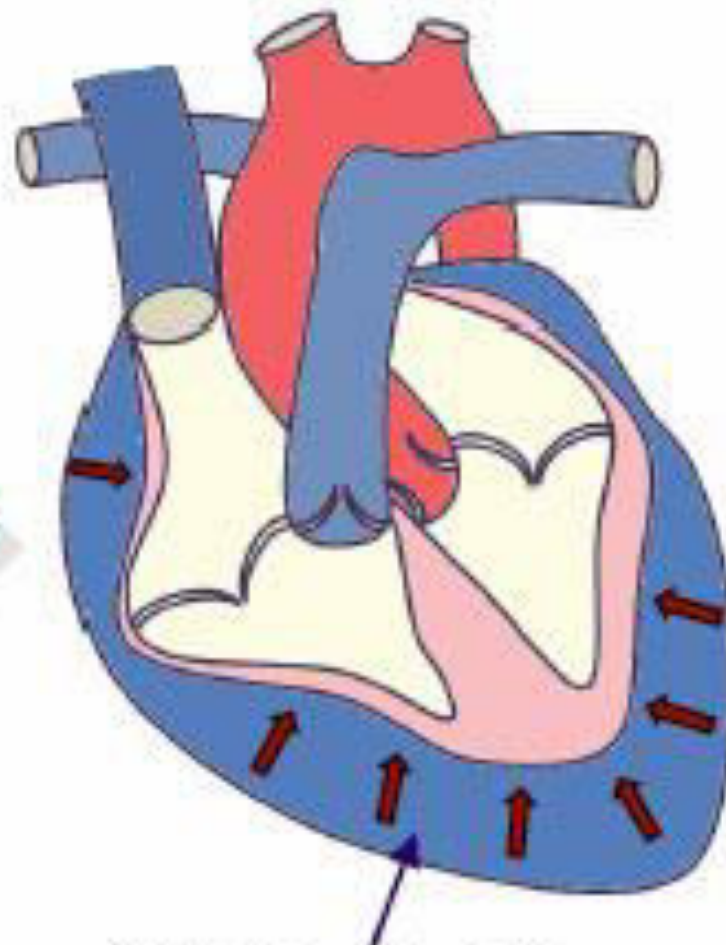
Flask-Shaped Heart (Pericardial effusion)

NORMAL



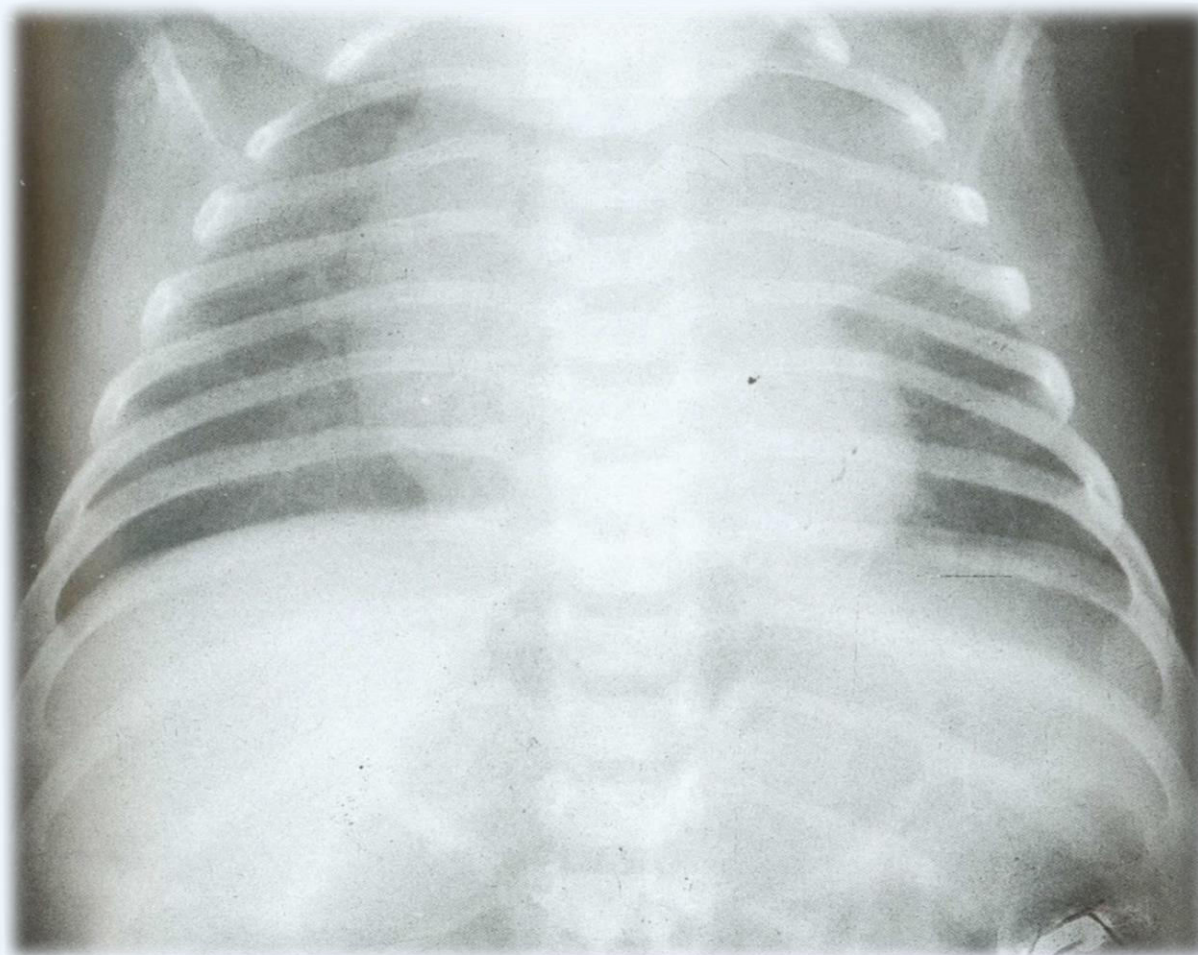
Pericardial sac with a small amount of fluid

PERICARDIAL EFFUSION



Fluid in the pericardial sac compressing the heart

Thymic Shadow (Sail sign)



- Superior mediastinal widening in a male infant. There is a triangular shadow occupying the apical part of the left hemithorax and simulating left upper lobe collapse or consolidation. This triangular shadow (sail sign) is the left lobe of the thymus gland.
- Picture of enlarged thymus gland with prominent left lobe.

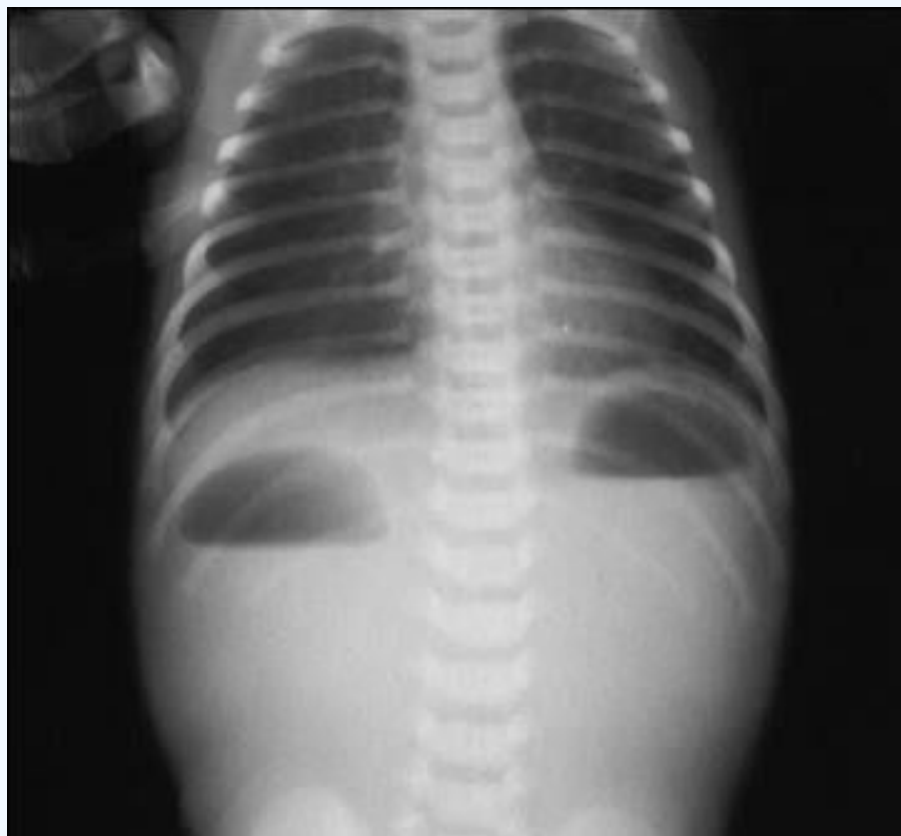
Thymic Shadow (Sail sign)



- Superior mediastinal widening in an infant. There is a triangular shadow occupying the apical part of the right hemithorax and simulating right upper lobe collapse or consolidation. This triangular shadow (sail sign) is the right lobe of the thymus gland.
- Picture of enlarged thymus gland with prominent right lobe.

ABDOMEN

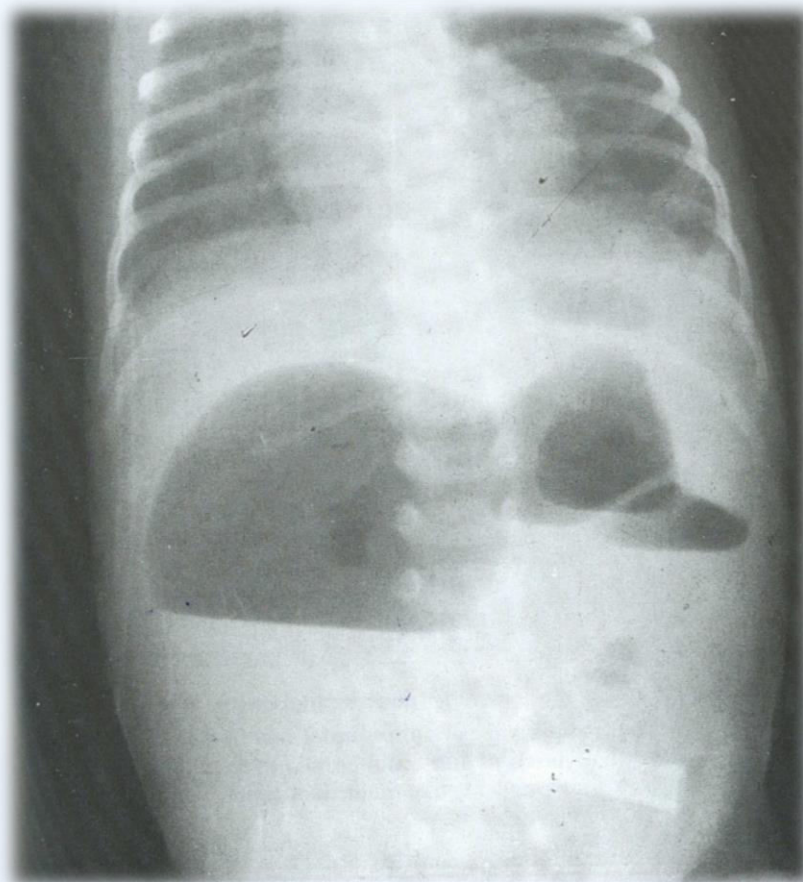
Congenital Intestinal Obstruction High Obstruction (Duodenal Atresia)



Plain x-ray of the abdomen (upright position) showing:

- Double bubble and double fluid level of the stomach (to left) and distended duodenum (to right), which is characteristic of duodenal atresia.
- No gas distal to the obstruction and no marked abdominal distention.

Congenital Intestinal Obstruction High Obstruction (Duodenal Atresia)



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- Double bubble and double fluid level of the stomach (to left) and distended duodenum (to right), which is characteristic of duodenal atresia.
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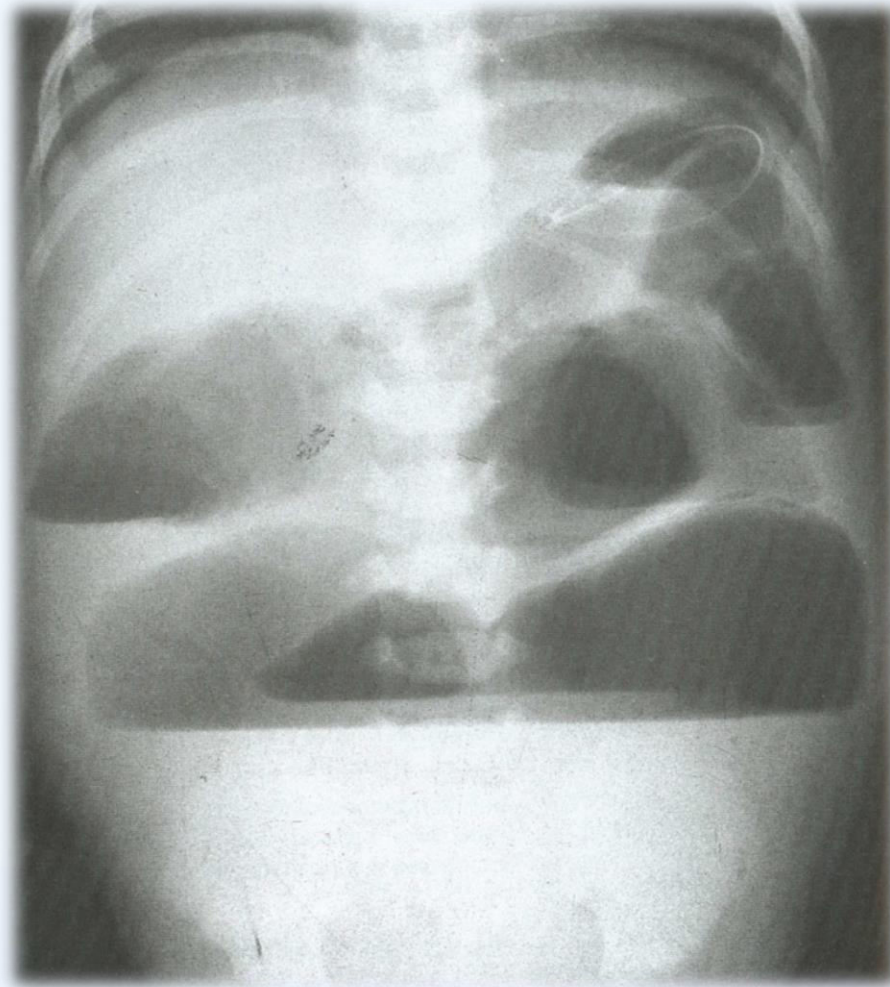
Low Obstruction (Malrotation and Volvulus)



Plain x-ray of the abdomen (upright position) showing:

- Multiple air-fluid levels with distended intestinal loops.
- There is marked abdominal distention (distended flanks).

Low Obstruction (Malrotation and volvulus)

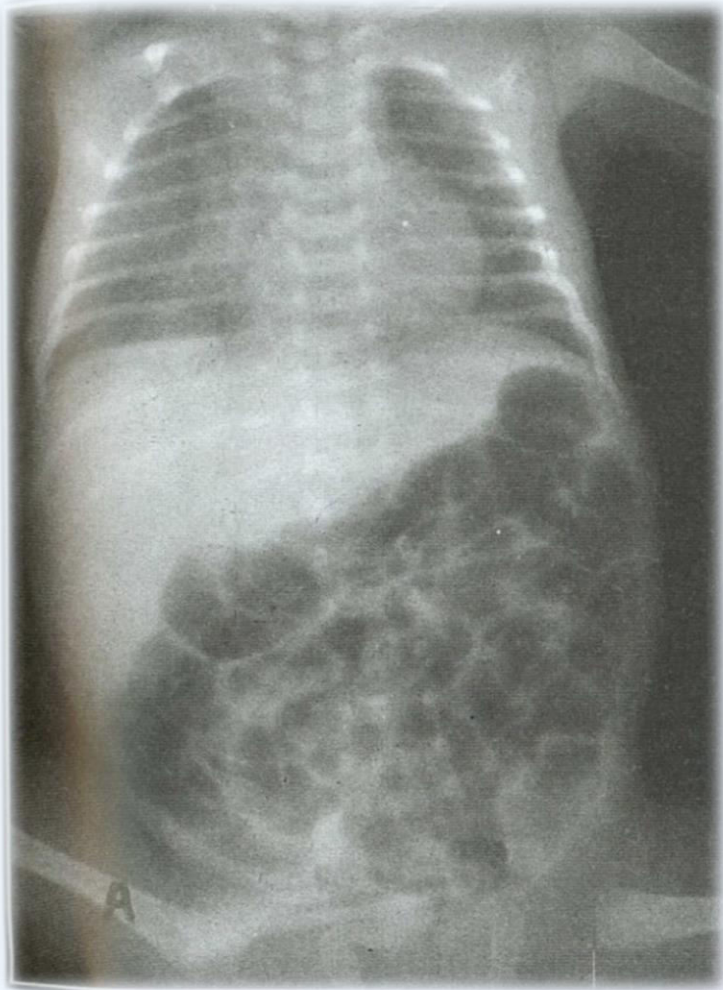


Plain x-ray of the abdomen (upright position) showing:

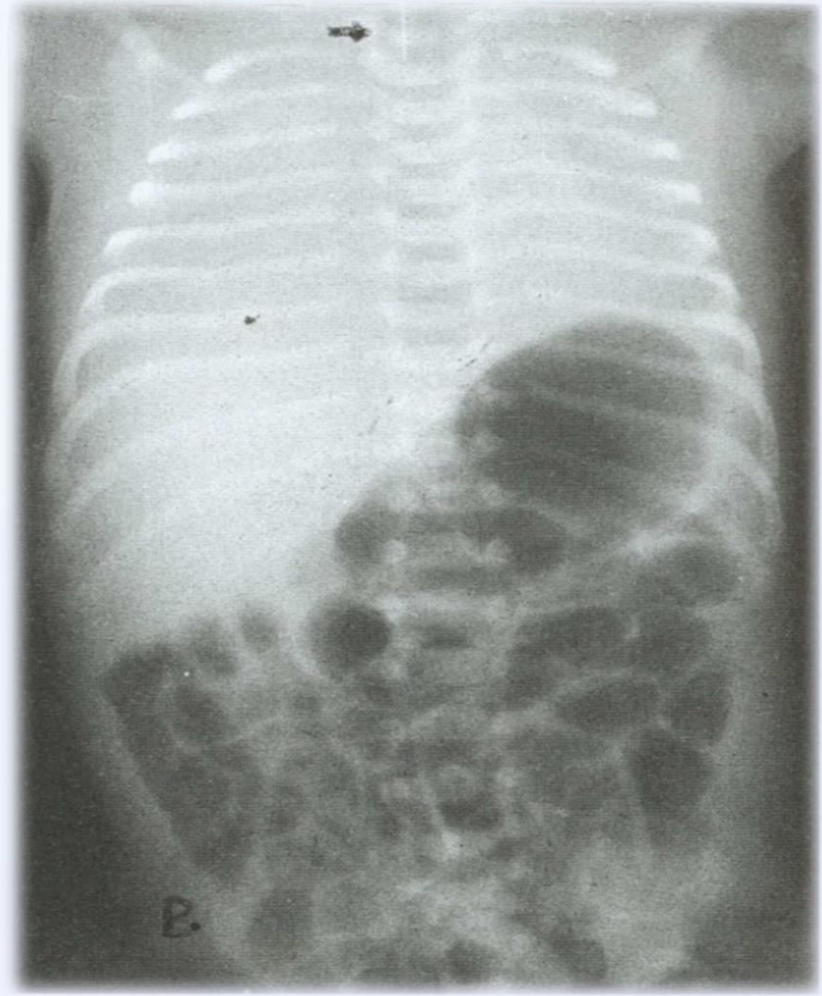
- Multiple air-fluid levels with distended intestinal loops.
- There is marked abdominal distention (distended flanks).

Paralytic Ileus

Meconium Plug



Hyaline Membrane Disease



Plain x-ray of the abdomen (upright position) showing:

- Dilated loops of the small and large “soap bubbles” with no fluid level.

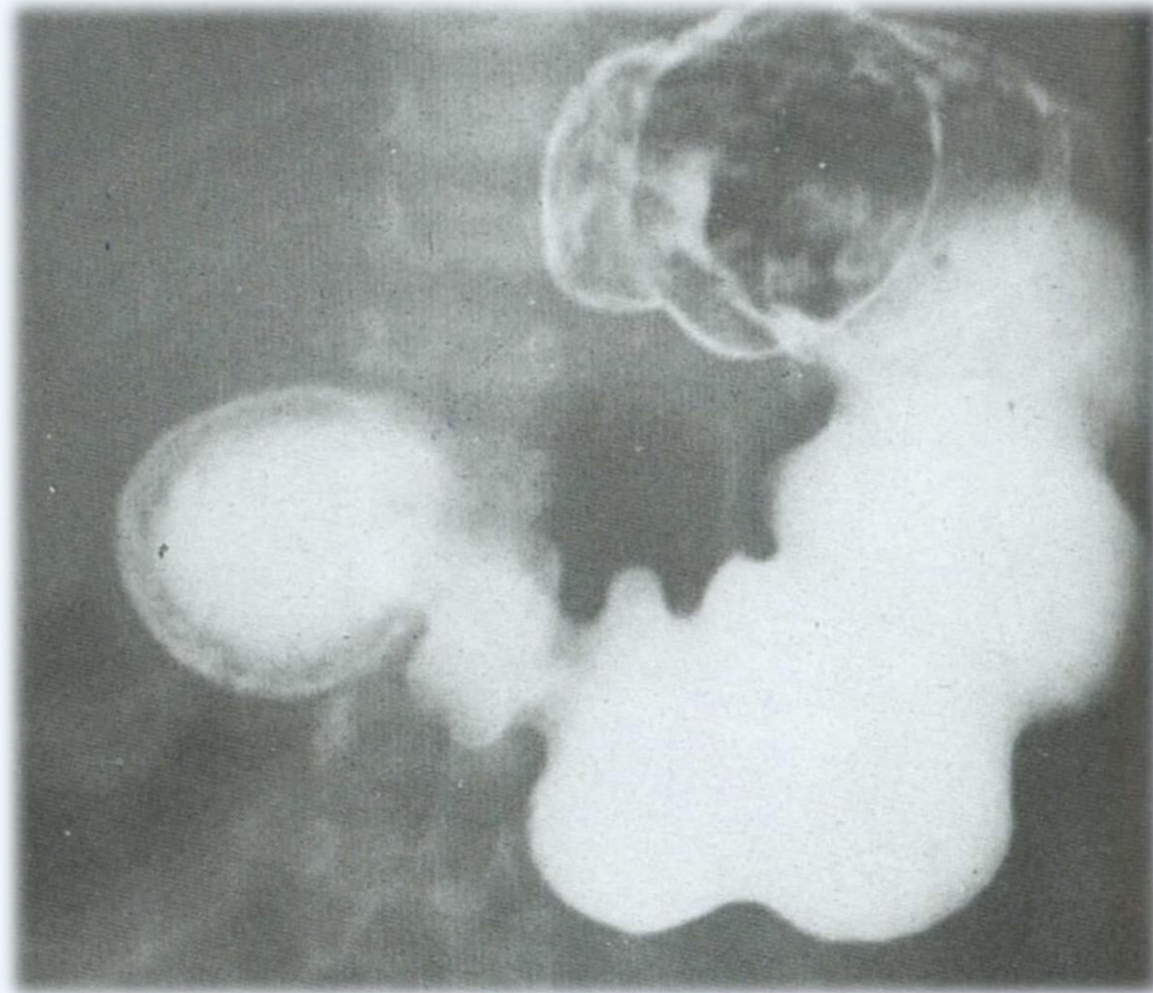
Congenital Pyloric Stenosis



X-ray of the abdomen with barium meal showing:

- Markedly dilated stomach, which appears full of barium.
- Fine elongated pyloric canal seen as a single line of barium (string sign).
- The pyloric tumour (hypertrophied pylorus appears as a rounded radio-translucent shadow surrounding the narrow pyloric canal.

Congenital Duodenal Stenosis



- Markedly dilated stomach, which appears full of barium.
- Dilated pylorus and proximal part of the duodenum, denoting duodenal obstruction. The present gas in the abdomen distal to obstruction indicated that the obstruction is incomplete.

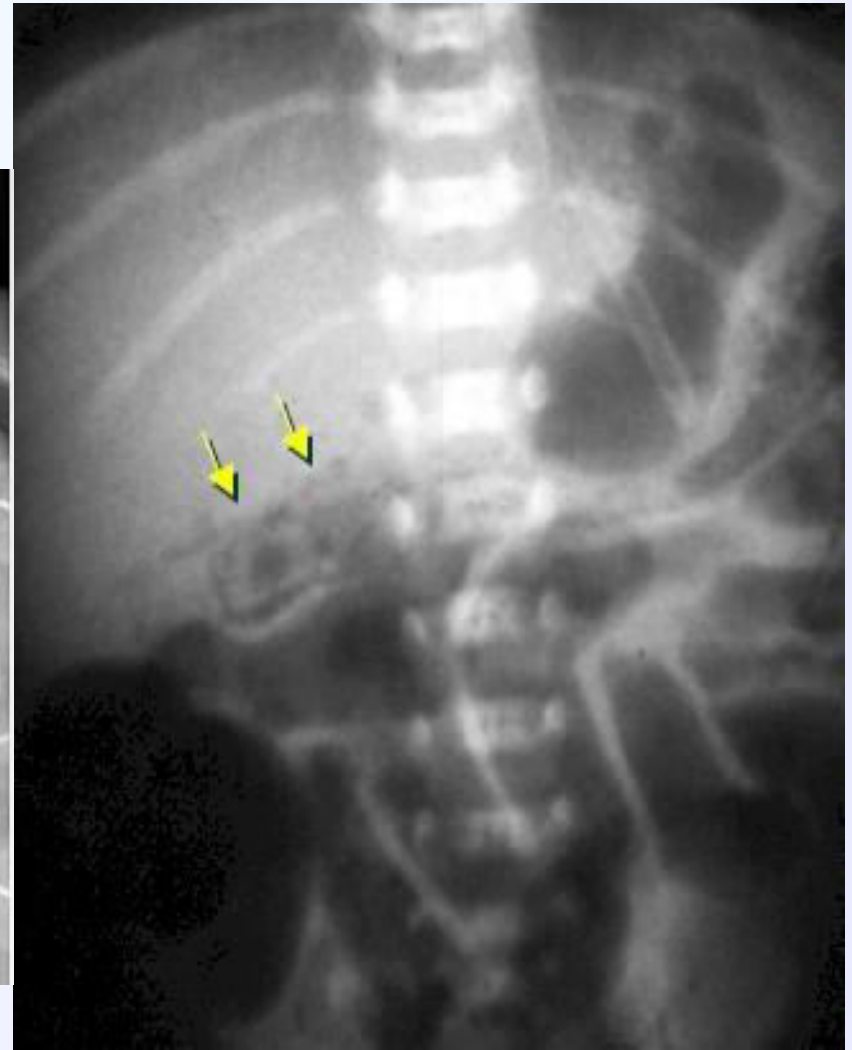
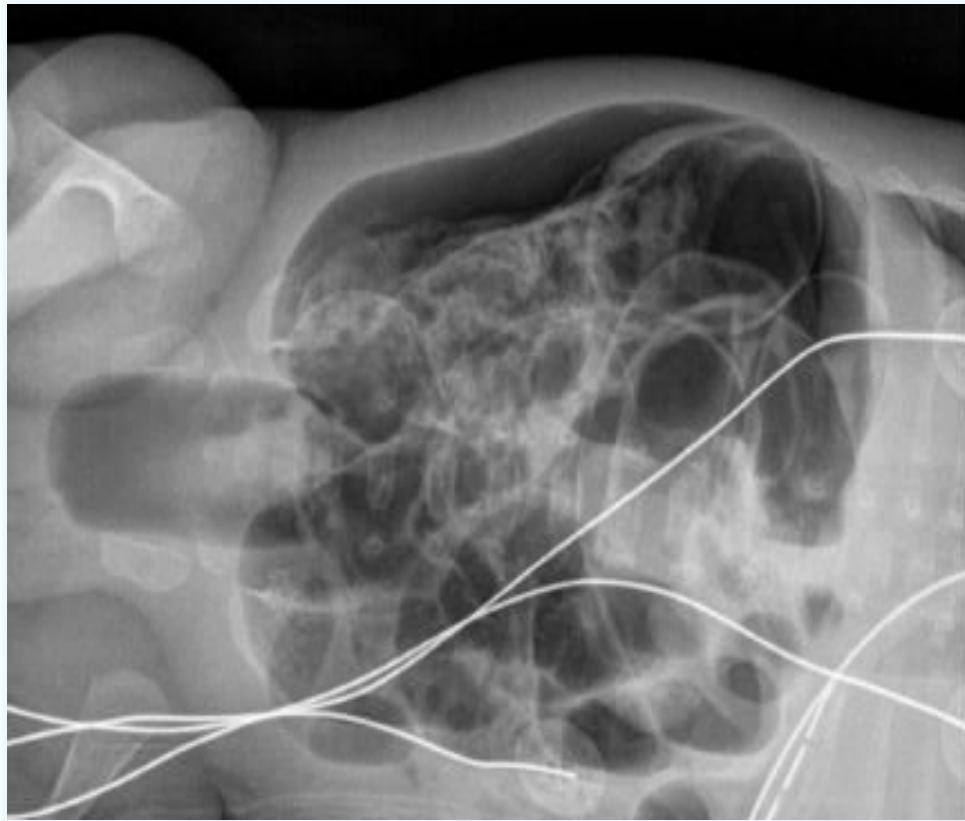
Pneumoperitoneum



Plain x-ray of the abdomen (upright position) showing:

- Free air in the peritoneal space under the diaphragm and along both flanks.
- The abdominal viscera are pushed centrally with marked abdominal distention denoting that the pneumoperitoneum is under tension.

Pneumoperitoneum



What is Wrong ?

- **OMPHALOCELE**

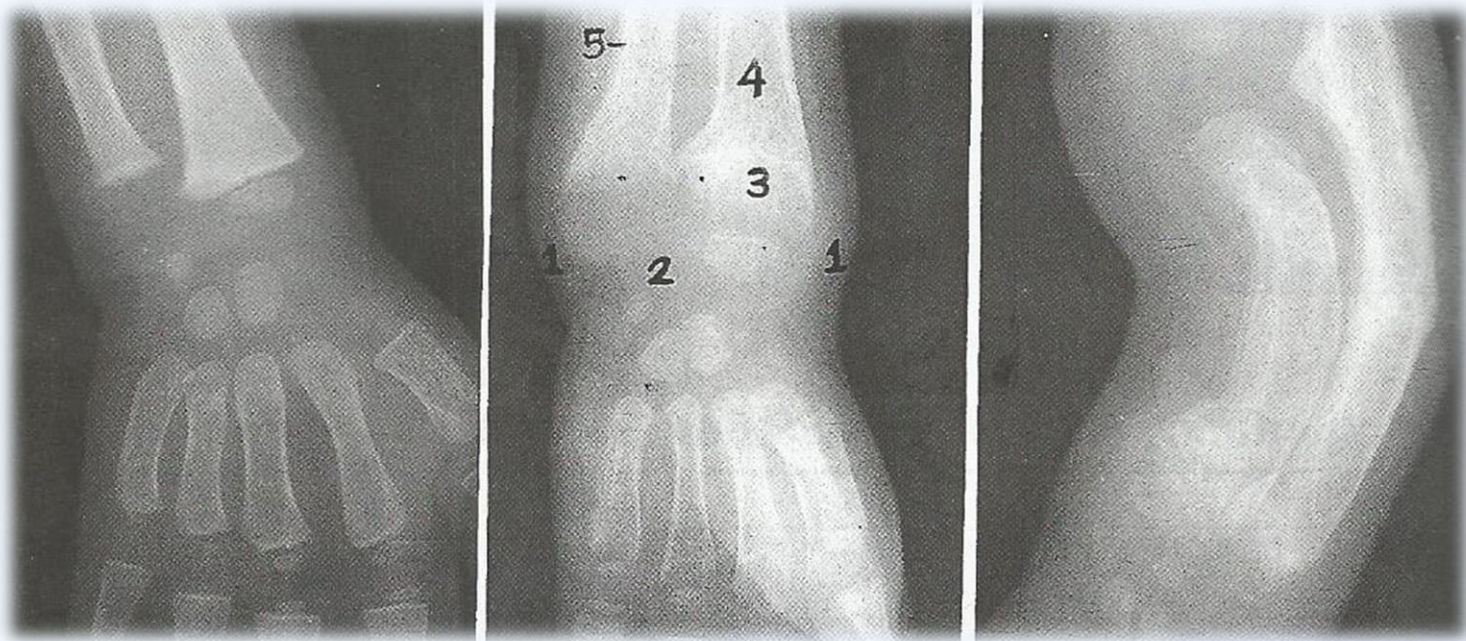


- **GASTROSCHISIS**



BONES

Active Rickets



Left: Normal plain x-ray on wrist region (for comparison).

Middle: Manifestations of active rickets. Note the following:

1. Board epiphysis (shown as a convex shadow).
2. Wide joint space (distance between carpal bones and long bones).
3. Widening, cupping and fraying of distal ends of the ulna and radius.
4. Markedly decreased bone density due to defective mineralization.
5. Double contour along the periosteum due to subperiosteal osteoid deposition.

Right: Severe rachitic changes with marked rarefaction, periosteal double contour and deformity of both ulna and radius.

Absent Clavicles



**“Make sure you have
finished speaking before
your audience has finished
listening.”**

Dorothy

Thank You



Any Questions?