

# CXR IN PEDIATRICS

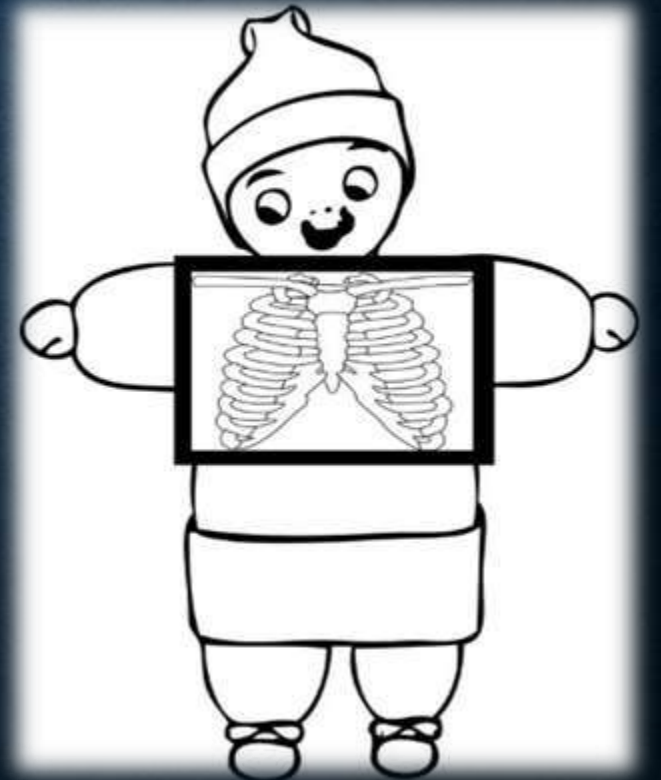
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# WHAT WILL BE OUR TALK ABOUT?

- ❖ Characteristics of different views in chest radiography
- ❖ Chest X-ray quality
- ❖ visible Anatomical components in children's chest radiographs
- ❖ Chest X-ray in foreign body aspiration and bronchiolitis
- ❖ Chest X-ray in viral and bacterial pneumonia
- ❖ Visible components of the mediastinum in different views of the chest X-rays
- ❖ Overview of mediastinal tumors and abnormalities in the pediatric chest X-rays
- ❖ Visible thymus changes with age in chest X-ray

## ◆ Front View in infant and young children

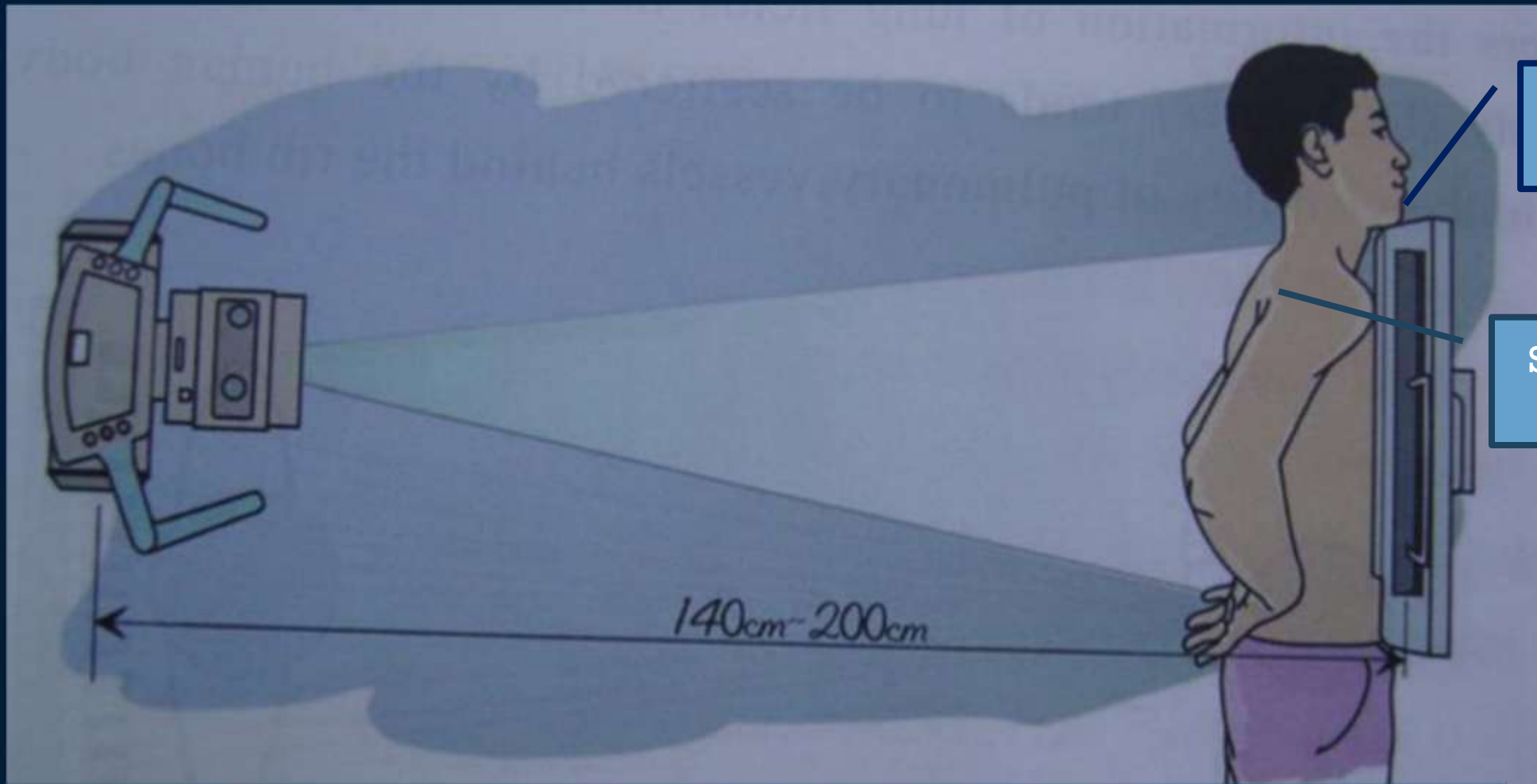


Correct position



« Take a deep breath and hold it »





Chin over grid device

Scapula rotated off lung

Radiography in **Postero-Anterior** incidence  
(The X-rays penetrate through the back)

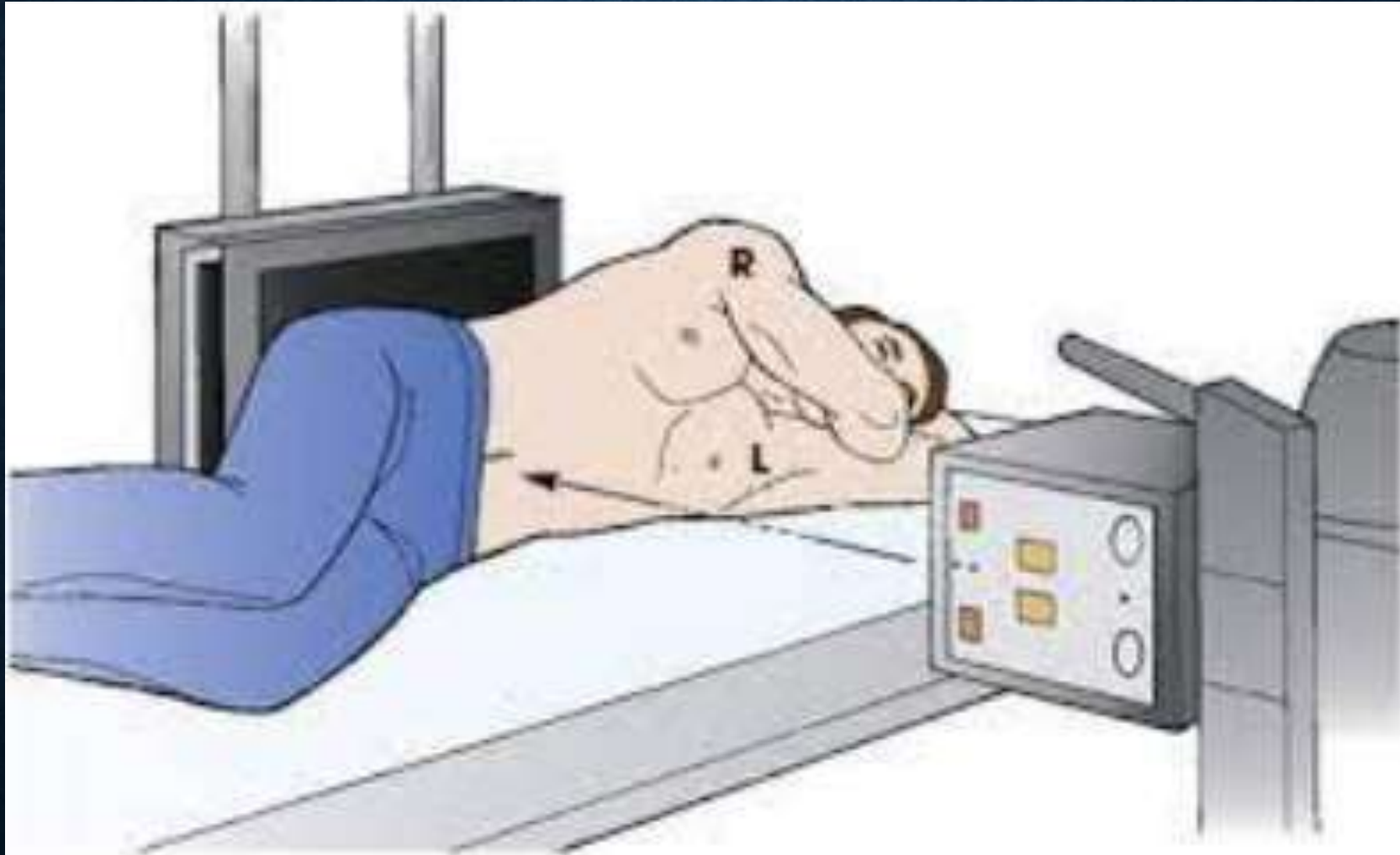
# AP VIEW





**Lateral  
View X-ray**

# LATERAL DECUBITUS CXRAY





Chest radiography with the patient in the PA upright (a) and left lateral decubitus (b) positions revealed massive left pleural effusion



## In what position were those three Chest x-ray taken ?



Standing up (erect)

Abdominal structures descend, allowing the patient to take a deeper breath



Sitting (semi-erect)

often appear lordotic



Lying down (supine)

- heart size and mediastinal width is exaggerated
- poor pulmonary vascularisation

the vascular supply to the upper and lower lobes of the lungs is equal because gravity has no effect

The choice of position depends on age and the patient's condition

## key points

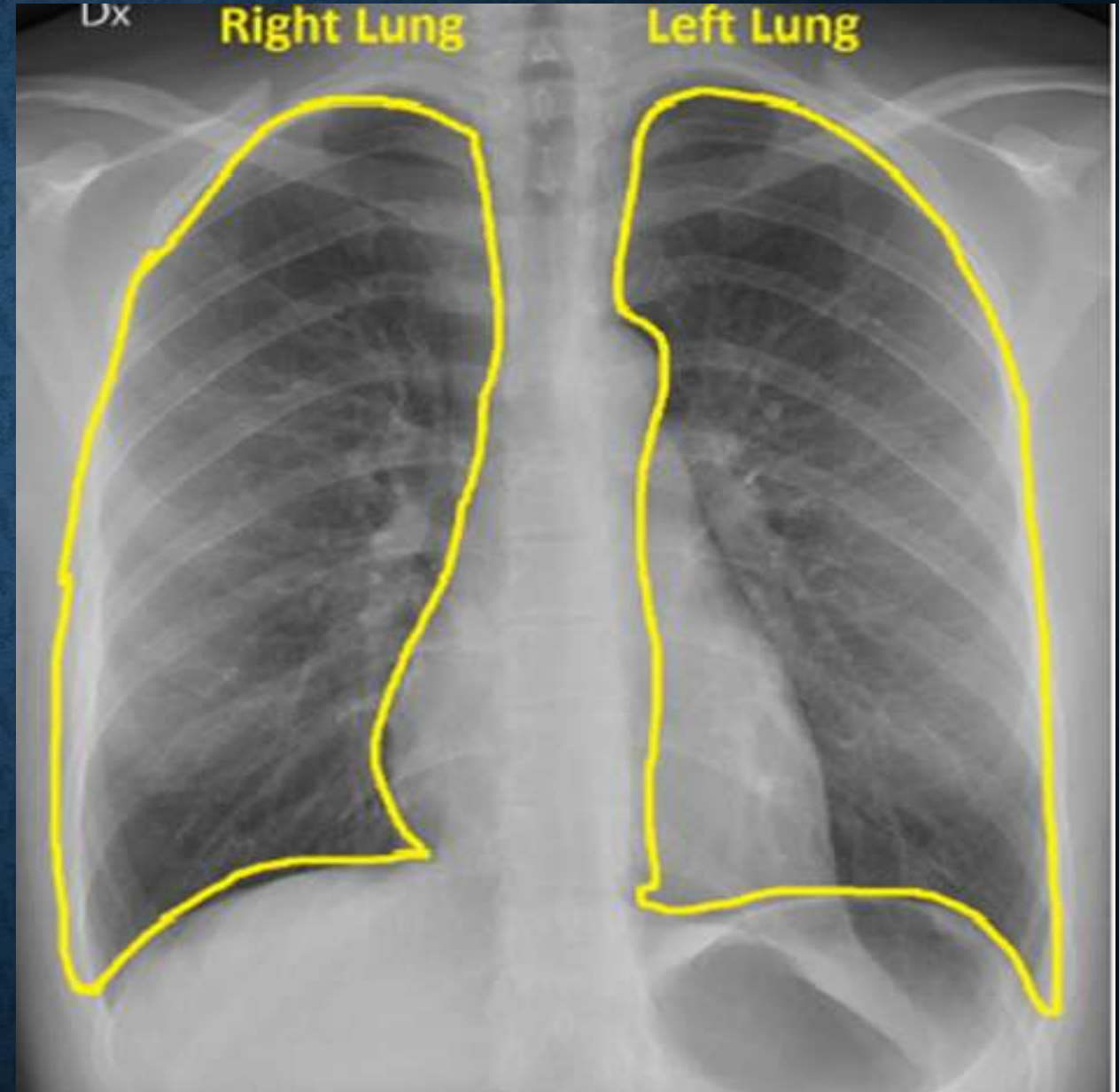
- ▶ Child CXR has specific Technical and anatomical aspects
  - AP view under 5 years old
  - PA view over 5 years old
  - Lateral view : systematic if doubt or to assess any focal areas of increased opacity (anterior posterior )
  - Other views have their own indications :
    - Expiration view in case of acute dyspnea:  
Foreign body, Pneumothorax
    - Lateral supine view: Pleural effusion , foreign body
- ▶ When interpreting a child's CXR use the systematic approach
  - Check the Good quality factors :  
inspiration, rotation, penetration  
they can help you avoid misinterpretations
  - Then Assess the 3 circles with an inward progression
  - Don't forget the Hidden zones

Interpretation of Child CXR Through  
Systematic approach

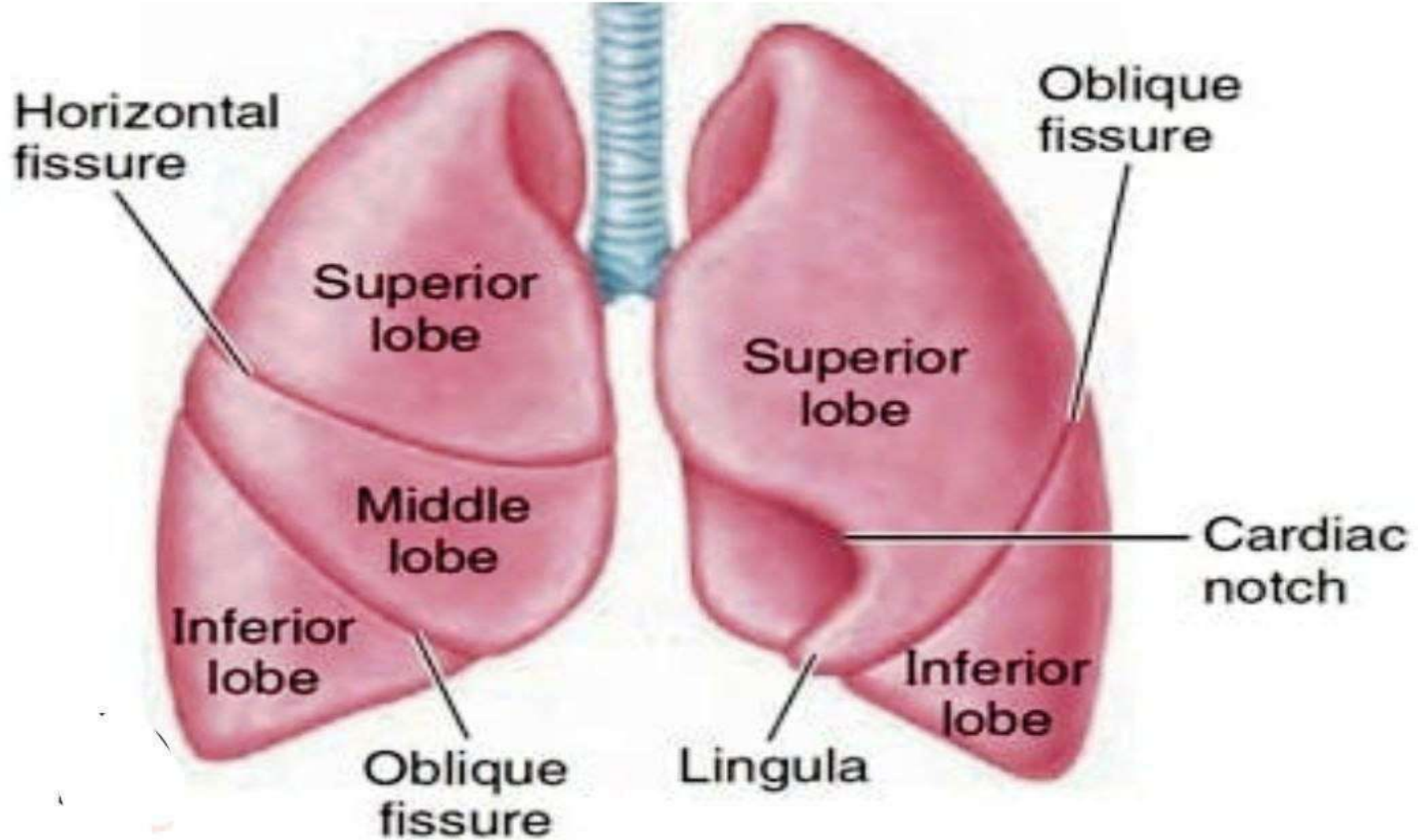
**Here I've outlined the lungs in yellow.**

**You can see that part of the left lung overlaps the heart.**

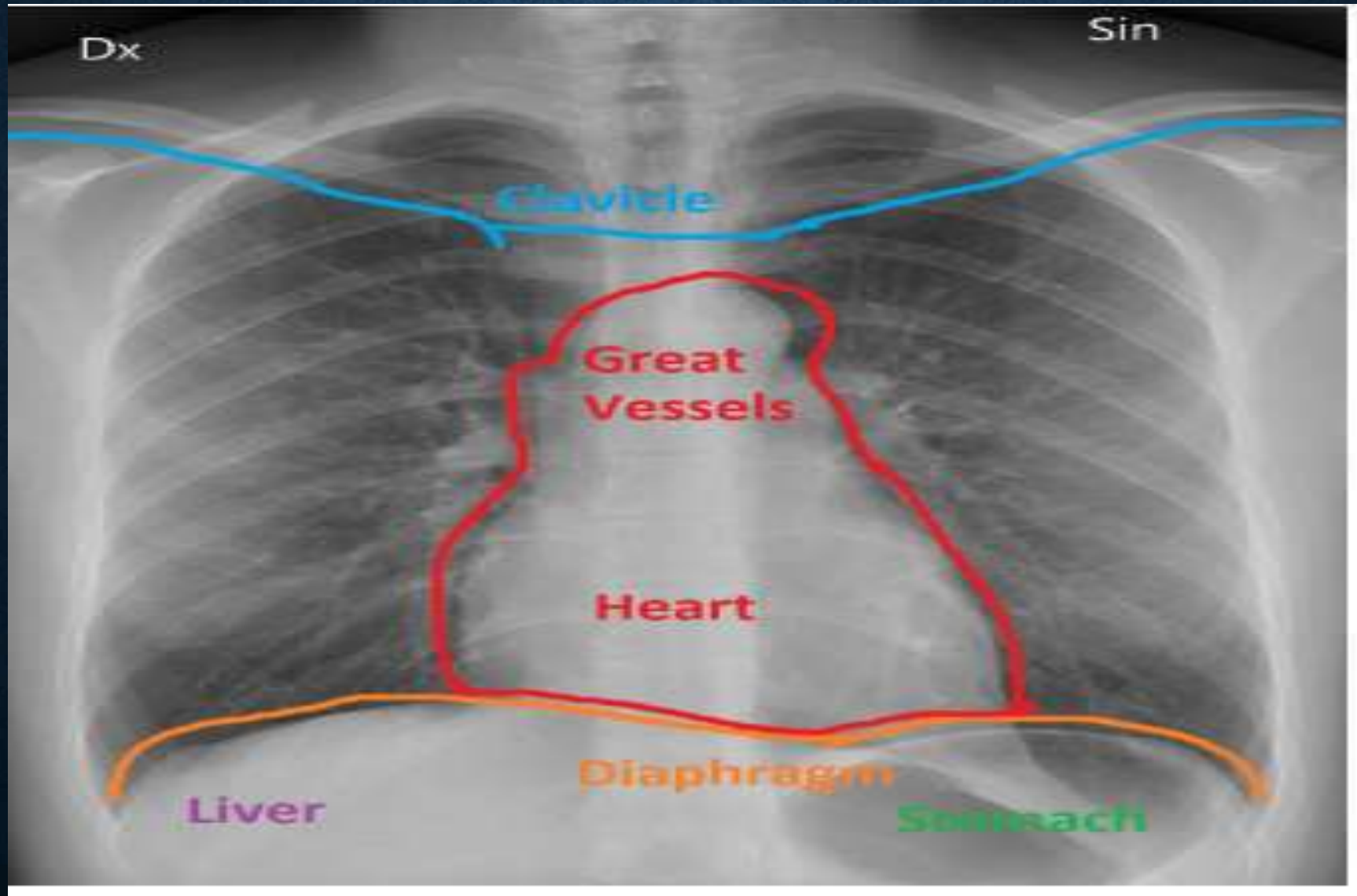
**The lungs are the darkest part of the chest x-ray because they are the least dense.**



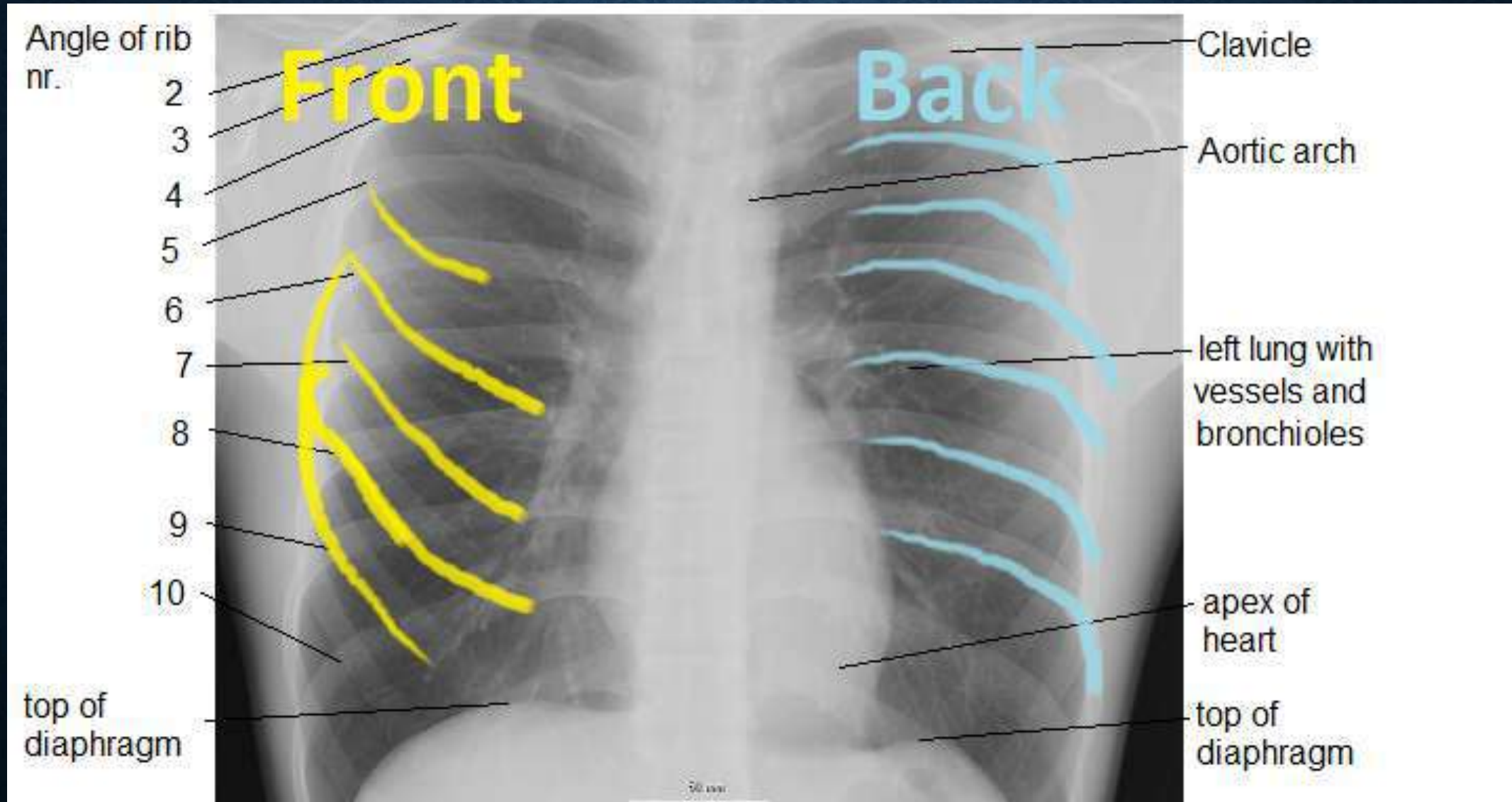
# FISSURES



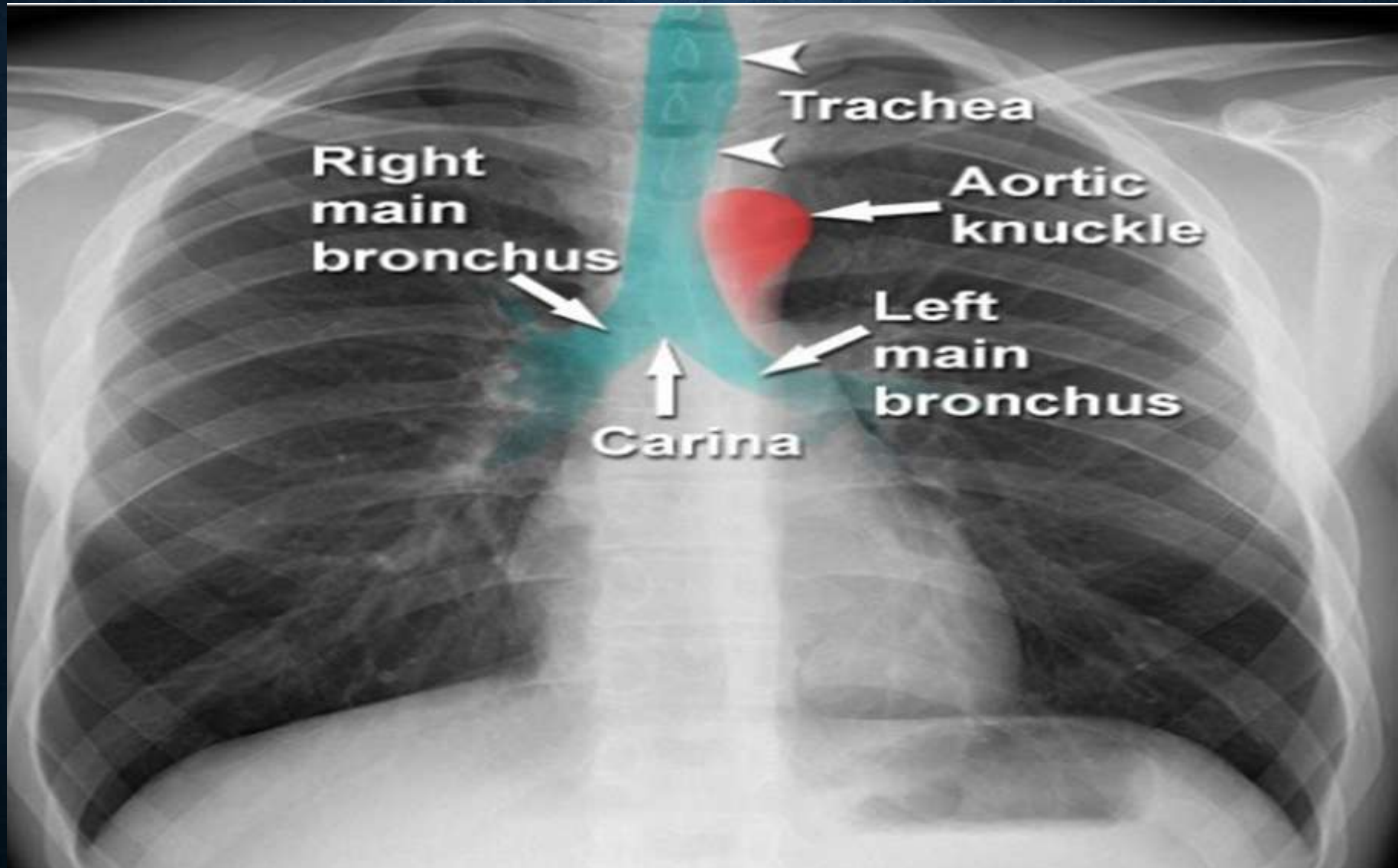
# LET'S SEE MORE STRUCTURES:



# CHALLENGING RIBS!

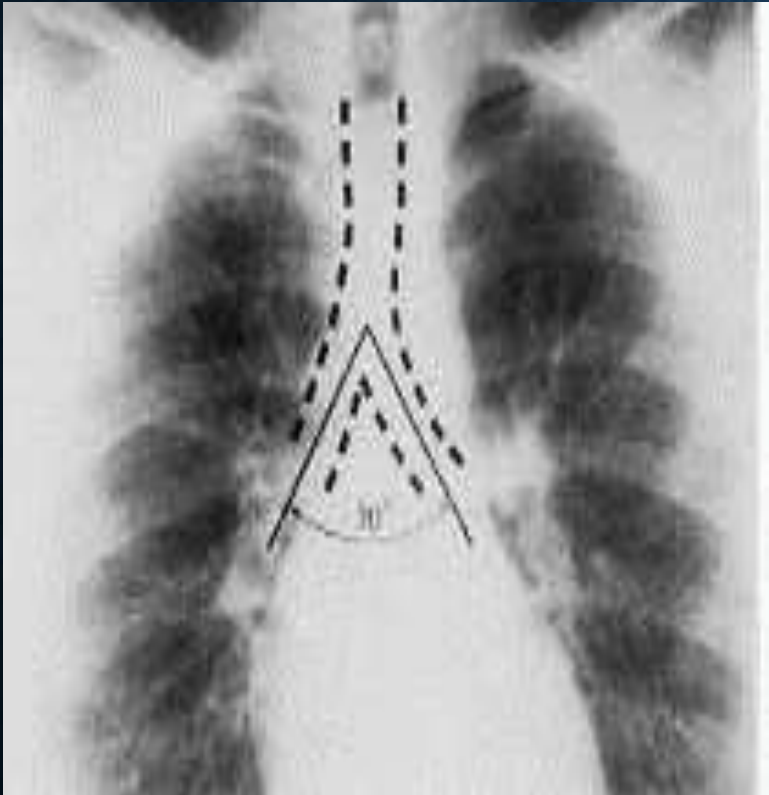


# LARGE AIRWAYS

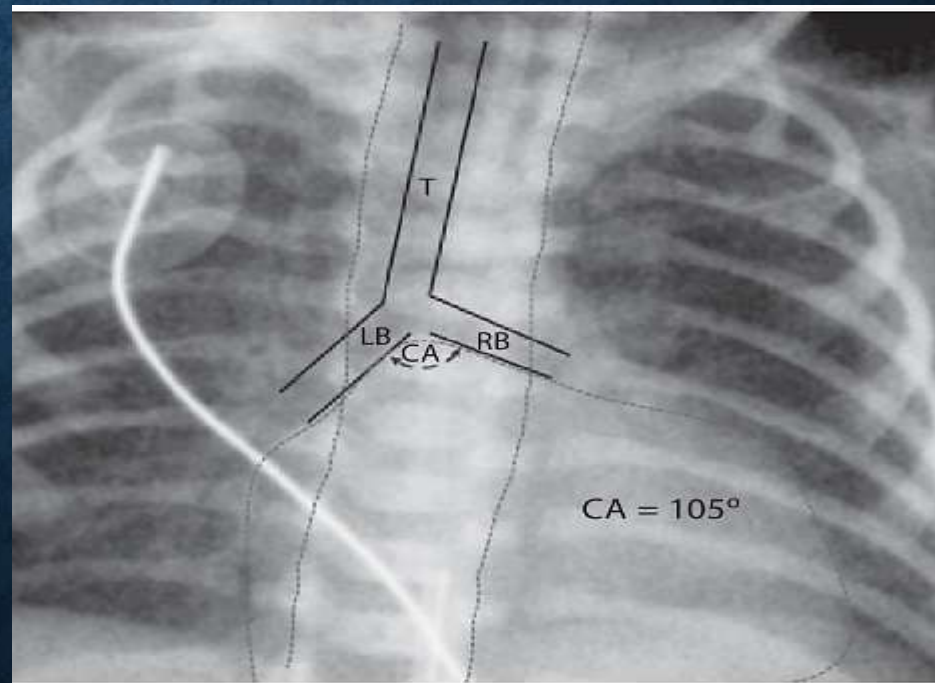


# NORMAL CARINAL ANGLE

- 60(45-75) degrees is normal

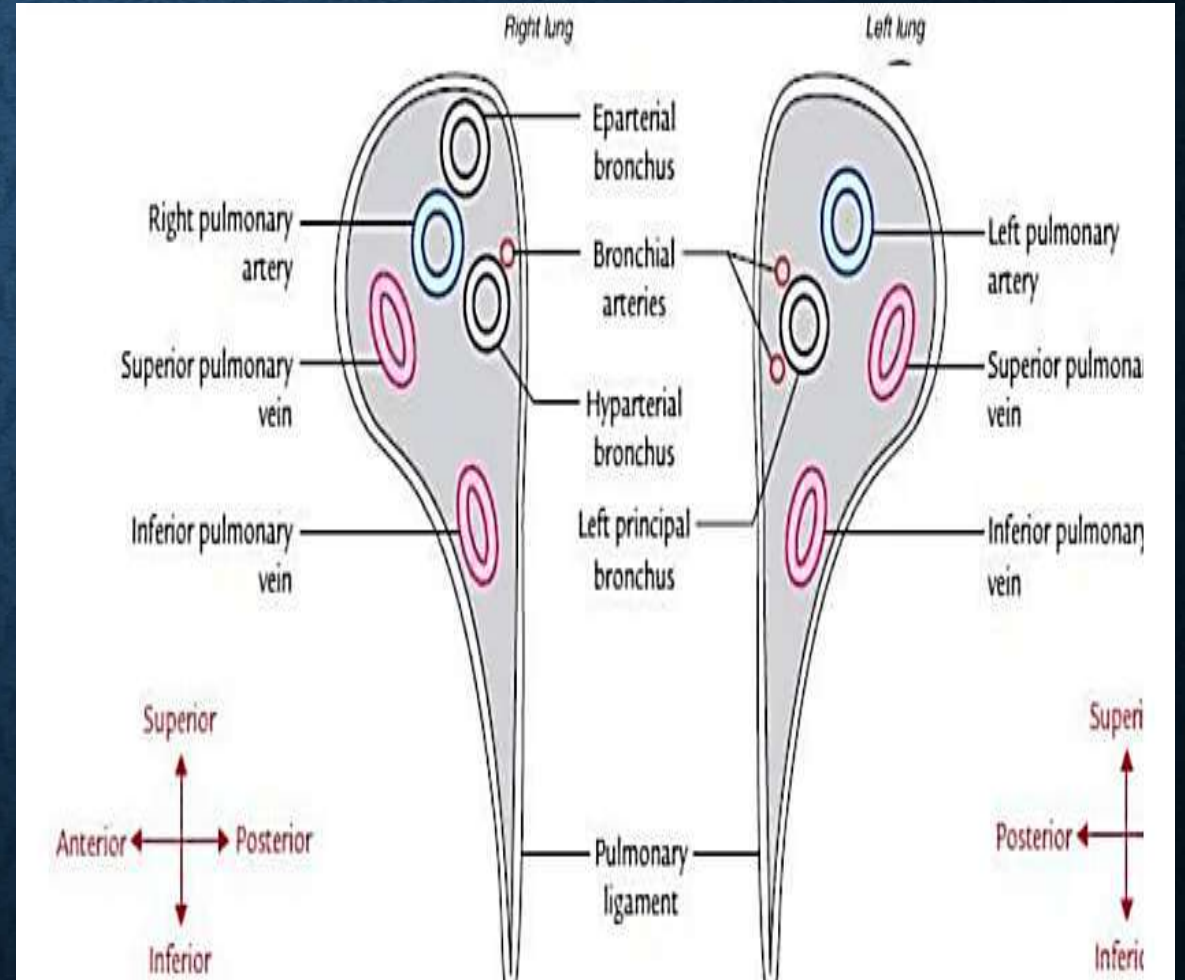
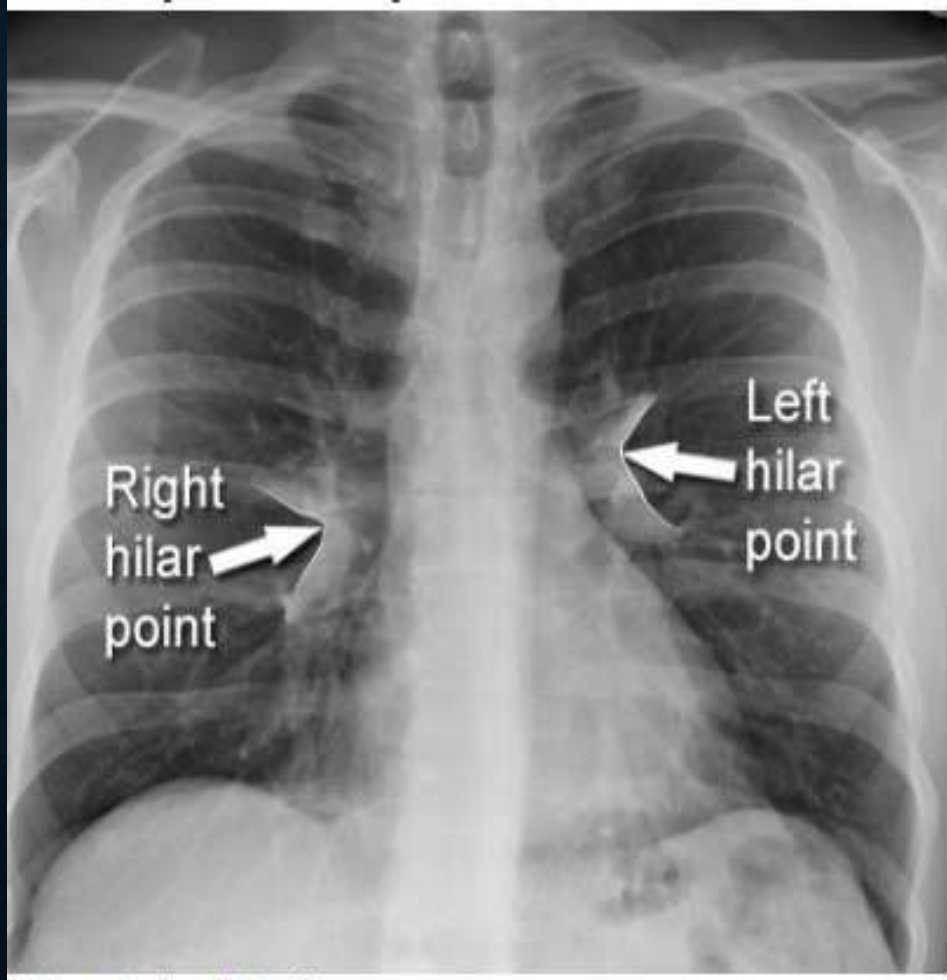


- a larger( $>75$ ) angle reflecting:
  - ❖ left atrial enlargement
  - ❖ subcarinal adenopathy



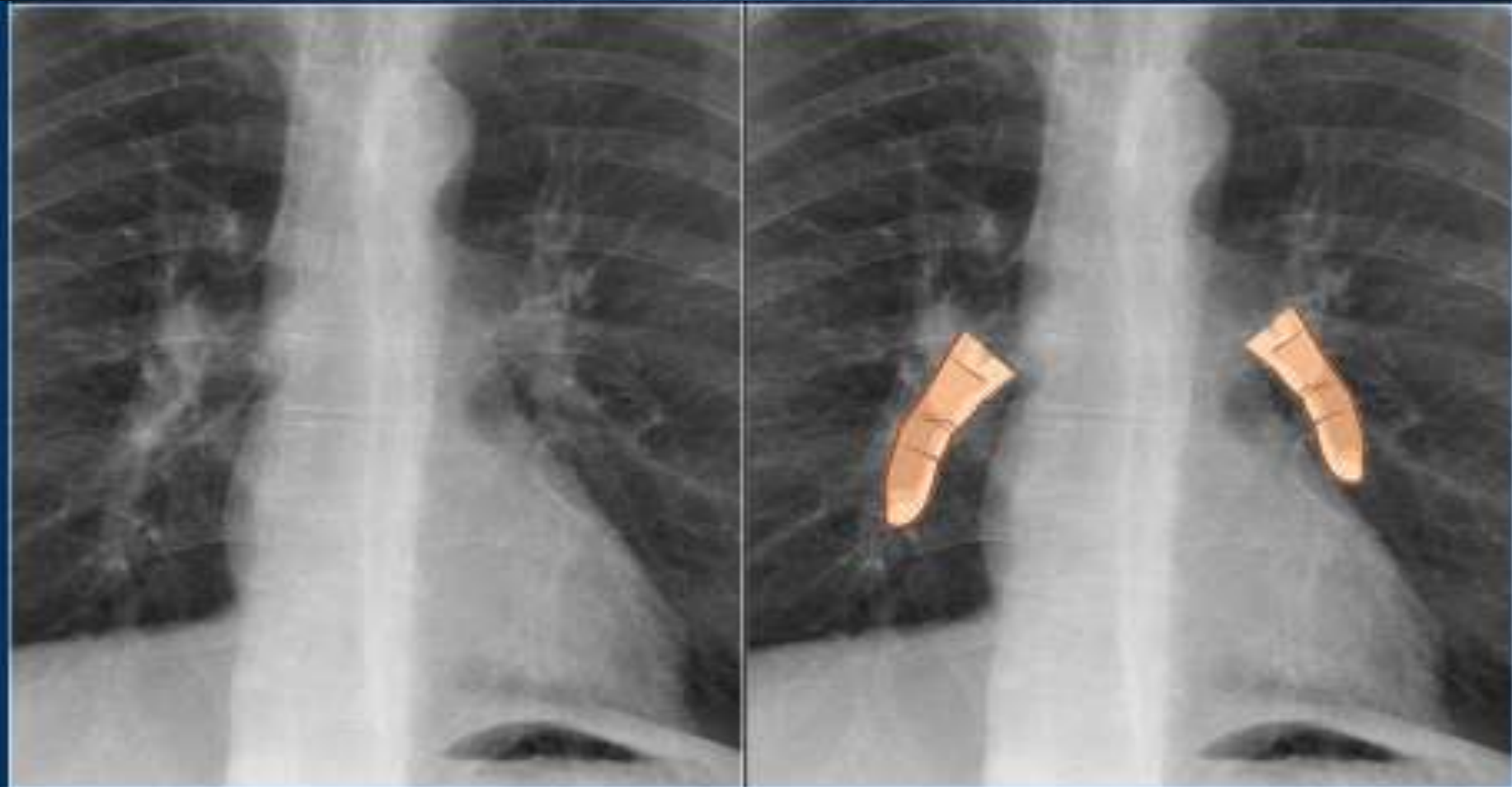


# LUNG HILUM CONTENTS

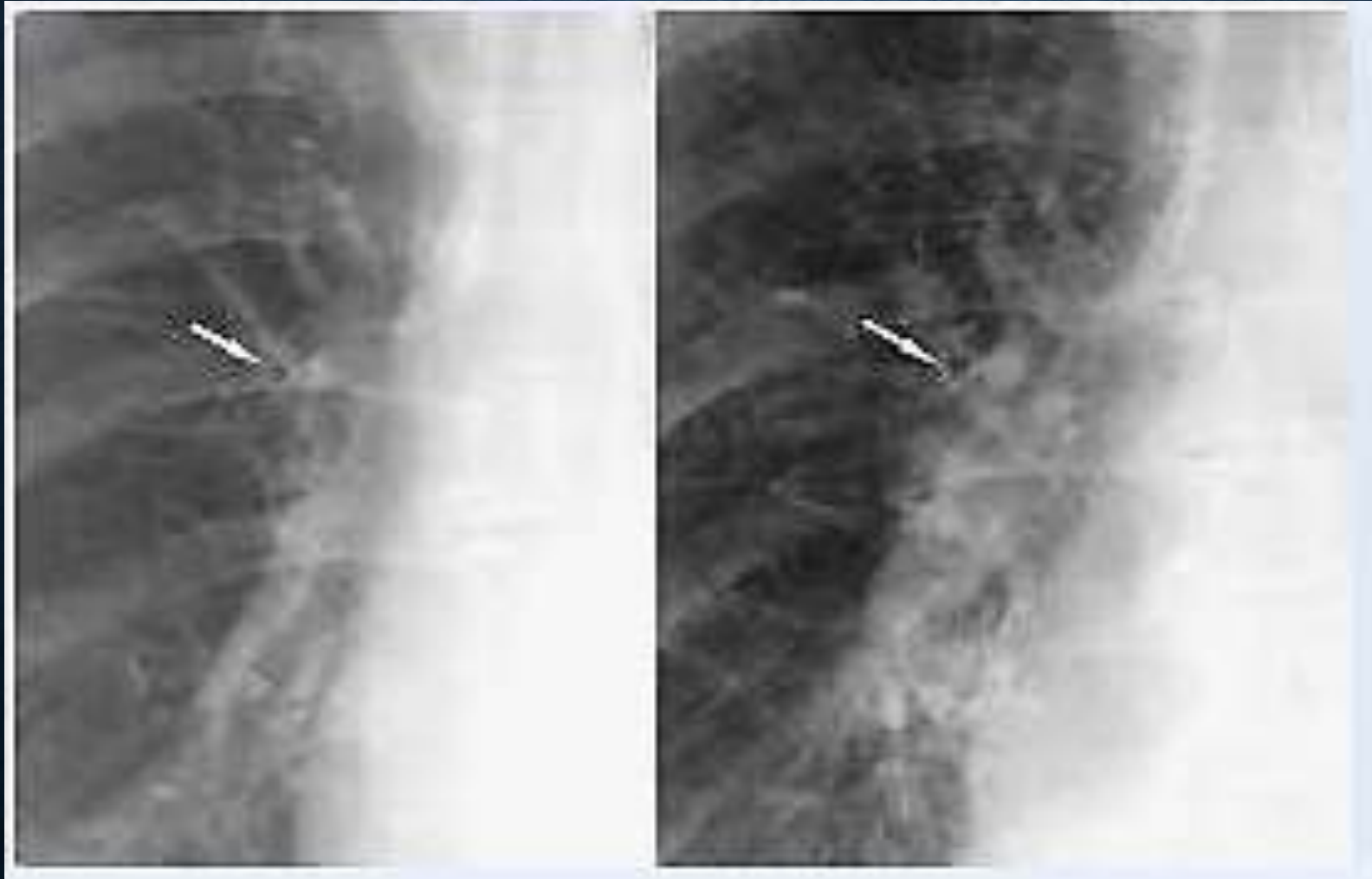


**LUNGS HILUM HAS THE SIZE OF EACH PERSON LITTLE FINGER.**

**RIGHT SIDE IS LOWER THAN LEFT SIDE**



# PERIBRONCHIAL CUFFING



# Normal chest: poor inspiration

Poor inspiration and rotation to the left produce an abnormal-appearing chest.

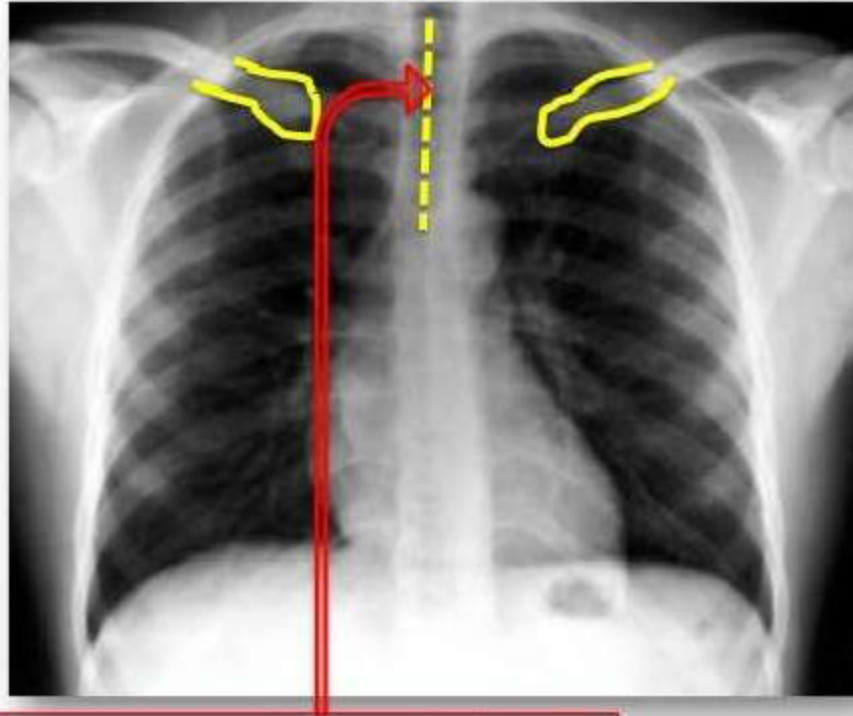
A few minutes later, deep inspiration results in a normal chest roentgenogram



## criteria for normal inspiration\* (normal lung volume)

1. **8/9th posterior rib** or **6/7th anterior rib** above the diaphragm
2. Less than 1/3rd of the heart below the diaphragm
3. The domes of the diaphragm are rounded
4. The lungs are air-filled ( black)

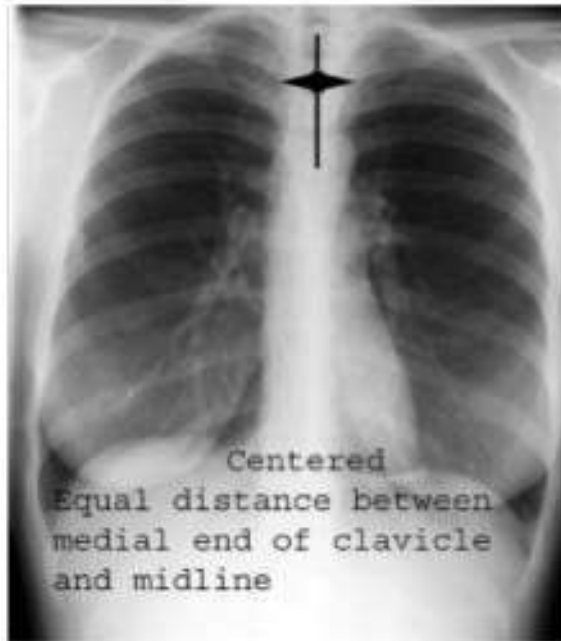
# Rotation



If the spinous process of the vertebral body is equidistant from the medial ends of each clavicle, there is NO rotation



## Rotation

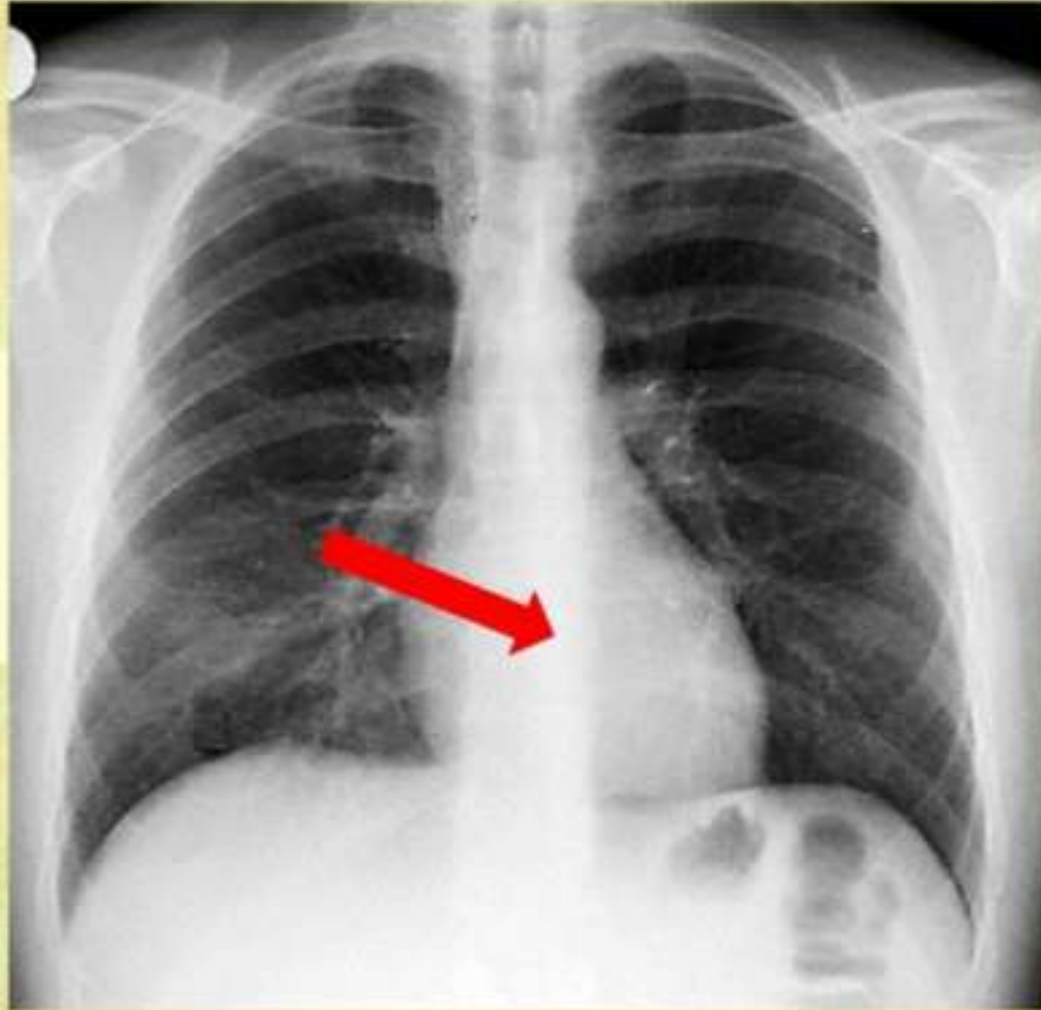


## Chest X-ray quality - Penetration

Clip slide

### Good penetration

You should be able to **just see** the thoracic spine through the heart



## Chest X-ray quality - Penetration

- ❑ An **under-penetrated** film looks **diffusely opaque** (too white), **structures behind the heart** are obscured, and **left lower lobe** pathology may be easily missed.
- ❑ An **over-penetrated** film looks **diffusely lucent**, the lungs appear blacker than usual and **the vascular markings** and **lung detail** are poorly seen.



Underpenetration: Likelihood of missing an abnormality overlying by another structure



Overpenetration: results in loss of visibility of low density lesion e.g. early consolidation



## key points

When interpreting a child's CXR use the systematic approach

- ▶ Check the Good quality factors :  
inspiration, rotation, penetration
- ▶ Assess the 3 circles with an inward progression  
with a good knowledge of infant specificities

Ribs, clavicles : lesions in bones , accidental injuries , deformities

Diaphragms: check their shape , symmetry and elevation

Lungs : read from top to bottom , compare right and left

Look for assymetry, areas of different lucencies, vascularisation

Unilateral hyperlucencies: foreign body aspiration, pneumothorax

Opacities : Pneumonia , atelectasis , pleural effusion...

## key points

### Airways :

- Normal Trachea buckle in expiration in infant
- look at size, position , displacement

### Mediastinum:

- Normal Thymus varies in size with age
- Know the clues to localize different masses
- Adenopathy often due to inflammatory or infectious causes  
TB is the main etiology in country with high incidence

• Other mediastinal masses : lymphoma, bronchogenic cyst, neuroblastoma , neurofibroma

### Heart :

- Shape changes with age and position
- Make sure you look at the lung behind the heart  
( a favorite place for pneumonia )

▶ DO NOT SKIP ANY ITEM ON THE CHECKLIST !

**First Circle:**

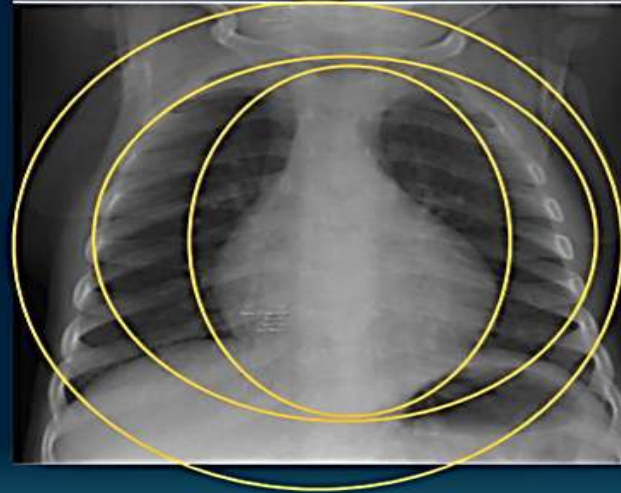
- Soft part of the chest wall
- Diaphragmatic areas
- Bony Thorax abnormalities

**Second Circle:**

- Lung parenchyma and vasculature
- Read from top to bottom
- Compare left and right side

**Third circle:**

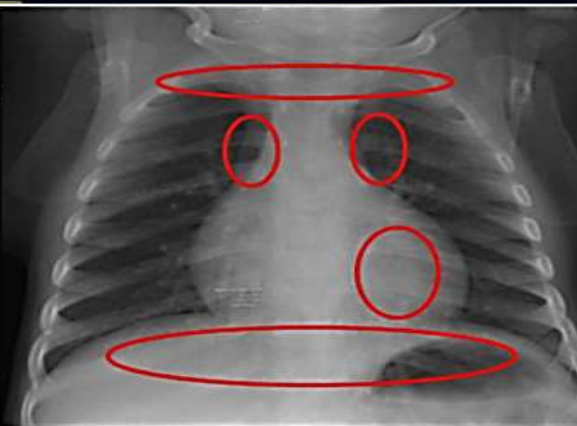
- Airway
- Mediastinum :
  - The container  
(= edges, contours )
  - The content  
(= behind the heart)



**The hidden areas: worth a second look**

There are some areas that need special attention, because pathology in these areas can easily be overlooked:

- Apical zones
- Hilar zones
- Retrocardial zone
- Zone below the dome of diaphragm



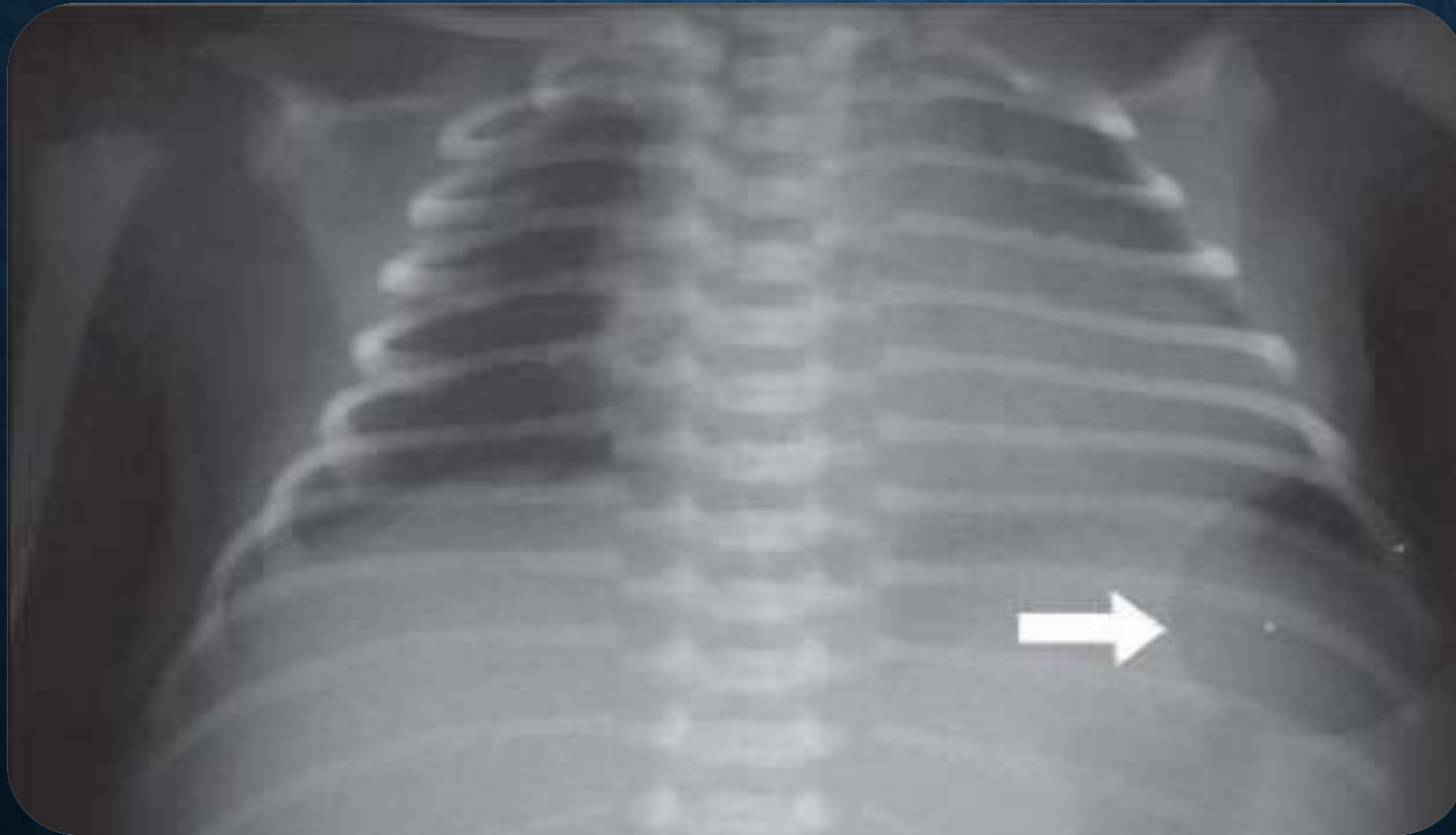
## ◇ Pitfalls and Artefacts

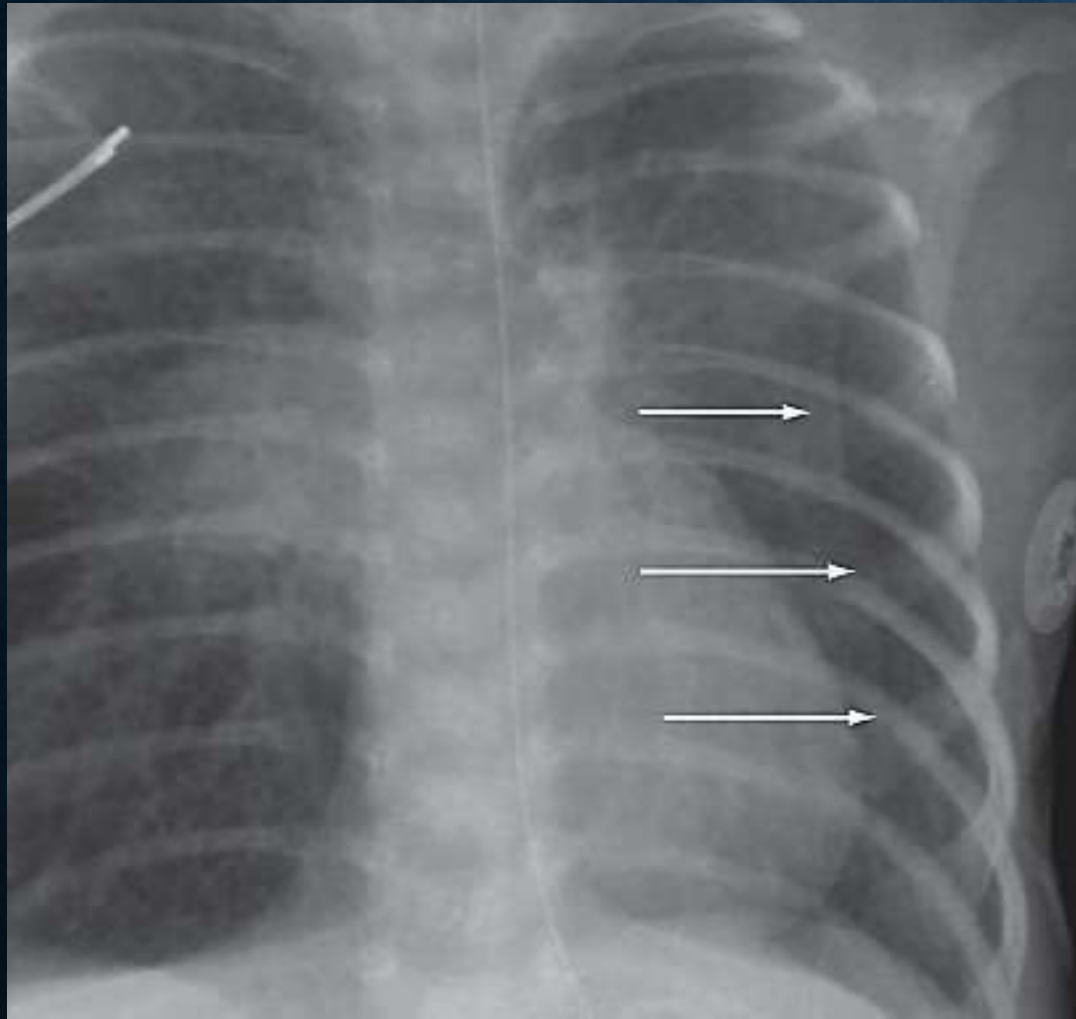
What do you see on this X-ray ?



linear opacity extending over  
the thorax : Brade

**1 HOUR OLD NEWBORN CXR DEMONSTRATING  
ARTIFACT RELATED TO PROJECTION OF NEONATAL  
INCUBATOR ACCESS PORT (ARROW)**





**SKINFOLD MIMICKING A  
PNEUMOTHORAX.  
RADIOGRAPH IN A 26-DAY-OLD  
GIRL DEMONSTRATES AN  
INTERFACE (ARROWS) IN THE  
LEFT HEMITHORAX.  
LUNG MARKINGS ARE SEEN  
PERIPHERAL TO THE  
INTERFACE, AND A  
SUBSEQUENT RADIOGRAPH  
DID NOT SHOW SIGNS OF A  
PNEUMOTHORAX**

## ◆ HYPERLUCENCIES

What do you see on this X-ray ?

- Bilateral peripheral and upper hyperlucency
- Central ill defined parahilar and peribronchial opacities



What is your diagnosis ?

- ◇ 3-year-old child, cough and dyspnea with quick onset.  
Decreased respiratory sounds on the right side

What do you see on this X-ray ?



The air is trapped in expiration in the right lung  
with mediastinal shift towards the normal contralateral side :  
Foreign body in the main right bronchus



What do you see on this X-ray ?



INSPIRATION



EXPIRATION

What is your diagnosis ?

The air is trapped in expiration in the left lung  
with mediastinal shift towards the normal contralateral side :  
Foreign body in the main left bronchus

## First Circle:

- Soft part of the chest wall
- Diaphragmatic areas
- Bony Thorax abnormalities



## First Circle:

- Diaphragmatic areas

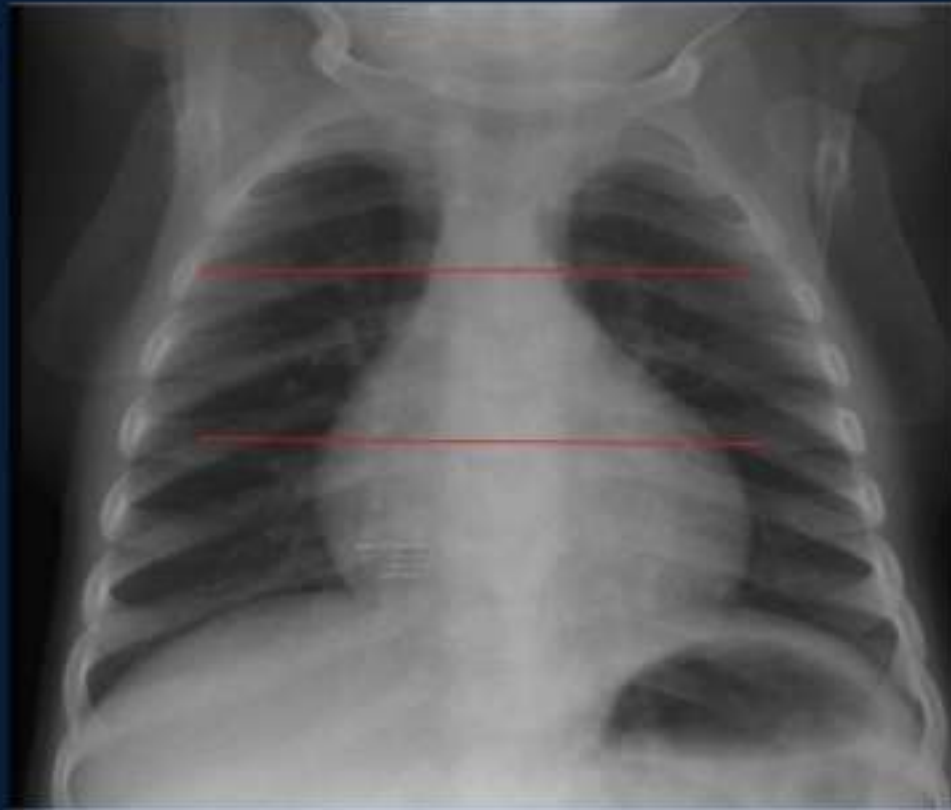
### ◆ Diaphragm

- The hemidiaphragms have a slightly domed contour
- The right side is usually higher than the left side ( liver)
- Curving can be due to phrenic nerve paralysis, liver enlargement, abdominal tumour ....
- Loss of clarity in upper zone if pulmonary collapse or consolidation obscuring the diaphragm



## Second Circle:

- Lung parenchyma and vasculature
- Read from top to bottom
- Compare left and right side



- Look for areas of different lucency
- Look at the vascularisation
- Lungs should appear “black” with thin white lung markings that extend almost to the periphery of the lung fields