



# Radiologic investigation of Chest and CVS diseases

By

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**KKUH**

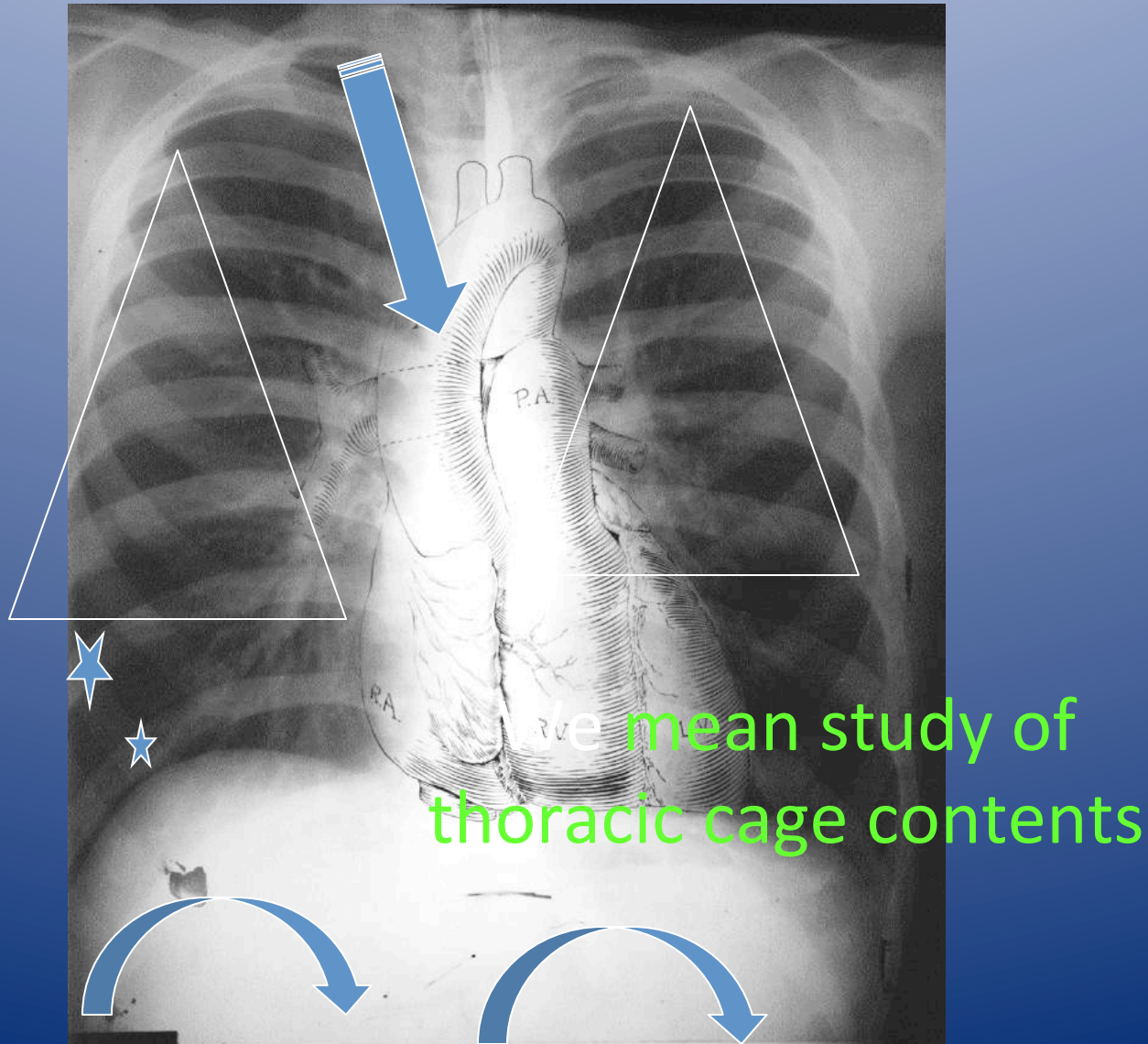
**KING SAUD UNIVERSITY**

LAST UPDATE

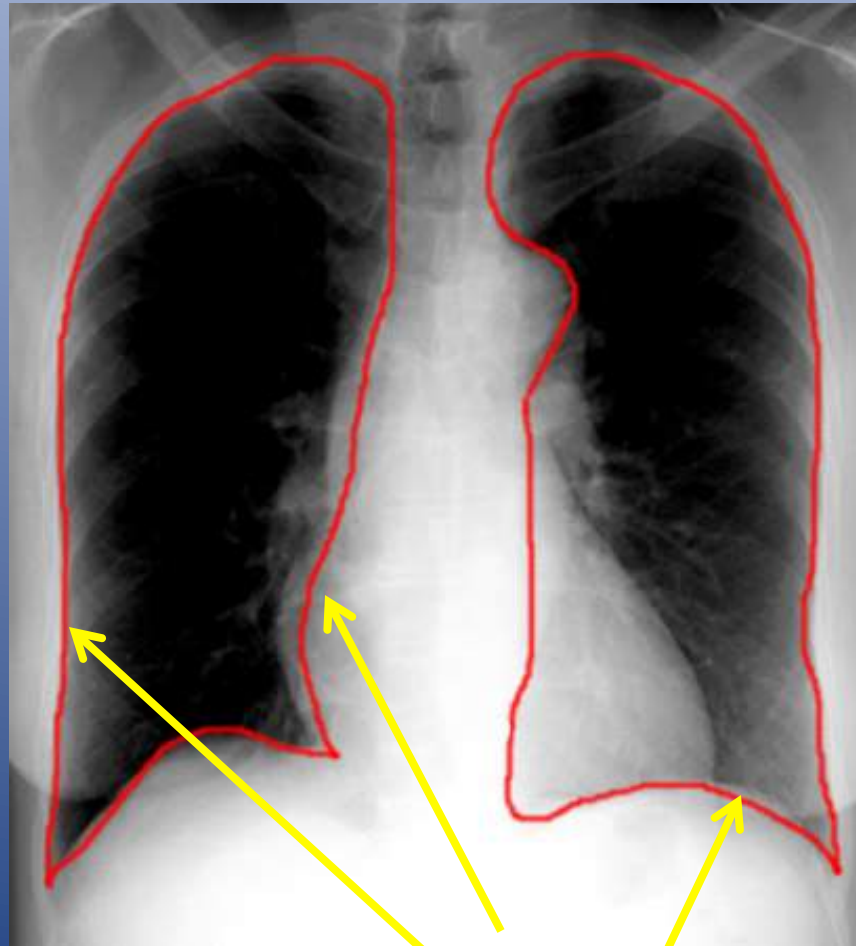
October 2016 5

LECTURES SERIES

# What do we mean by chest



# LUNGS



Pleural lining

# BASIC CHEST EXAMS

- PLAIN FILM=CHEST X-RAY(CXR)
- CT FOR CHEST AND MEDIASTINUM
- CT FOR LUNG PARENCHYMA *HRCT*
- MRI
- ANGIOGRAMS

# BASIC CHEST EXAM FOR THE HEART

- PLAIN FILM=CHEST X-RAY(CXR)
- CT FOR HEART AND MEDIASTINUM
- ANGIOGRAMS
- MRI
- ULTRASOUND (ECHOCARDIOGRAPHY)
- ISOTOPIC SCANNING

# Imaging Modalities for chest and CVS examinations

1-Plain films

2-COMPUTED TOMOGRAPHY

**CT LUNGS AND MEDIASTINUM**

**CT- angiography (CTA)**

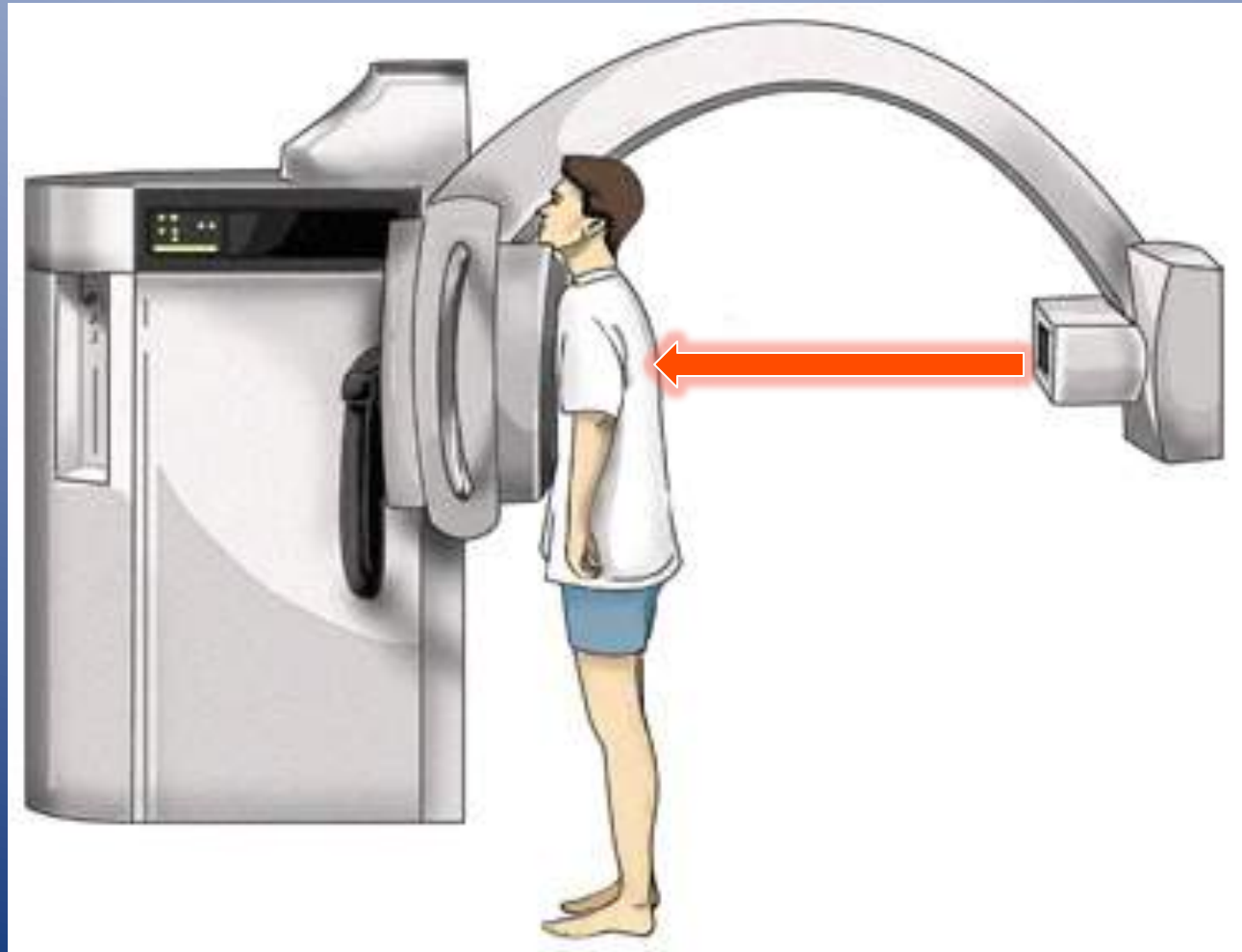
**High resolution CT of the chest  
(HRCT)**

3-Angiography

4- MRI



# Basic Chest X-Ray





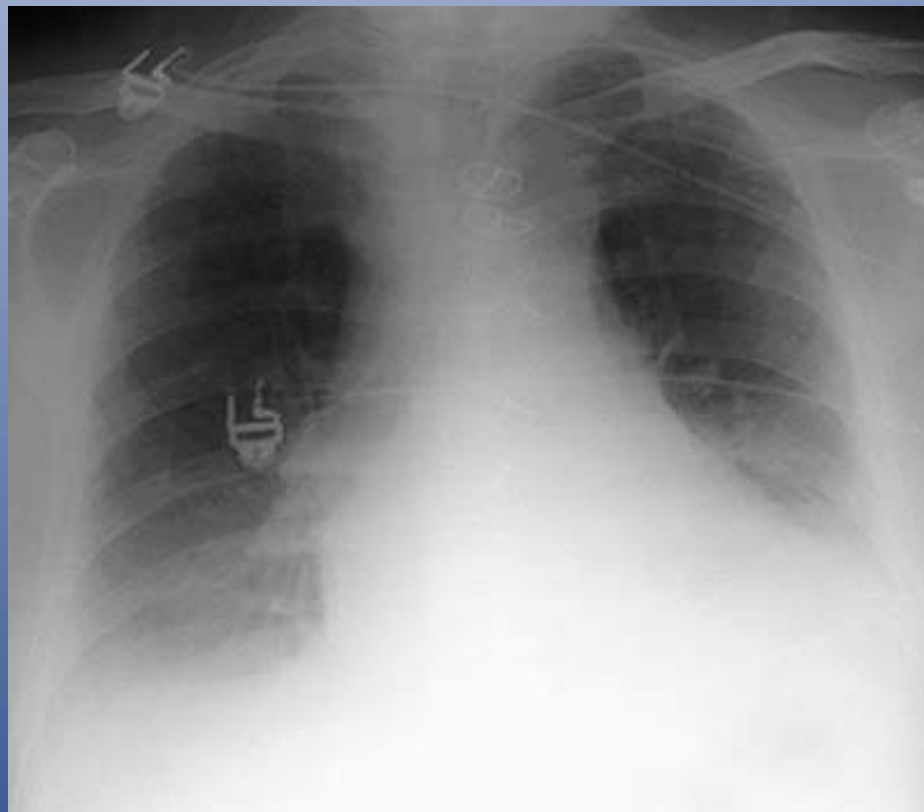
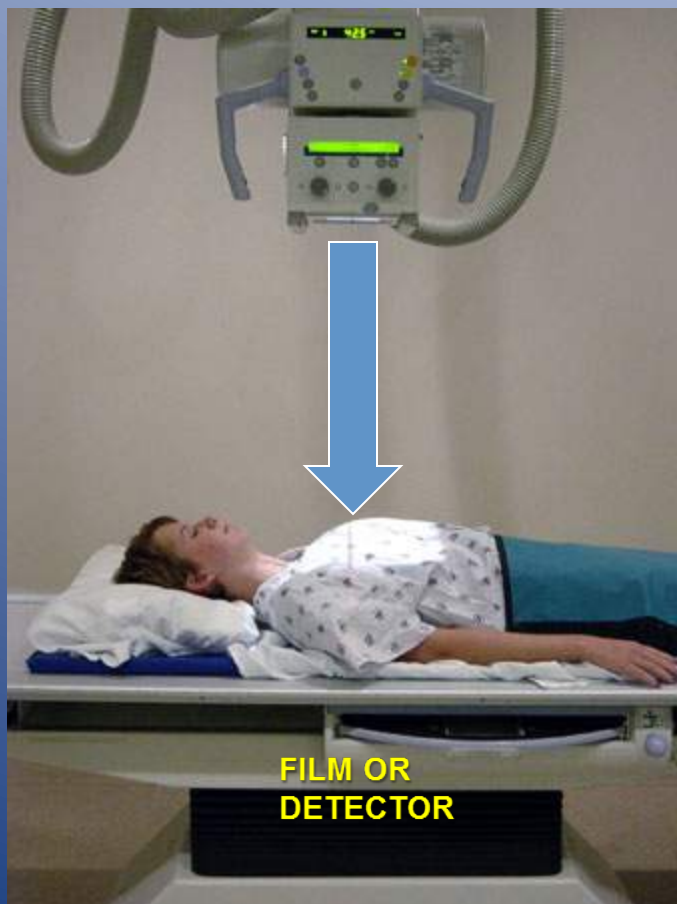
# PA VIEW



# LATERAL VIEW



# AP VIEW



# OPTIMAL EXAMINATION

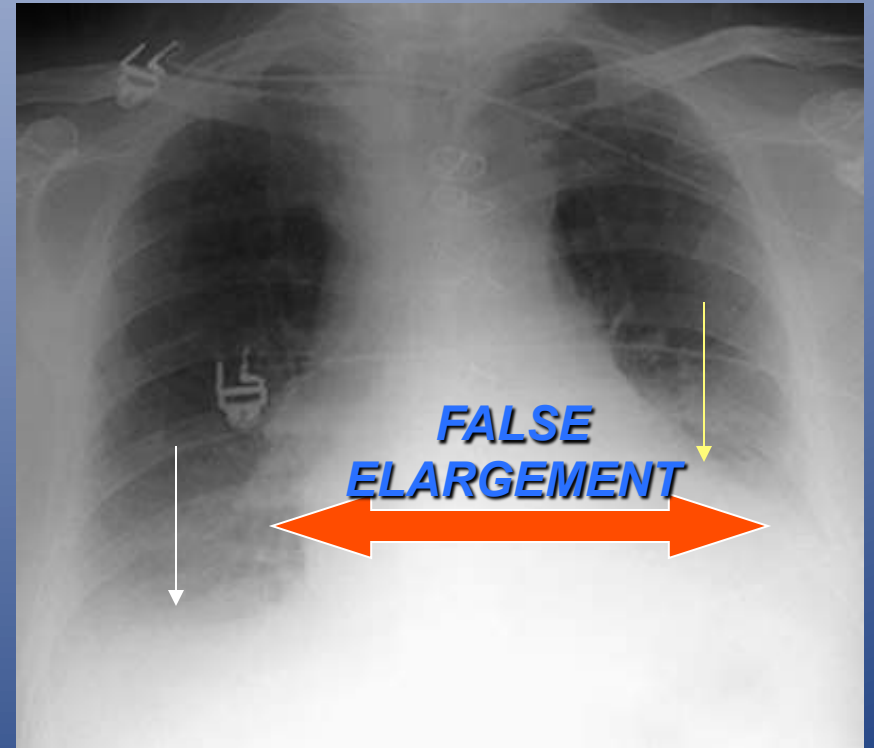
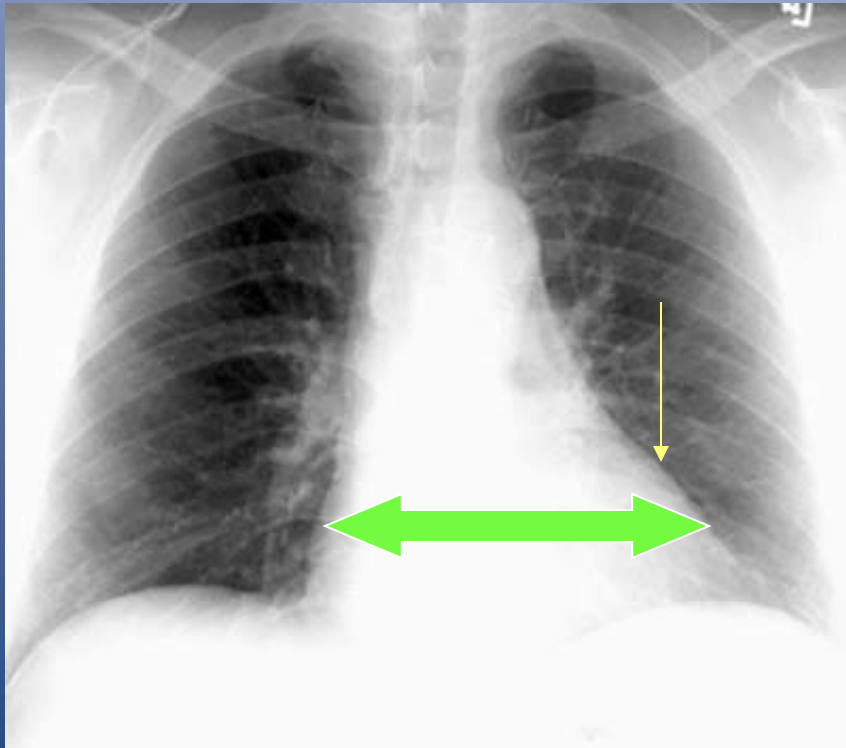
# Patient data



PA

vs.

AP

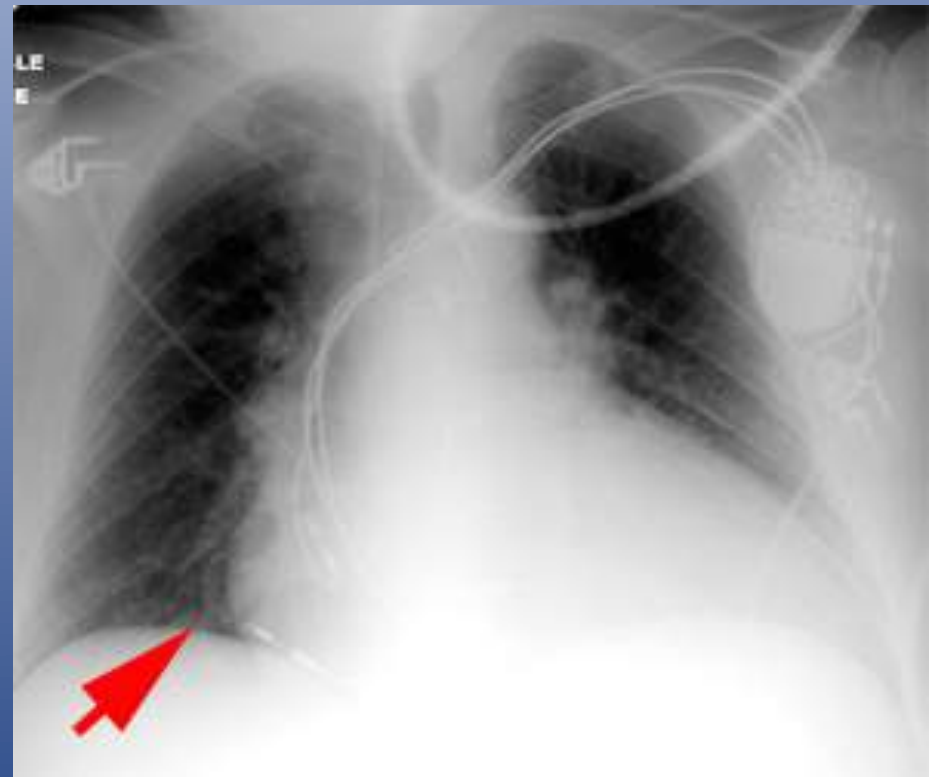
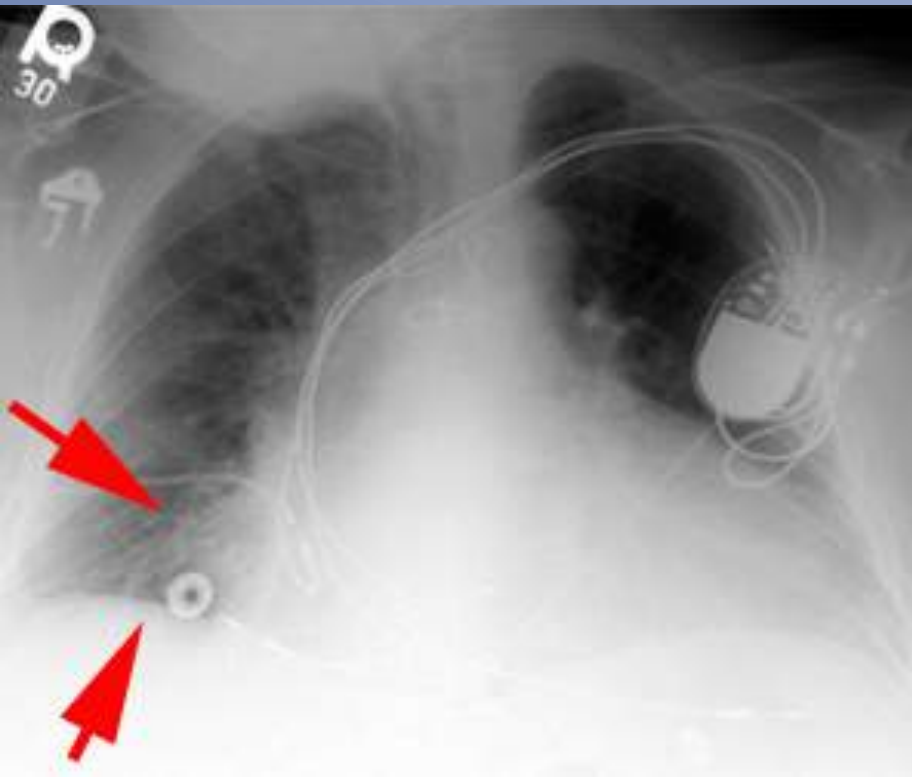


# Technical Factors

- Depth of inspiration
- Visualization of pathology depends on contrast provided by air in the lungs
- Count ribs!
- PATIENT NOT ROTATED



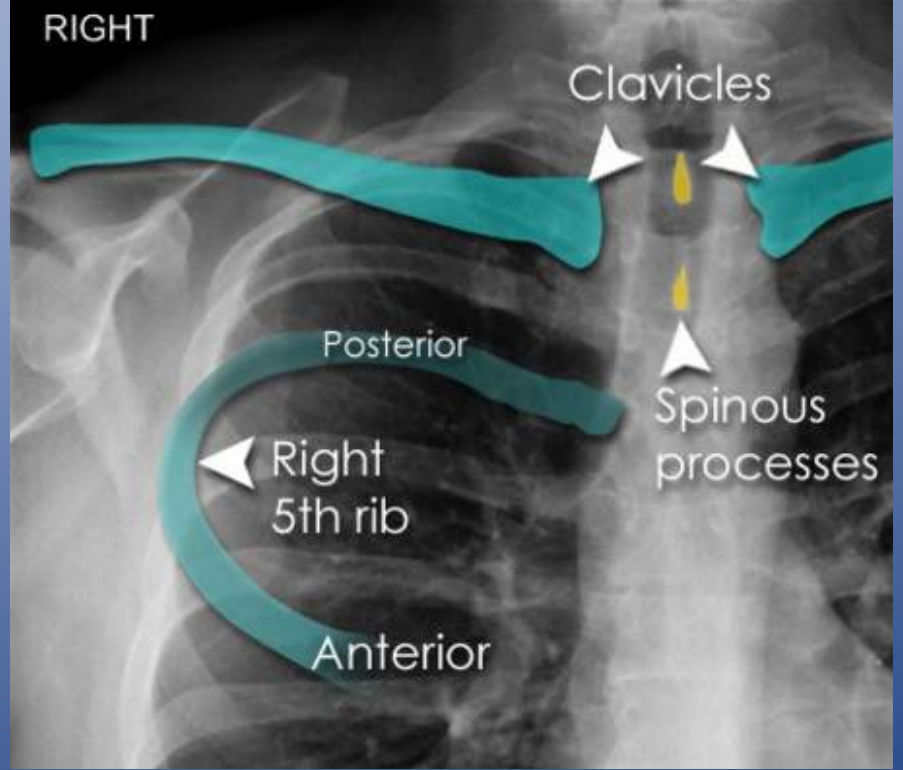
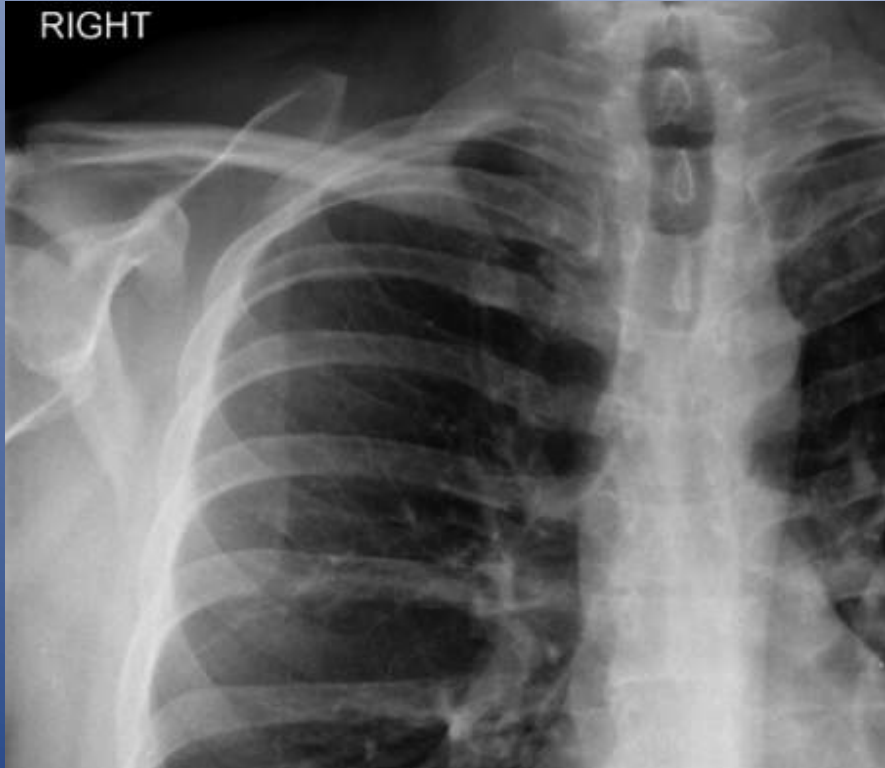
# Hypo-inspiratory vs inspiratory



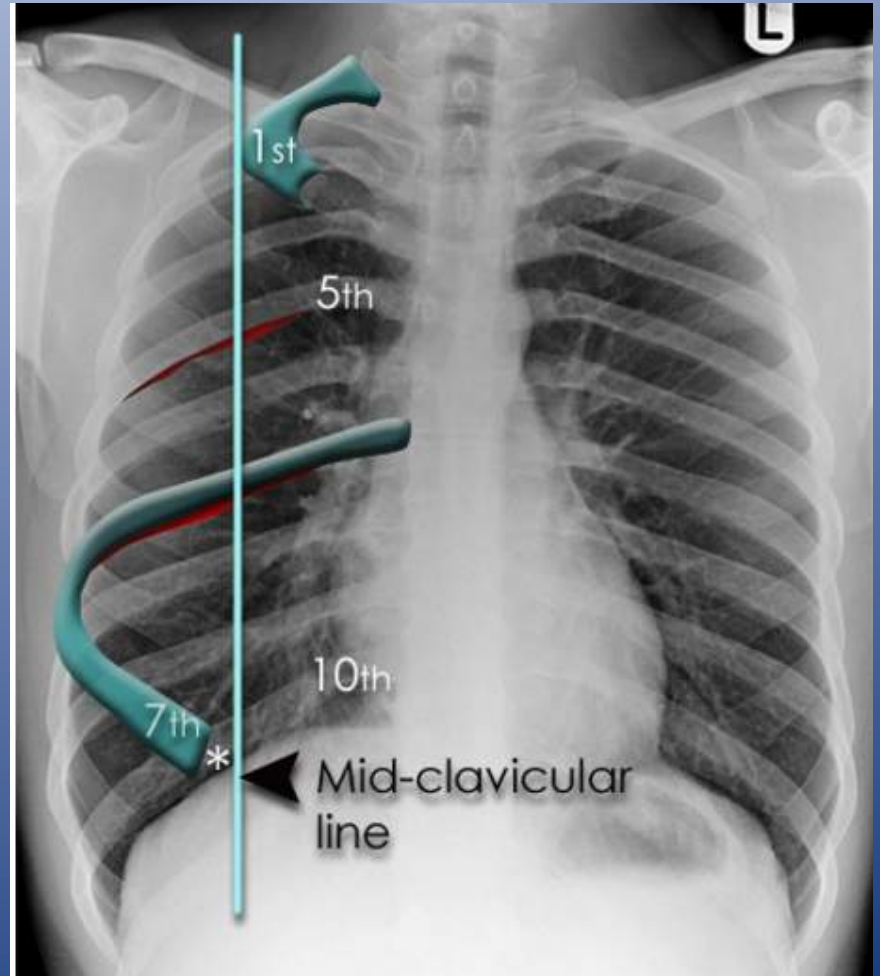


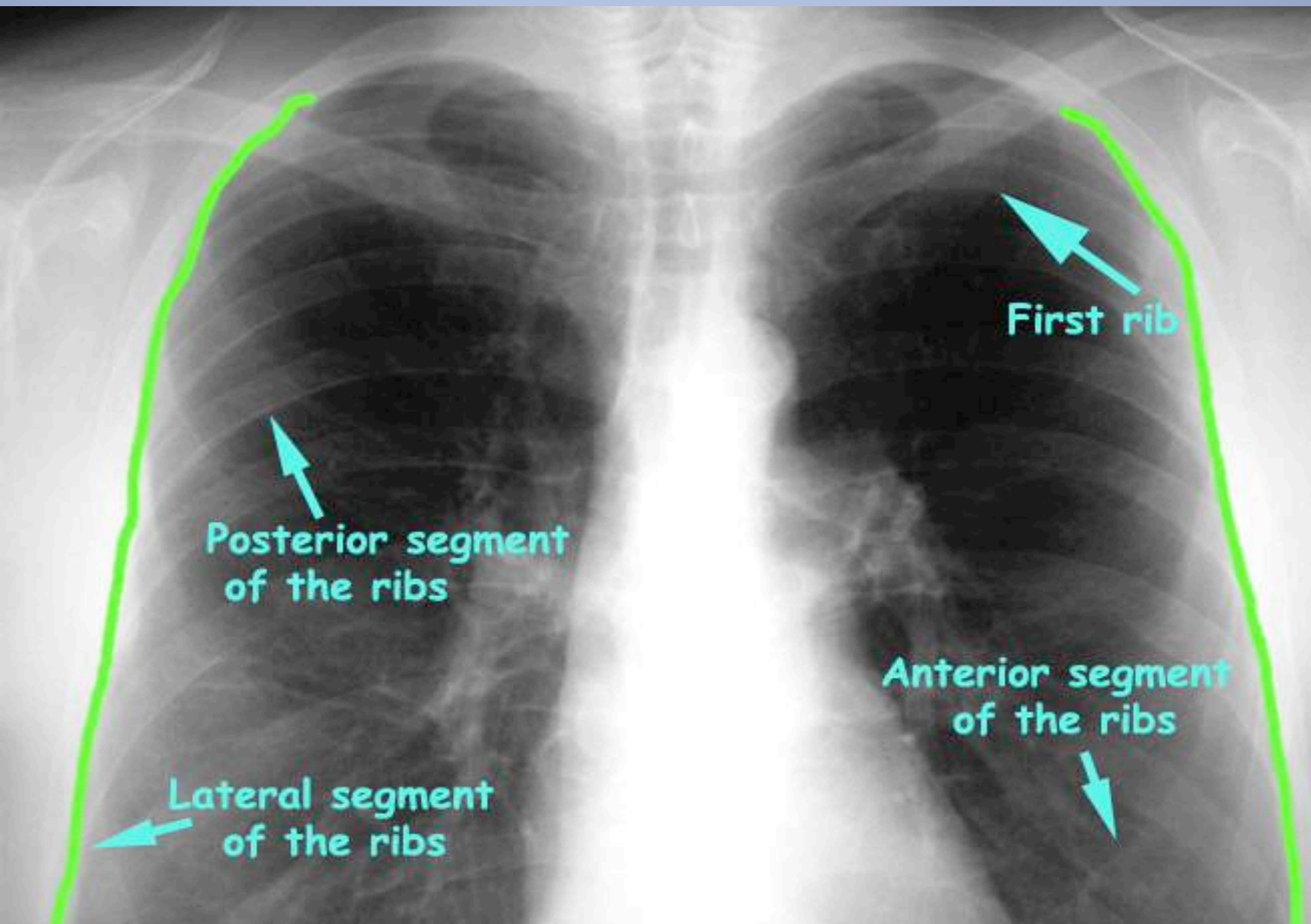
# Inspiration

- This greatly helps the radiologist to determine if there are **intrapulmonary abnormalities**.
- The diaphragm should be found at about the level of the 8th - 10th posterior rib or 5th - 6th anterior rib on good inspiration.



# RIBS





First rib

Posterior segment  
of the ribs

Anterior segment  
of the ribs

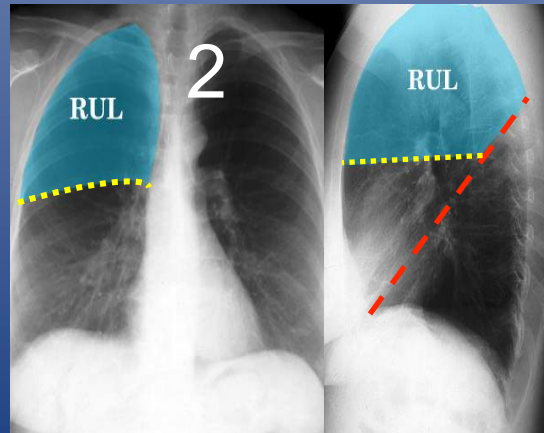
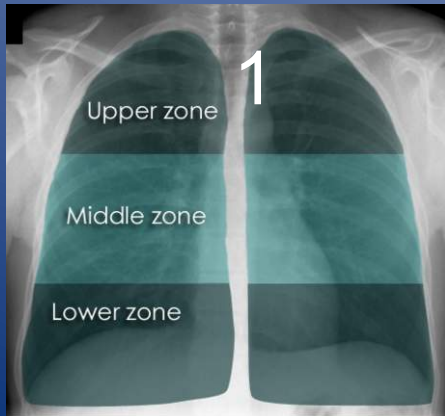
Lateral segment  
of the ribs

FOR DIAGNOSTIC REASONS

# DIVIDING LUNG FIELDS

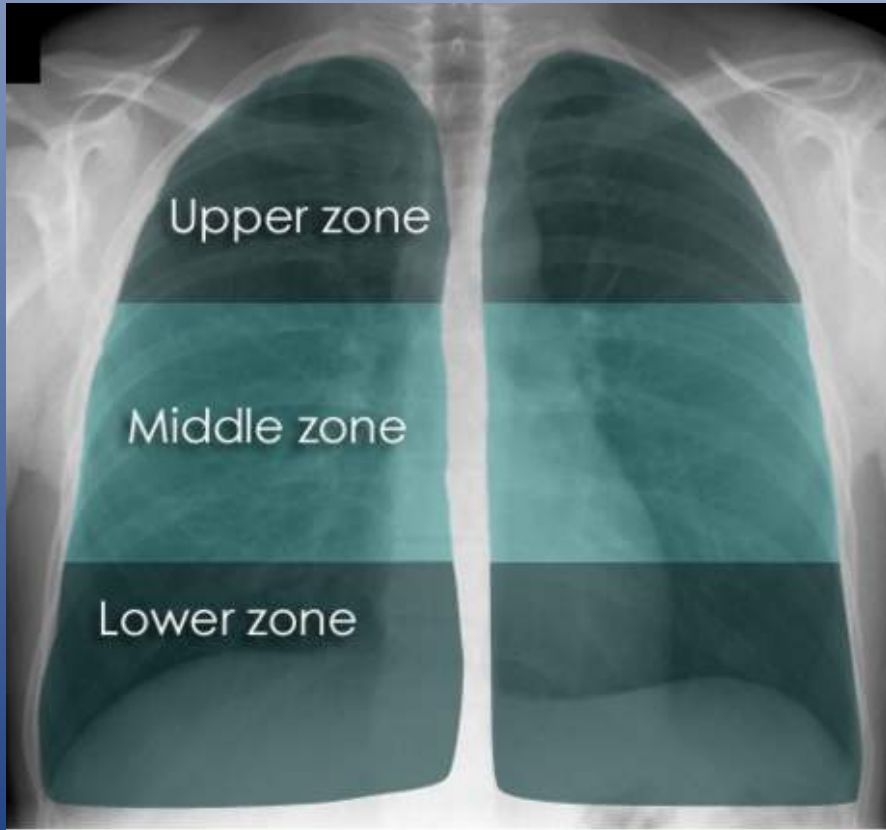
1-BY ZONES

2-BY LOBES



# Assessing the lung zones

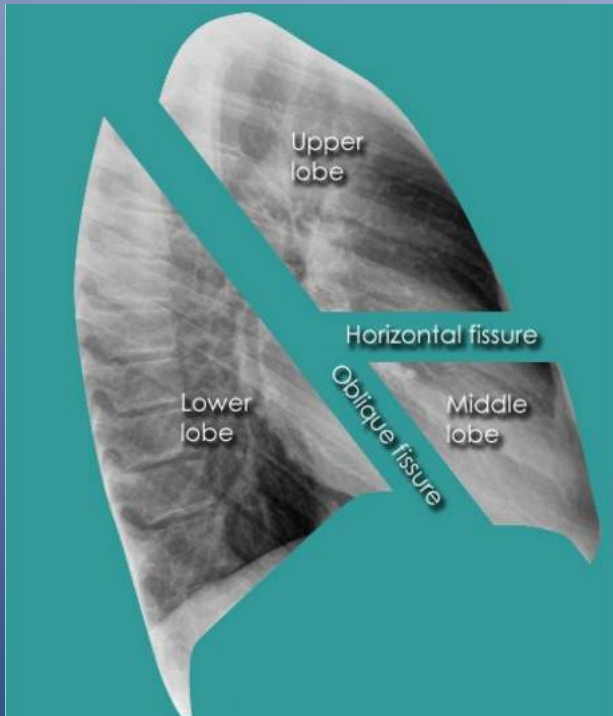
## BY ZONES



- **Each zone is compared with its opposite side paying attention to any asymmetry.**
- If the lungs appear asymmetrical, it should be determined if this can be explained by asymmetry of normal structures, technical factors such as rotation, or lung pathology.
- If there is genuine asymmetry, decide which side is abnormal. Often a dense (whiter) area is abnormal, but some diseases cause reduced density (blacker). If there is an area that is different from the surrounding ipsilateral lung, then this is likely to be the abnormal area. You should also be aware that some diseases result in bilateral lung abnormalities, making comparison of left with right difficult. In these cases it is still important to assess each zone in turn, to avoid missing subtle abnormalities on the background of abnormal lung.
- Lung zones
- Dividing the lungs into zones allows more careful attention to be paid to each smaller area. If this is not done it is easy to ignore important abnormalities.
- Note that the lower zones reach below the diaphragm. This is because the lungs pass behind the dome of the diaphragm into the posterior sulcus of each hemithorax. Normal lung markings can be seen below the well defined edges of the diaphragm.

# ASSESSING LUNG FIELDS

## BY LOBES

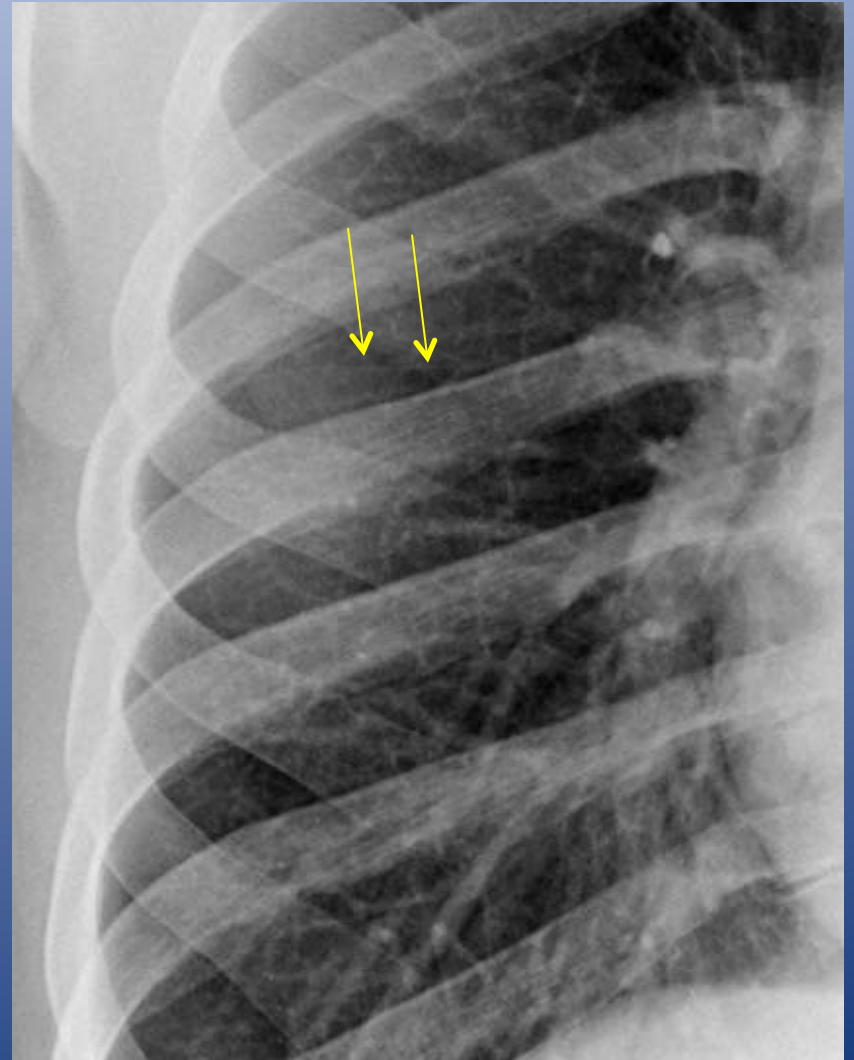
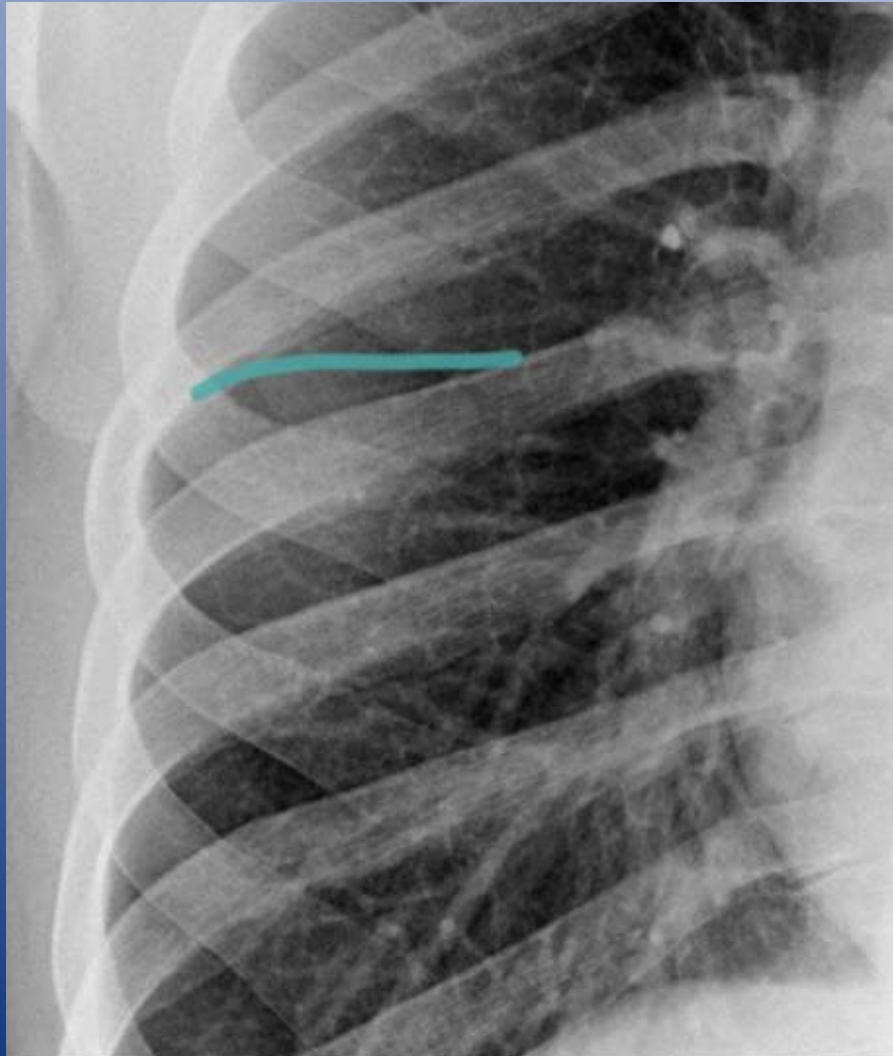


- The surface of the visceral pleura that covers the lung, is continuous with the visceral pleura that covers the fissures. The left lung is divided into two lobes, upper and lower. These lobes have their own pleural covering and these lie together to form the oblique (major) fissure. In the right lung there is an oblique fissure and a horizontal fissure, separating the lung into three lobes - upper, middle, and lower. Each lobe again has its own visceral pleural covering.
- Lateral chest X-rays are helpful in demonstrating the oblique fissures (also known as the major fissures)

### Lobes and fissures

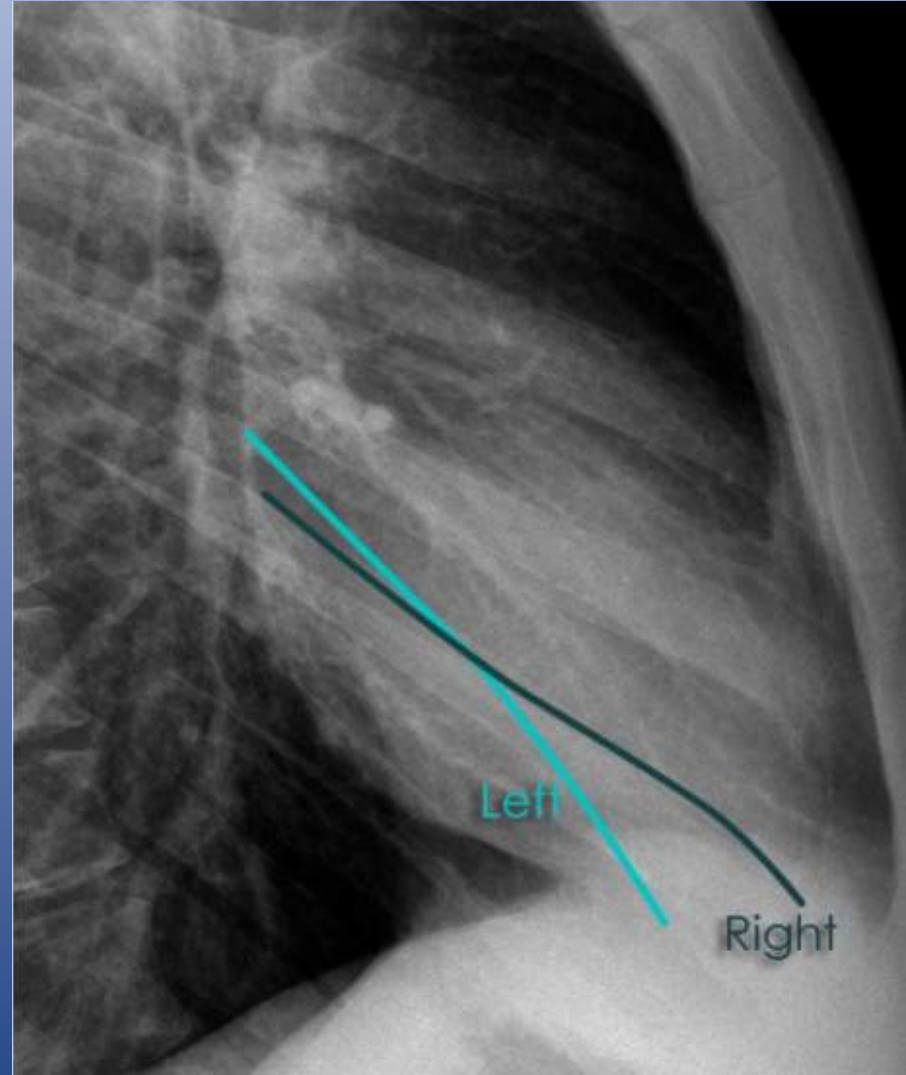
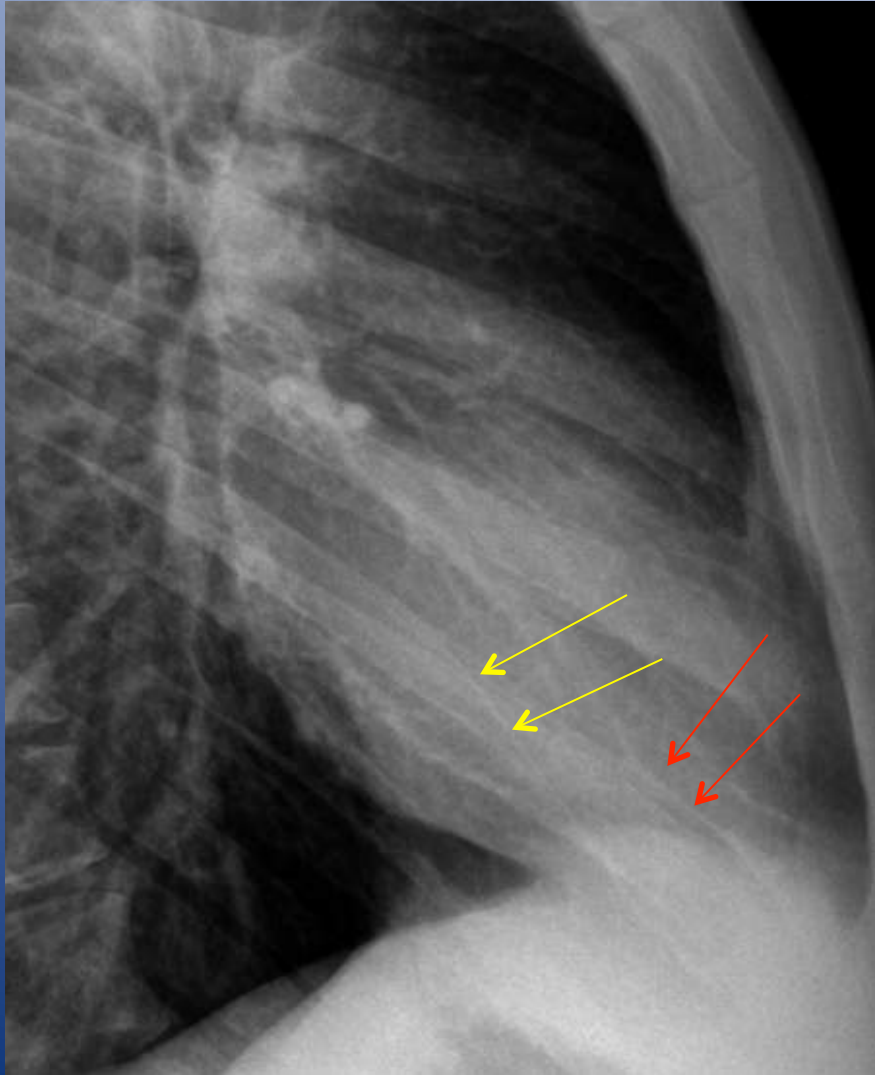
- **This cut-out of a lateral chest X-ray shows the positions of the lobes of the right lung**
- **On the left the oblique fissure is in a similar position but there is usually no horizontal fissure, and so there are only two lobes on the left.**

# Transverse fissure

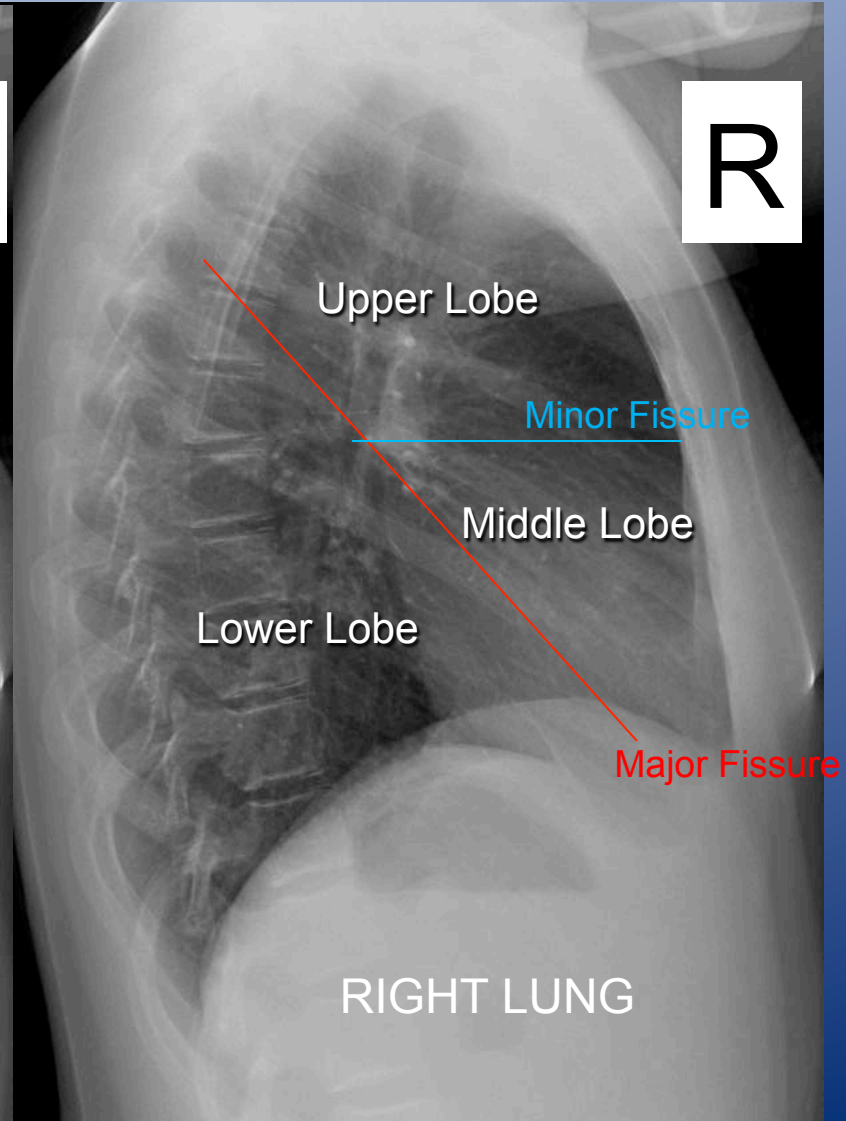
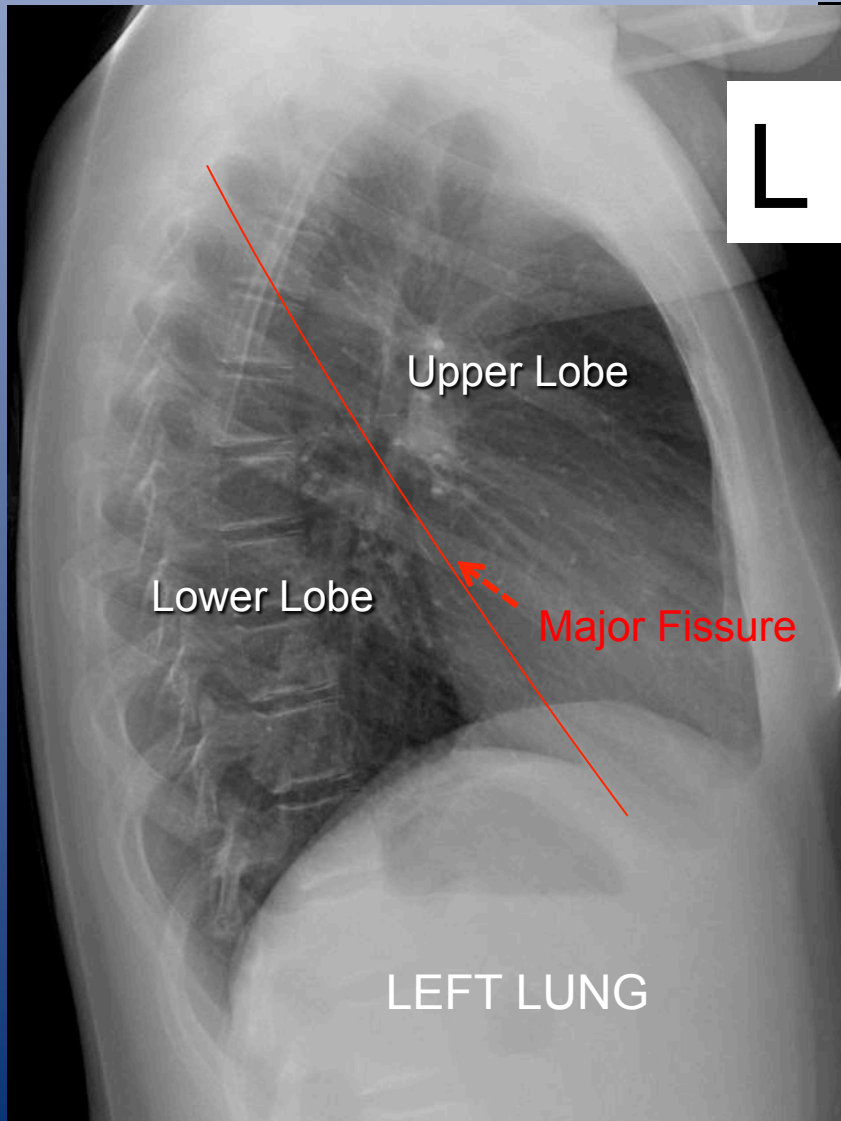




# Oblique fissure

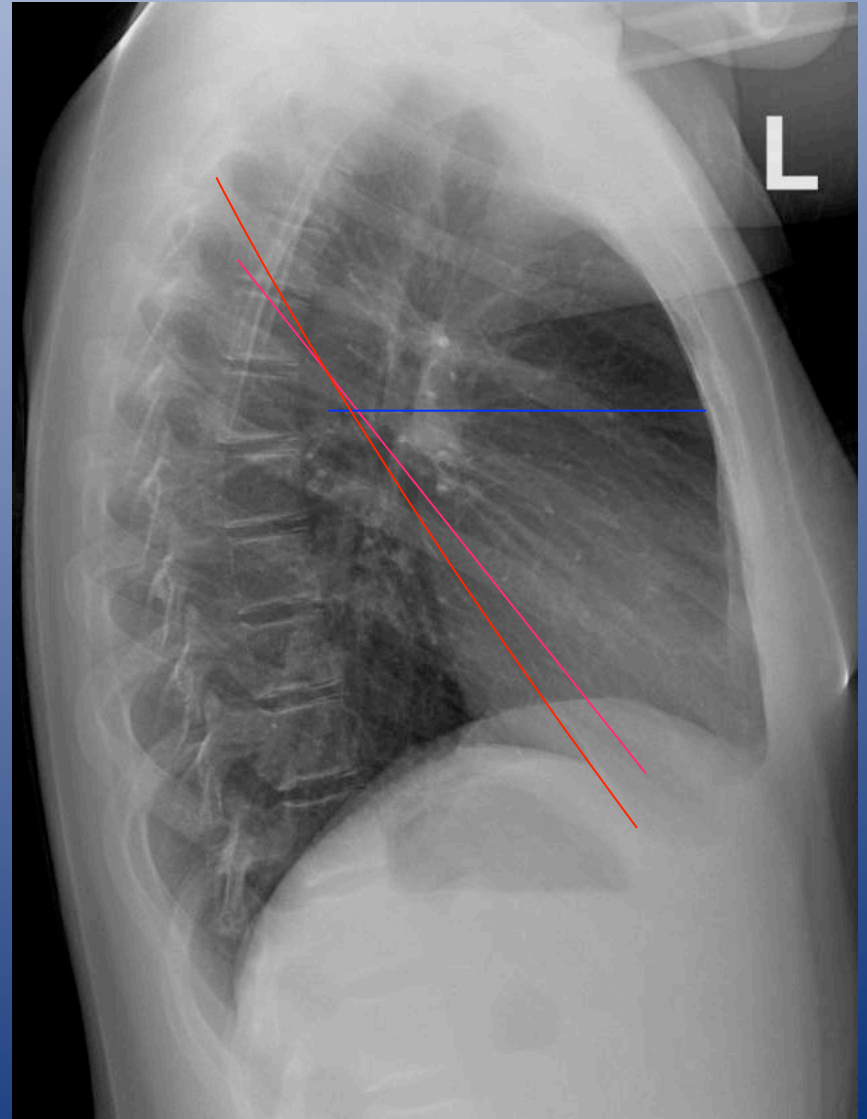


# Radiological Anatomy of the Chest



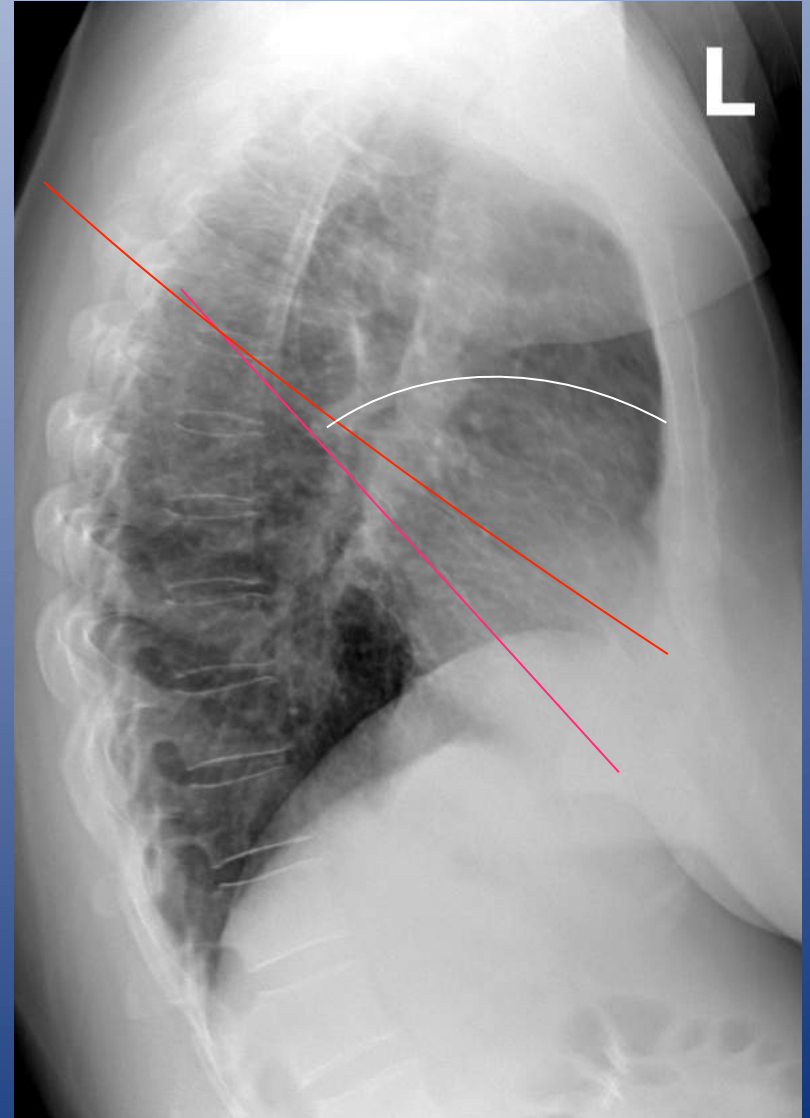
## Radiological Anatomy of the Chest

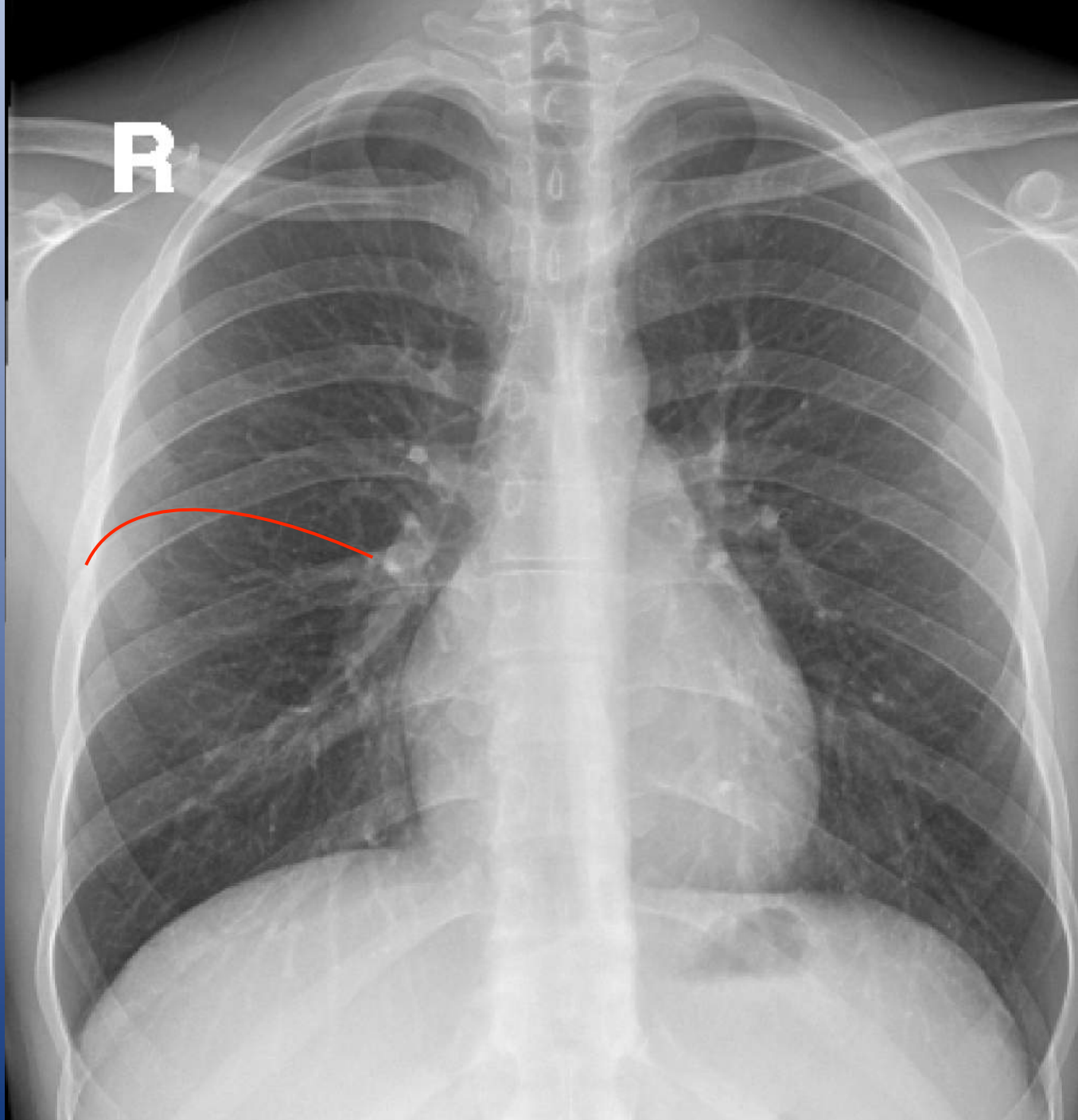
### Fissures



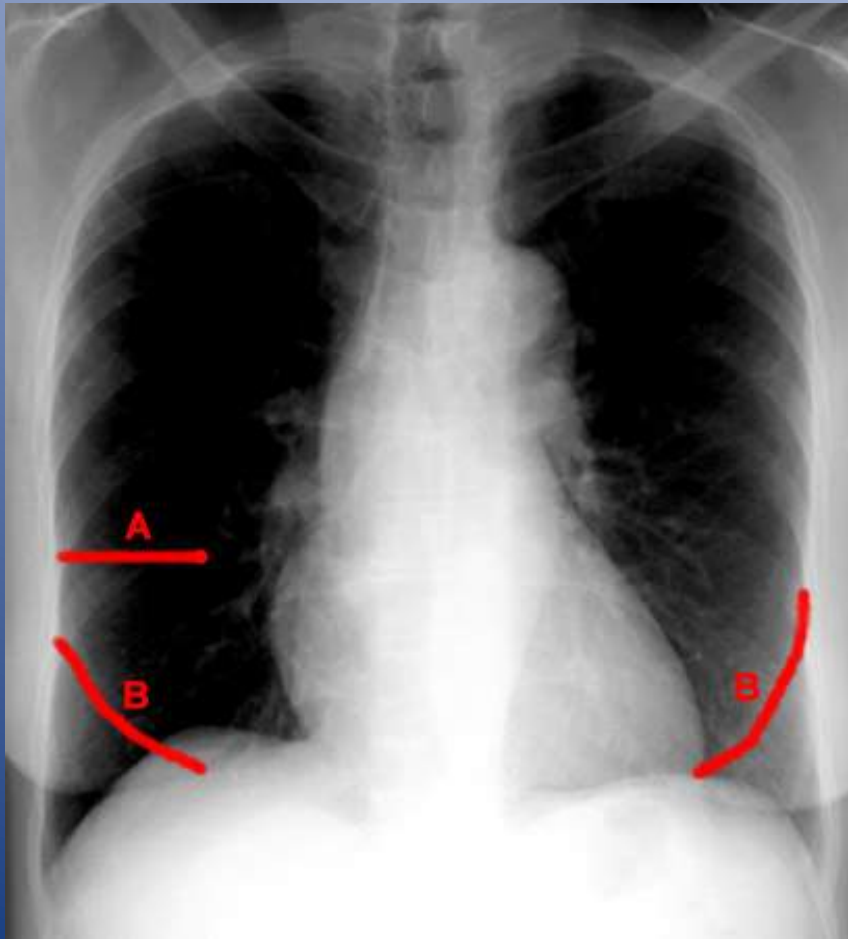
# Radiological Anatomy of the Chest

## Fissures

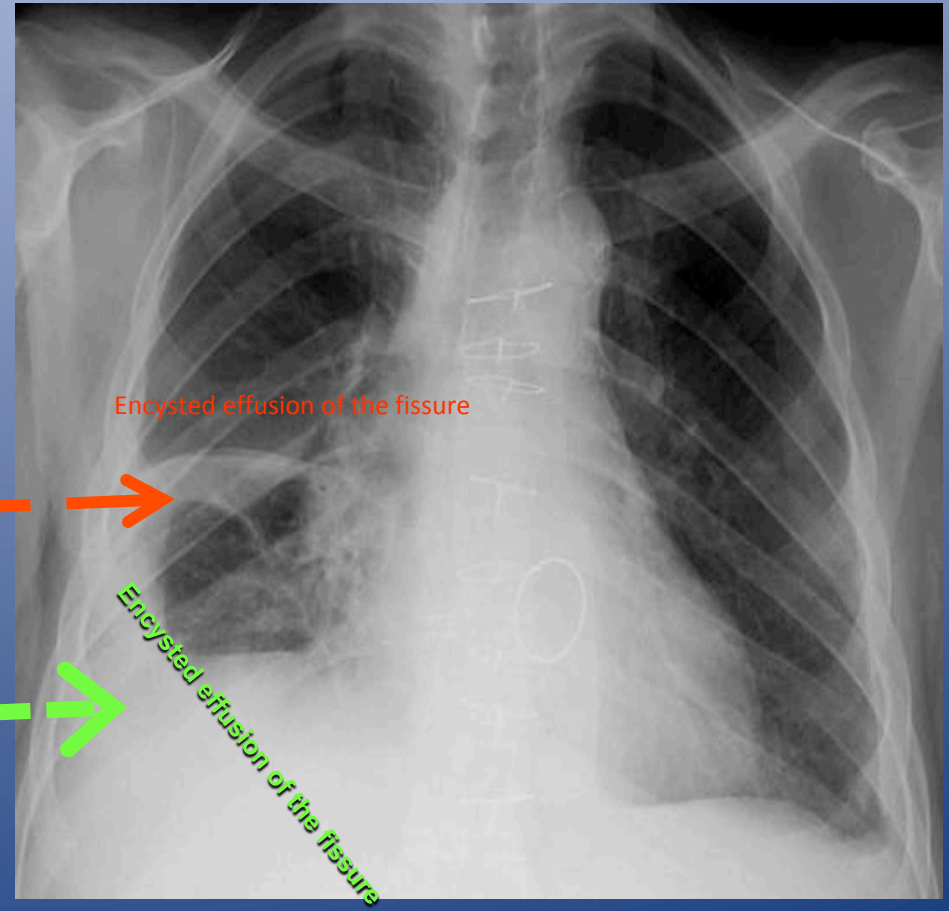
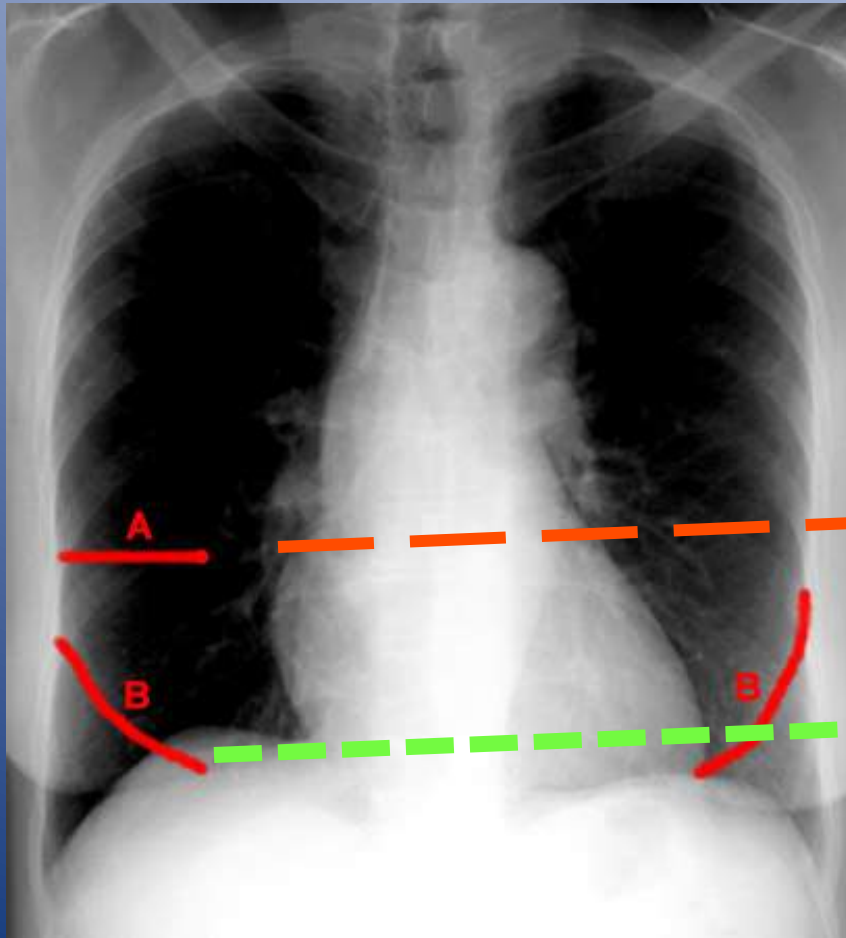




# FISSURES

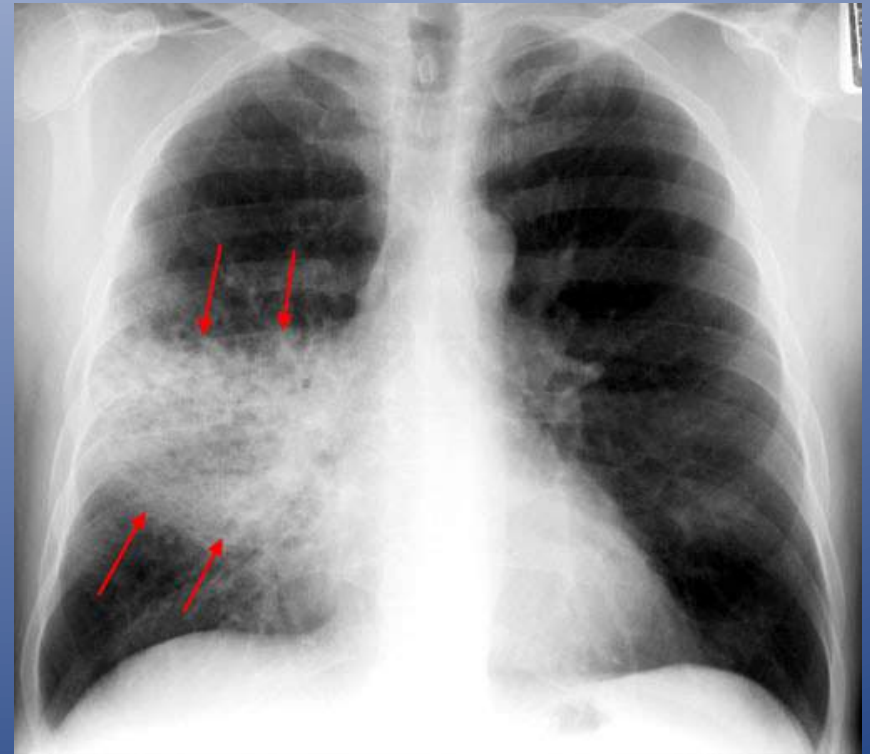
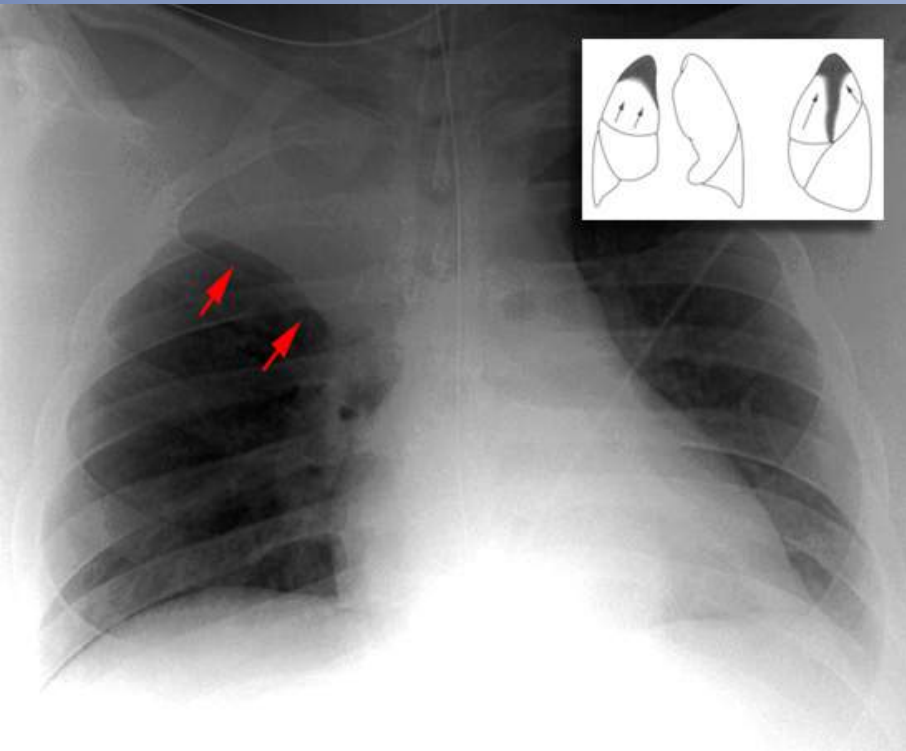


# FISSURES



# Fissures outlines segments

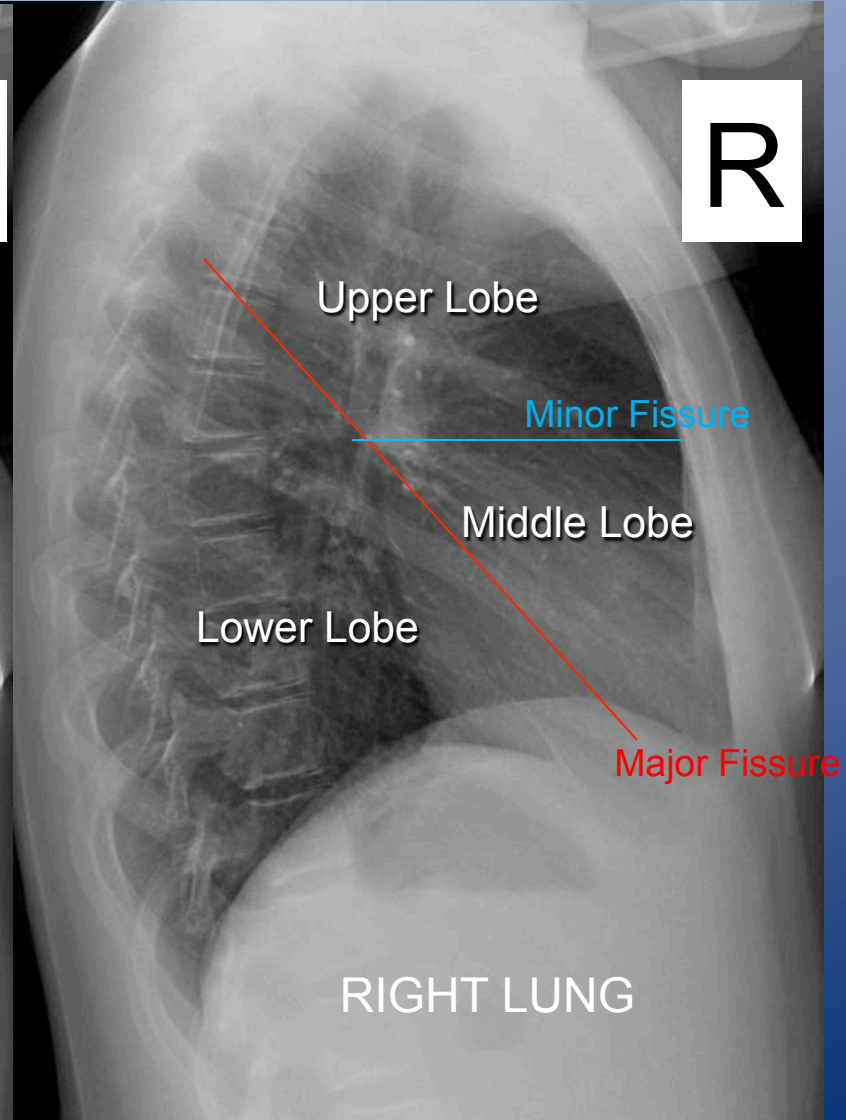
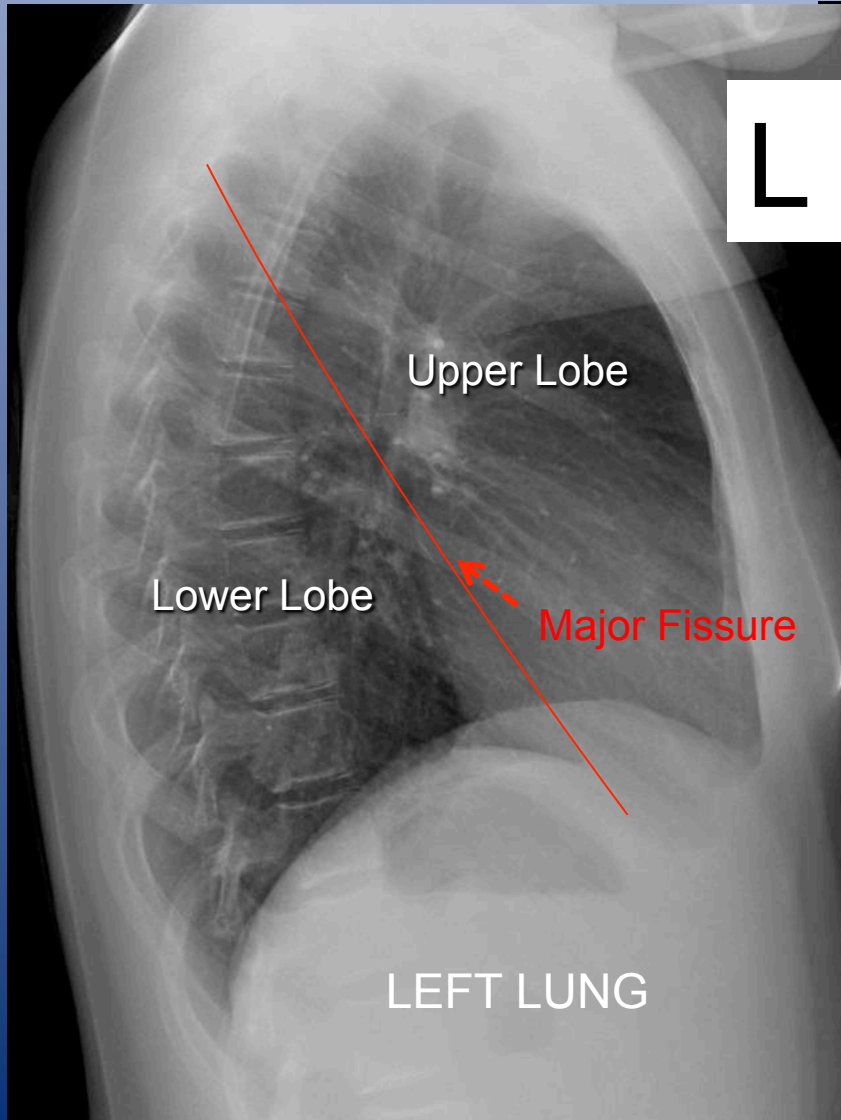
## **ATELECTASIS** Vs **PNEUMONIA**



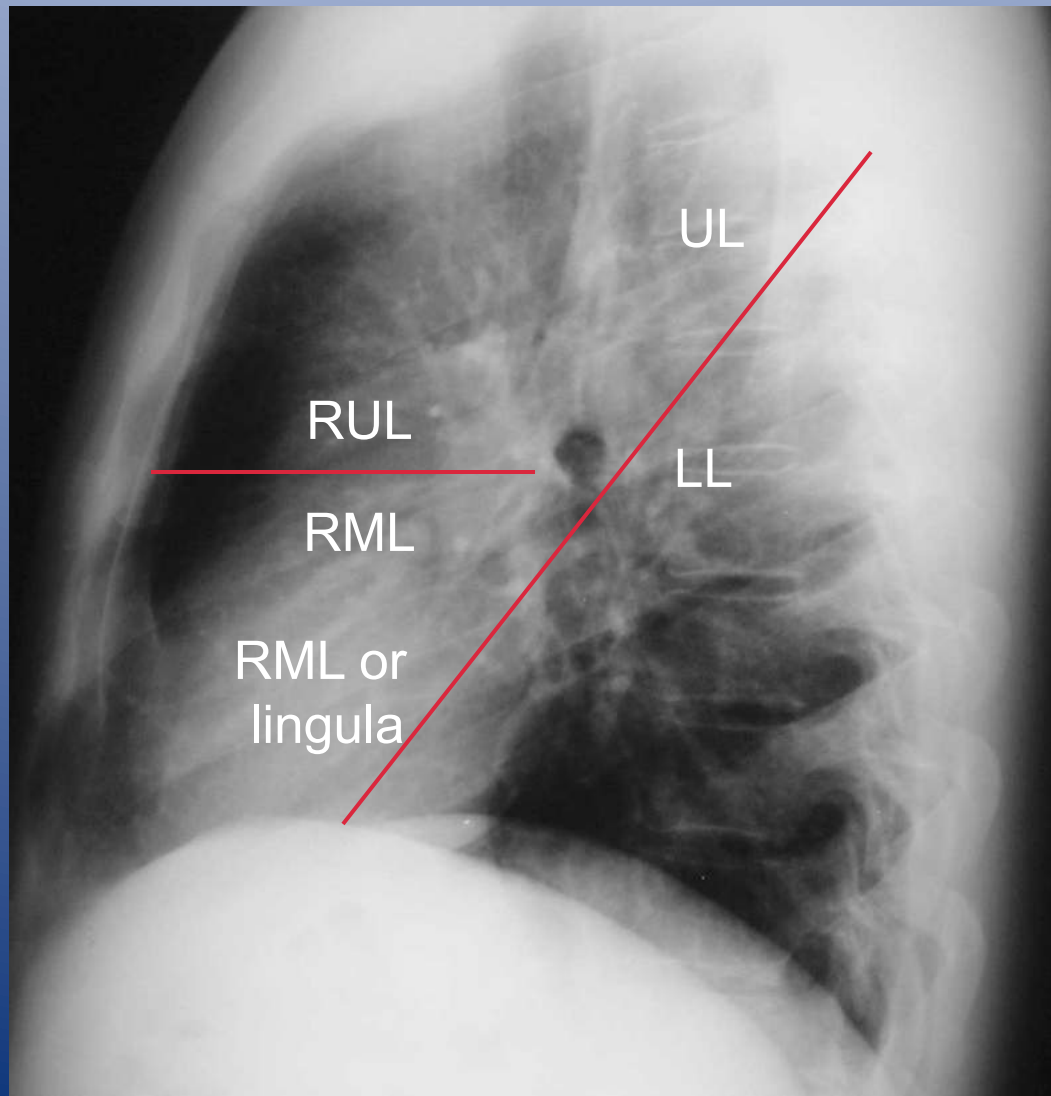


# Radiological Anatomy of the Chest

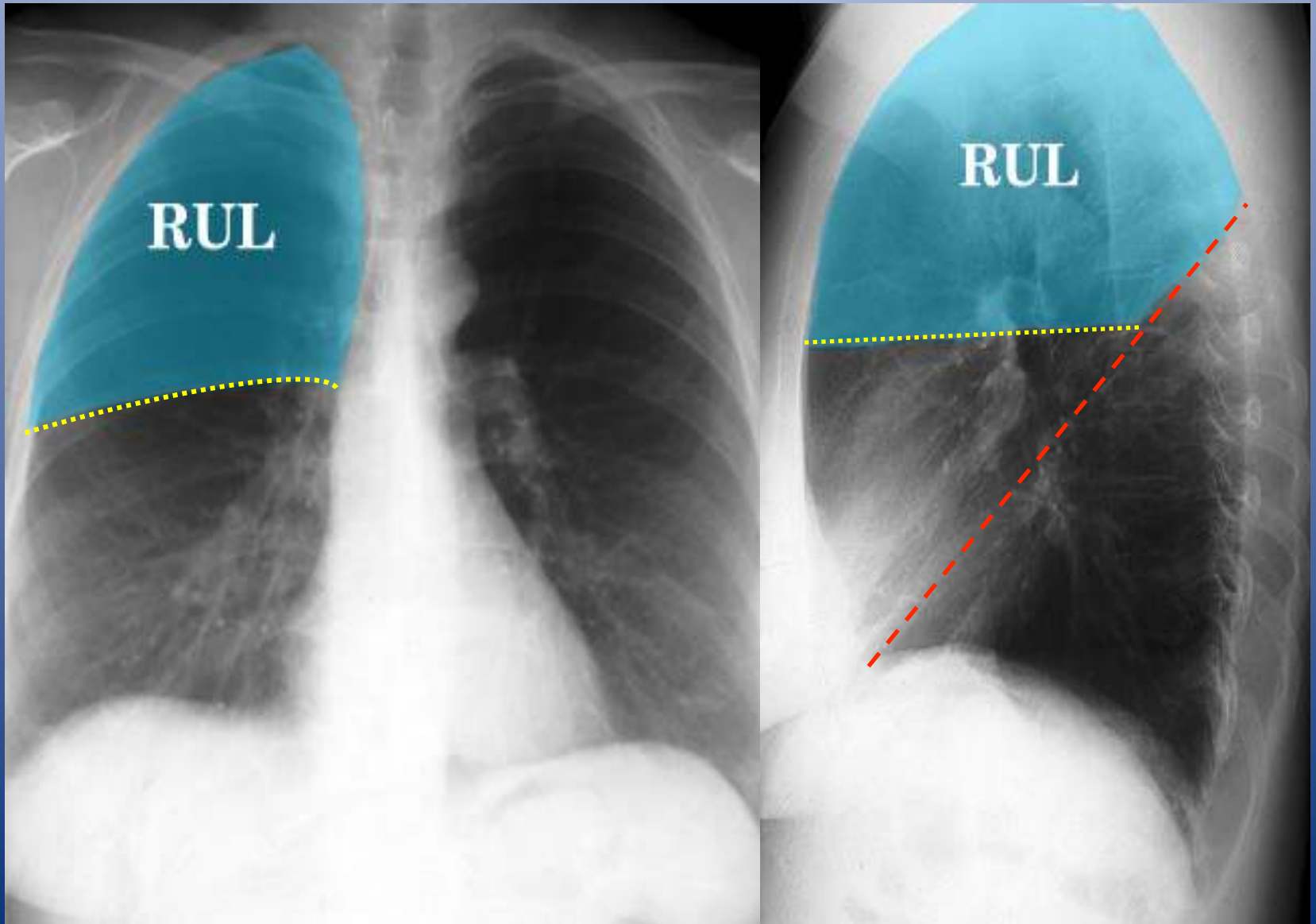
## Localizing disease by fissures



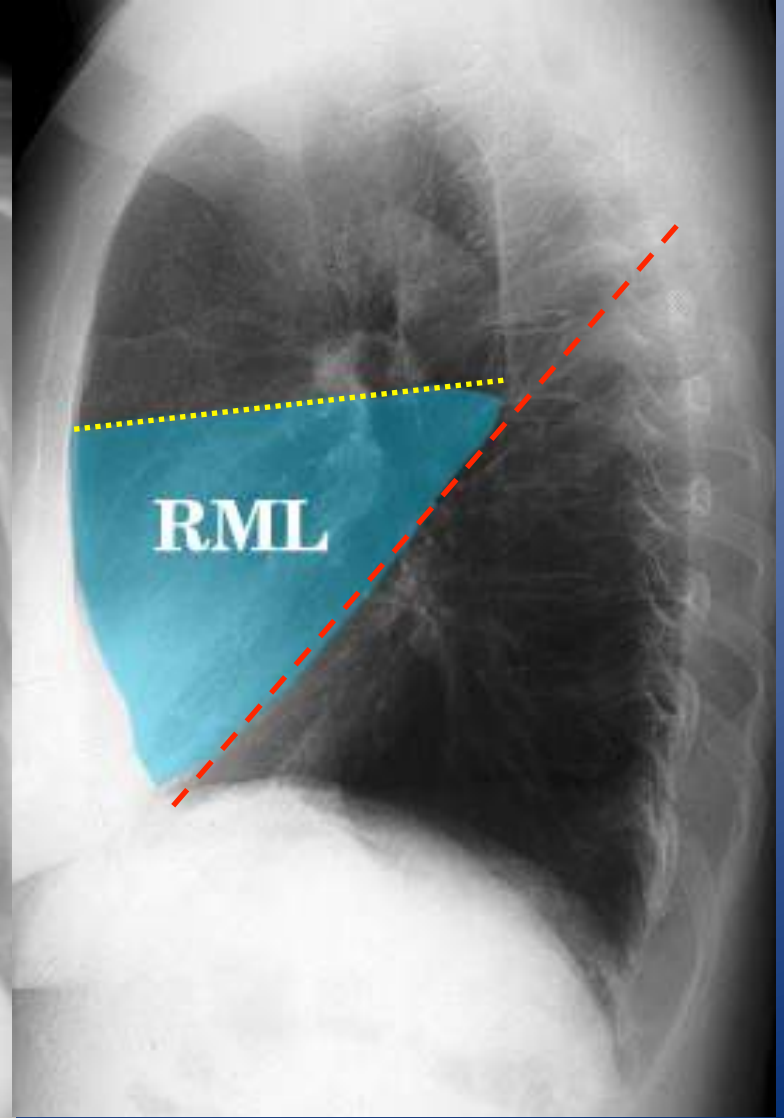
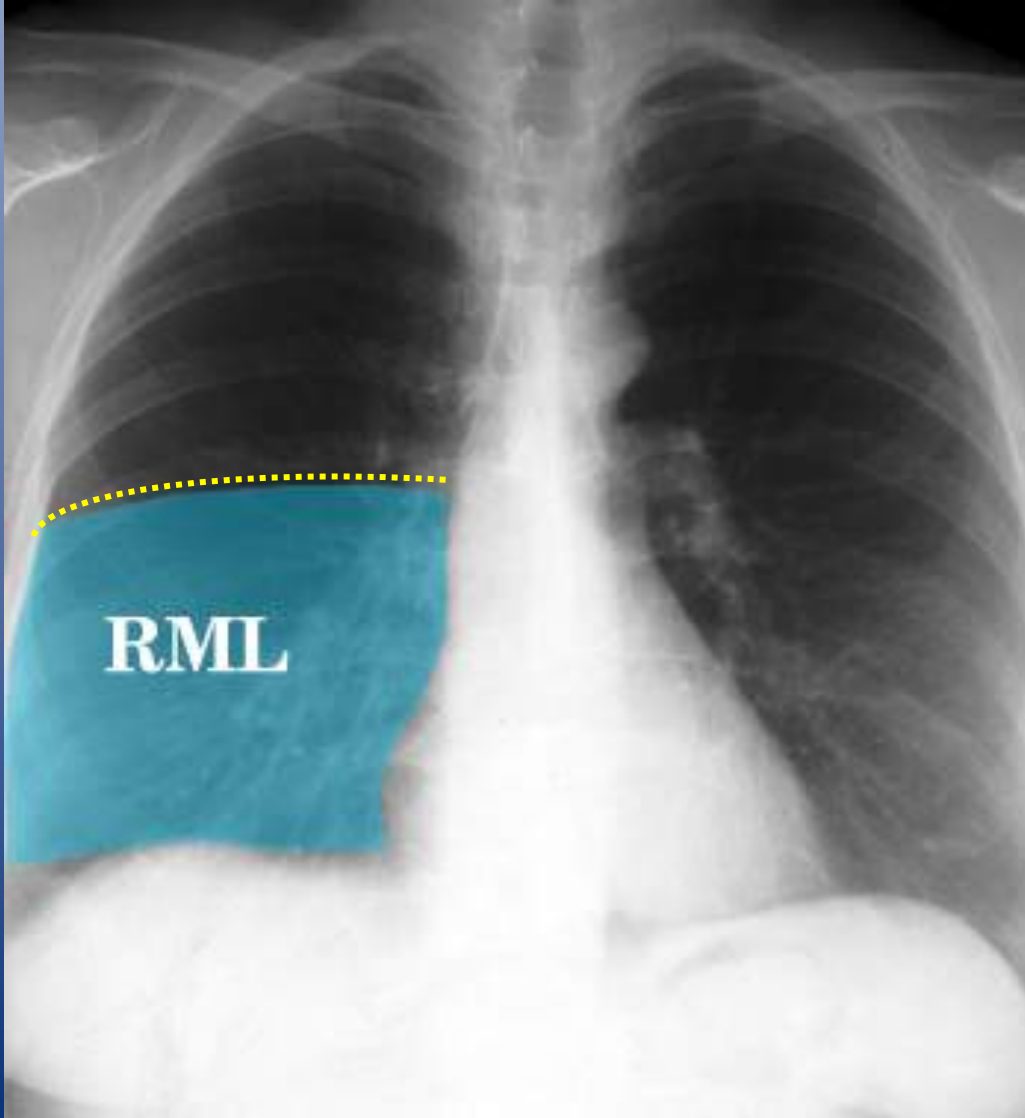
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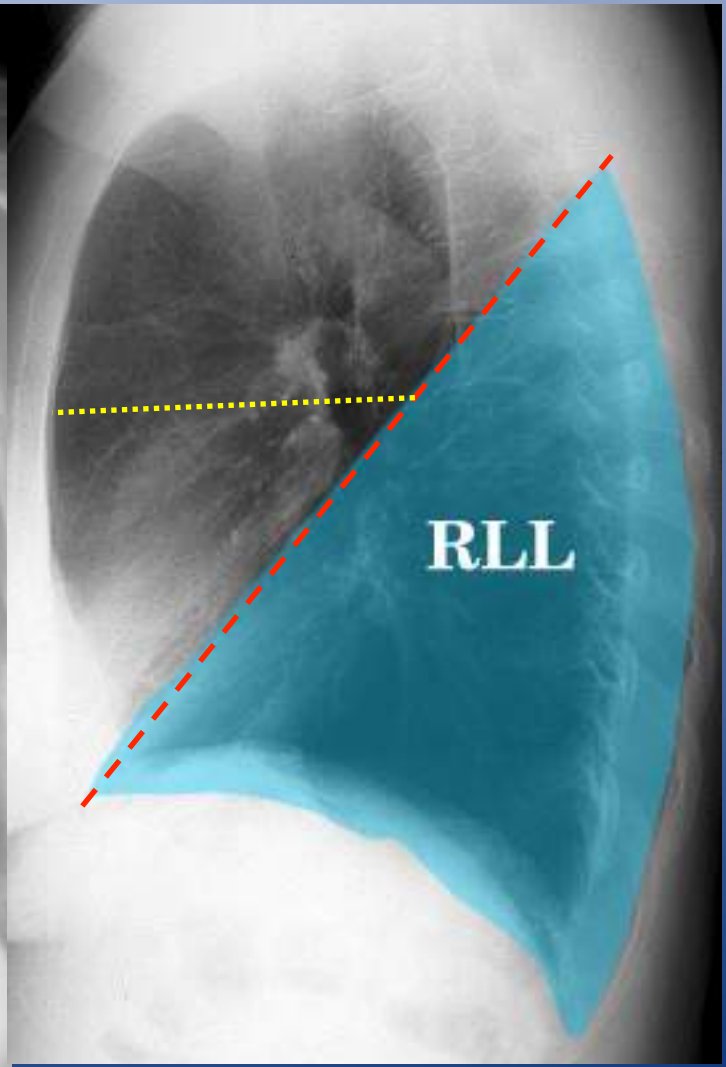
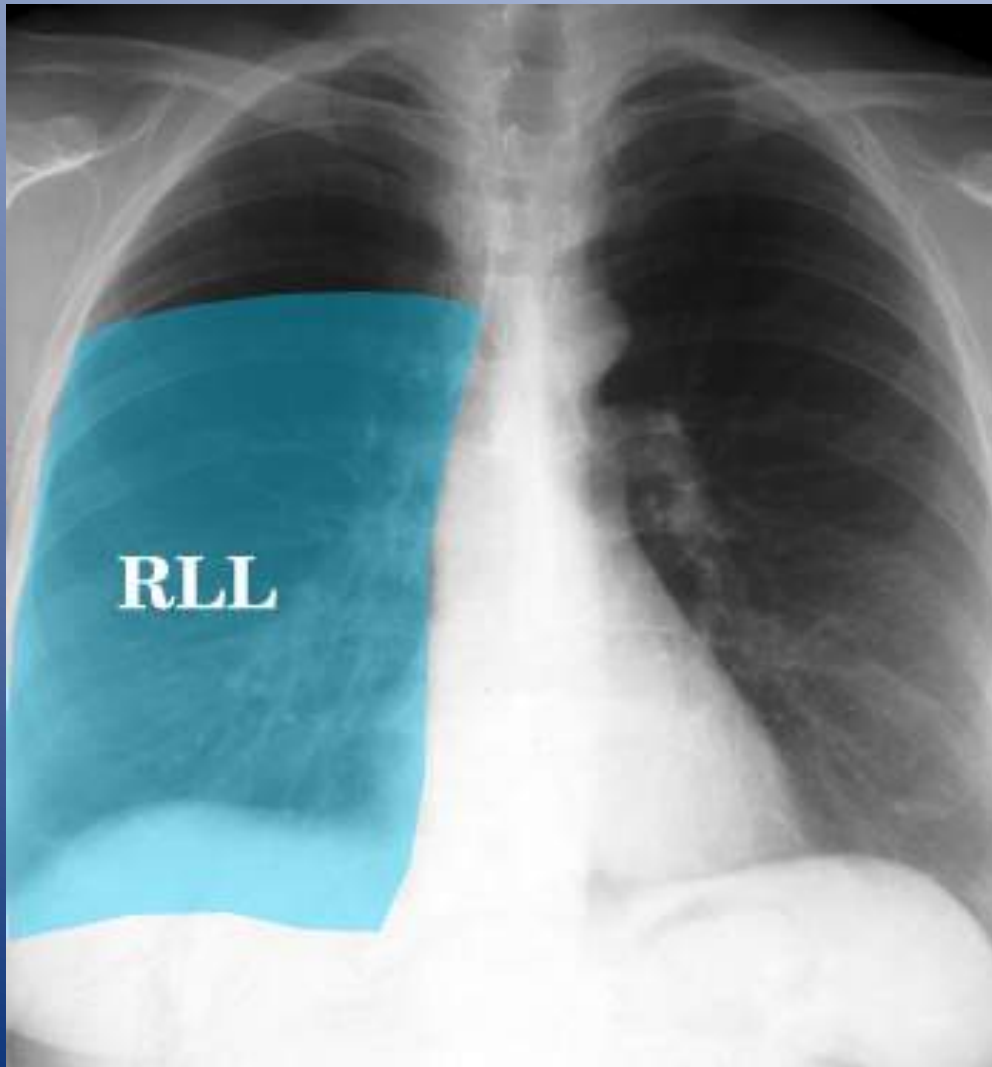
## Radiological Anatomy of the Chest



# Radiological Anatomy of the Chest

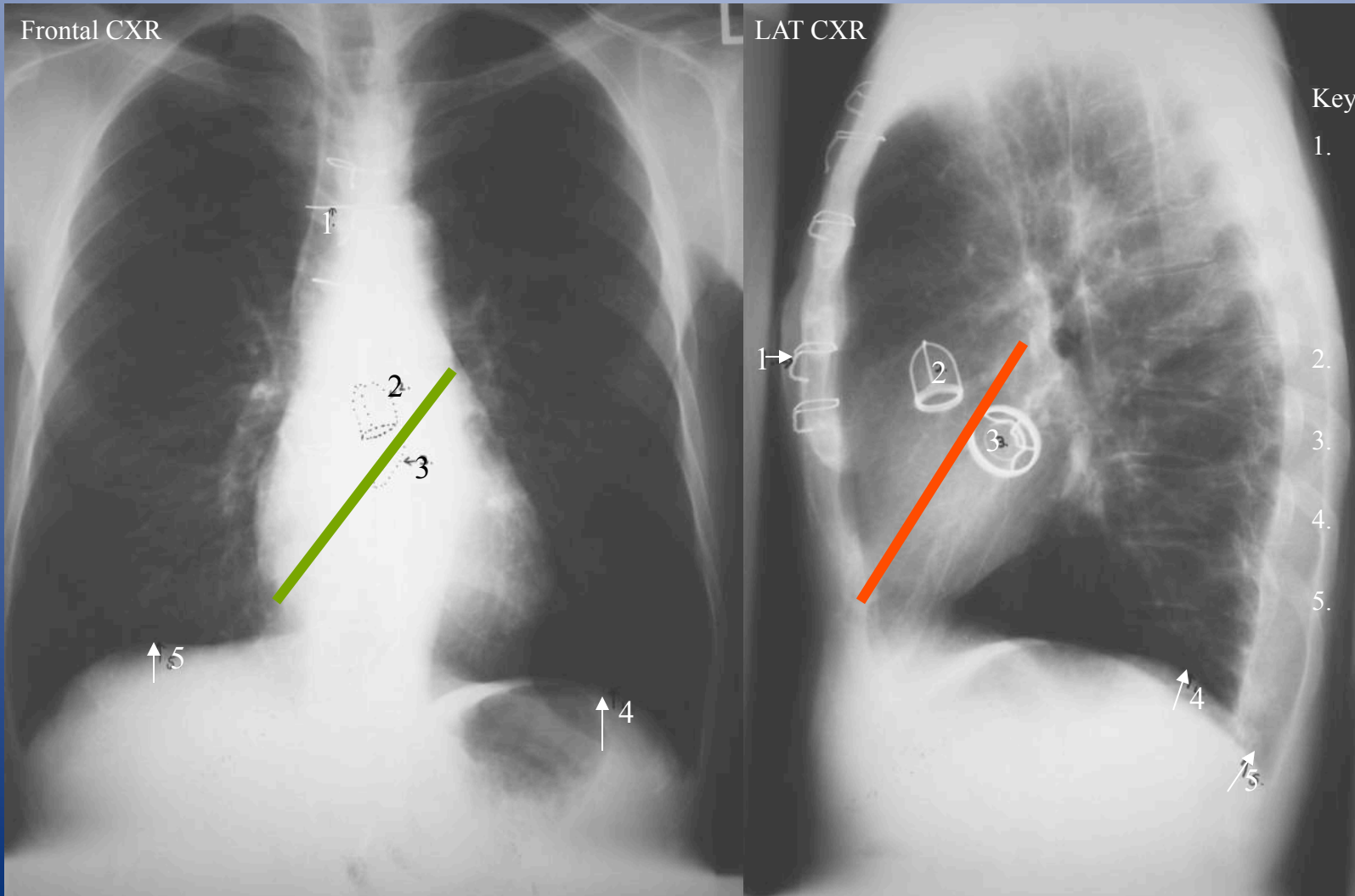


## Radiological Anatomy of the Chest



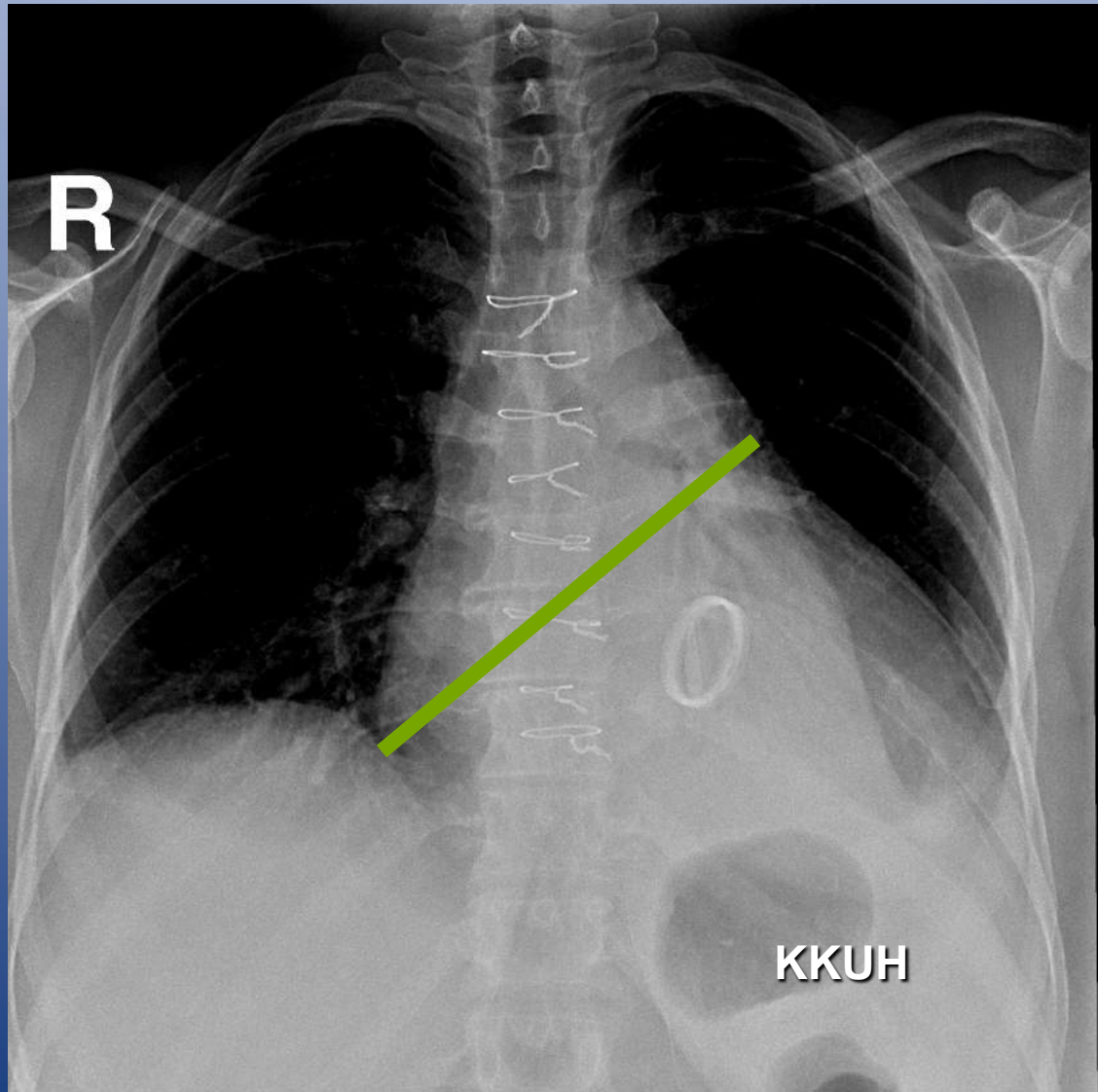
# CARDIAC Valves

This patient had a malfunctioning mitral valve (between left atrium and left ventricle) and aortic valve (between left ventricle and aorta) and prosthetic valves were inserted (better seen on lateral)

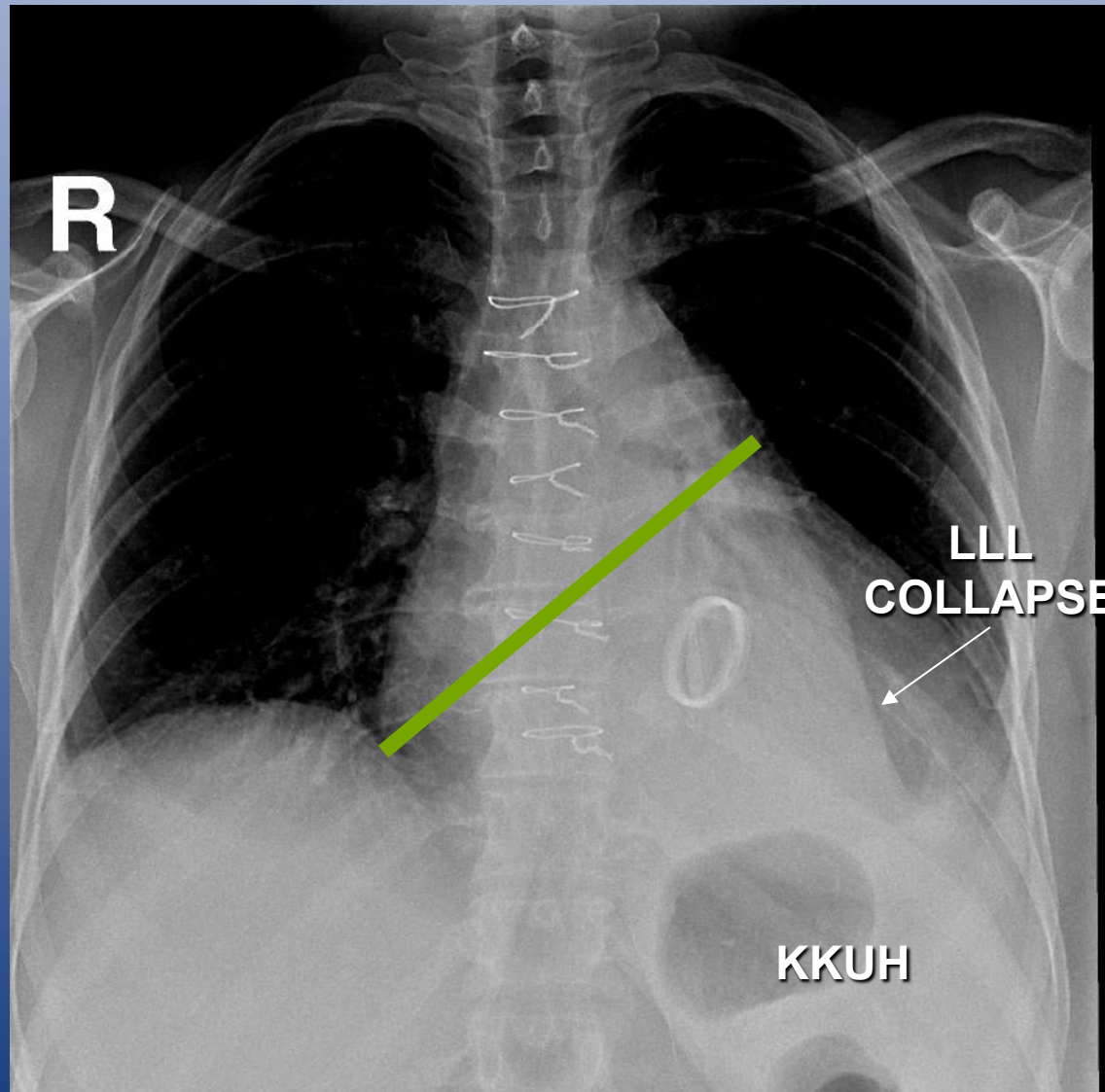


- Key:
- 1. Suture material used for repair of vertical incision thru sternum (median sternotomy)
  - 2. Aortic valve prosthesis
  - 3. Mitral valve prosthesis
  - 4. Left hemi diaphragm
  - 5. Right hemi diaphragm

# MITRAL VALVE REPLACEMENT

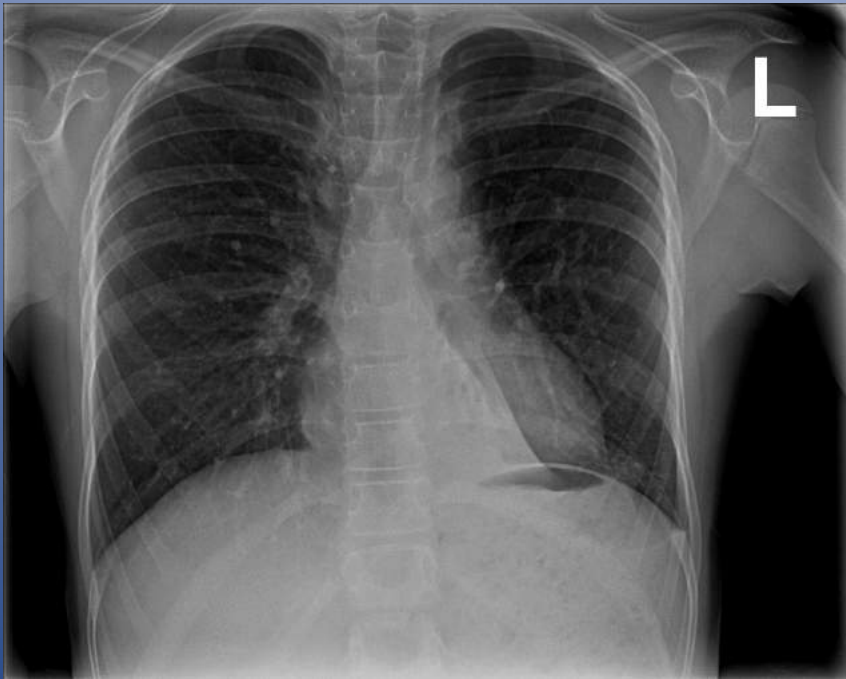


# MITRAL VALVE REPLACEMENT

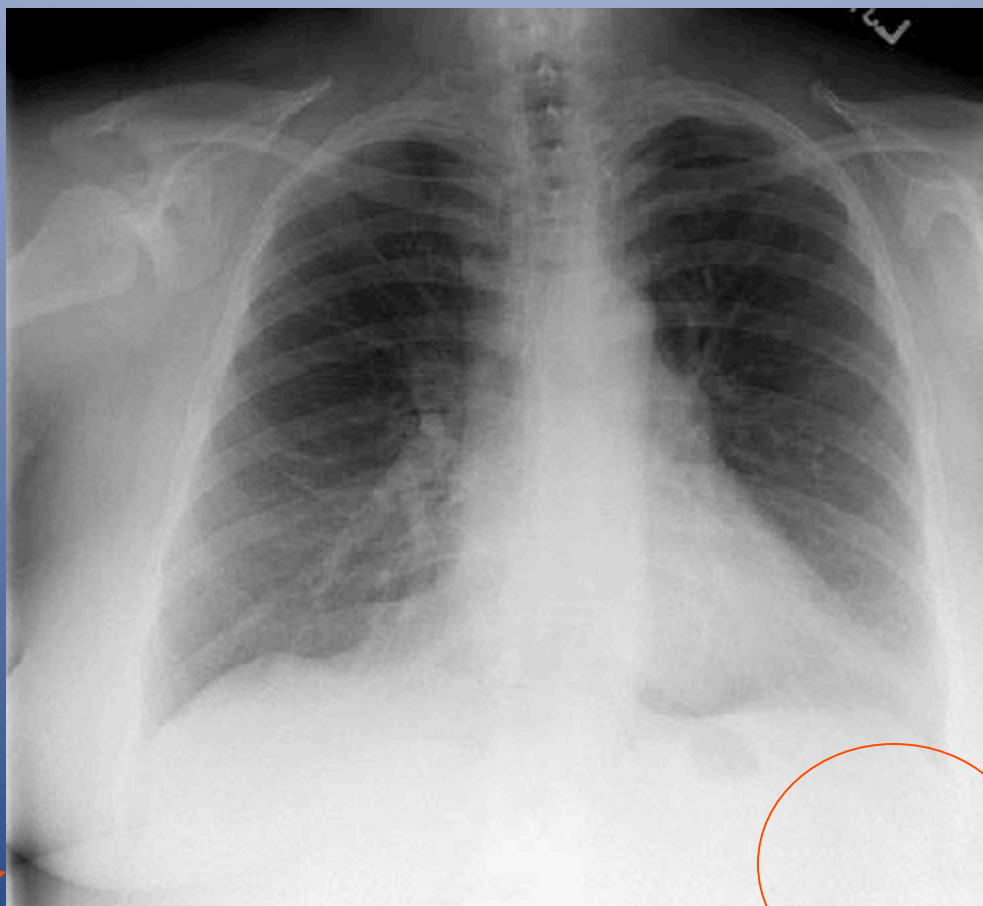




# LLL COLLAPSE

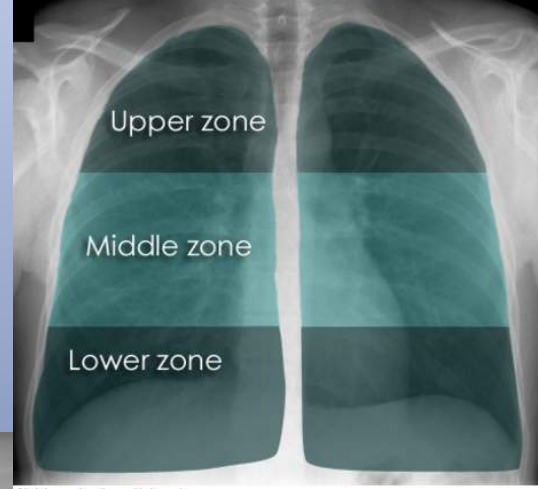


# ROUTINE CXR

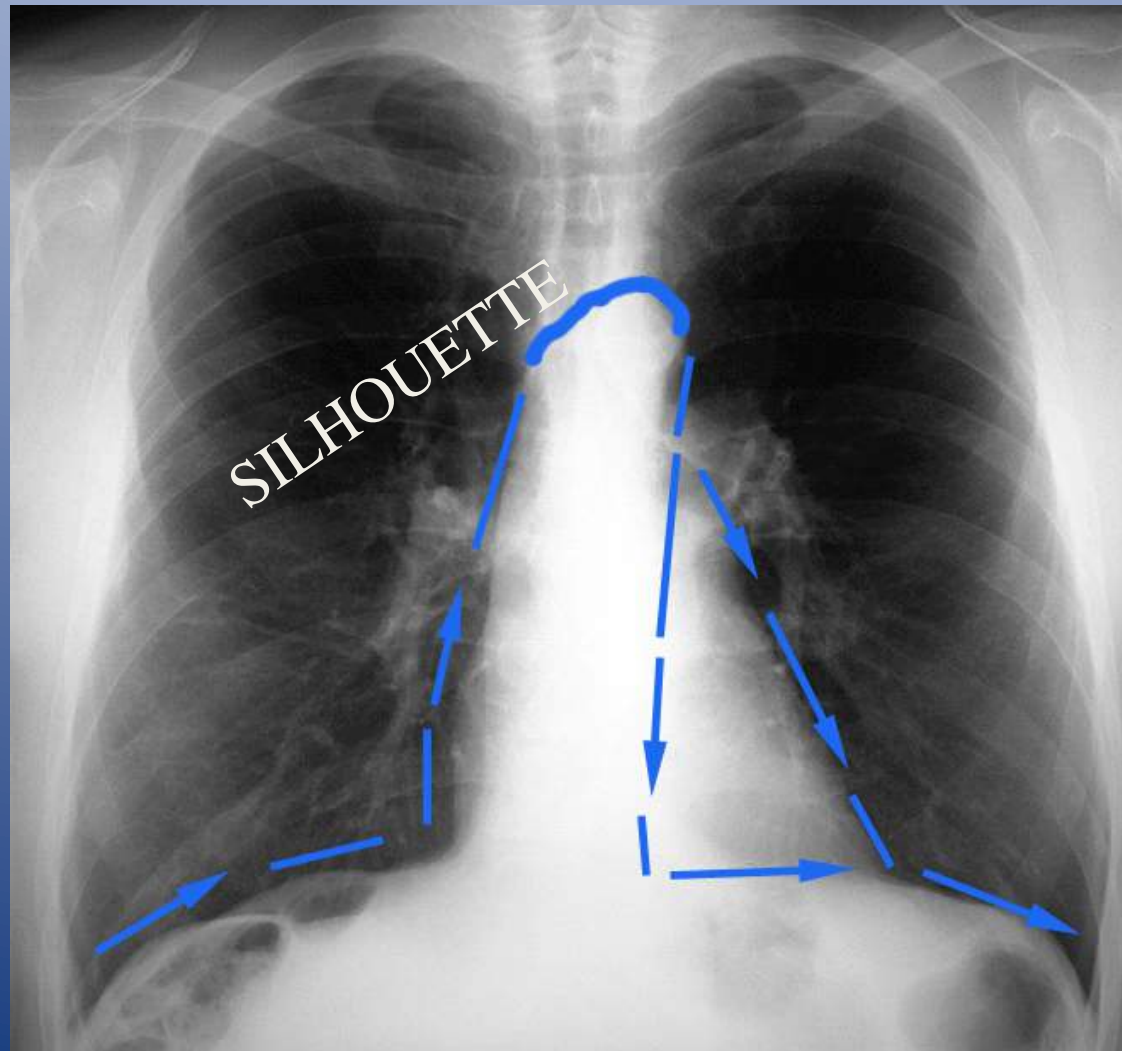


**REAST SHADOW**

# How to read Frontal Chest X-Ray

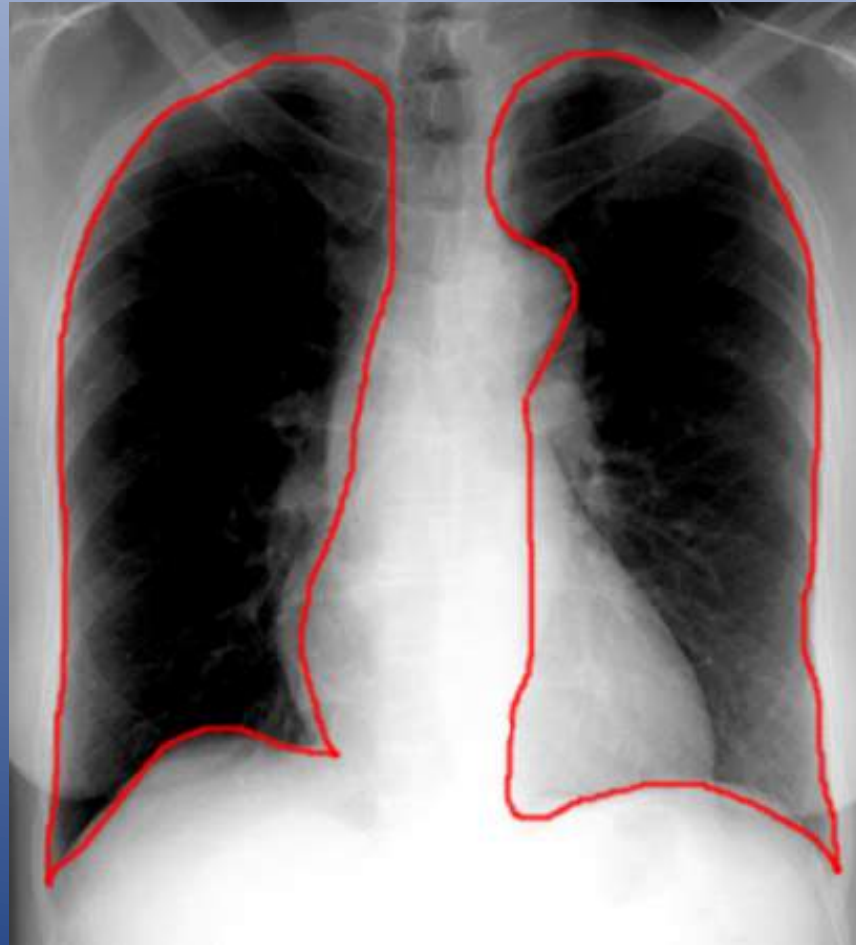


# Frontal Chest X-Ray

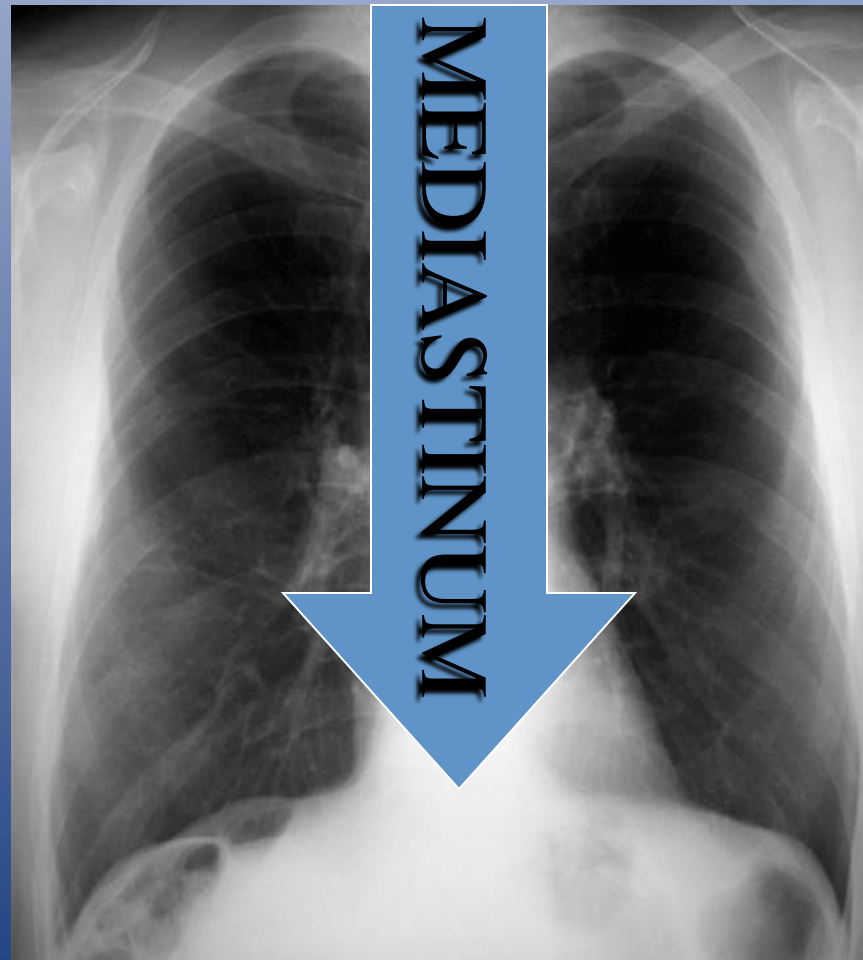


See  
Section on the Silhouette  
Sign

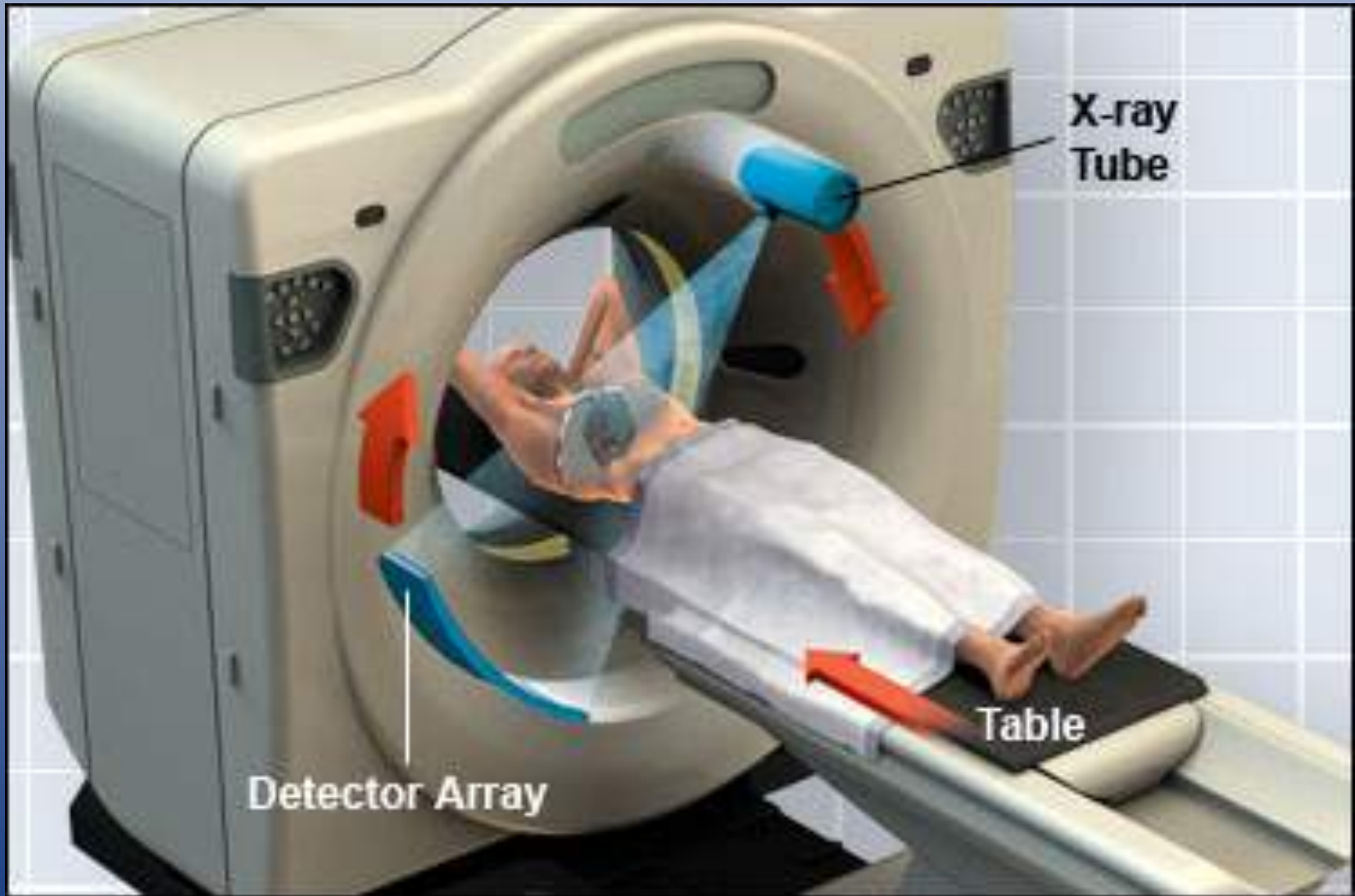
# LUNGS



# Frontal Chest X-Ray



# CT EXAMINATION OF THE CHEST

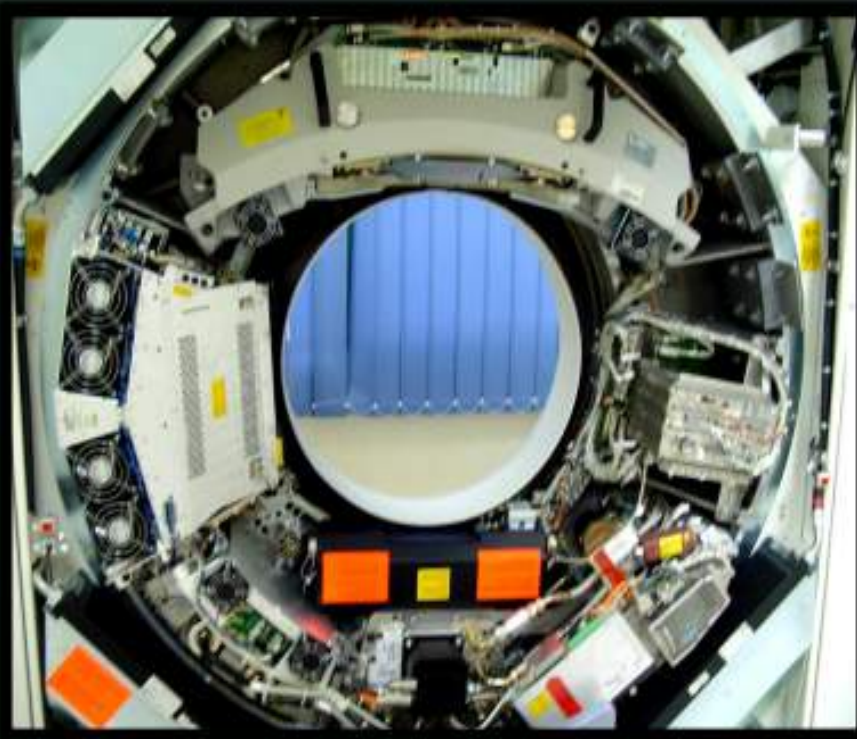


The Examination



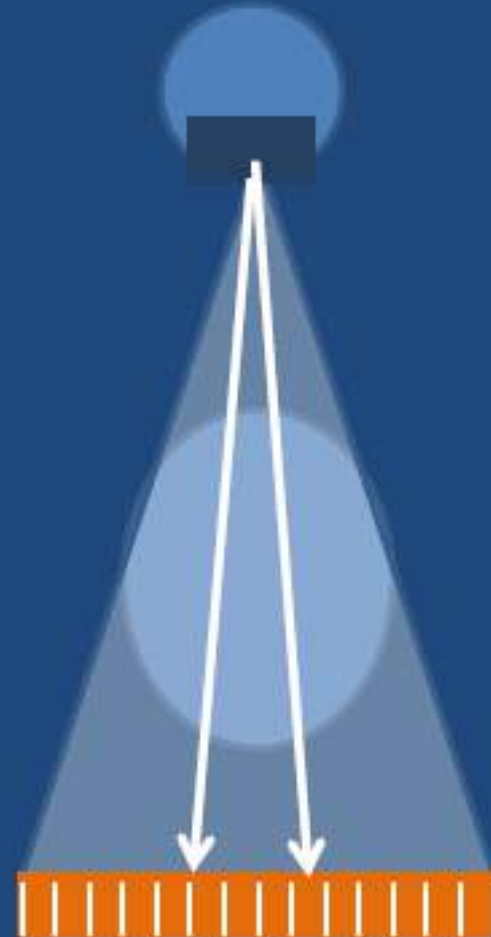
# Scanning techniques

- ◆ Standard Examination
- ◆ High resolution [HRCT]

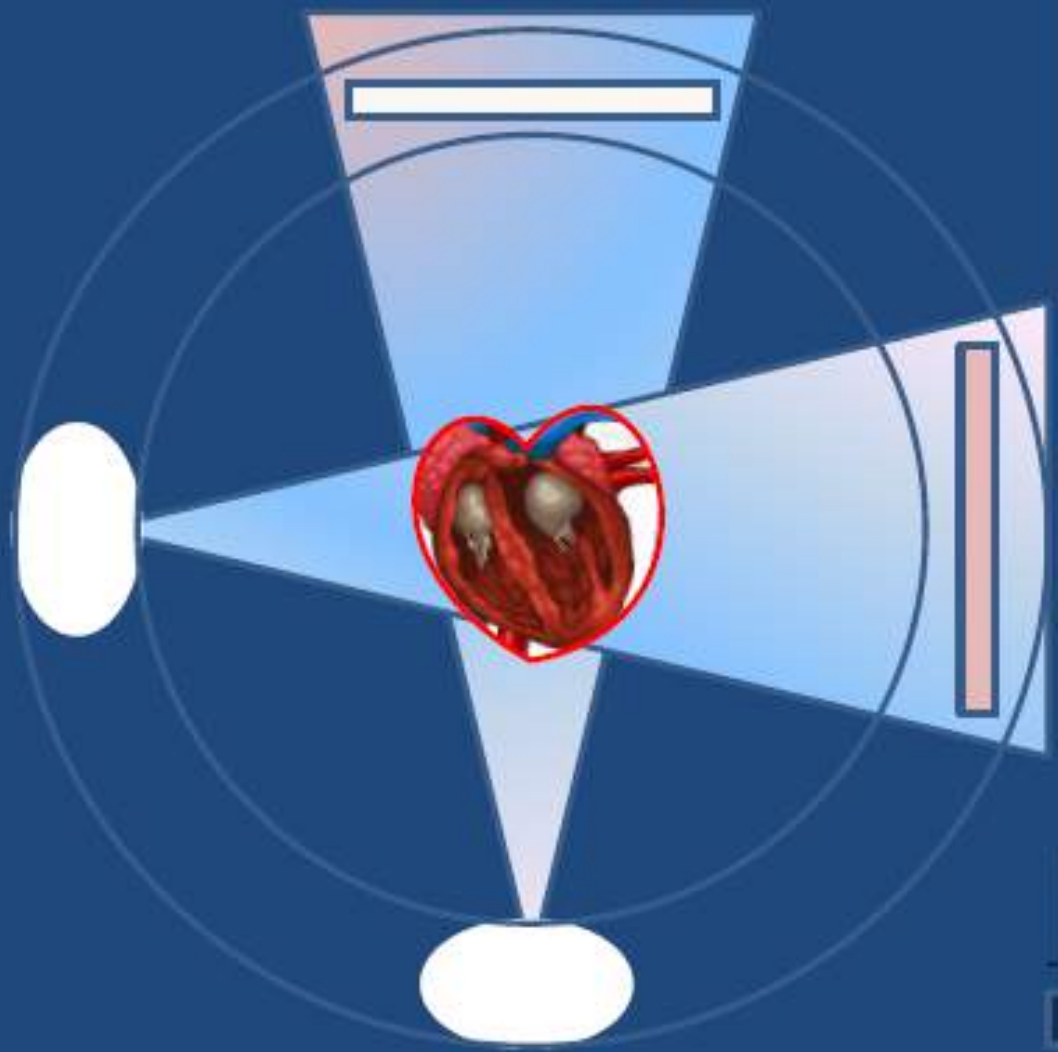


# Third Generation CT

- Arc of detector elements
- Wider fan beam
- Translation of tube and detector
- Faster scan speed

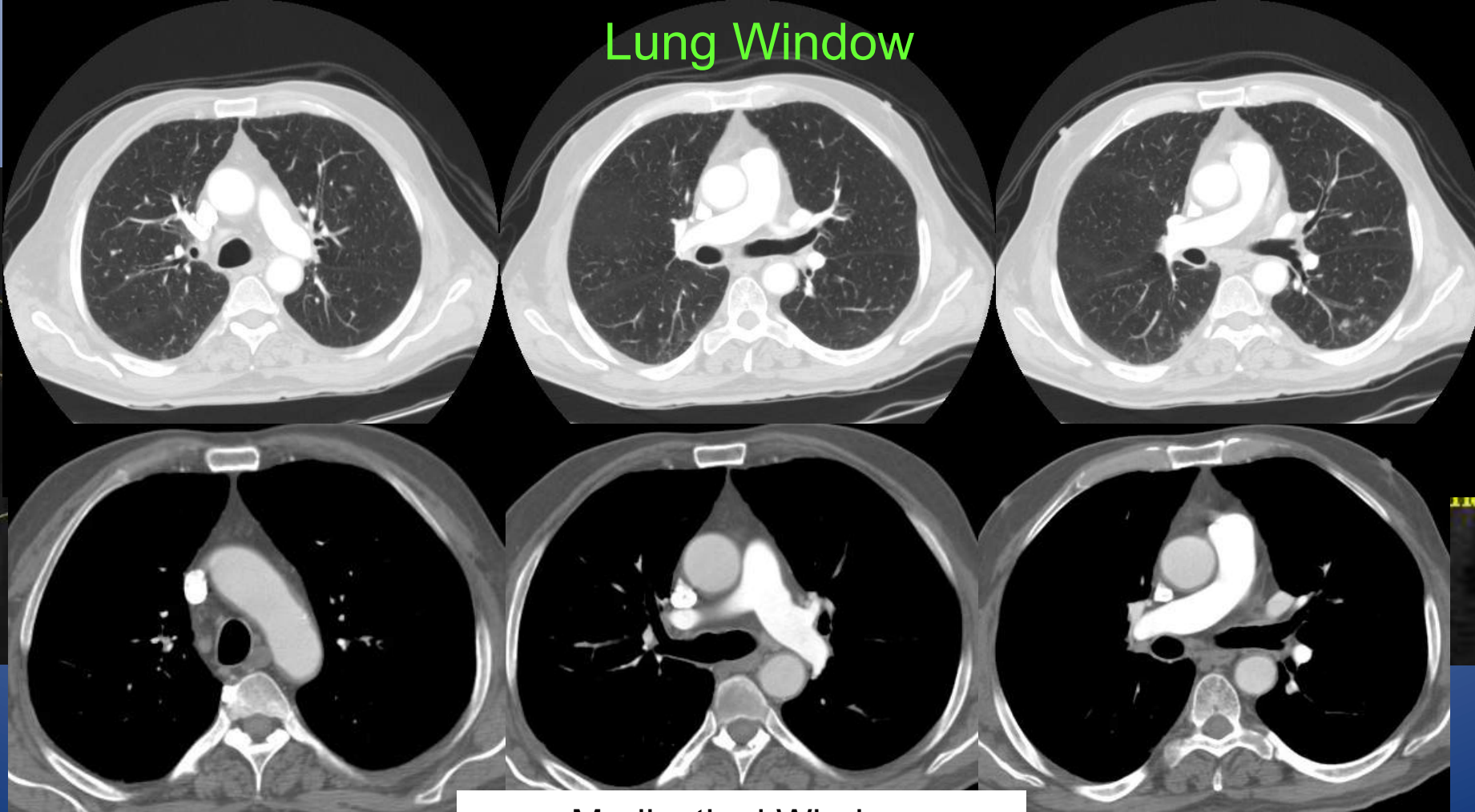


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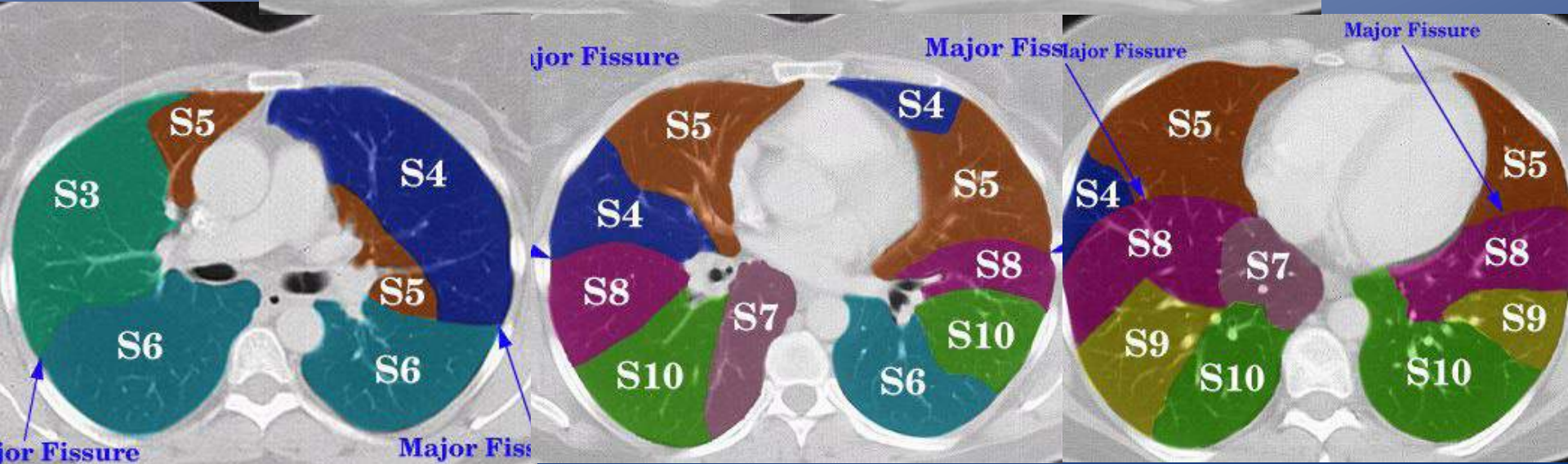
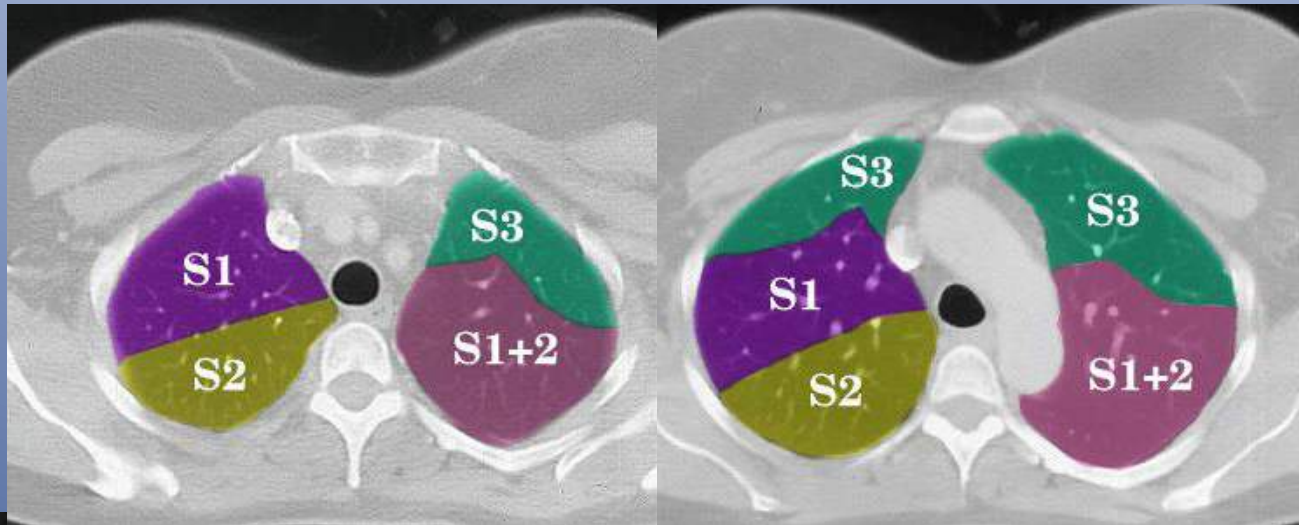
# Radiological Anatomy of the Chest

Lung Window



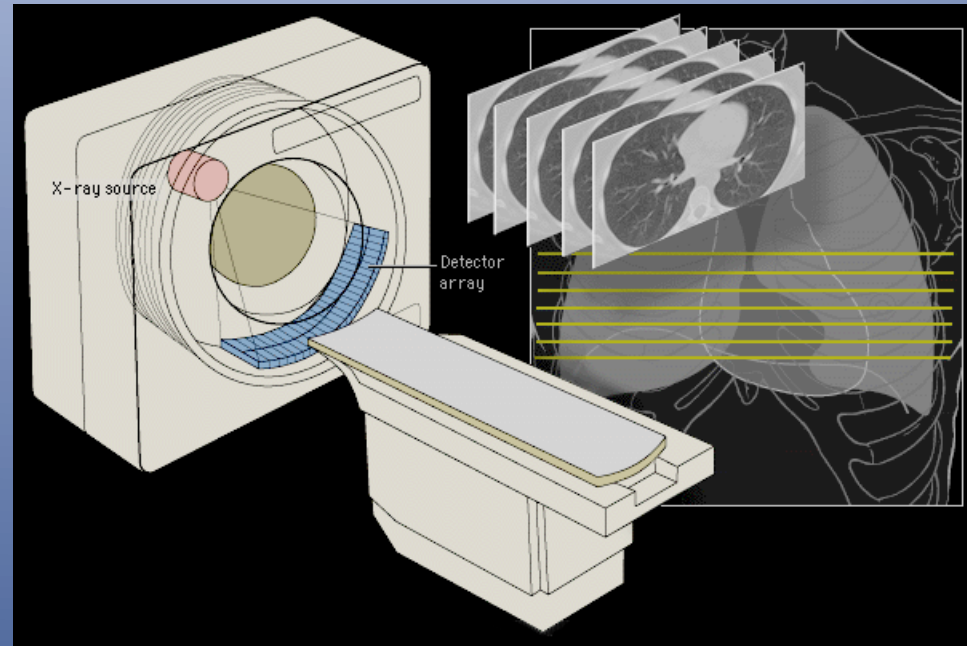
Mediastinal Window

# Radiological Anatomy of the Chest



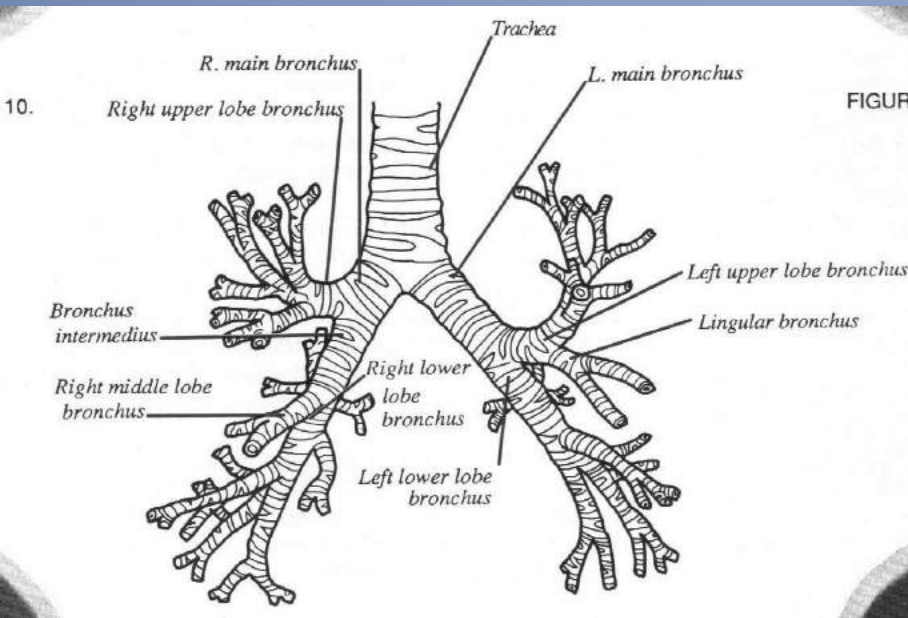
# High Resolution CT Scan

- HRCT uses very **thin slices** (1mm) to achieve better spatial resolution & precision.
- HRCT is indicated after normal CXR in a symptomatic patient - the setting of high clinical suspicion of disease.
- Advantages
  - High sensitivity for adenopathy, infiltrates, and architectural distortion.
  - HRCT can identify areas of reversible vs. irreversible lung damage.

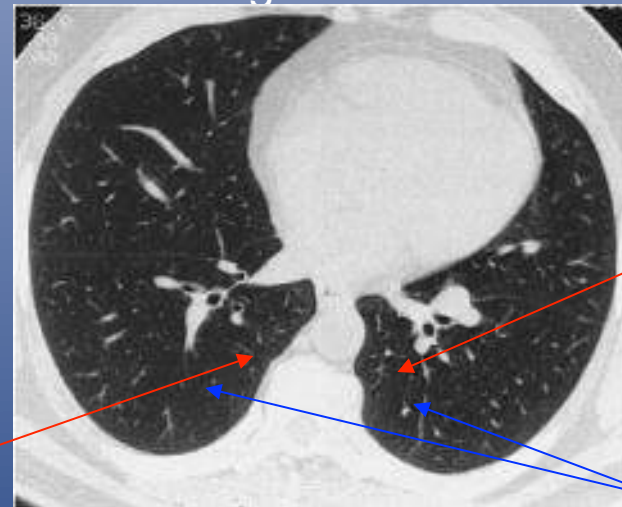


# Normal Lung Anatomy

## Tracheobronchial Tree



## Normal lung at level inferior

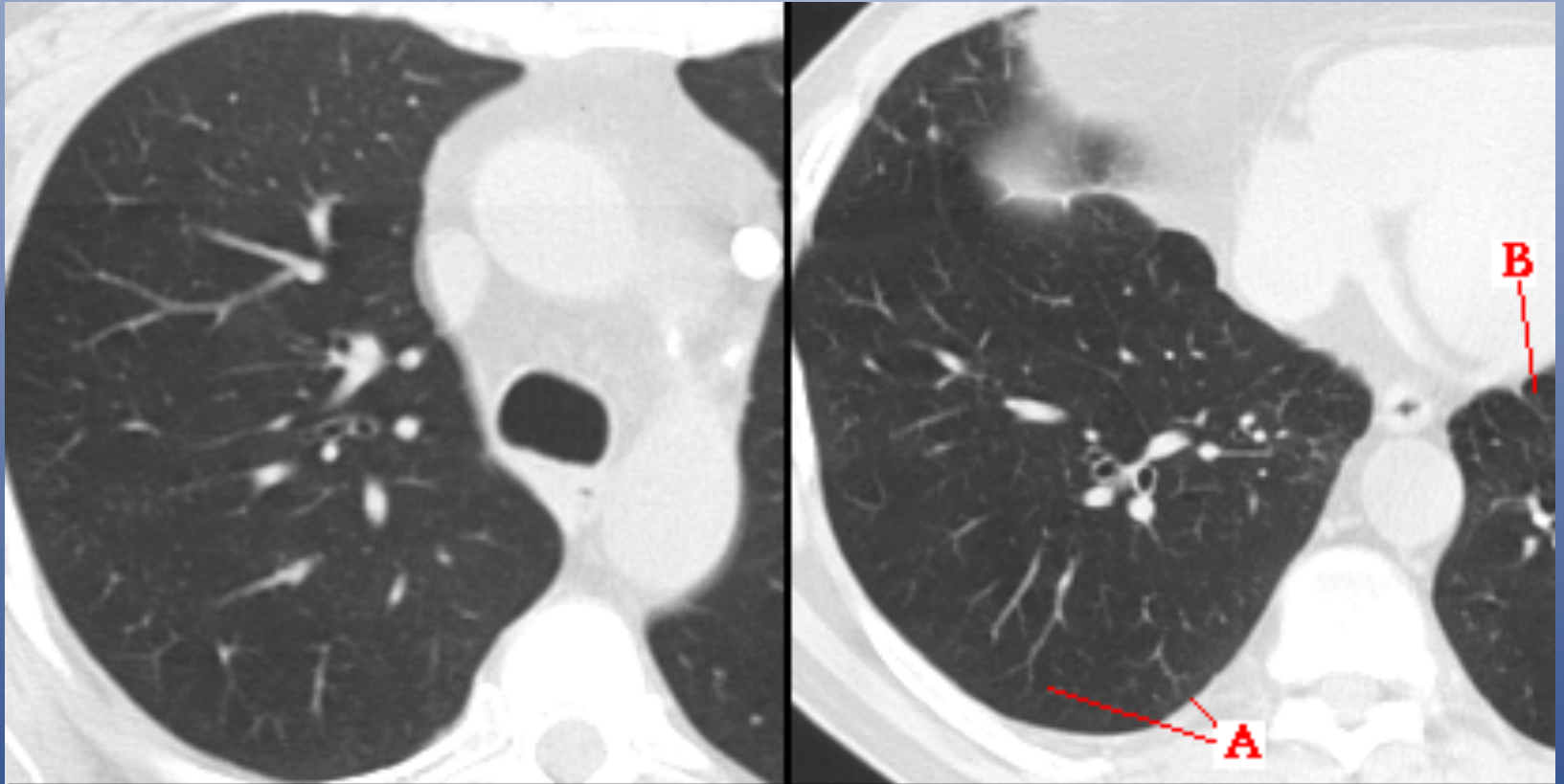


R inferior pulmonary vein

L inferior pulmonary vein

Lower lobe bronchi

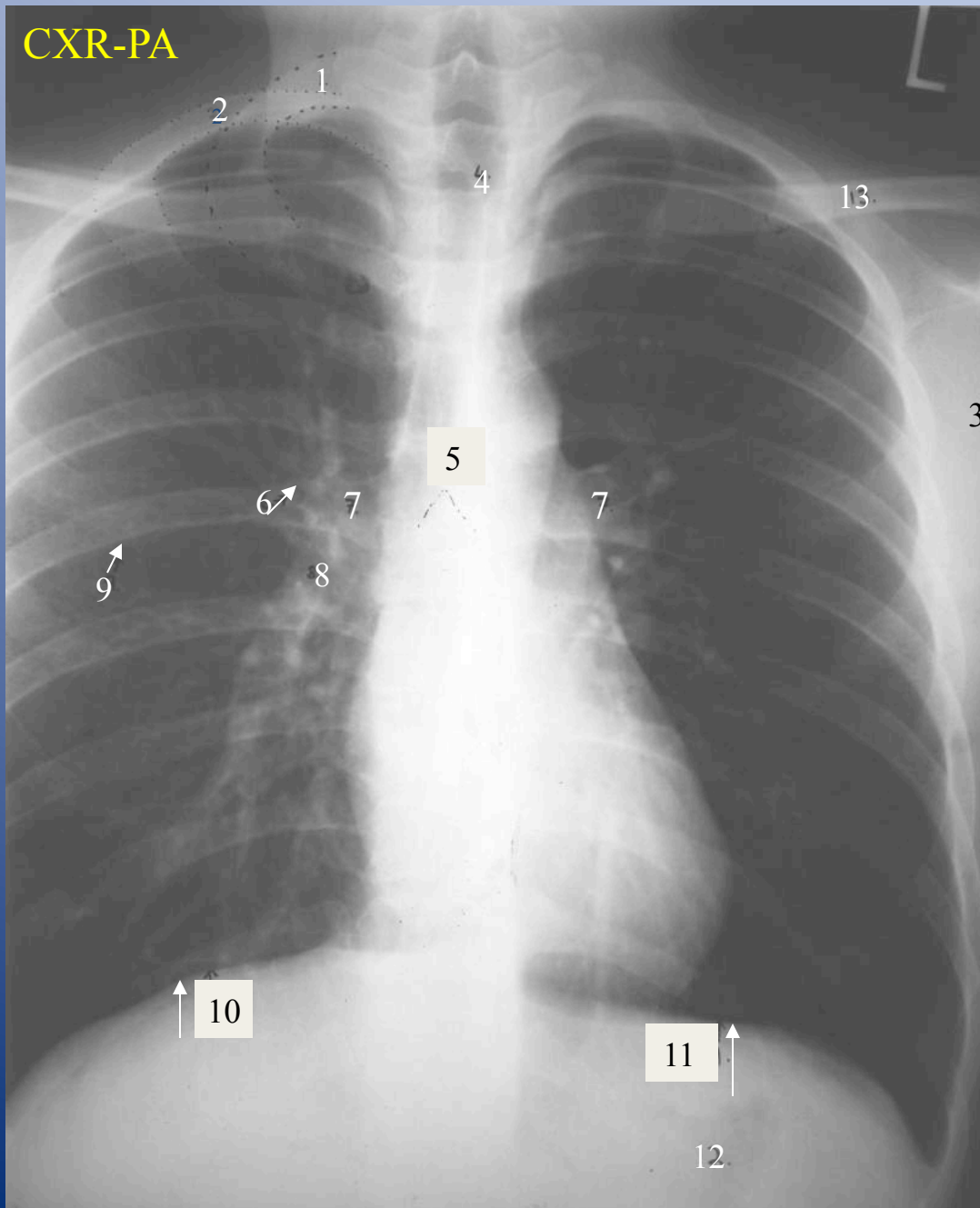
# Normal HRCT



**Normal upper (left) and lower (right) HRCT scans obtained in the prone position. The center of a pulmonary lobule is defined by the presence of a distal pulmonary artery (A). The faint outline of a distal interlobular septum is noted in the lower lobes (B). A subpleural clear space is normally present in the nondependent lung.**



CXR-PA

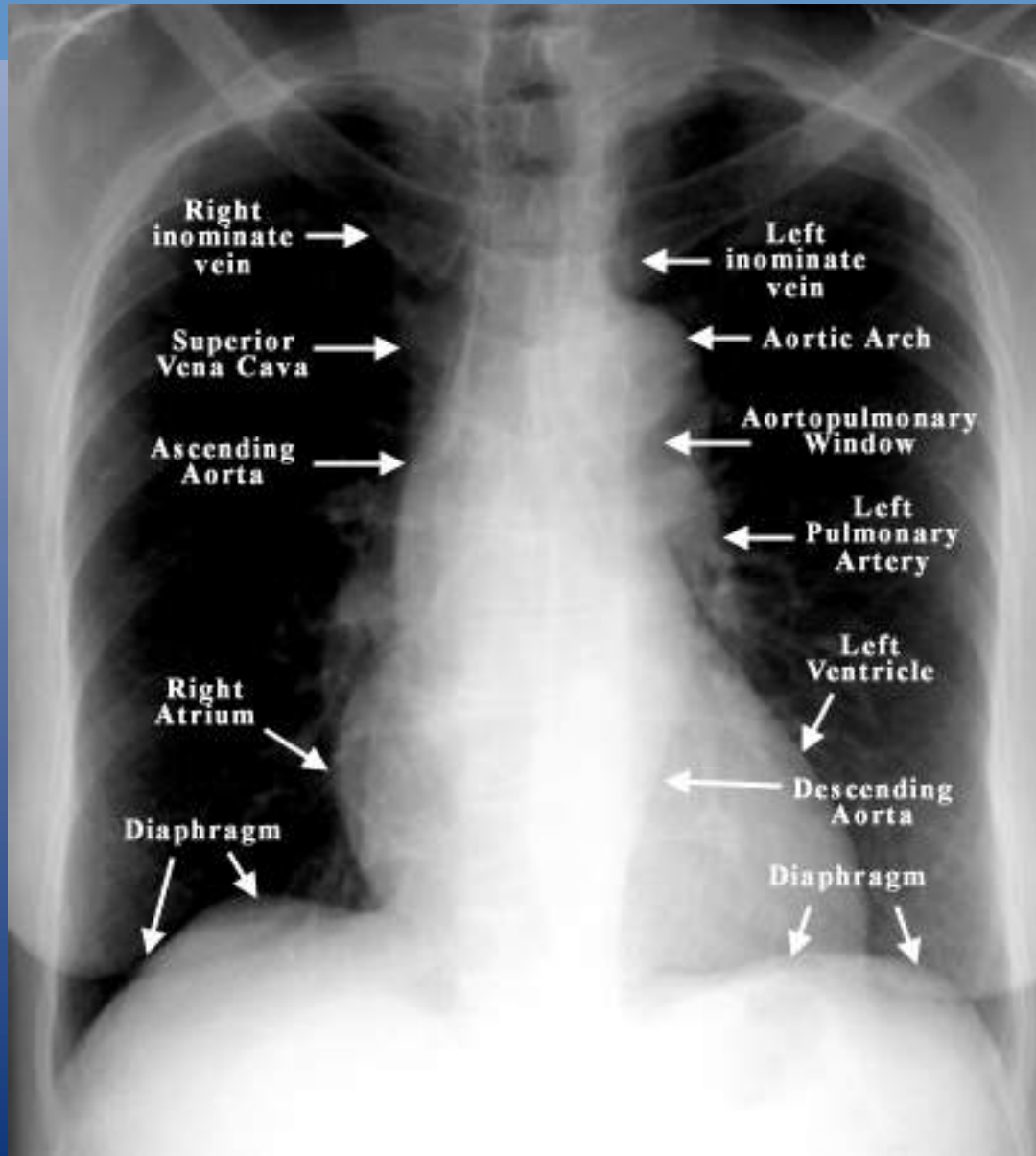


# Anatomy on Normal Chest X-Ray

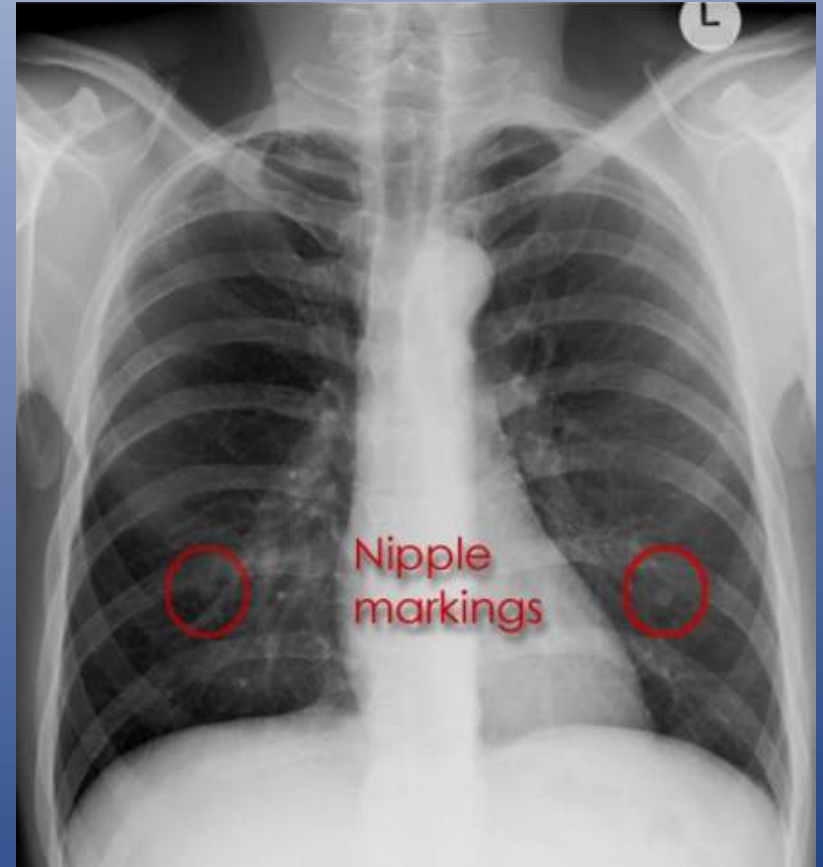
Key:

1. Right 1<sup>st</sup> rib
2. Right 2<sup>nd</sup> rib
3. Scapula
4. Trachea
5. Carina
6. Bronchus seen end on
7. Bilateral hila
8. Branch of right main descending pulmonary artery
9. Right minor (horizontal fissure)
10. Right hemi diaphragm
11. Left hemi diaphragm
12. Gastric air bubble
13. Left clavicle

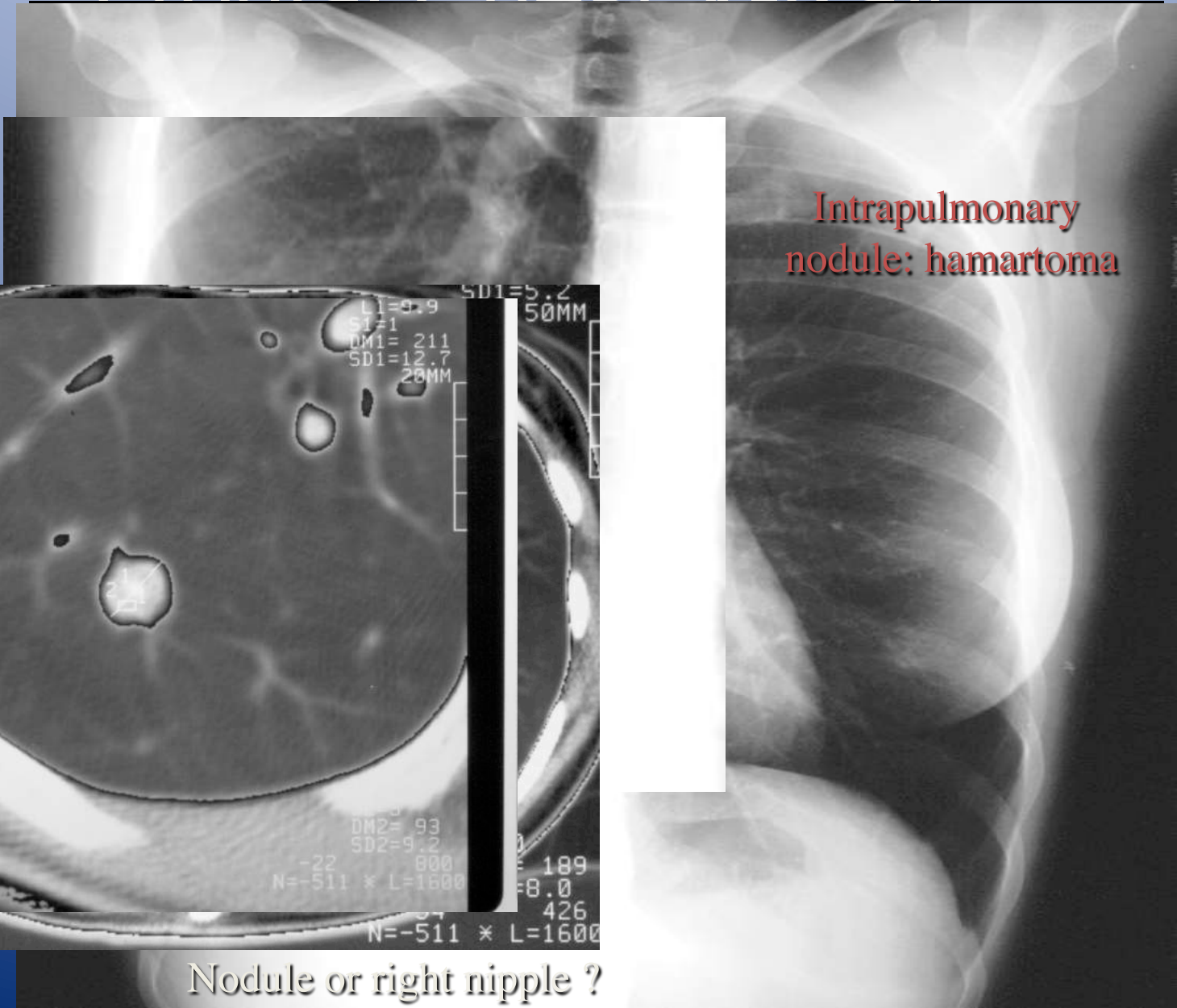
# PA VIEW ANATOMY



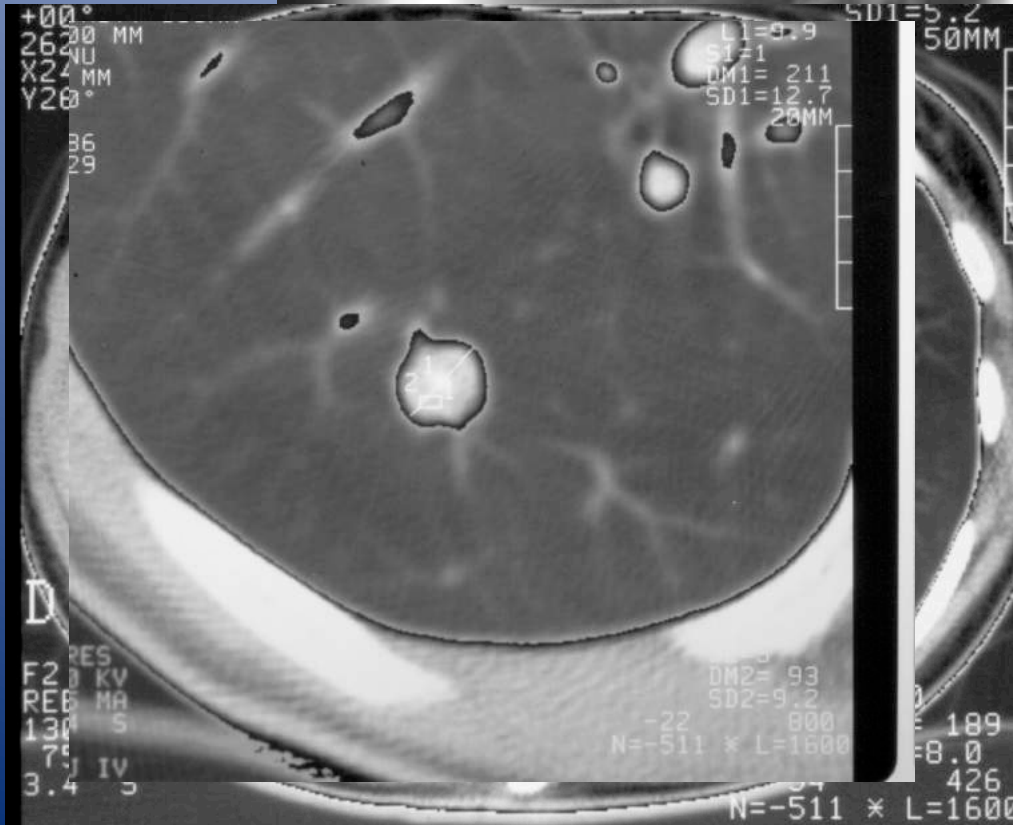
# Nipple shadows



# Frontal Chest X Ray



Intrapulmonary  
nodule: hamartoma



Nodule or right nipple ?

Remember

It's a **chest** x-ray,

not a **lung** x-ray.