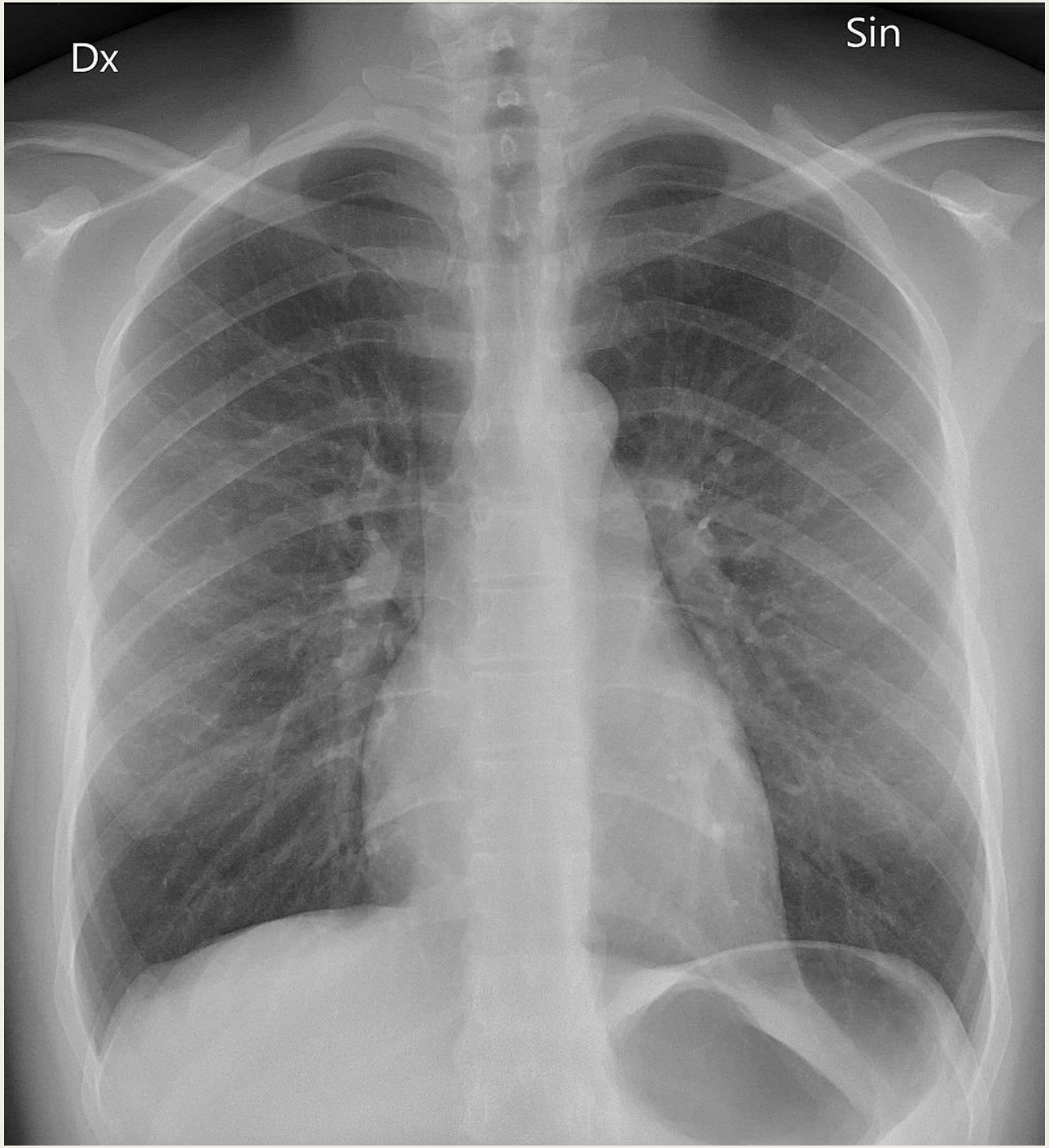
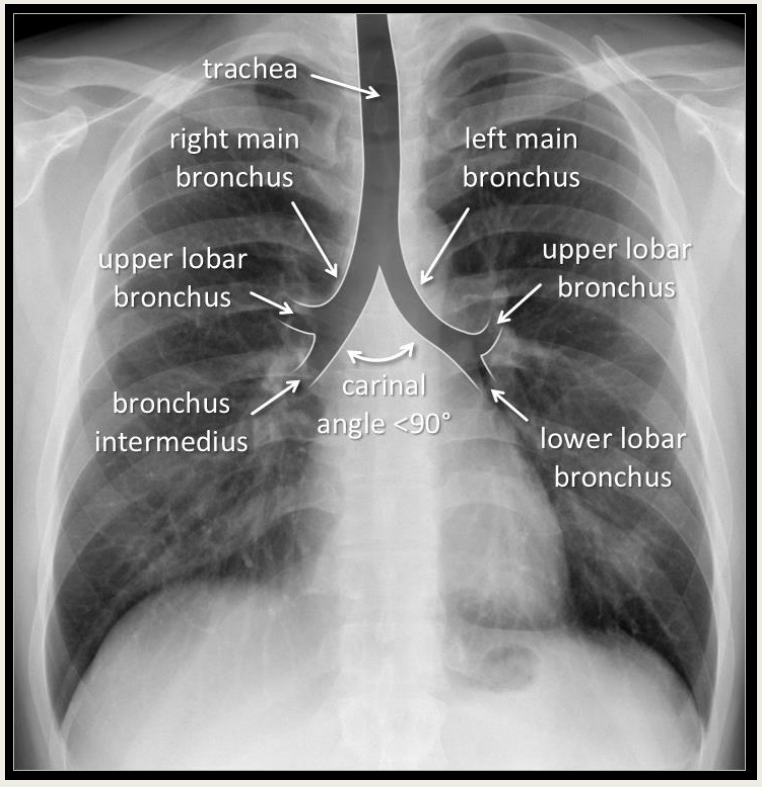
CHEST 2

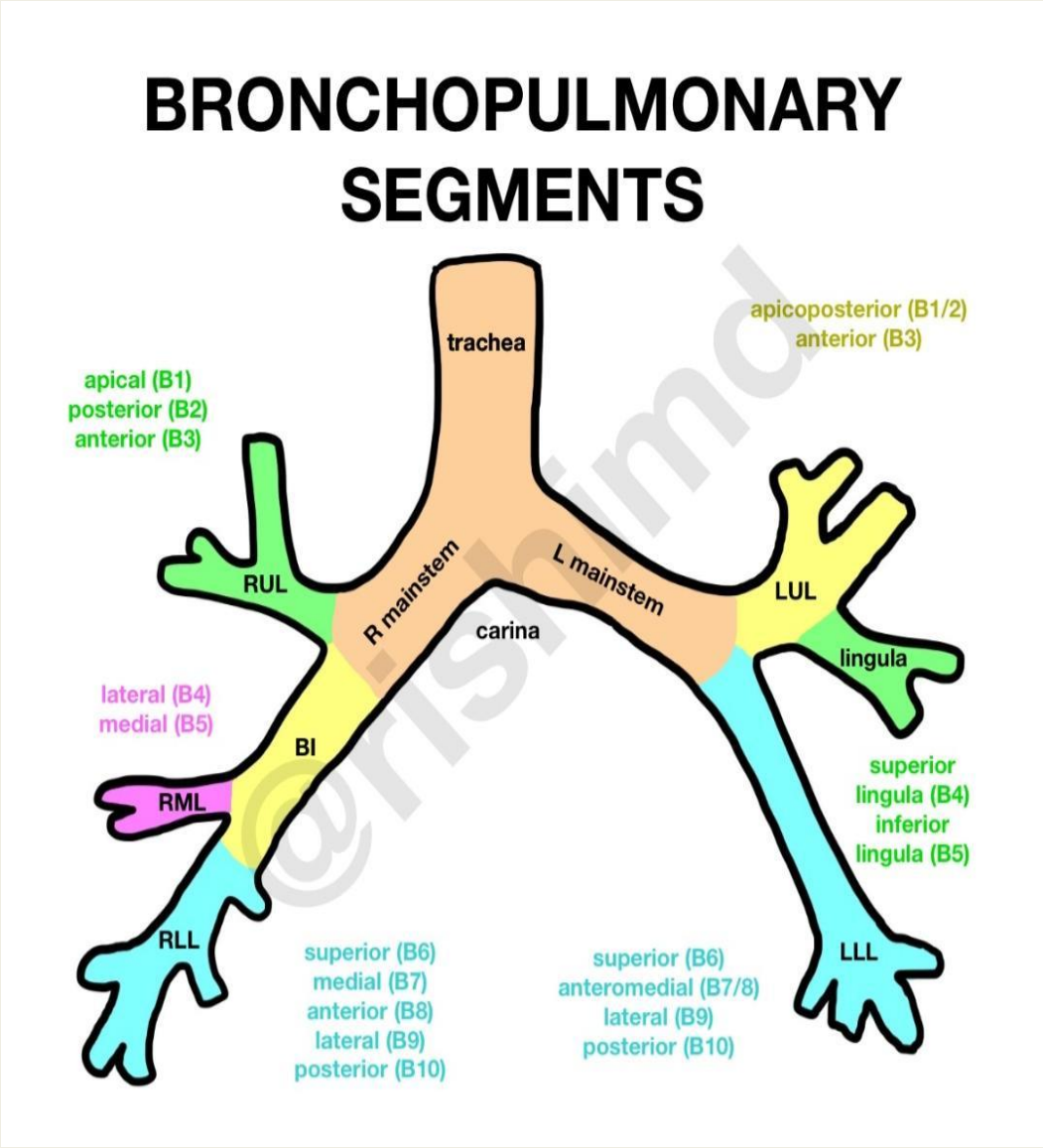
Dr.Anwar Al-Naimat


Dx
Sin

A – Airway and hilum

- Trachea carina, bronchi and hilar structures.





- The trachea extends from the inferior margin of the cricoid cartilage (C6) and branches into the right and left main bronchi at the carina, located at the T4 vertebral body leveL
- reinforced anteriorly by approximately 20 semicircular, cartilaginous rings
- The trachea divides into the right and left mainstem bronchi which further divide into secondary bronchi (RUL, RML, RLL, LUL, and LLL)

Trachea

Inspect the trachea for evidence of deviation:

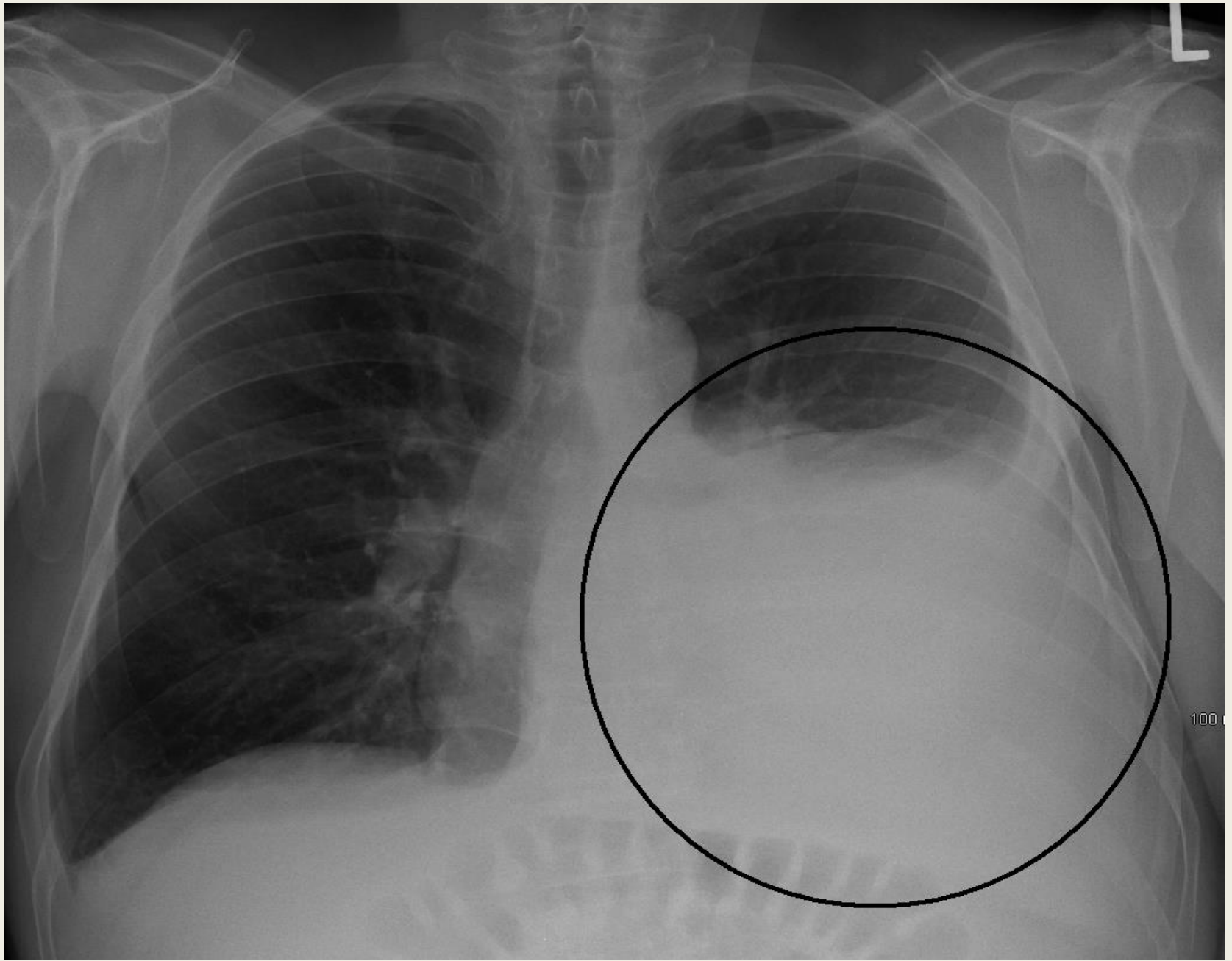
The trachea is normally located centrally or deviating very slightly to the right.

If the trachea appears significantly deviated, inspect for anything that could be pushing or pulling the trachea. Make sure to inspect for any paratracheal masses and/or lymphadenopathy.

- Causes of true and apparent tracheal deviation
- True tracheal deviation:

  Pushing of the trachea: large pleural effusion or tension pneumothorax.
  Pulling of the trachea: consolidation with associated lobar collapse.
- Apparent tracheal deviation:

  Rotation of the patient can give the appearance of apparent tracheal deviation, so as mentioned above, inspect the clavicles to rule out the presence of rotation.

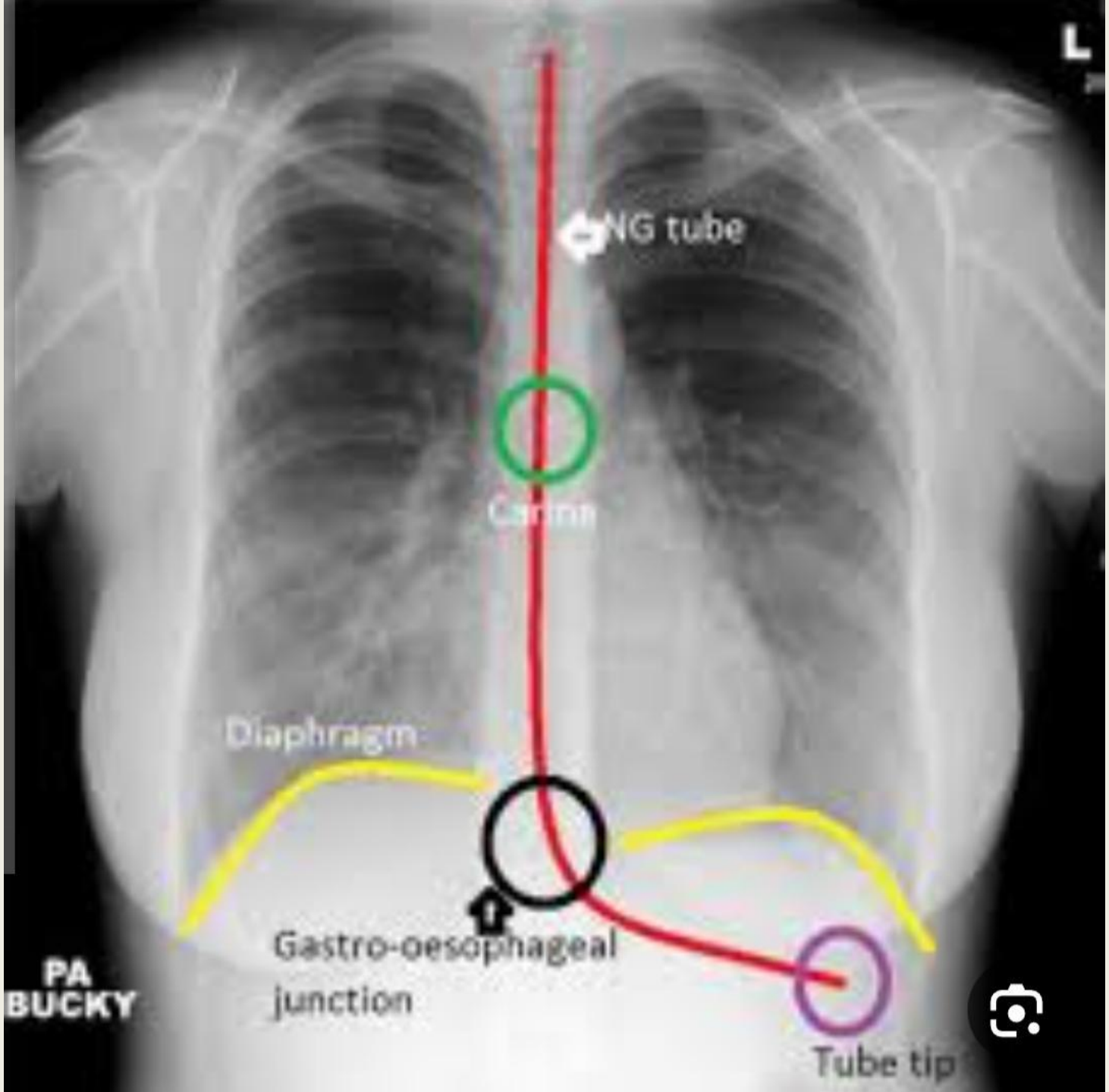


Carina and bronchi

- The carina is cartilage situated at the point at which the trachea divides into the left and right main bronchus.

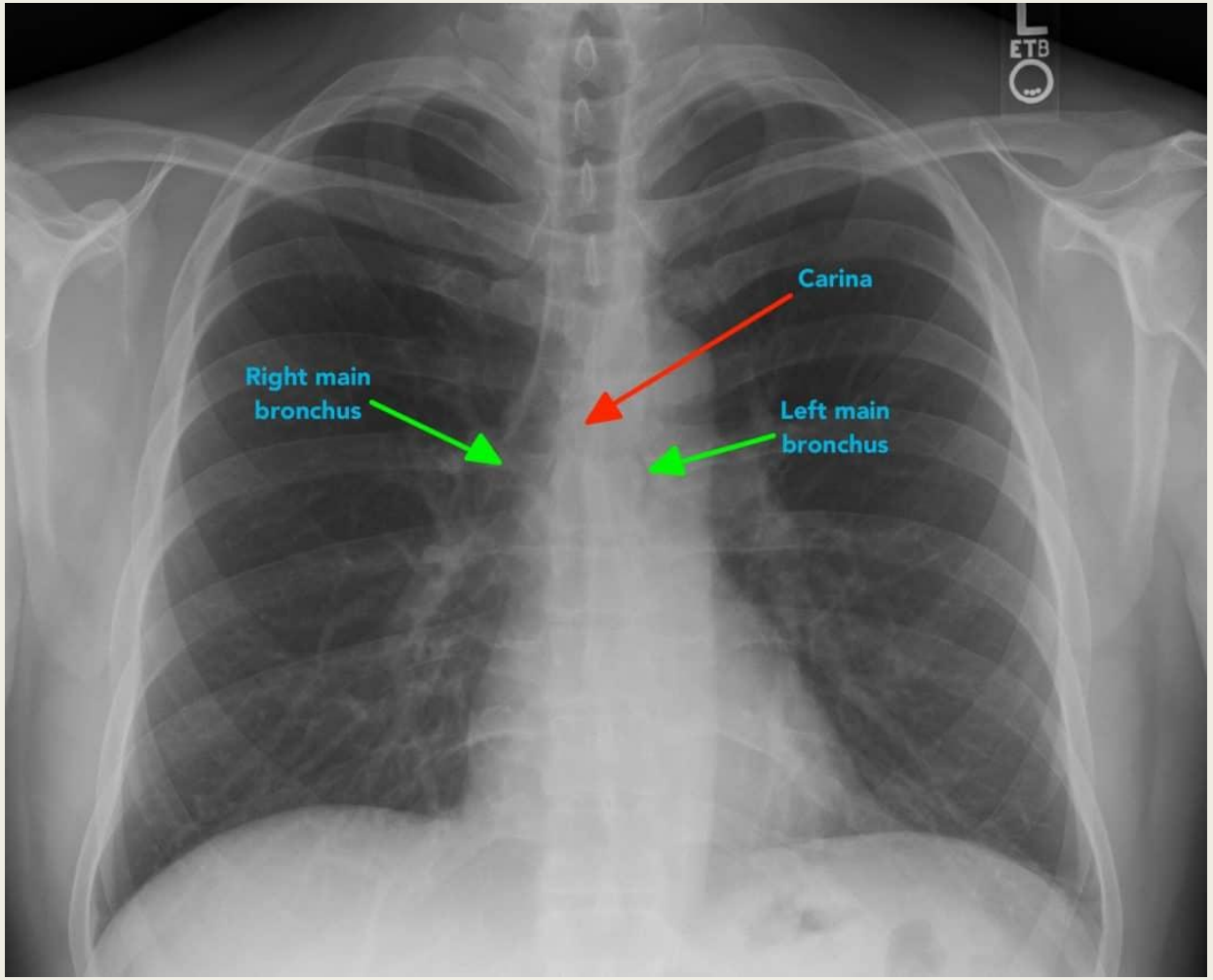
  On appropriately exposed chest X-ray, this division should be clearly visible.

- The carina is an important landmark when assessing nasogastric (NG) tube placement, as the NG tube should bisect the carina if it is correctly placed in the gastrointestinal tract.


L
NG tube
Carina
Diaphragm
Gastro-oesophageal junction
Tube tip
PA BUCKY

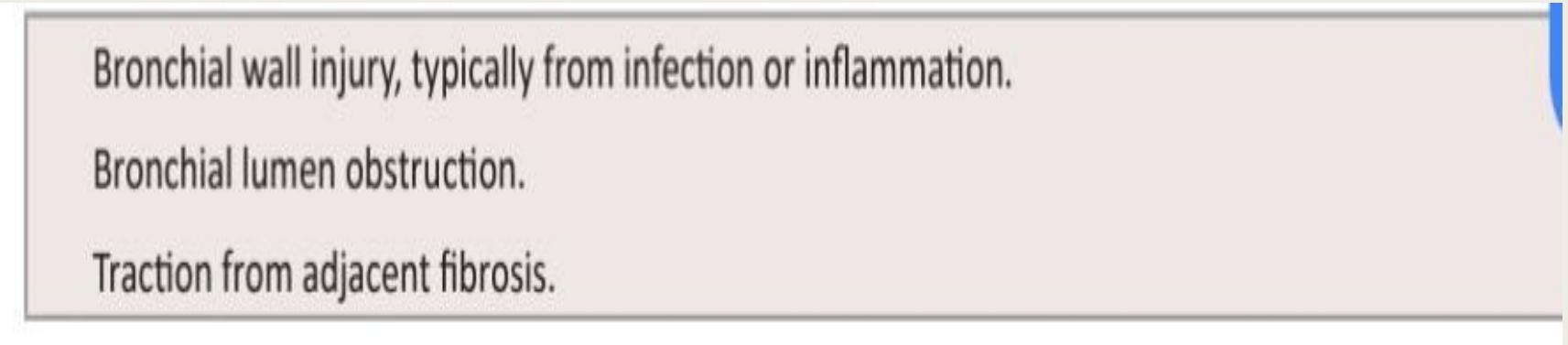
- The right main bronchus is generally wider, shorter and more vertical than the left main bronchus.
- As a result of this difference in size and orientation, it is more common for inhaled foreign objects to become lodged in the right main bronchus.

Depending on the quality of the chest X-ray you may be able to see the main bronchi branching into further subdivisions of bronchi.


L
ETB
Carina
Right main bronchus
Left main bronchus

Bronchiectasis

- progressive, irreversible dilation of cartilage-containing bronchi .
- Three etiologies of bronchiectasis have been described, with a final common pathway of mucus plugging, superimposed bacterial colonization, and inflammatory response.

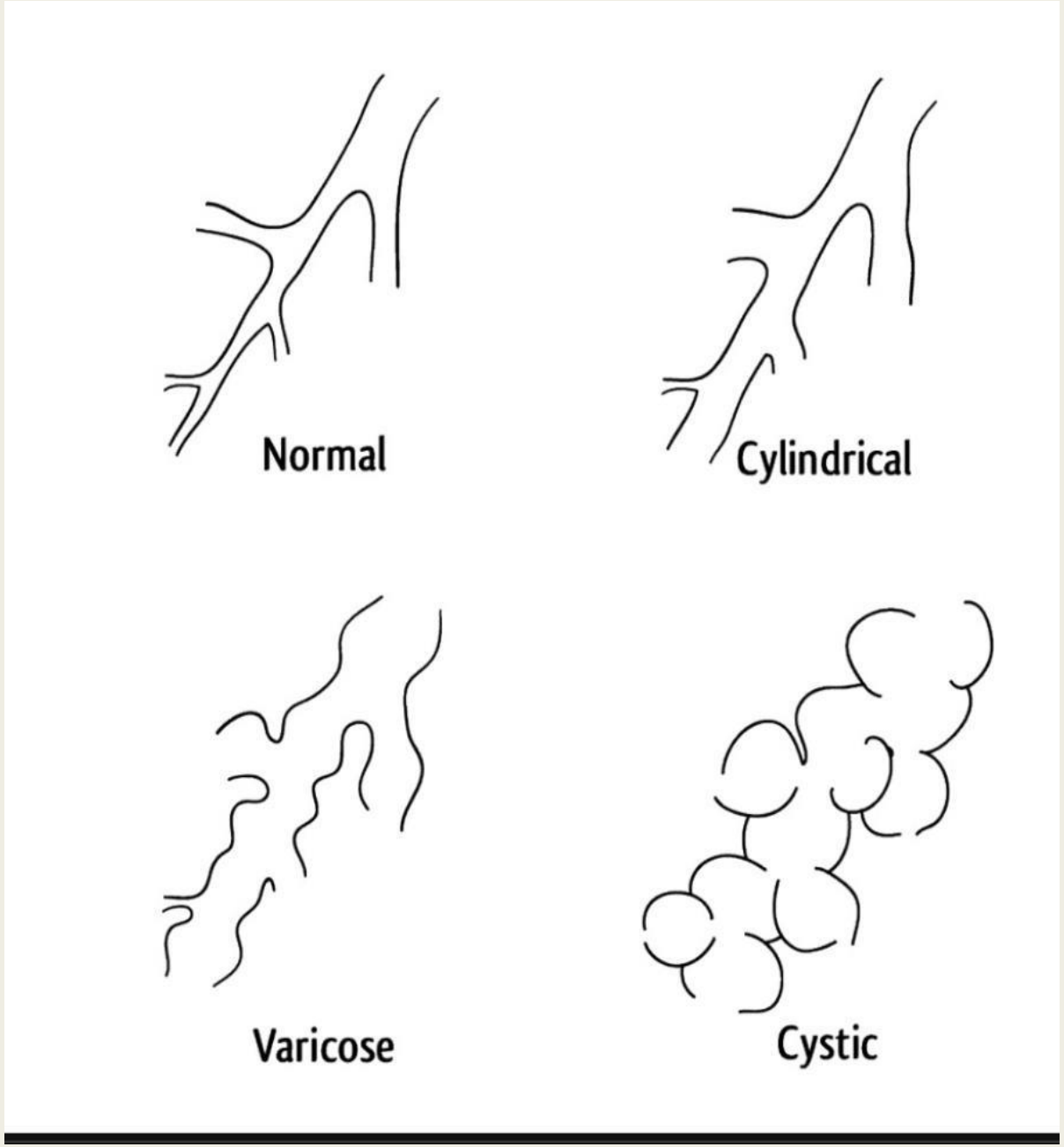


- Morphologic classification of bronchiectasis is most useful as a rough gauge of severity.

1. Cylindrical bronchiectasis (least severe): Mild bronchial dilation .

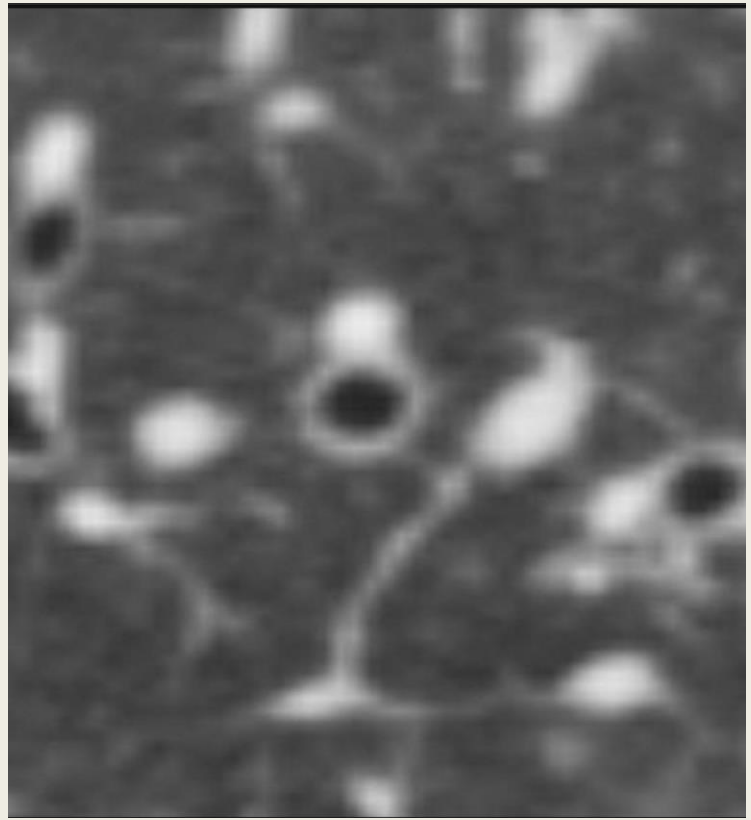
2. Varicose bronchiectasis (moderately severe): Bronchi may become beaded and irregular .

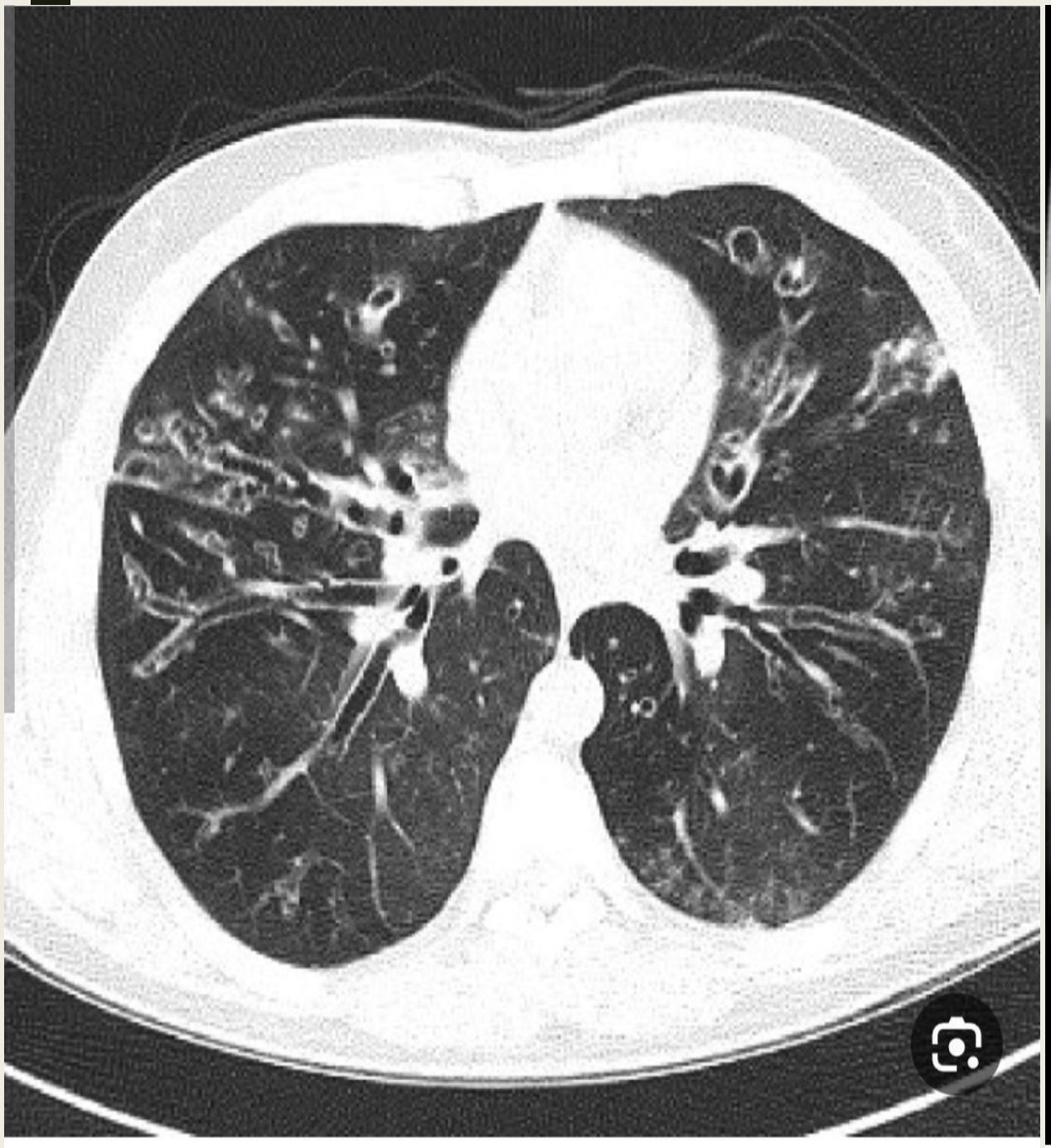
3. Cystic bronchiectasis (most severe): Bronchi are markedly enlarged and ballooned, with formation of multiple cysts that may not connect to the airways.

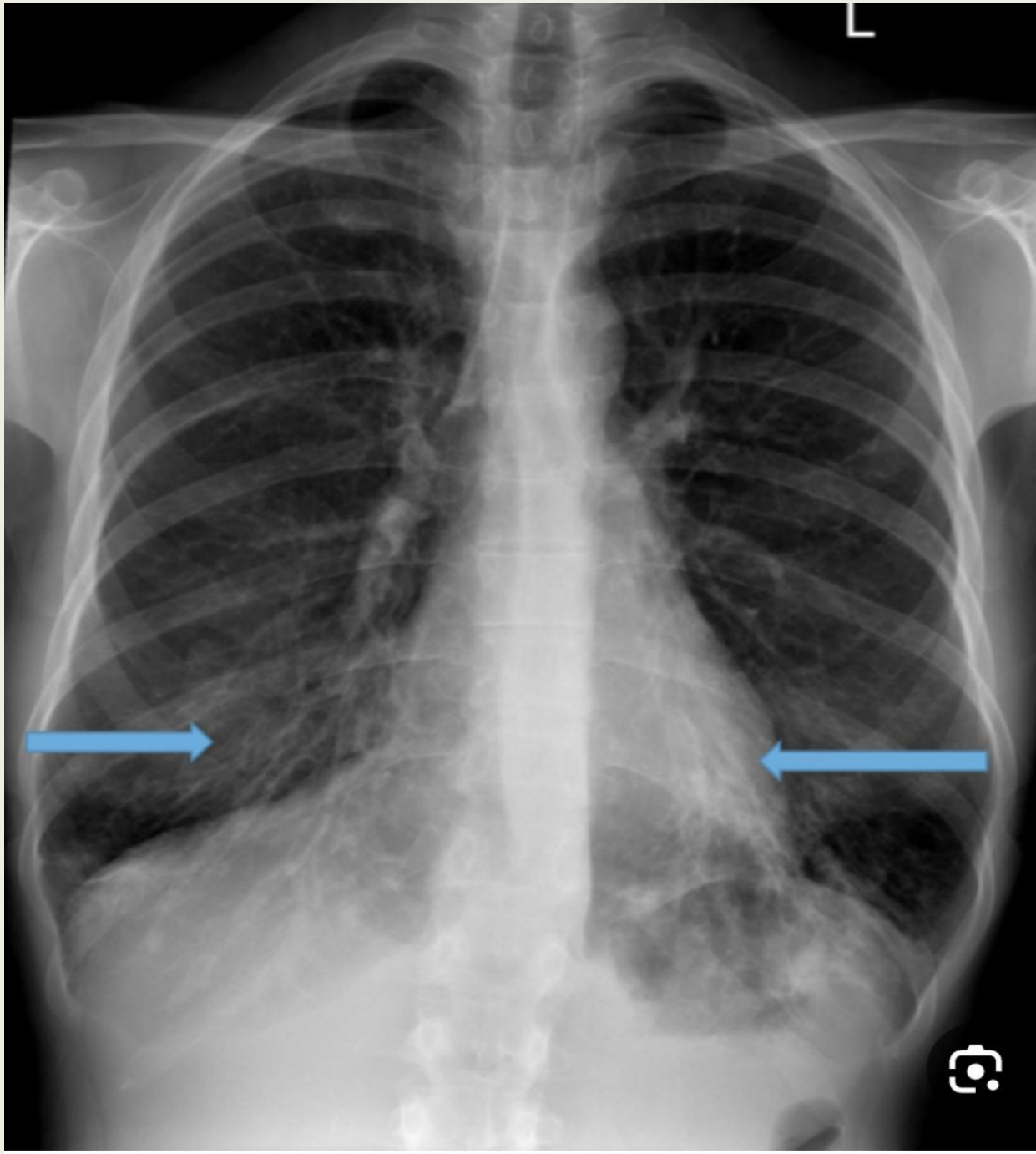


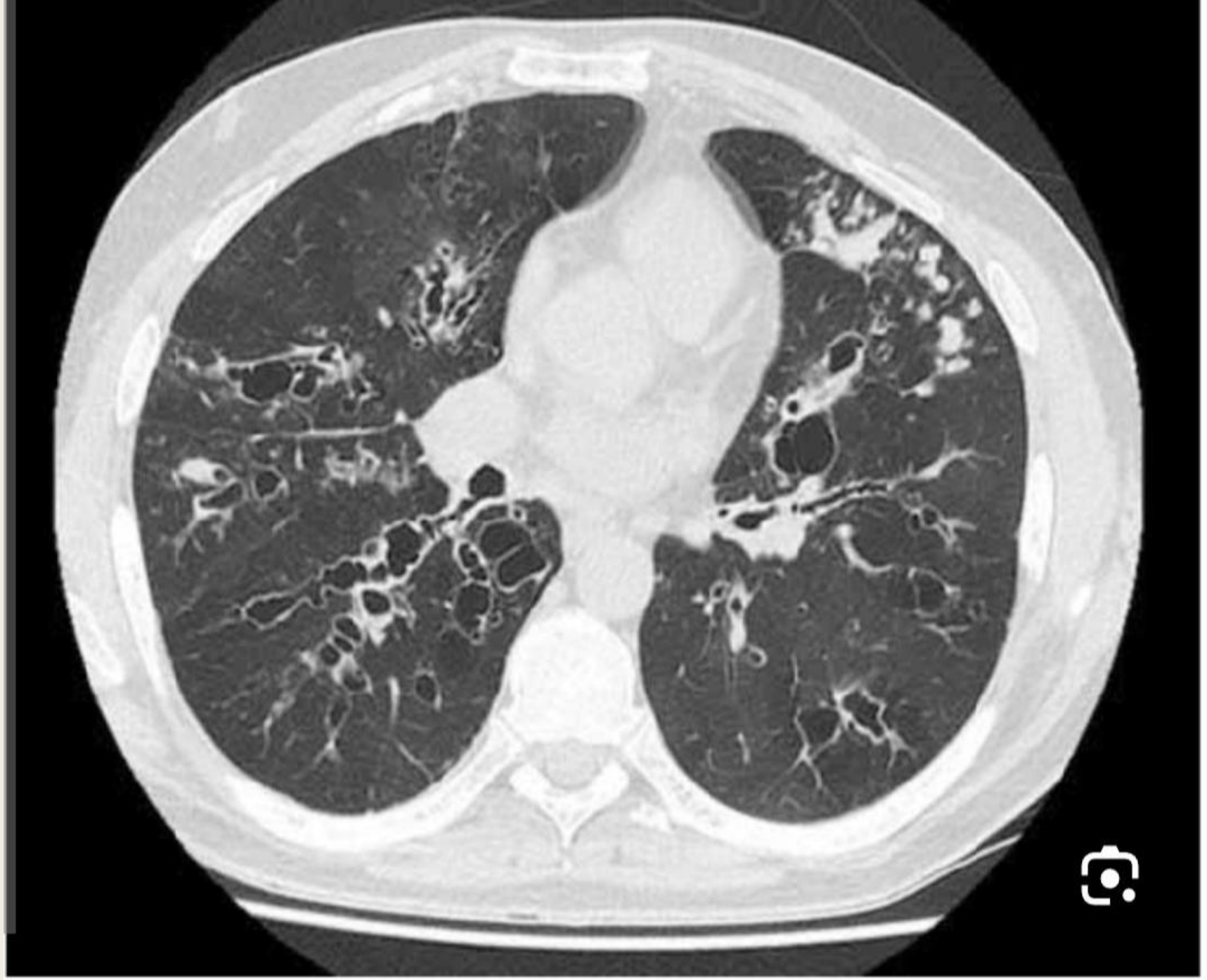
- Radiographic findings depend on severity. In mild cases only tram tracks may be visible, representing thickened bronchial walls causing parallel radiopaque lines resembling tram tracks. In more severe cases there can be extensive cystic change

- CT findings include the signet ring sign







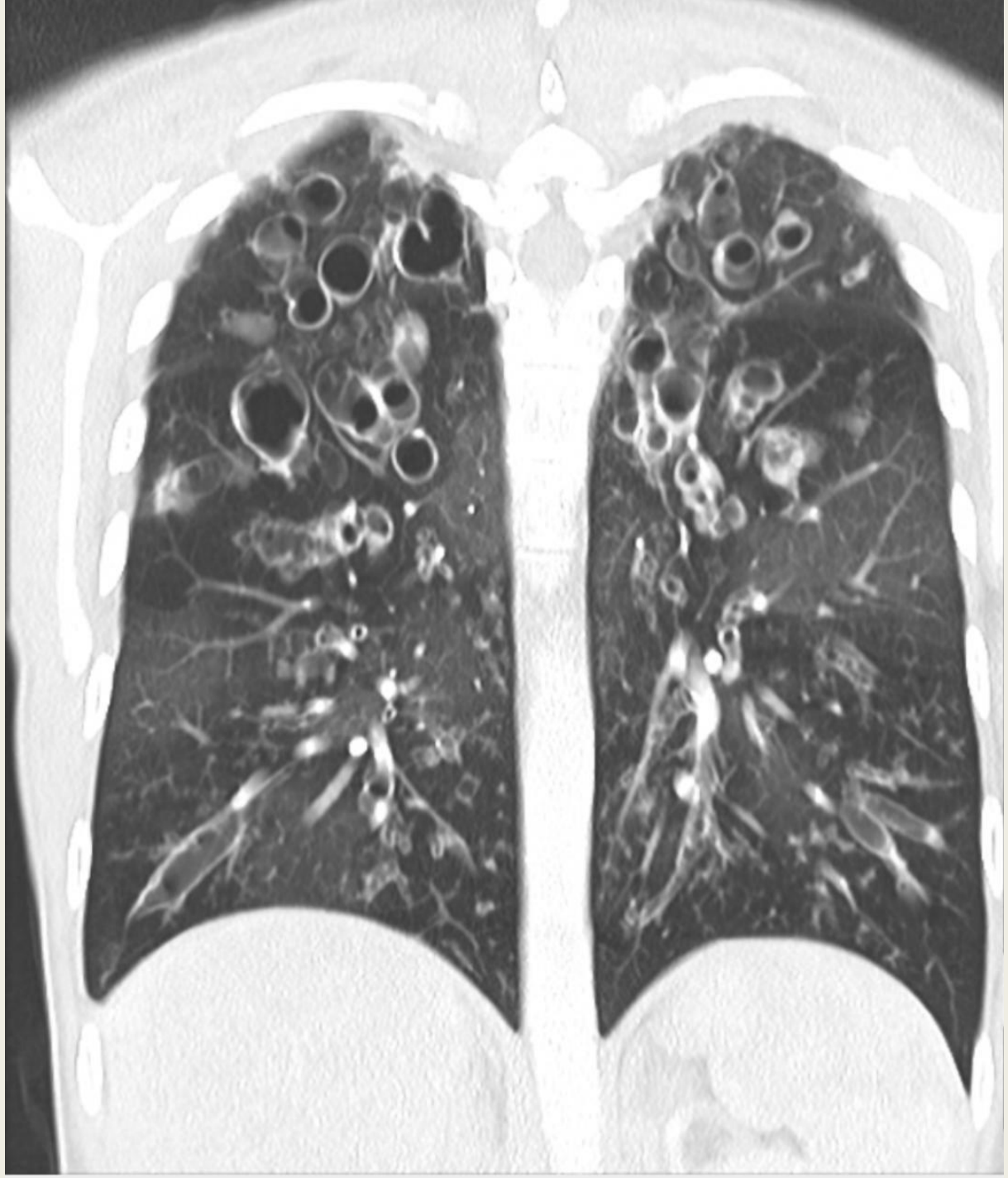


Cystic fibrosis

- Autosomal recessive genetic disease that affects the exocrine function of the lungs, liver, pancreas, small bowel, sweat glands, and the male genital system. This is resulting in progressive disability and multisystem failure
- Although the entire lung is affected, there is a predilection for:

1. central (perihilar) distribution
2. upper lobes
3. apical segment of lower lobes


R



- Chest radiographs are insensitive to the early changes of cystic fibrosis, with changes seen on HRCT in 65% of patients with CF and normal chest radiographs . Later changes include:

1. Bronchiectasis
2. Hyperinflation

3. lobar collapse
4. pulmonary arterial enlargement due to pulmonary arterial hypertension in patients with long-standing disease


L
TG

Hyperinflation

- **Lung hyperinflation** is a common feature of patients with chronic obstructive pulmonary disease (COPD). It is also linked to aging and other chronic diseases that cause airflow obstruction.

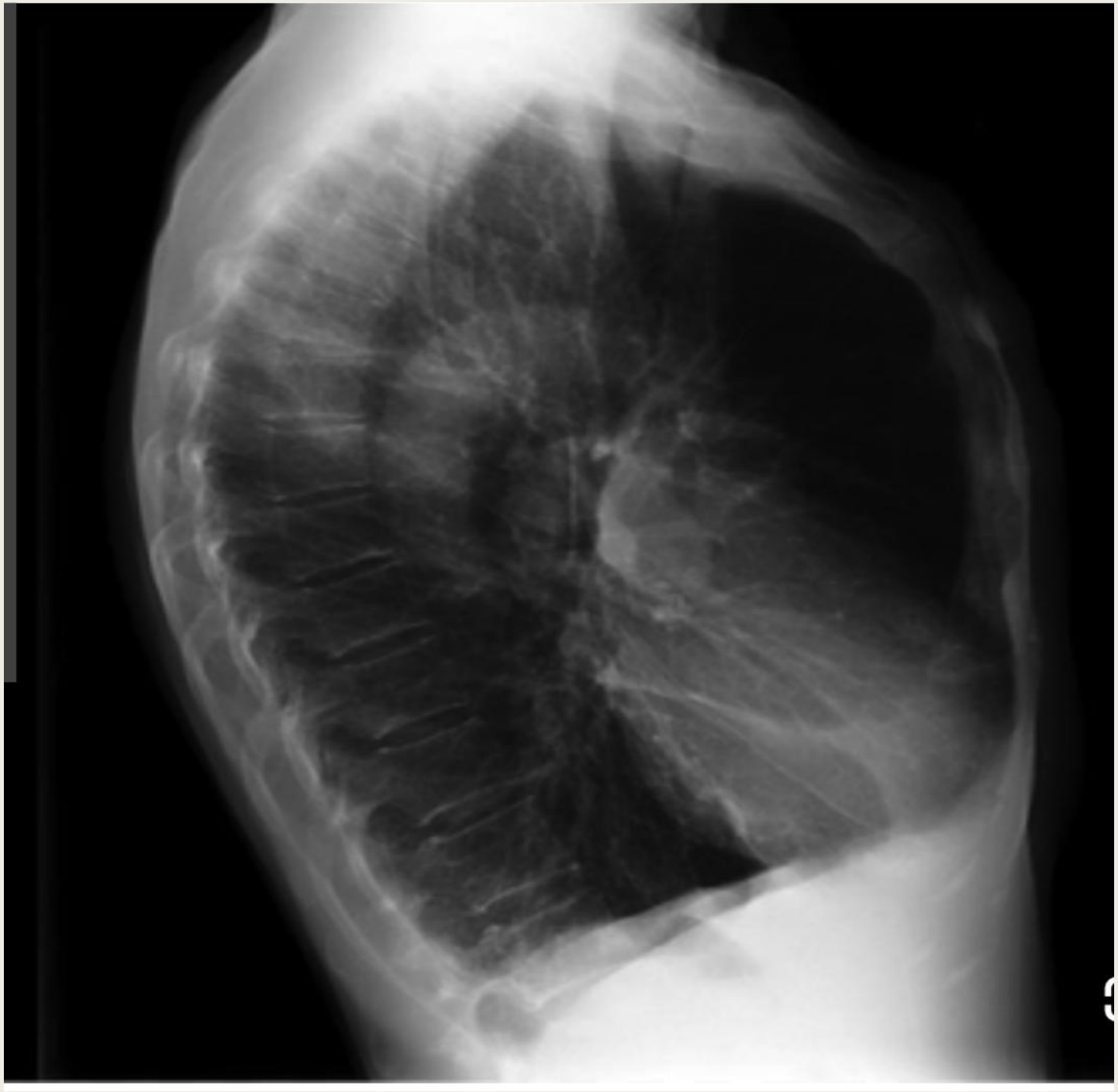

L

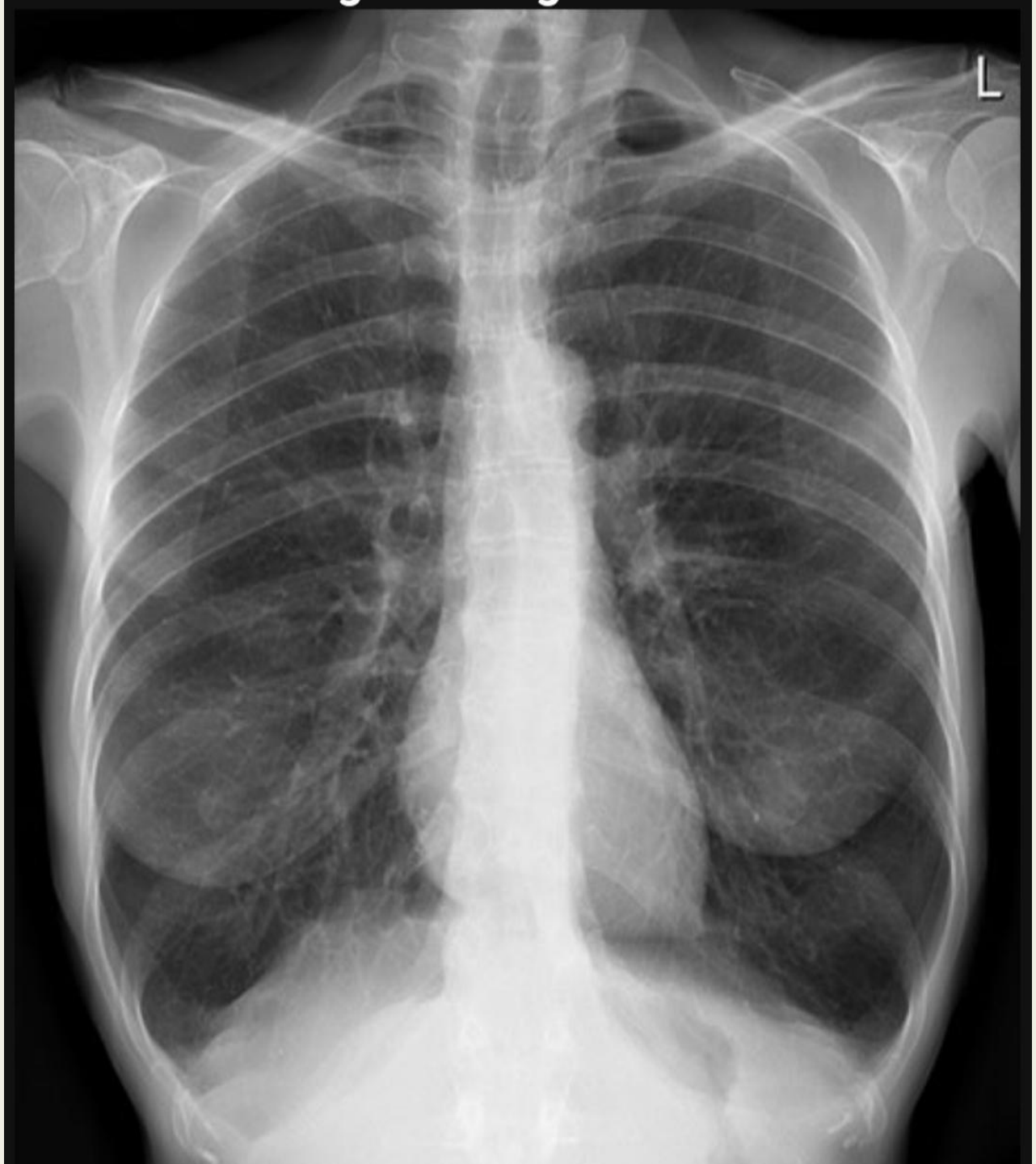
• Plain radiograph

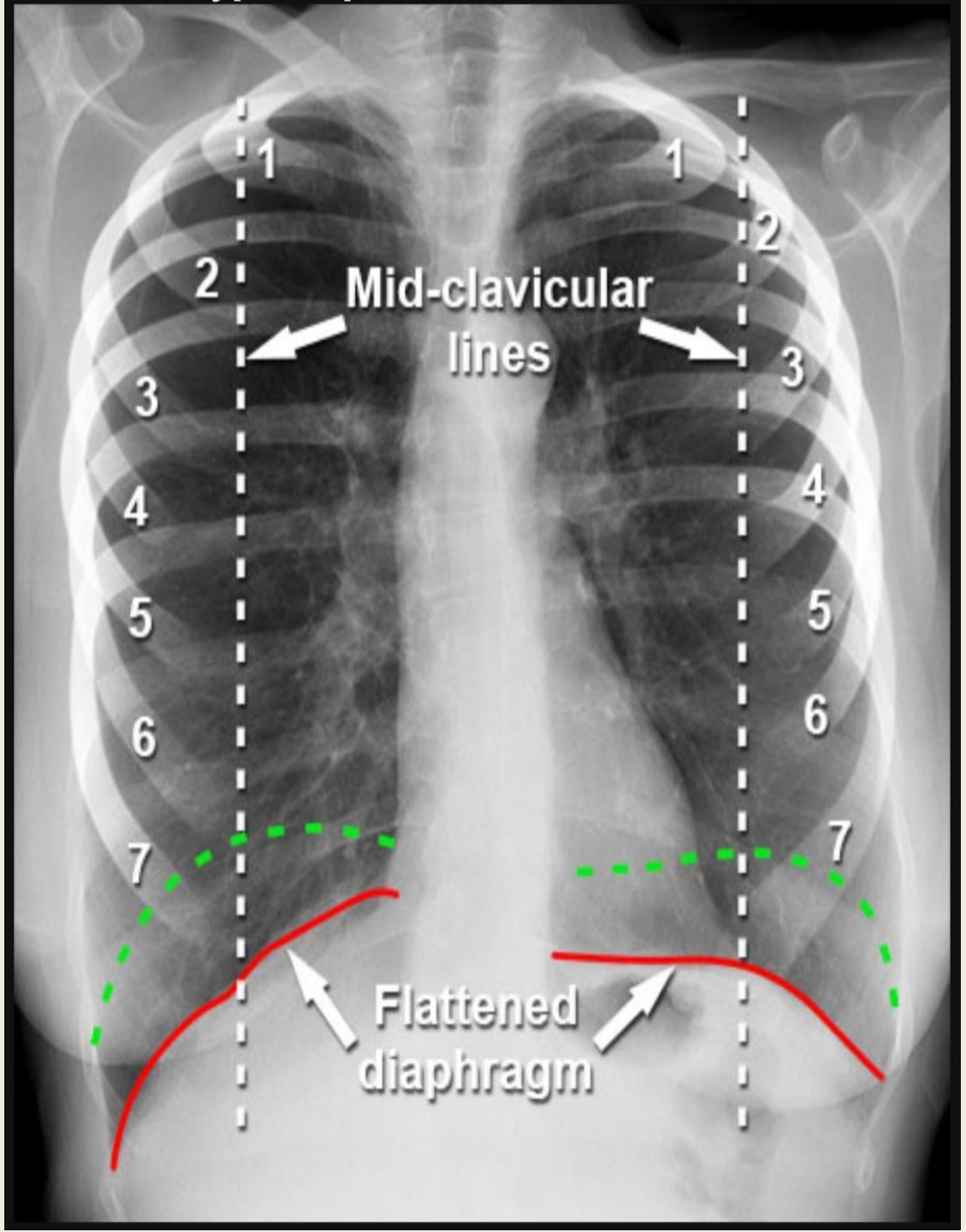
- Observable features include:

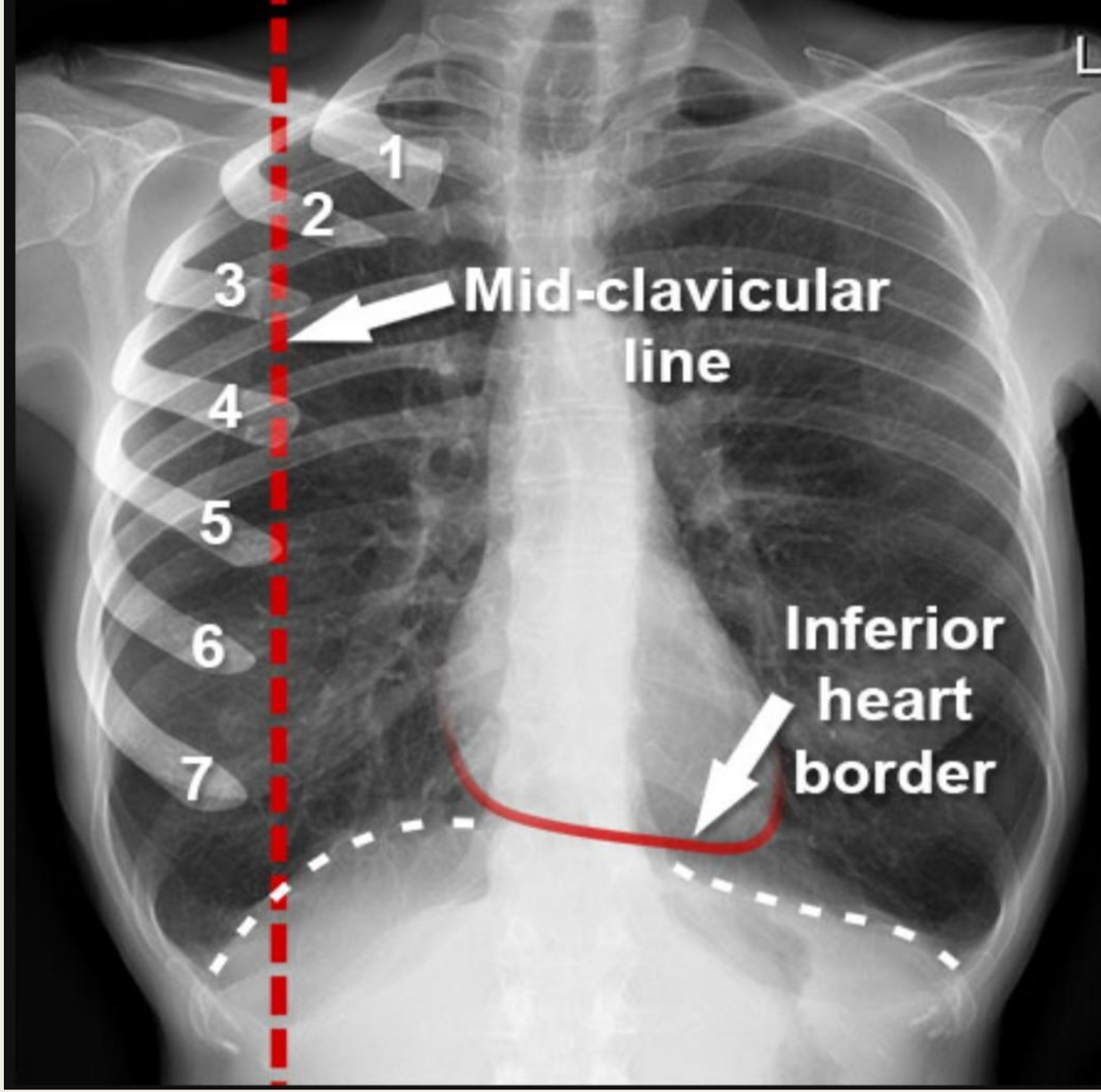
1. flattened hemidiaphragmatic contour
2. air trapping: when comparing two radiographs acquired in maximal inspiration and maximal expiration, the vertical movement of the diaphragm is less than 3 cm

3. appearance of the ribs:
   - more than 6 anterior or 10 posterior ribs above the diaphragm level on the midclavicular line
   - horizontalisation of ribs
4. presence of air below the heart
5. increased anteroposterior diameter of the chest, also called barrel chest
6. hyperlucent lungs (i.e. less bronchovascular markings per unit area)




L

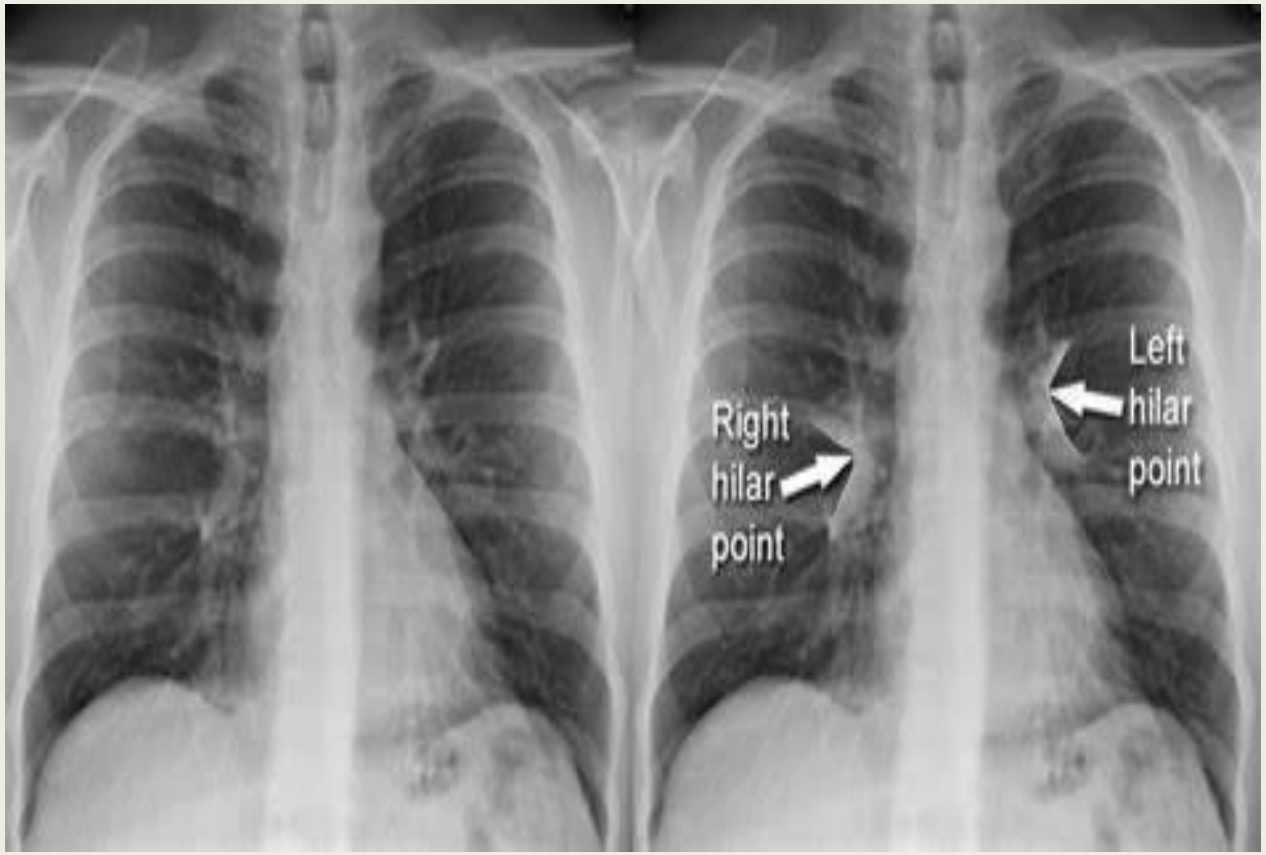

1
2
3
4
5
6
7
Mid-clavicular lines
Flattened diaphragm


1
2
3
Mid-clavicular line
4
5
6
Inferior heart border
7

Hilar structures

- The hilar consist of the main pulmonary vasculature and the major bronchi.
- Each hilar also has a collection of lymph nodes which aren’t usually visible in healthy individuals
- The left hilum is often positioned slightly higher than the right, but there is a wide degree of variability between individuals.
  The hilar are usually the same size, so asymmetry should raise suspicion of pathology.

- The hilar point is also a very important landmark; anatomically it is where the descending pulmonary artery intersects the superior pulmonary vein. When this is lost, consider the possibility of a lesion here (e.g. Lung tumour or enlarged lymph nodes).

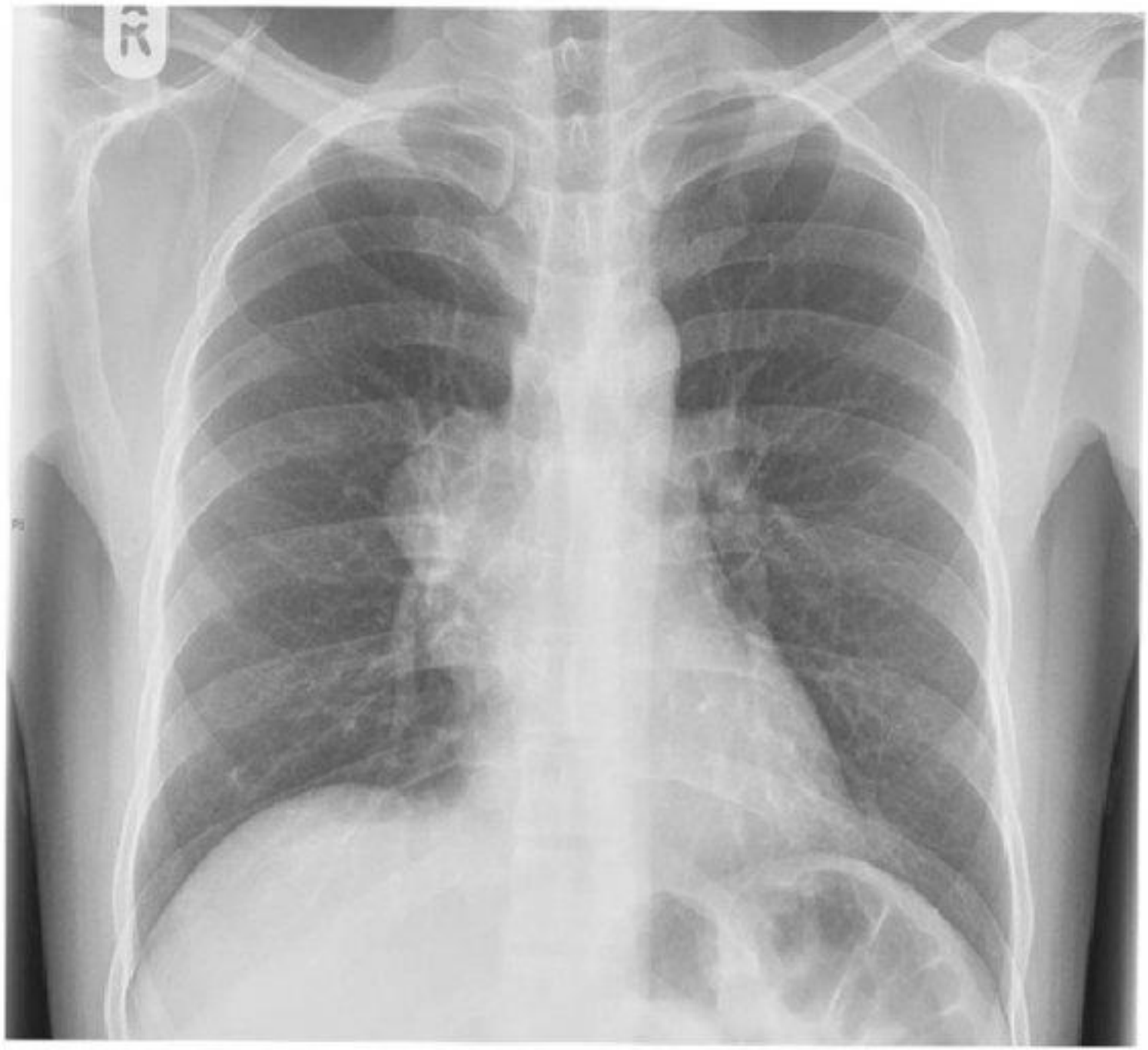


Causes of hilar enlargement or abnormal position

- Hilar enlargement can be caused by a number of different pathologies:

1. Bilateral symmetrical enlargement is typically associated with sarcoidosis.
2. Unilateral/asymmetrical enlargement may be due to underlying malignancy

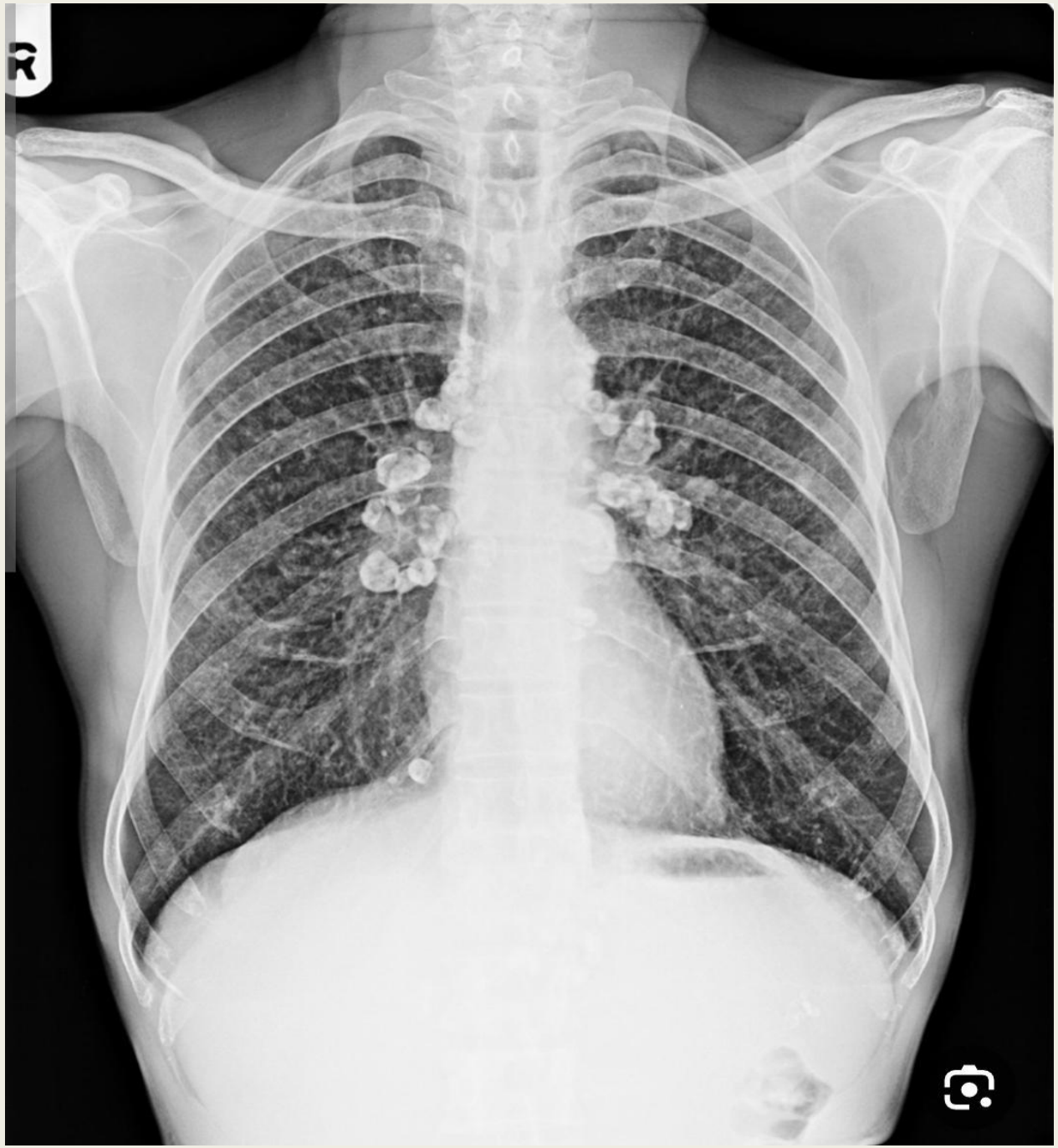
- Abnormal hilar position can also be due to a range of different pathologies. You should inspect for evidence of the hilar being pushed (e.g. By an enlarging soft tissue mass) or pulled (e.g. Lobar collapse)

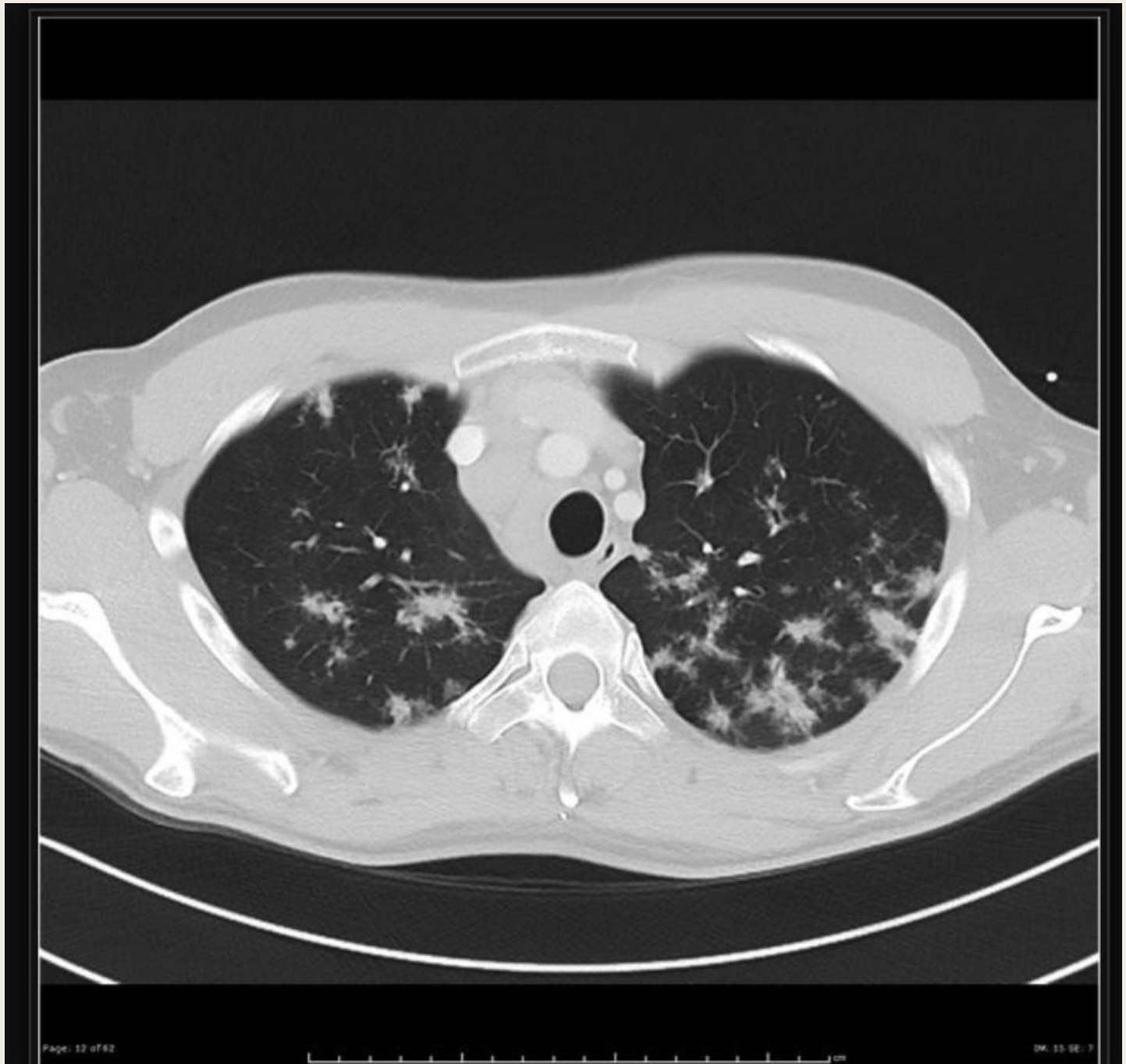

R

Sarcoidosis

- a non-caseating granulomatous multisystem disease with a wide range of clinical and radiographic manifestations .
- Pulmonary manifestations are present in ~ 90% of patients .
- Pulmonary sarcoidosis may progress to pulmonary fibrosis with honeycombing.

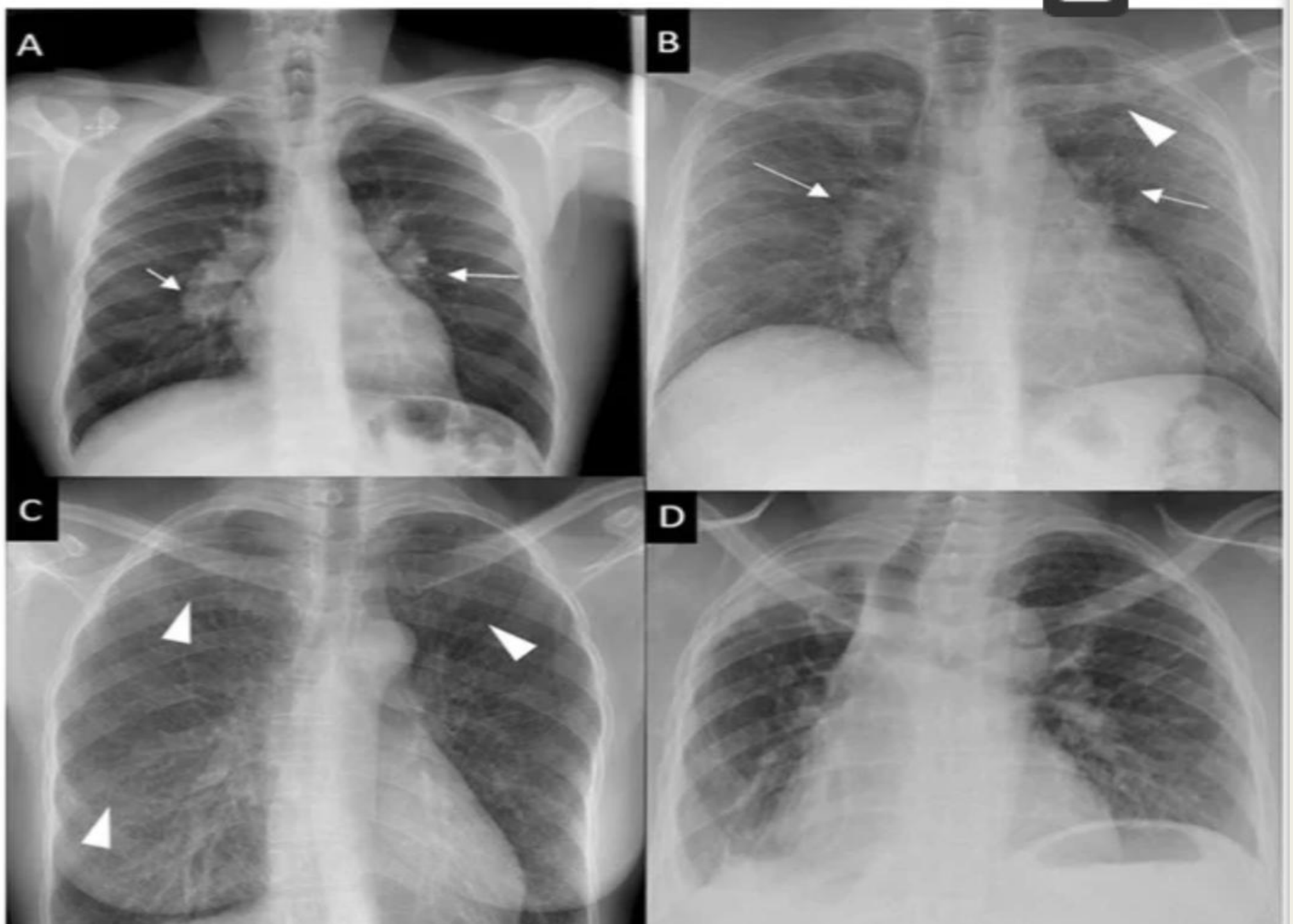
- The most common radiographic finding in sarcoidosis is symmetric adenopathy.
- Lymph nodes may contain stippled or eggshell calcification in up to 50%.
- The most common CT finding in sarcoidosis, in addition to adenopathy, is upper lobe predominant perilymphatic nodules of variable sizes, representing sarcoid granulomas.




Page: 12 of 62
IM: 15 SE: 7

- Historical staging system has been used for radiographic findings (not CT)

Table 1 - Radiologic stages of thoracic changes of sarcoidosis.	
Stage 0	Normal chest radiograph.
Stage 1	Lymphadenopathy only.
Stage 2	Lymphadenopathy with parenchymal infiltration.
Stage 3	Parenchymal infiltration only.
Stage 4	Pulmonary fibrosis.


A
B
C
D

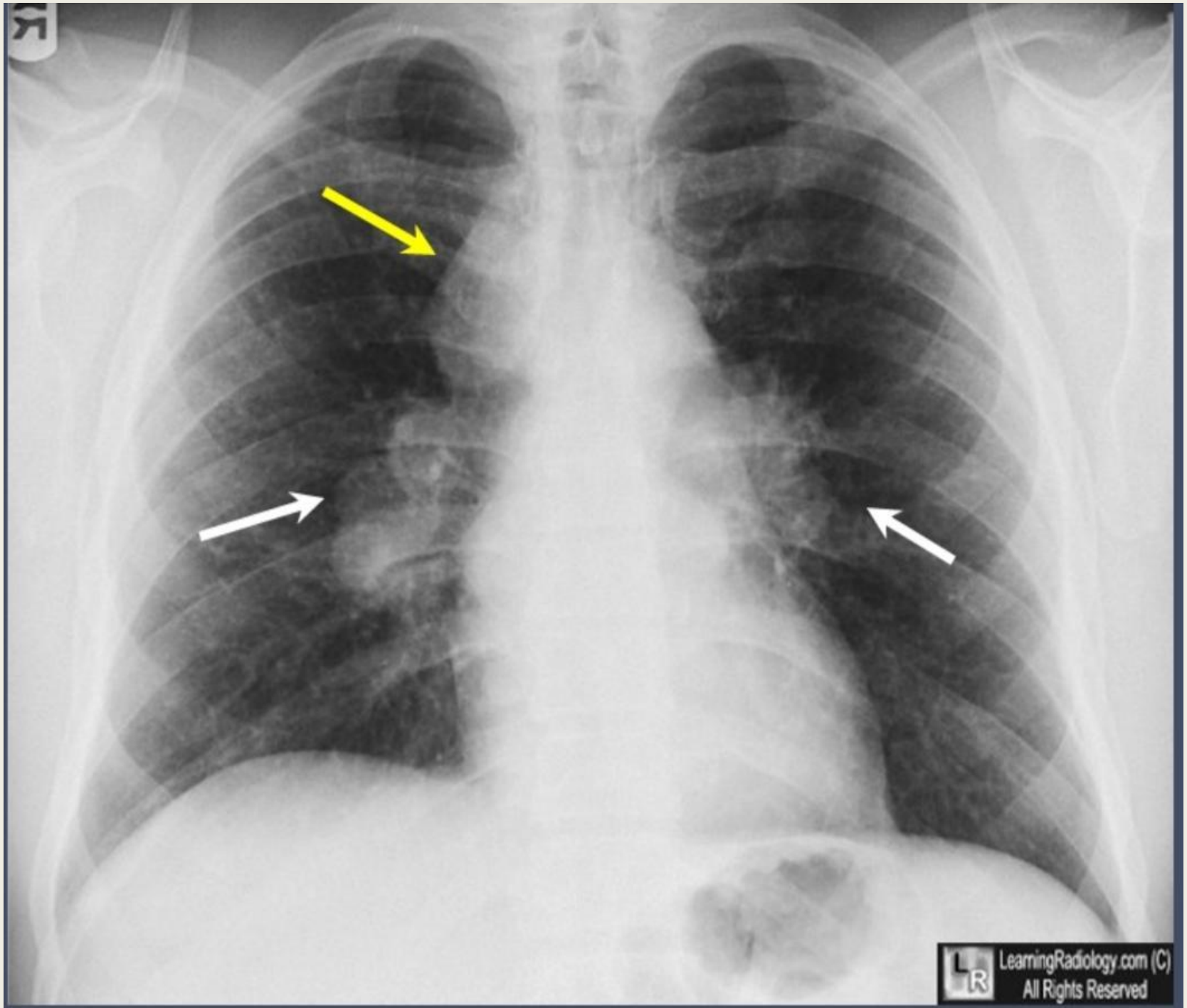
Garland triad

- also known as the 1-2-3 sign or pawnbroker's sign, is a lymph node enlargement pattern on chest radiographs which has been described in sarcoidosis:

1. Right paratracheal nodes
2. right hilar nodes
3. left hilar nodes

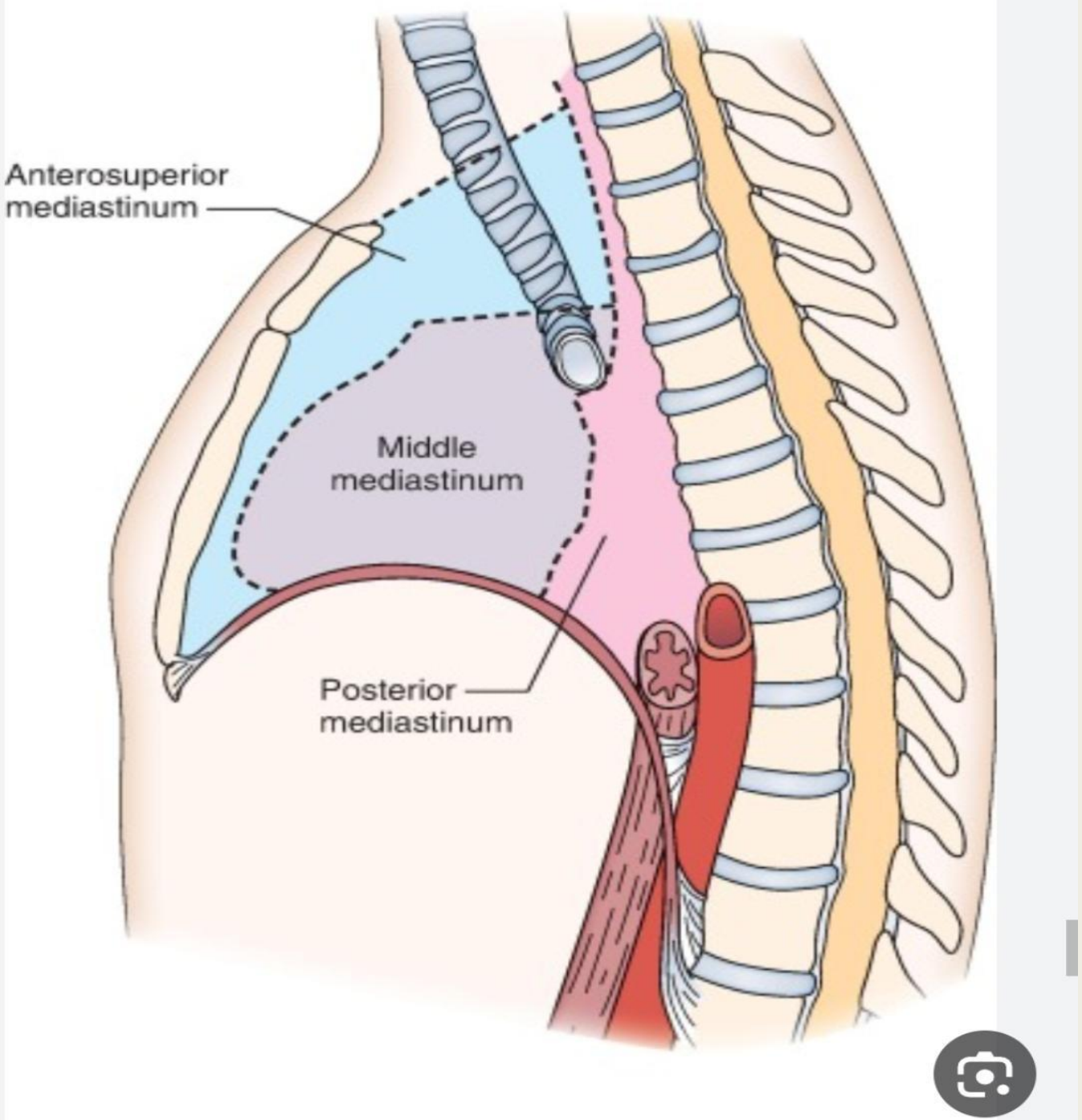
- Hilar lymphadenopathy is symmetrical and usually massive.

These so-called potato nodes typically do not abut the cardiac border which distinguishes the nodal enlargement from lymphoma


LearningRadiology.com (C)
All Rights Reserved

MEDIASTINUM

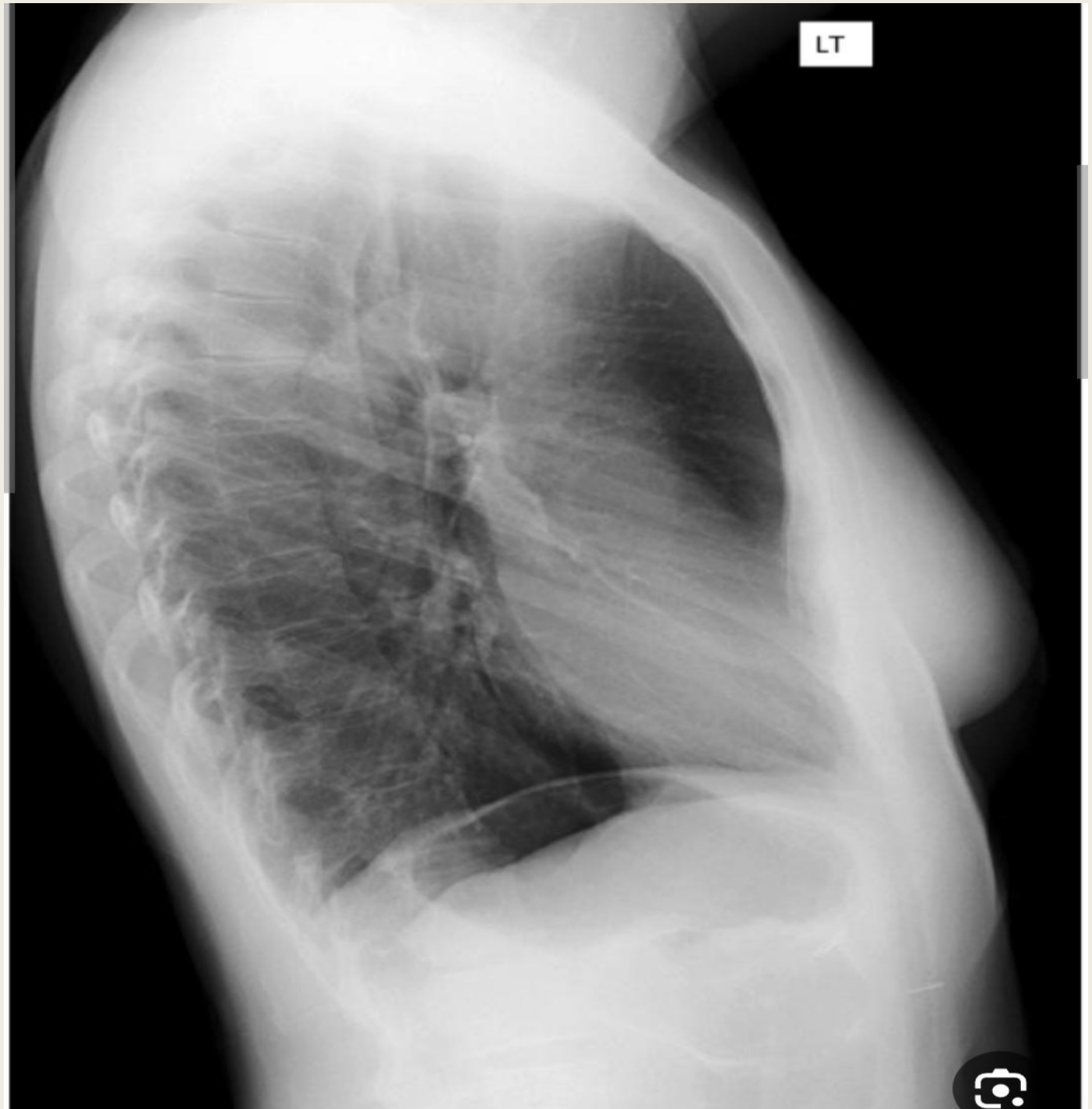
- The mediastinum is a space in the thorax that contains a group of organs, vessels, nerves, lymphatics and their surrounding connective tissue .
- It lies in the midline of the chest between the pleura of each lung and extends from the sternum to the vertebral column .
- The mediastinum contains all the thoracic viscera except the lungs


Anterosuperior
mediastinum
Middle
mediastinum
Posterior
mediastinum

Anatomic division

- The mediastinum is divided into three arbitrary compartments to aid in the differential diagnosis of a mediastinal mass. However, there are no anatomic planes separating these divisions and disease can spread from one “compartment” to another

1. anterior mediastinummuidracirep eht ot roiretna :
2. middle mediastinum:within the pericardium
3. posterior mediastinum : posterior to pericardium

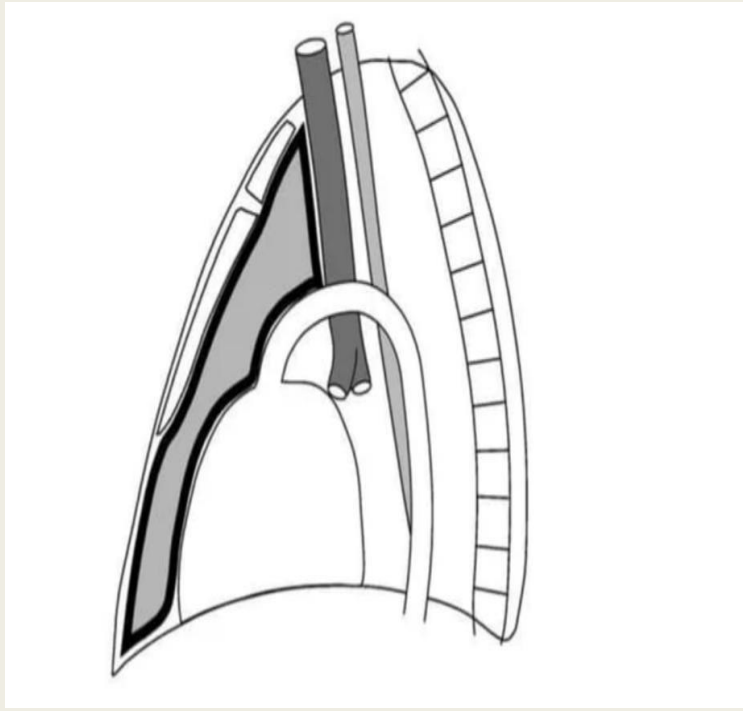

LT

Anterior mediastinum

- The anterior mediastinum is the space between the sternum and the pericardium inferiorly and ascending aorta and brachiocephalic vessels superiorly .
- The anterior mediastinum can be thought of as two compartments –the prevascular compartment superiorly and the precardiac compartment inferiorly .
- The contents of the prevascular anterior mediastinum include

- Thymus.
- Lymph nodes .
- Enlarged thyroid gland, if it extends inferiorly into the mediastinum .

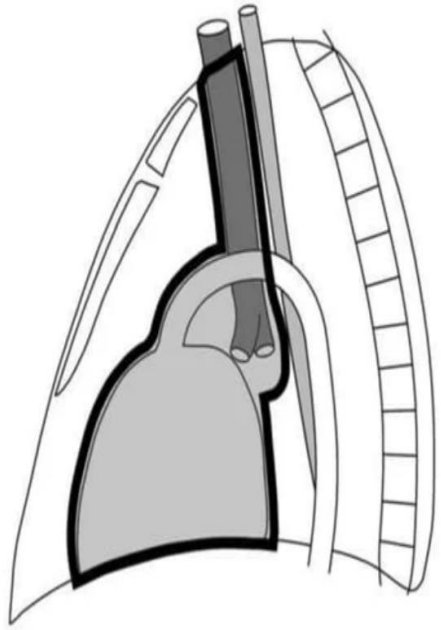
- The precardiac anterior mediastinum is a potential space.



Middle mediastinum

- The anterior border of the middle mediastinum is the anterior pericardium and the posterior borders are the posterior pericardium and posterior tracheal wall .
- The contents of the middle mediastinum include:

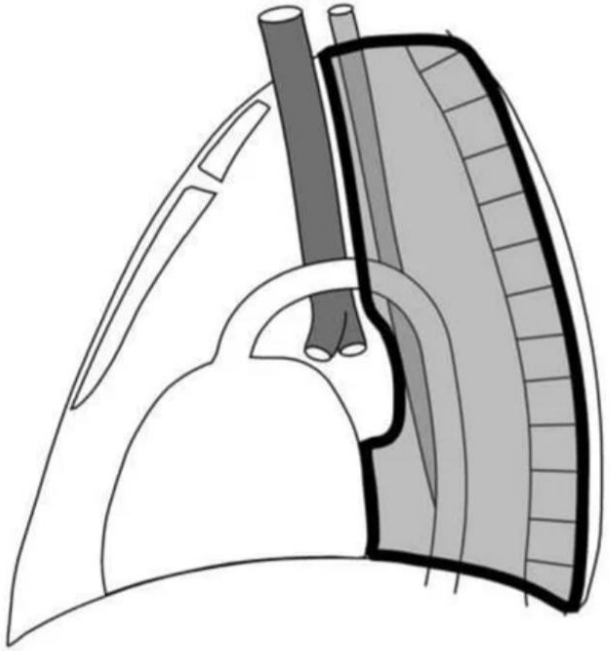
1. Ascending aorta and aortic arch .
2. Great vessels including SVC, IVC, pulmonary arteries and veins, and brachiocephalic vessels
3. Trachea and bronchi
4. Lymph nodes .
5. Phrenic, vagus, and recurrent laryngeal nerves (all of which pass through the AP window) .



Posterior mediastinum

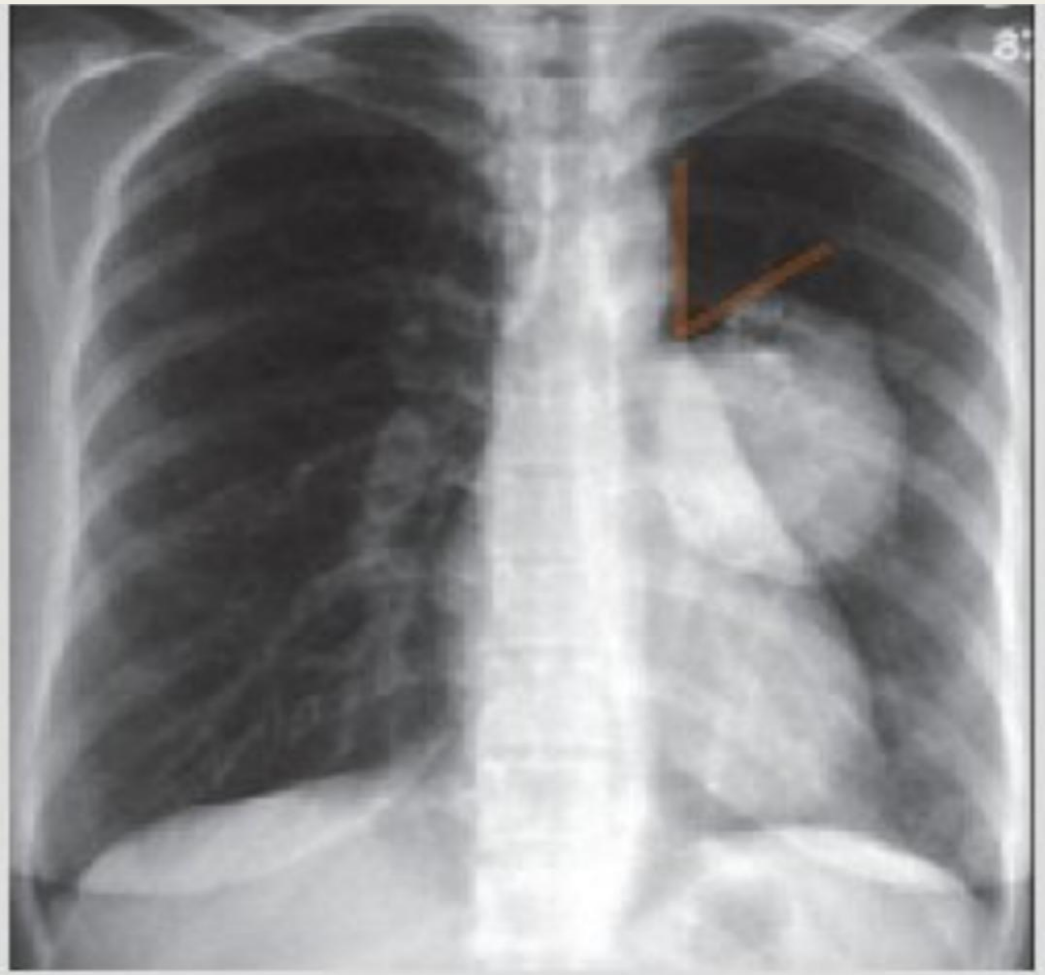
- The anterior border of the posterior mediastinum is the posterior trachea and posterior pericardium.
- The posterior border is somewhat loosely defined as the anterior aspect of the vertebral bodies; however, paraspinal masses are generally included in the differential of a posterior mediastinal mass
- The contents of the posterior mediastinum include:

Esophagus.	Thoracic duct.
Descending thoracic aorta.	Vagus nerves.
Azygos and hemiazygos veins.	Lymph nodes.



The following characteristics indicate that a lesion originates within the mediastinum

1. Unlike lung lesions, a mediastinal mass will not contain air bronchograms.
2. The margins with the lung will be obtuse.
3. There can be associated spinal, costal or sternal abnormalities.



Pulmonary mass

- Acute angle with mediastinum
- No silhouetting of mediastinum

Mediastinal mass

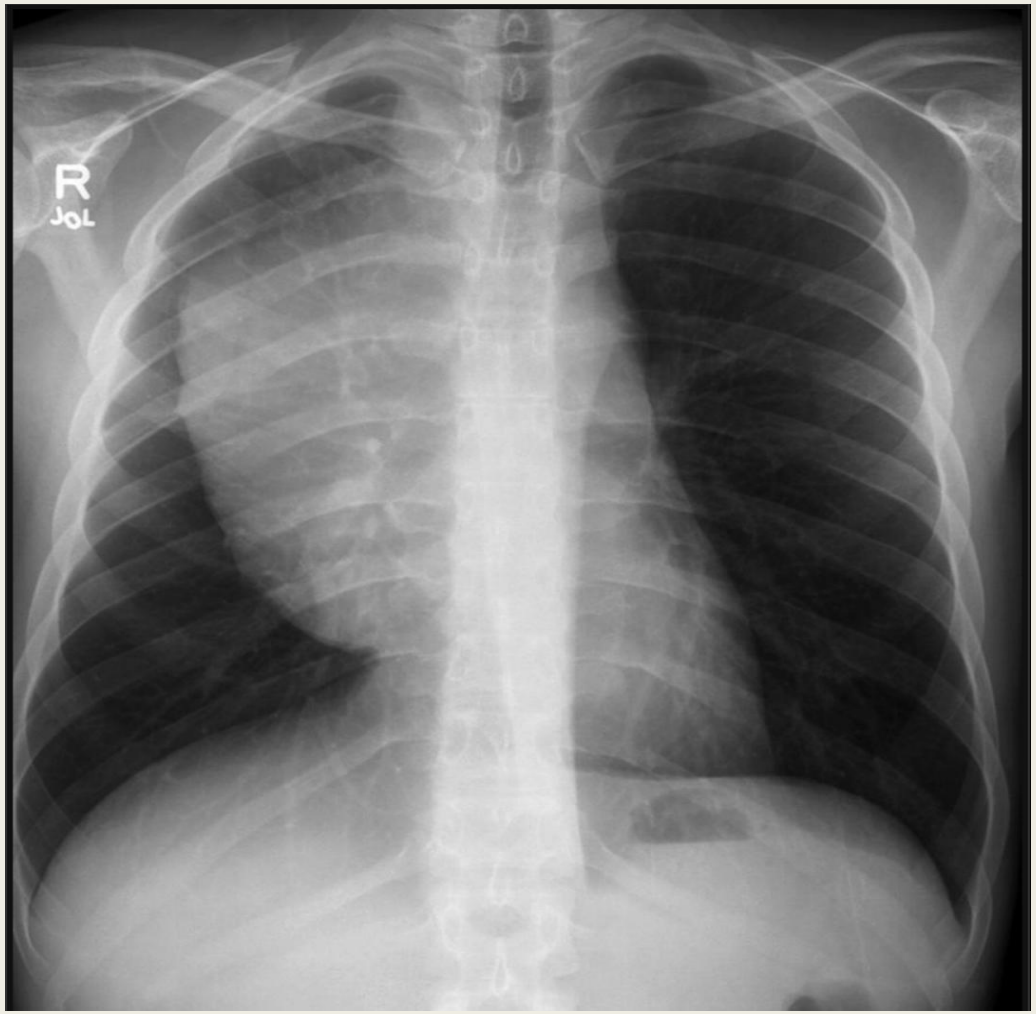
- Obtuse angle with mediastinum
- Silhouetting of mediastinum

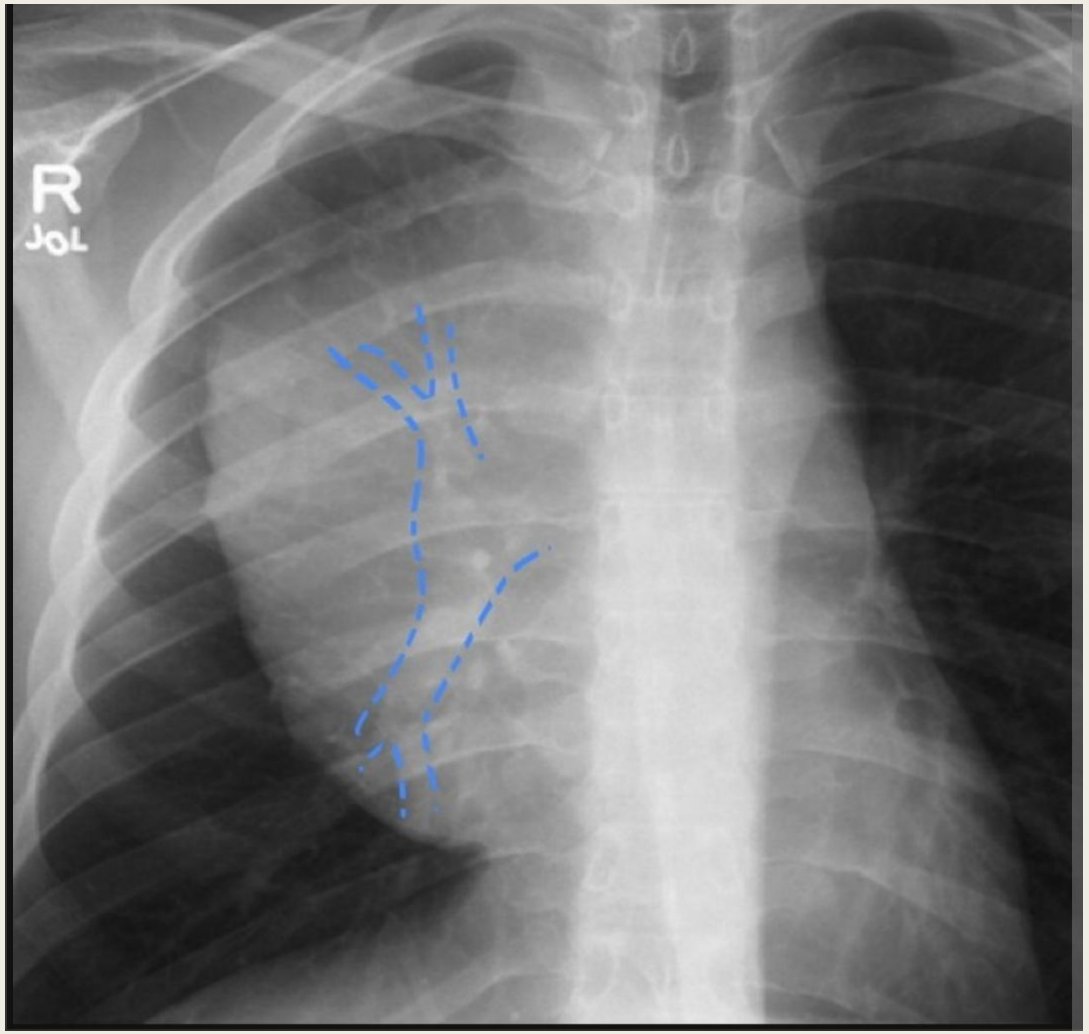
Mass in anterior mediastinum

1. Obliterated retrosternal clear space

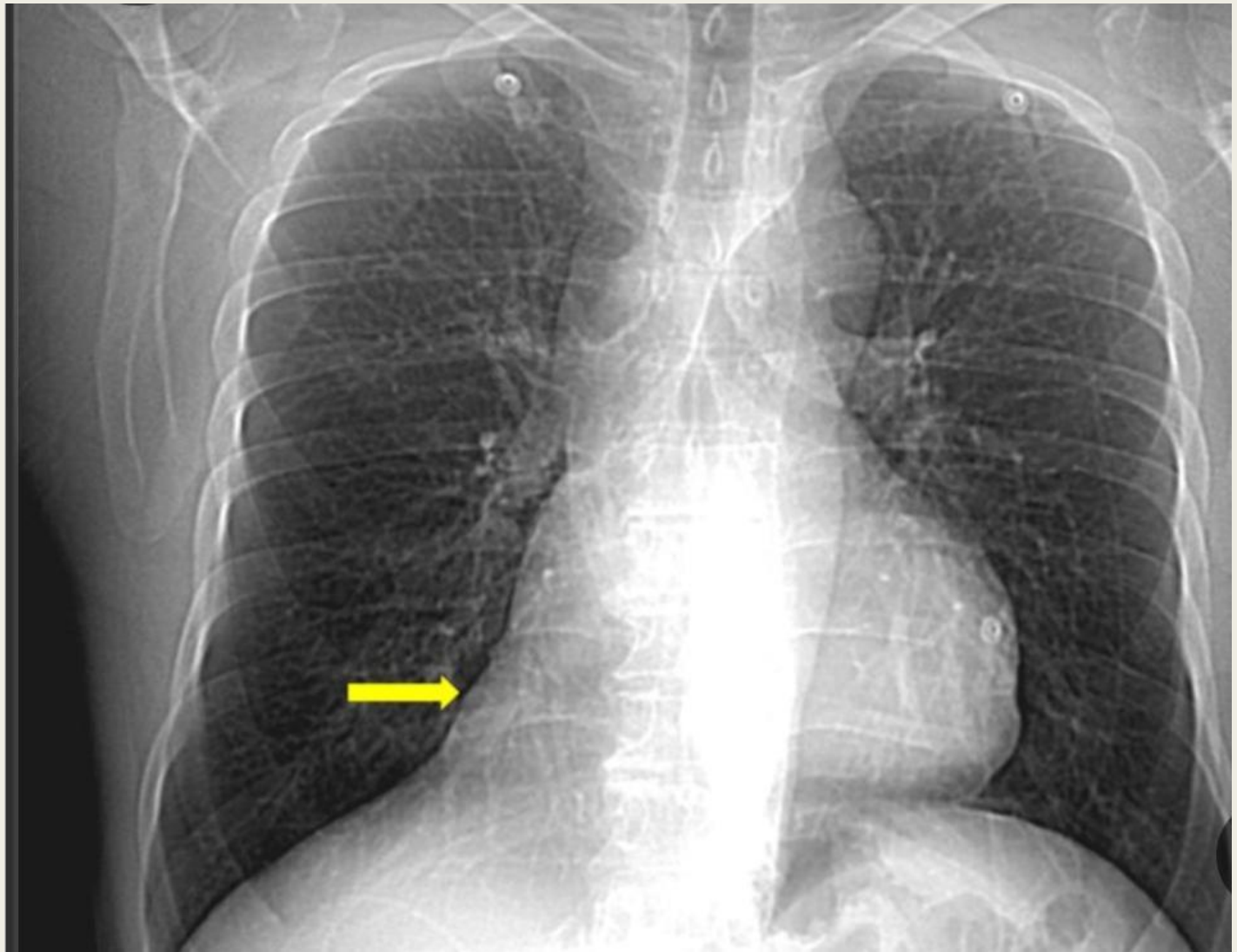
2. The hilum overlay sign :

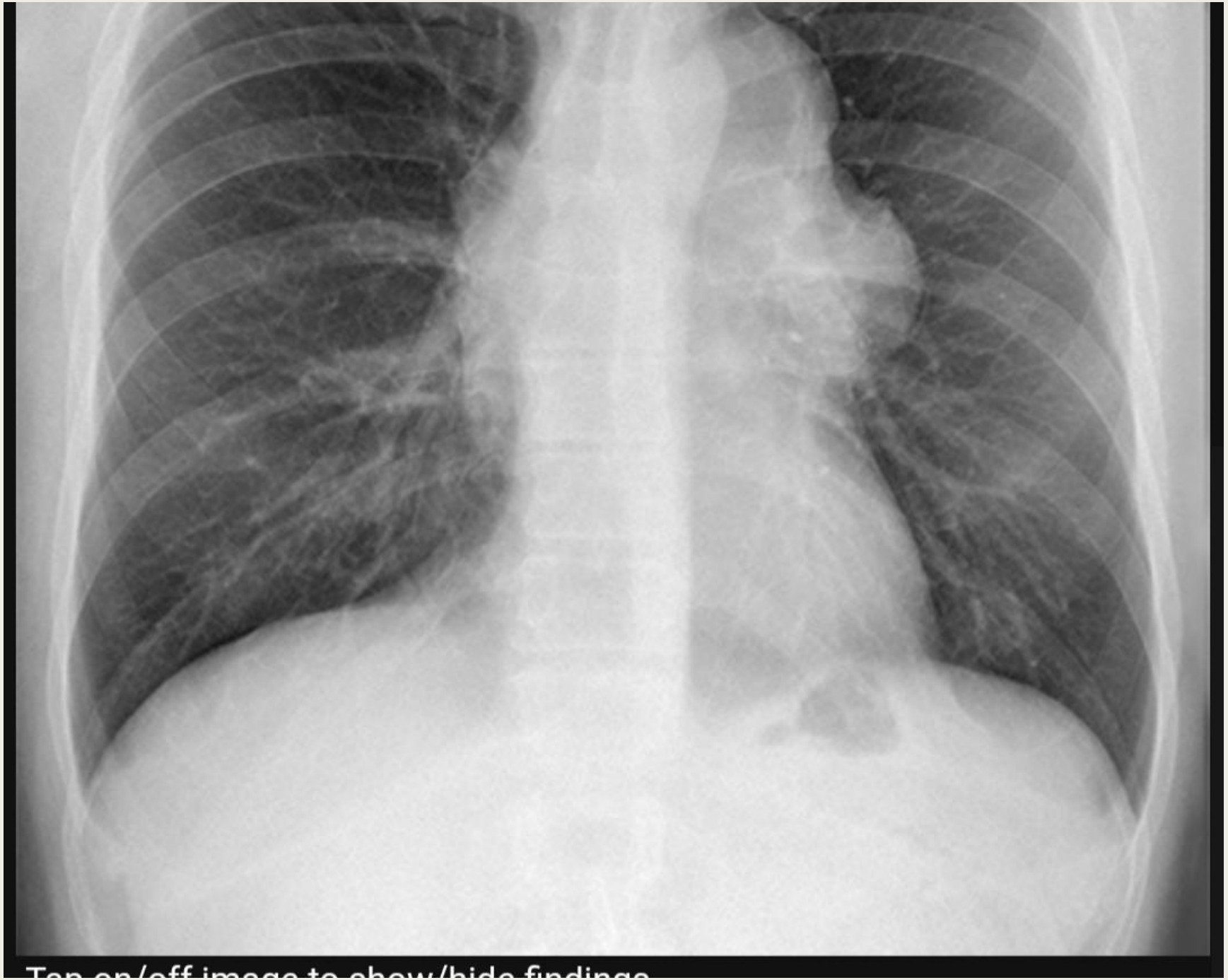
is present on the frontal view if hilar vessels are visualized through the mass. It indicates that the mass cannot be in the middle mediastinum. The mass may be in the anterior (most likely) or posterior mediastinum.

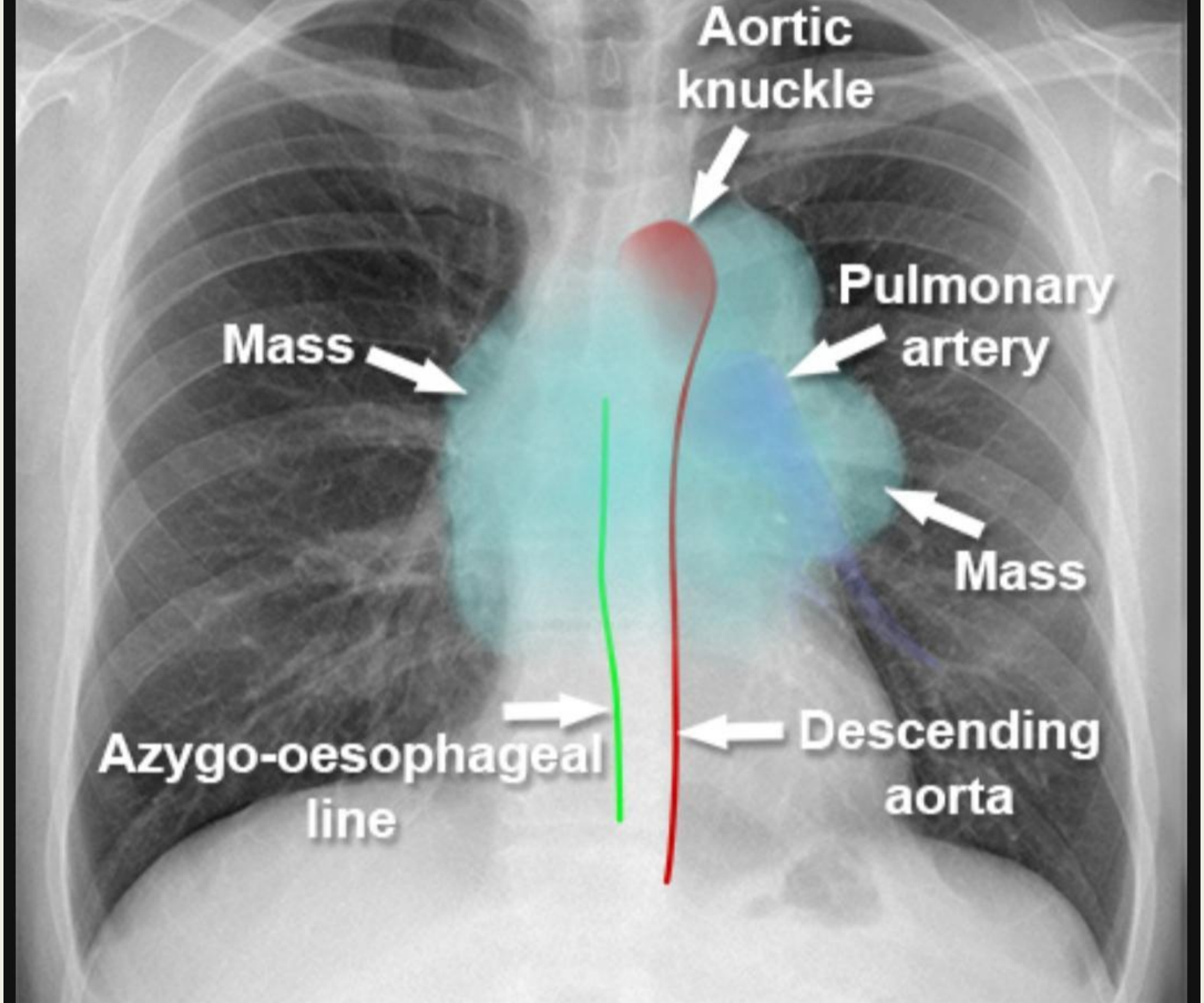




3.Obliteration of cardiophrenic angle



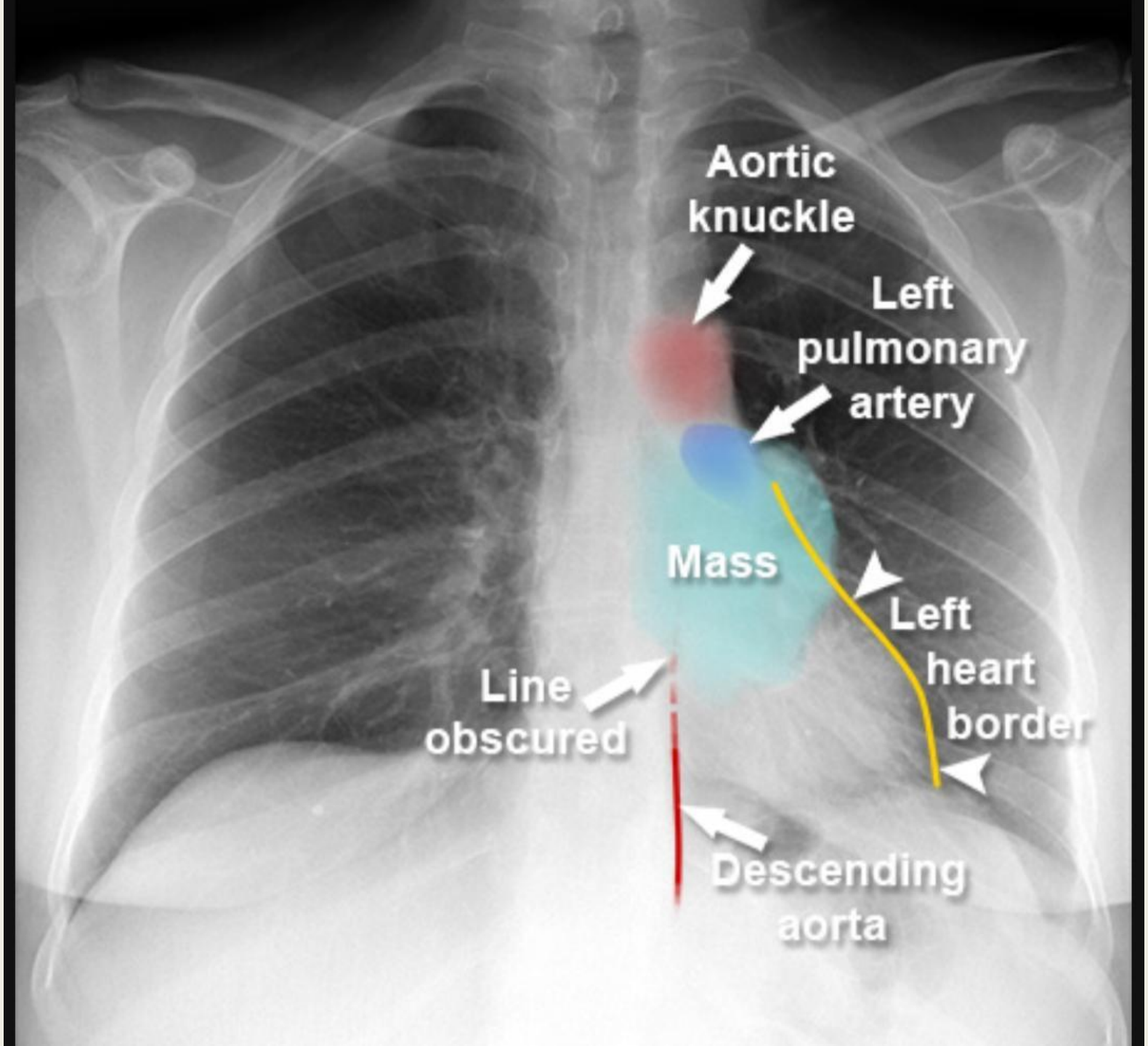

Tap on/off image to show/hide findings

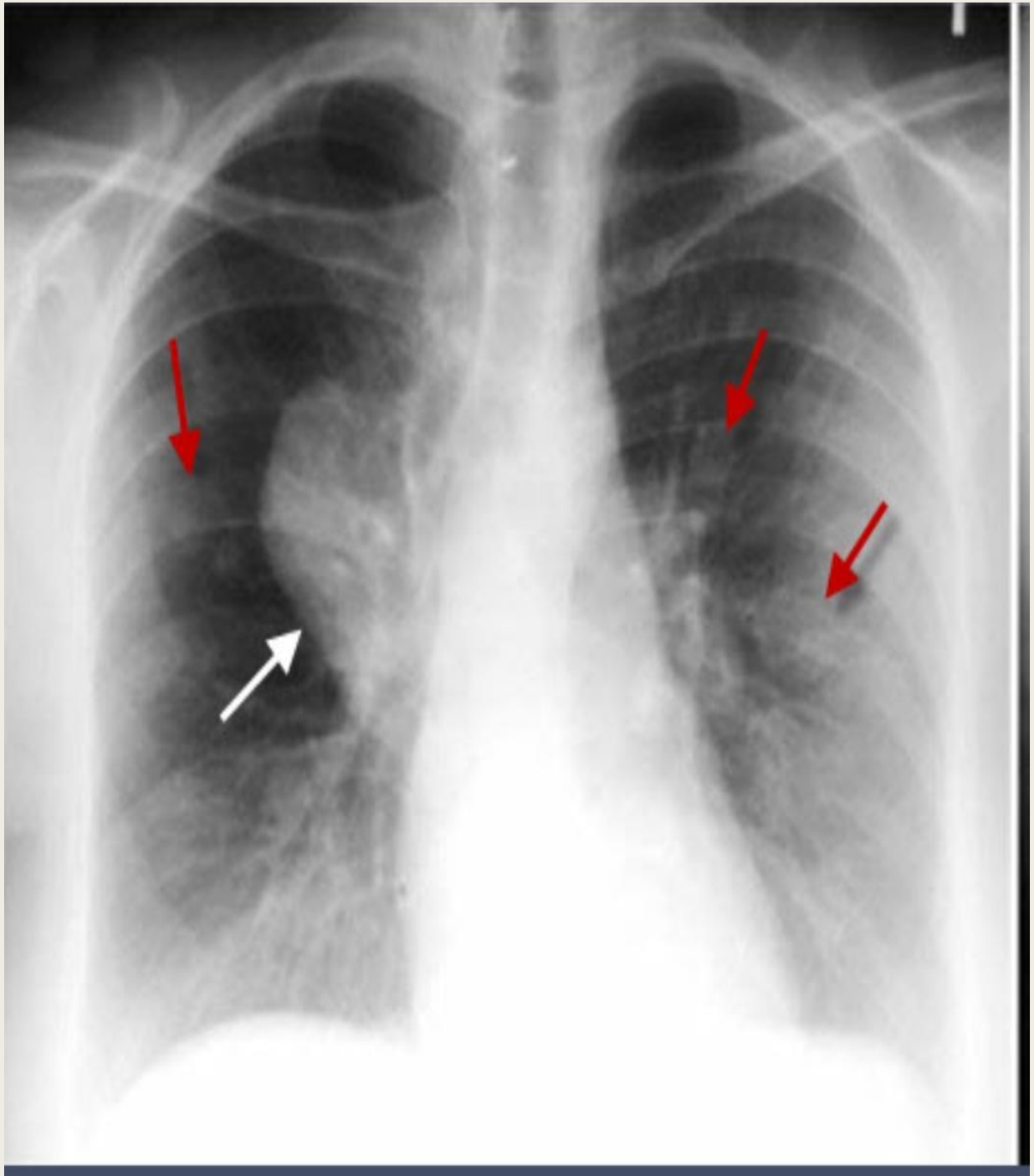

Aortic knuckle
Pulmonary artery
Mass
Mass
Azygo-oesophageal line
Descending aorta

Posterior mediastinal mass

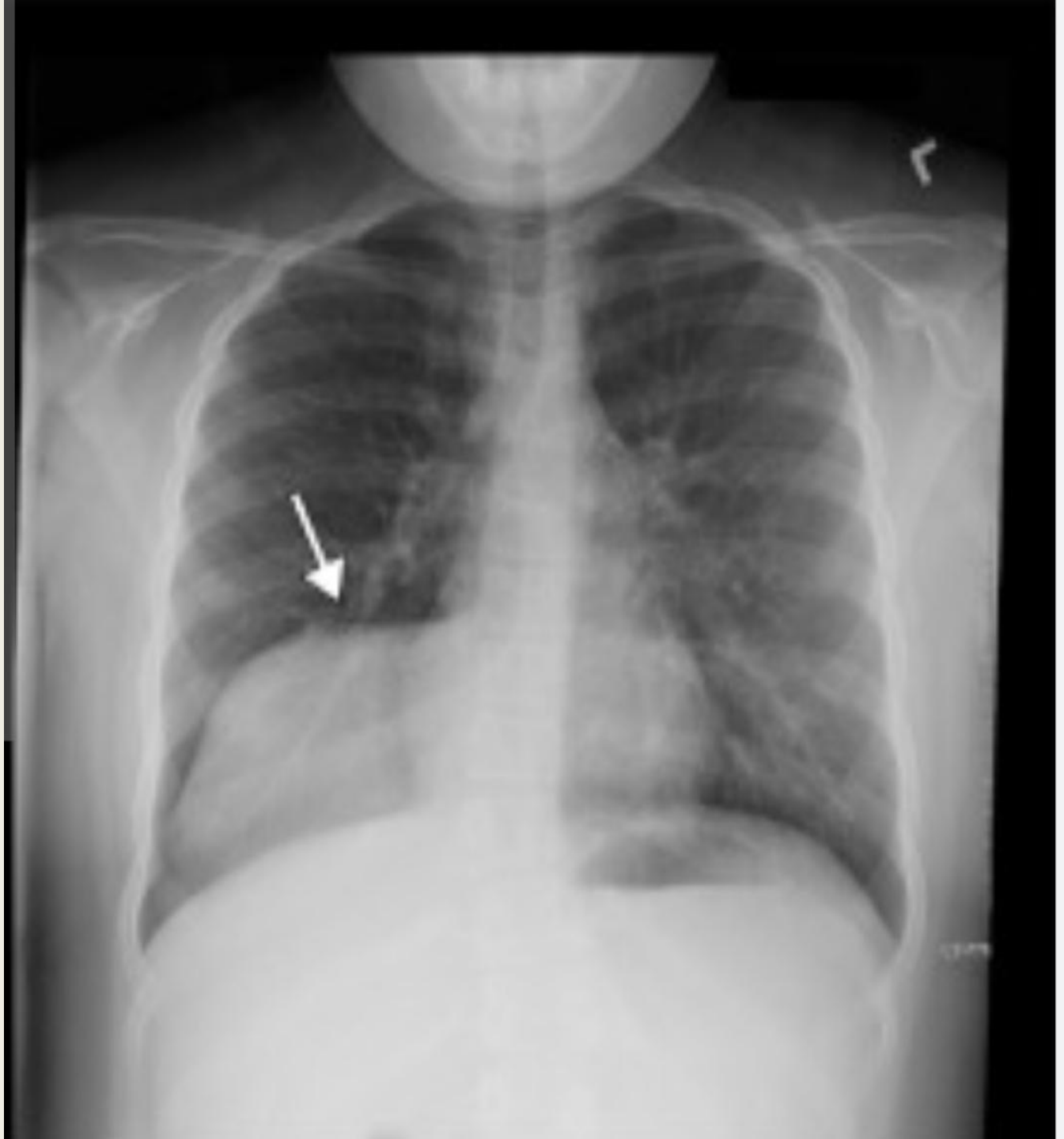
1. Hilum overlay sign
2. Distinct heart border [not in middle mediastinum]
3. Seen on lateral view posterior to heart
4. On left side obscuring the descending aorta
5. Adjacent to vertebral body on lateral view

Po


Aortic knuckle
Left pulmonary artery
Mass
Left heart border
Line obscured
Descending aorta

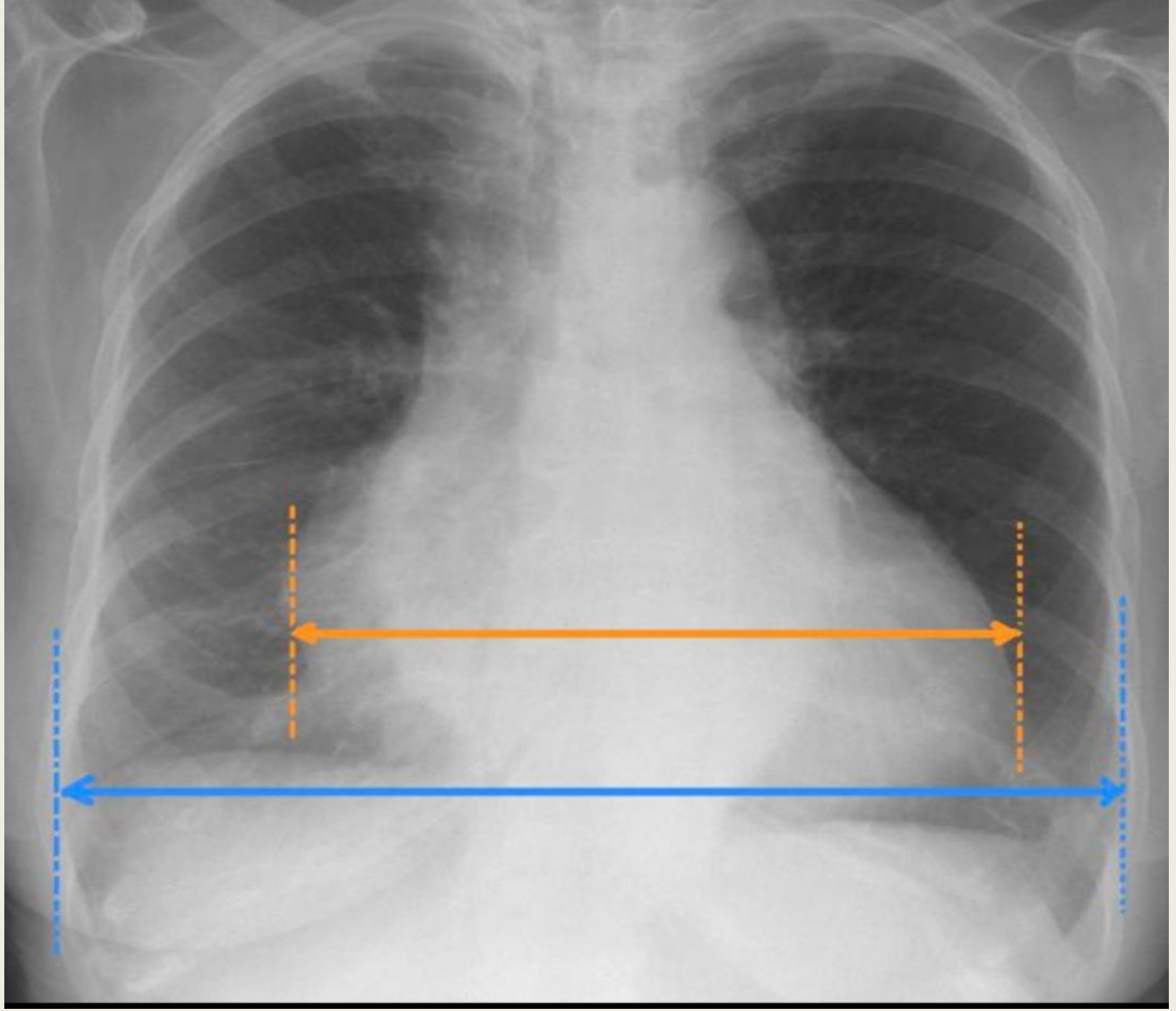



LearningRadiology.com (C
All Rights Reserved



Cardiomegaly

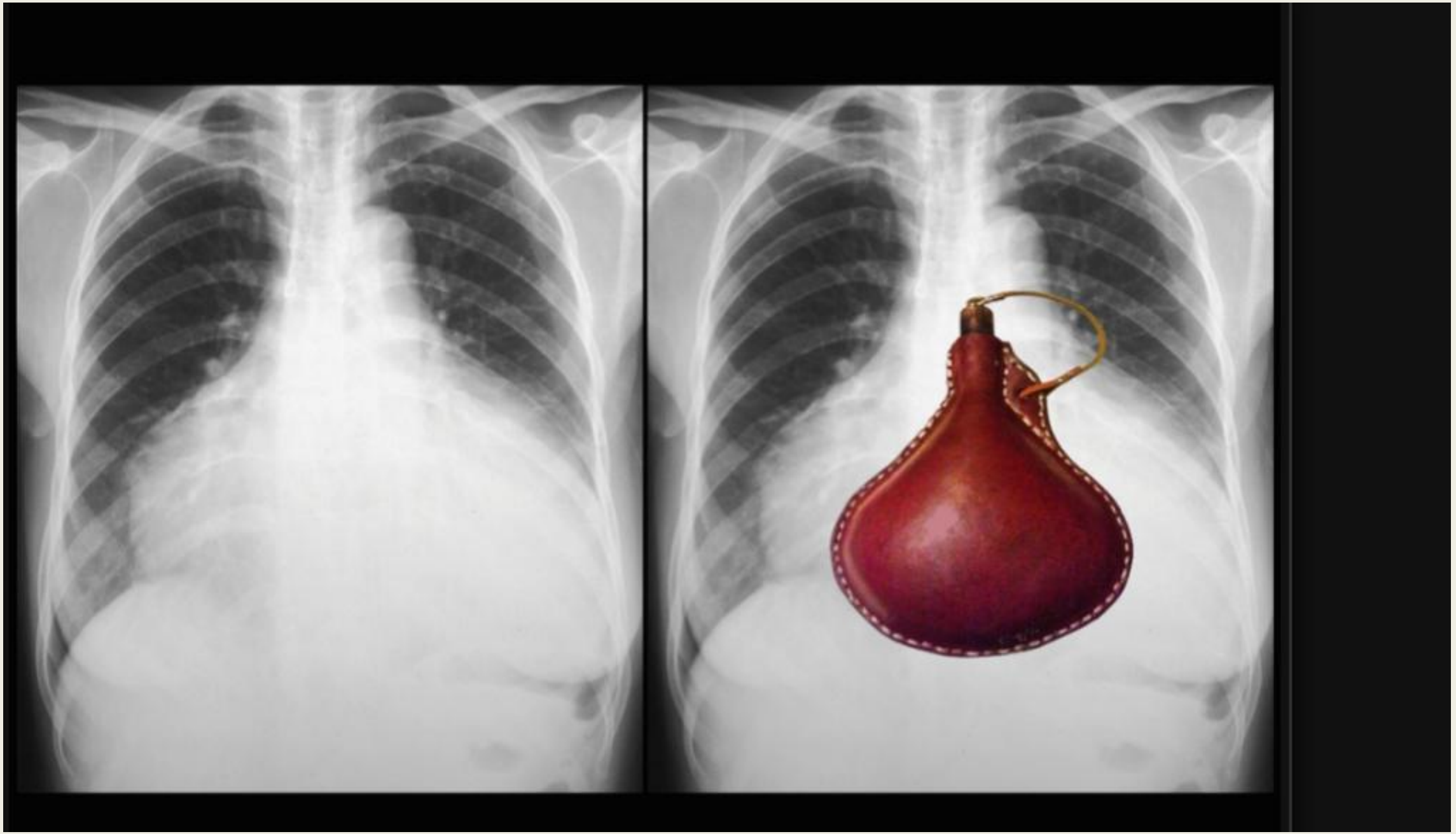
- means enlargement of the heart.
- The definition is when the transverse diameter of the cardiac silhouette is greater than or equal to 50% of the transverse diameter of the chest (increased cardiothoracic ratio) on a posterior-anterior projection of a chest radiograph or a computed tomography



Pericardial effusion

- Pericardial effusions occur when excess fluid collects in the pericardial space (a normal pericardial sac contains approximately 30-50 mL of fluid).

There can be globular enlargement of the cardiac shadow giving a water bottle configuration

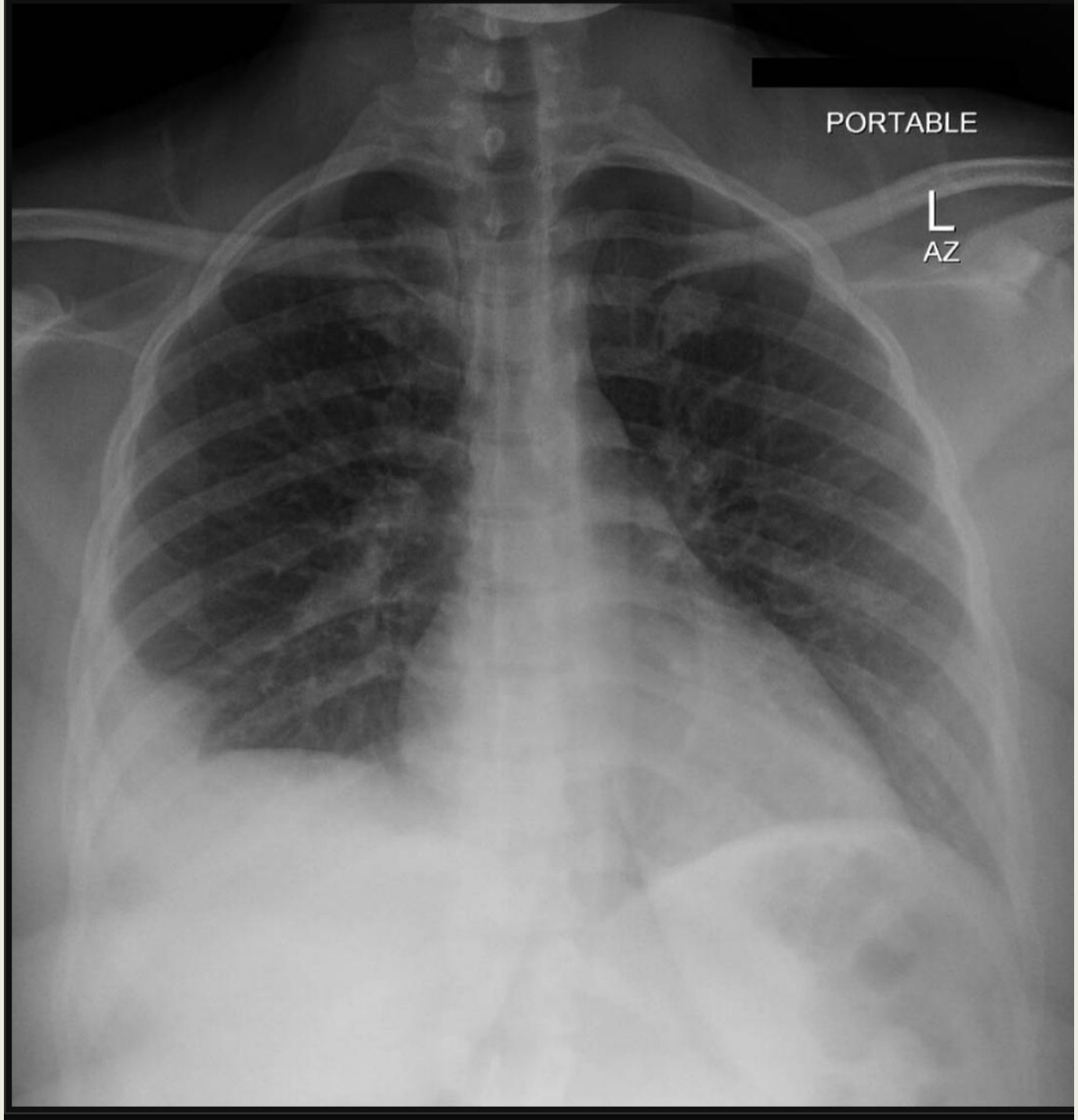


Pulmonary embolism (PE)

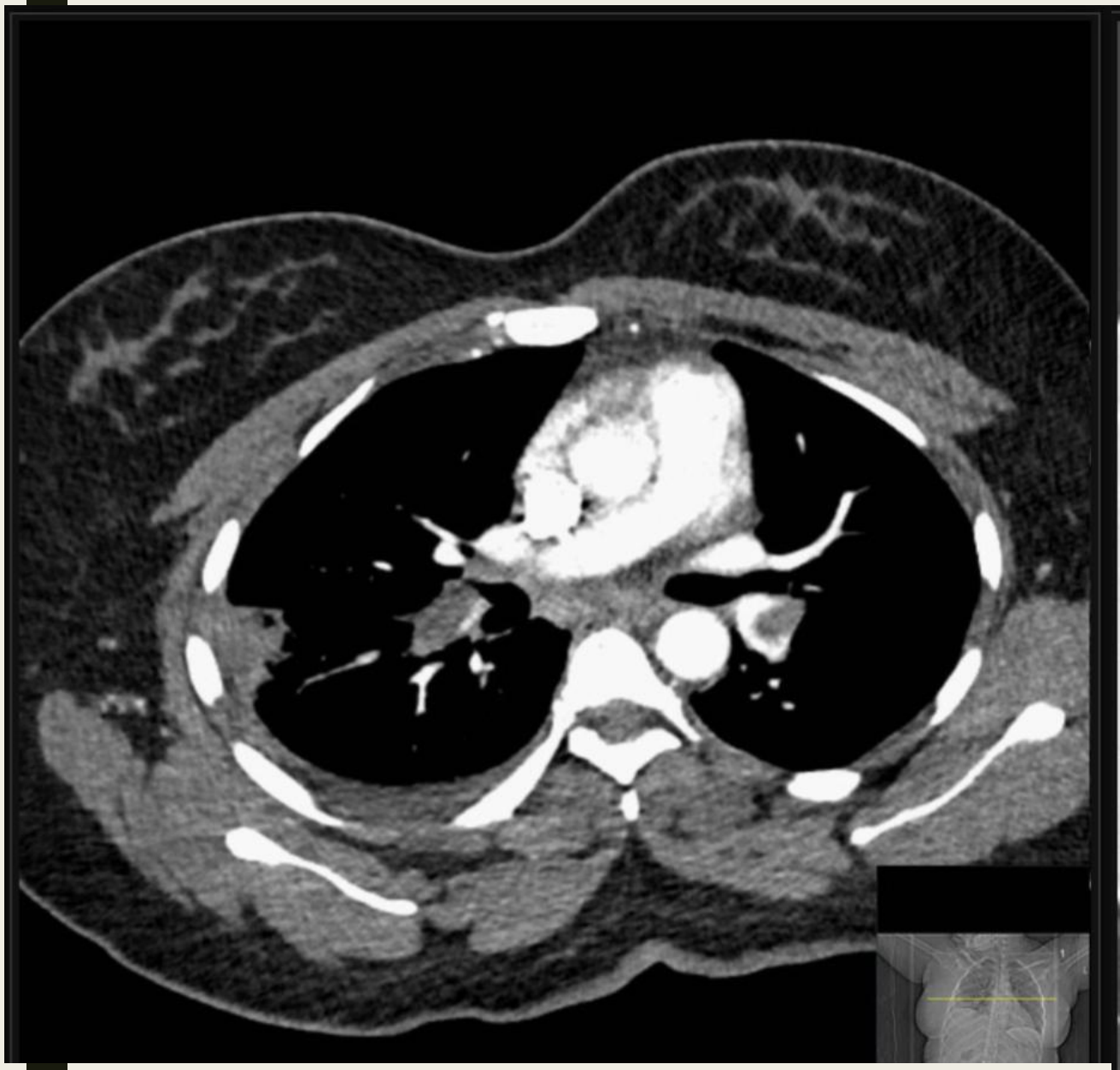
- refers to embolic occlusion of the pulmonary arterial system. The majority of cases result from thrombotic occlusion, and therefore the condition is frequently termed pulmonary thromboembolism

- Chest radiography is neither sensitive nor specific for a pulmonary embolism. It is used to assess differential diagnostic possibilities such as pneumonia and pneumothorax rather than for the direct diagnosis of PE.

- Hampton hump refers to a dome-shaped, pleural-based opacification in the lung most commonly due to pulmonary embolism and lung infarction


PORTABLE
L
AZ

- CT pulmonary angiography (CTPA) will show filling defects within the pulmonary vasculature with acute pulmonary emboli.
- When the artery is viewed in its axial plane the central filling defect from the thrombus is surrounded by a thin rim of contrast, which has been called the Polo Mint sign.



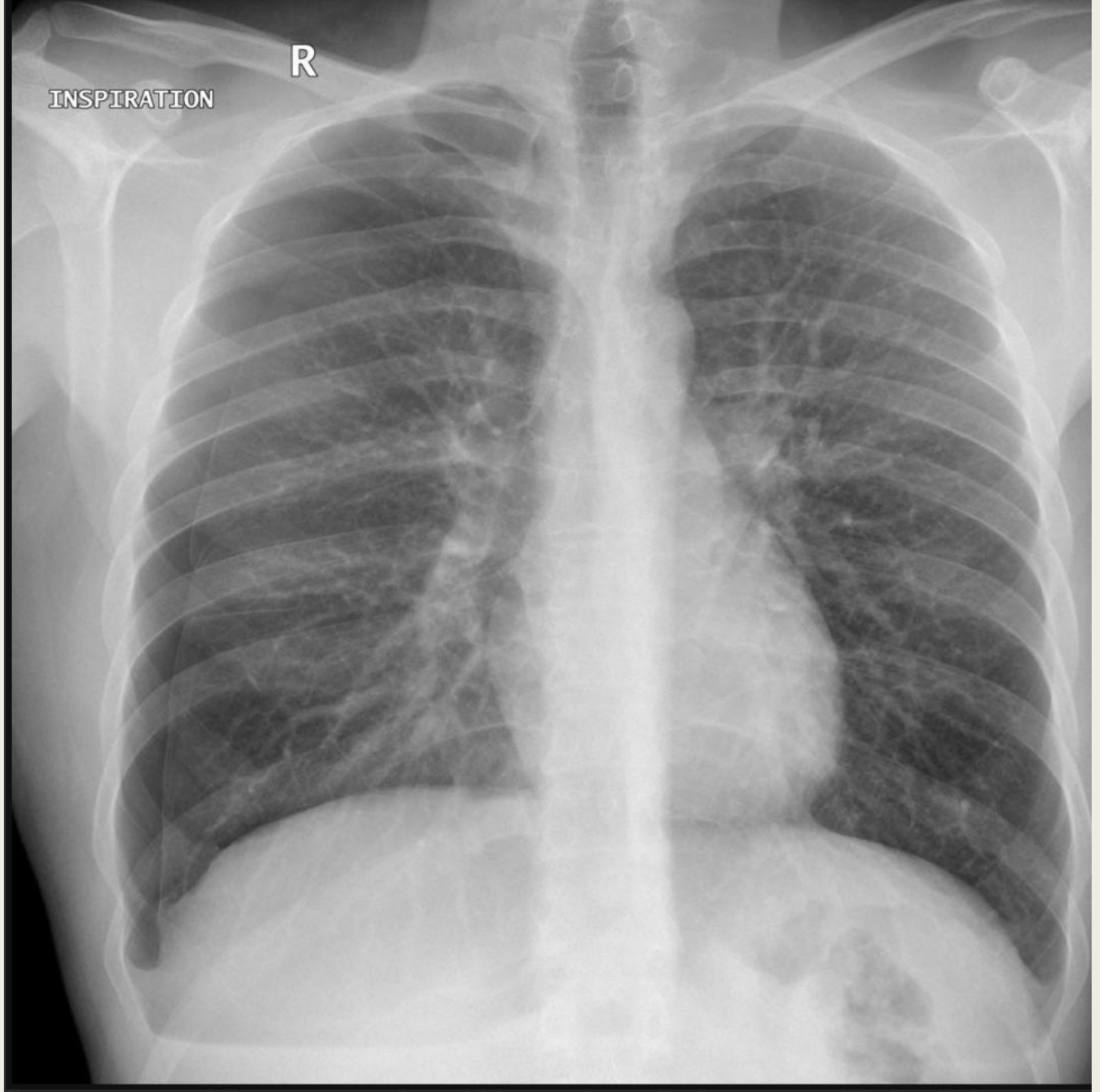
Saddle pulmonary embolism

- commonly refers to a large pulmonary embolism that straddles the bifurcation of the pulmonary trunk, extending into the left and right pulmonary arteries.

Pneumothorax

- Pneumothorax, commonly abbreviated to PTX, (plural: pneumothoraces) refers to the presence of gas (often air) in the pleural space.

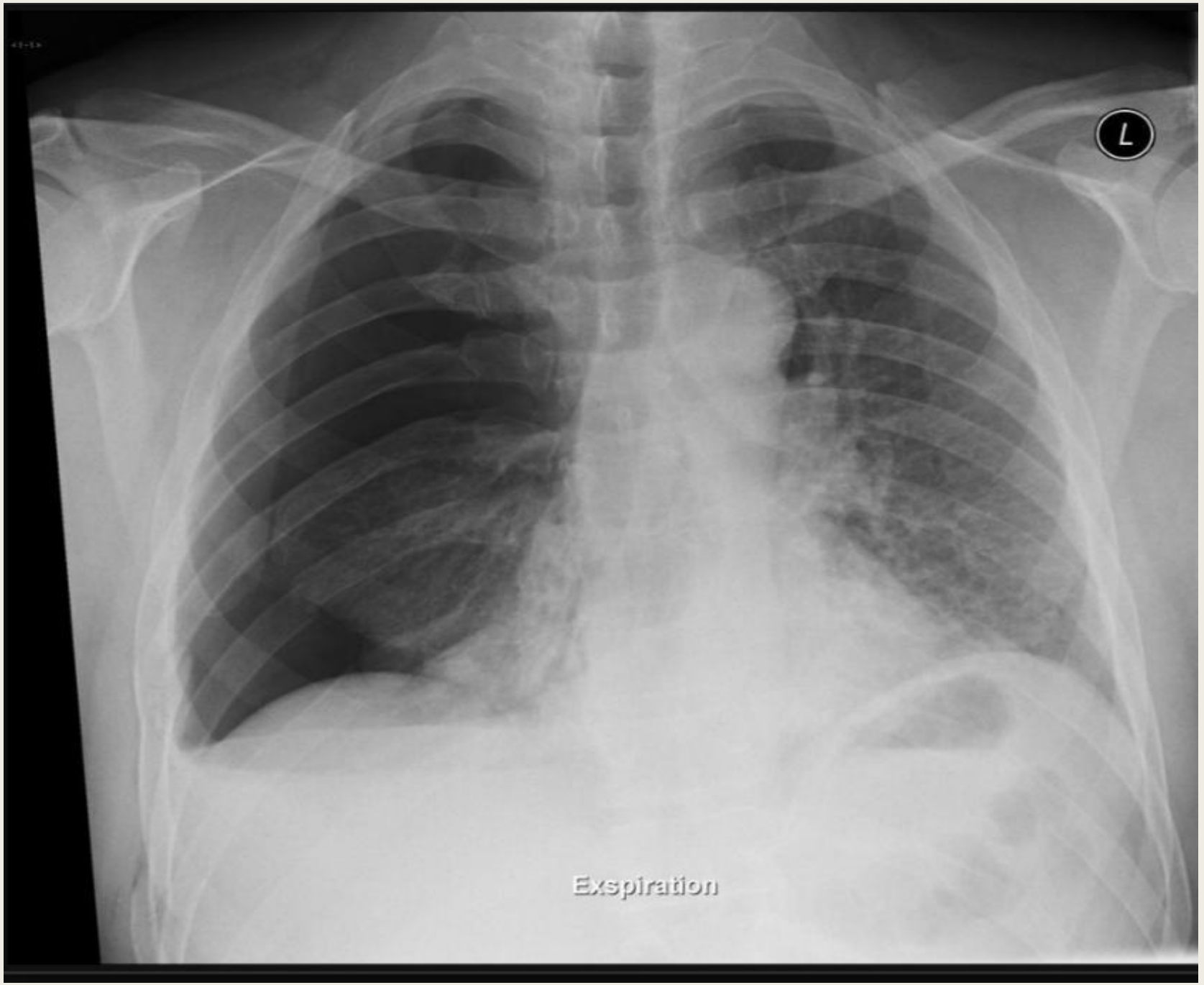
1. Tension pneumothorax : When this collection of gas constantly enlarges with resulting compression of mediastinal structures, it can be life-threatening
2. simple pneumothorax : No tension is present


R
INSPIRATION

On erect chest radiographs , Typically they demonstrate

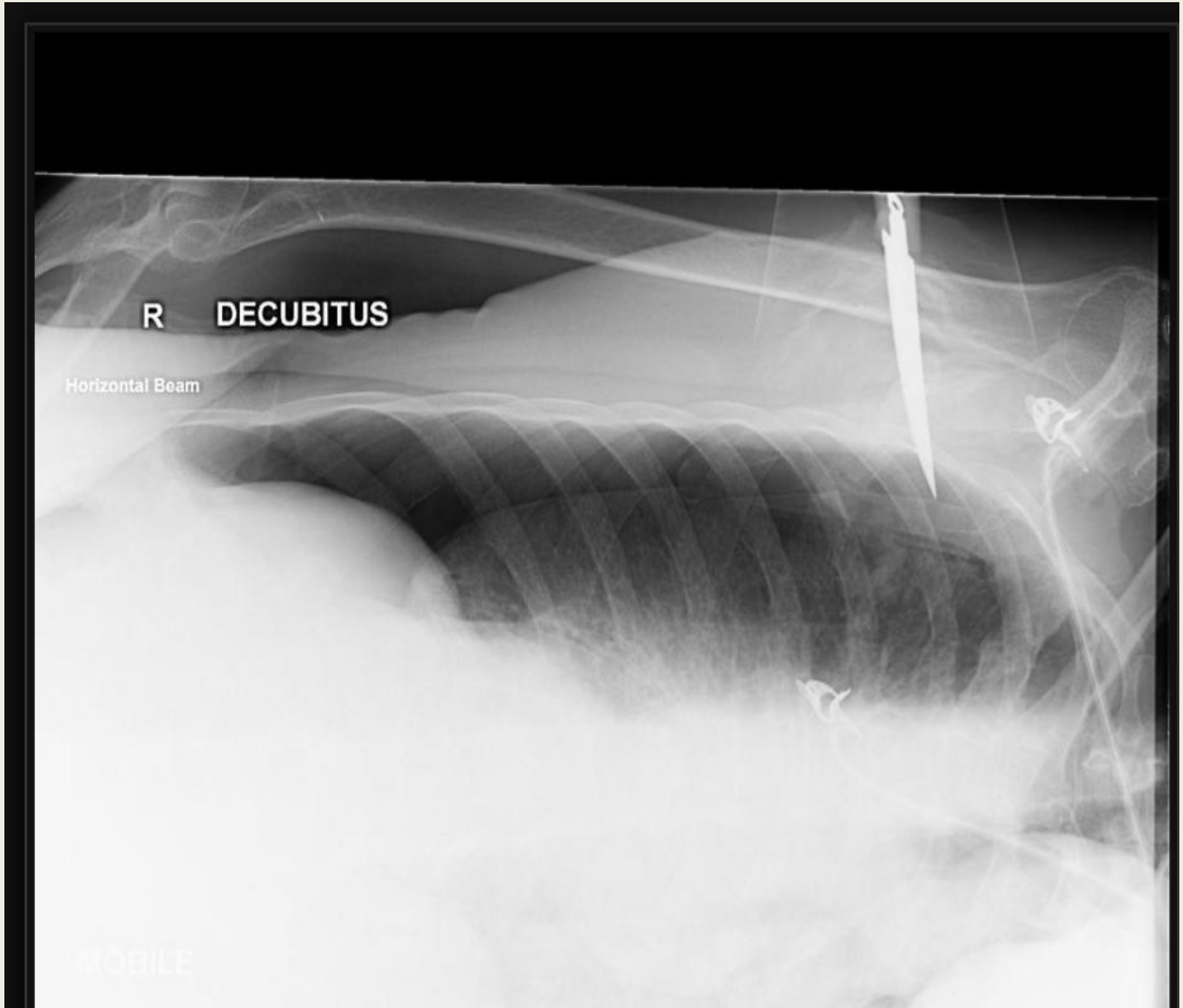
1. visible visceral pleural edge is seen as a very thin, sharp white line
2. no lung markings are seen peripheral to this line
3. peripheral space is radiolucent compared to the adjacent lung

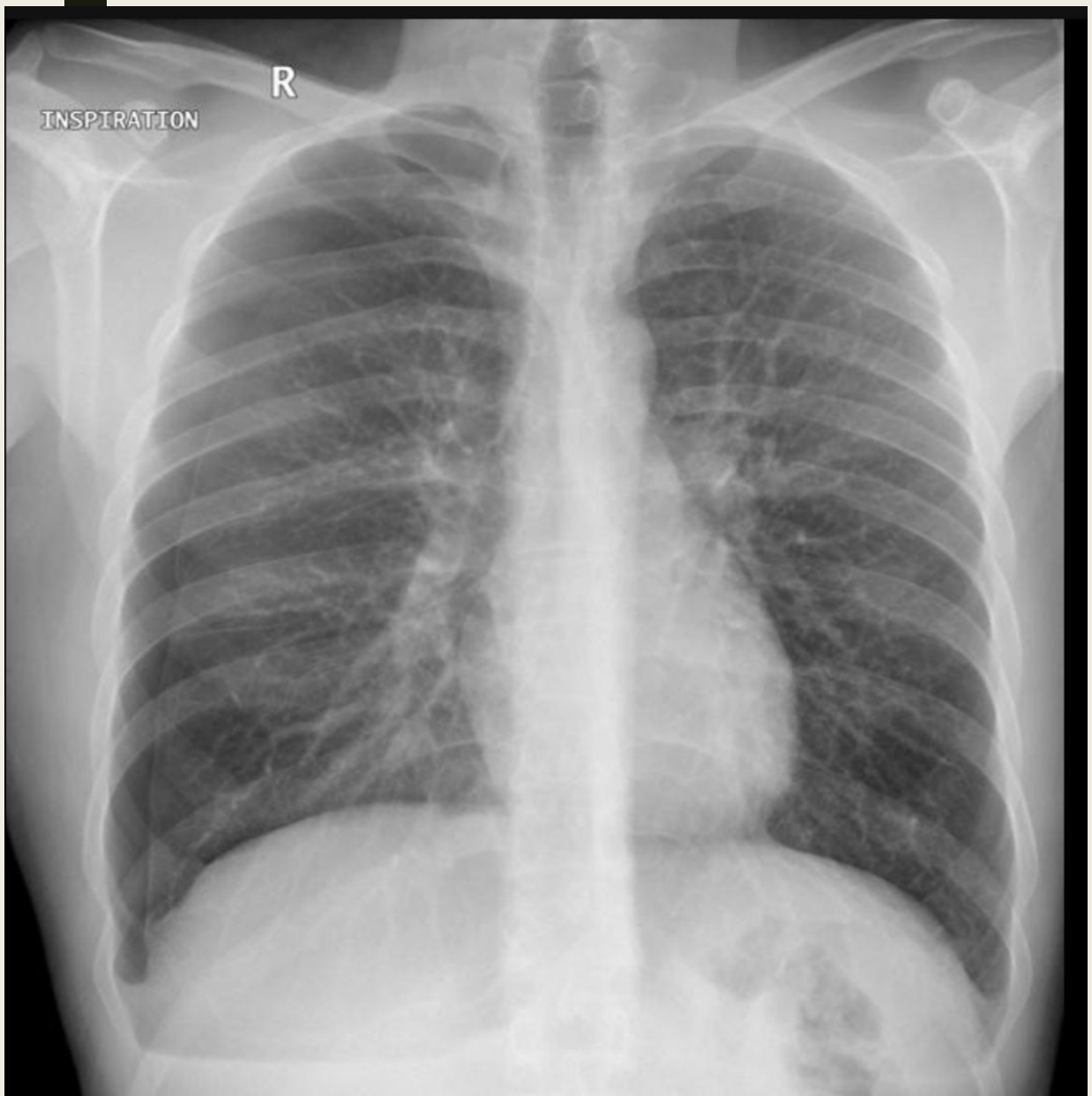
4. lung may completely collapse
5. mediastinum should not shift away from the pneumothorax unless a tension pneumothorax is present

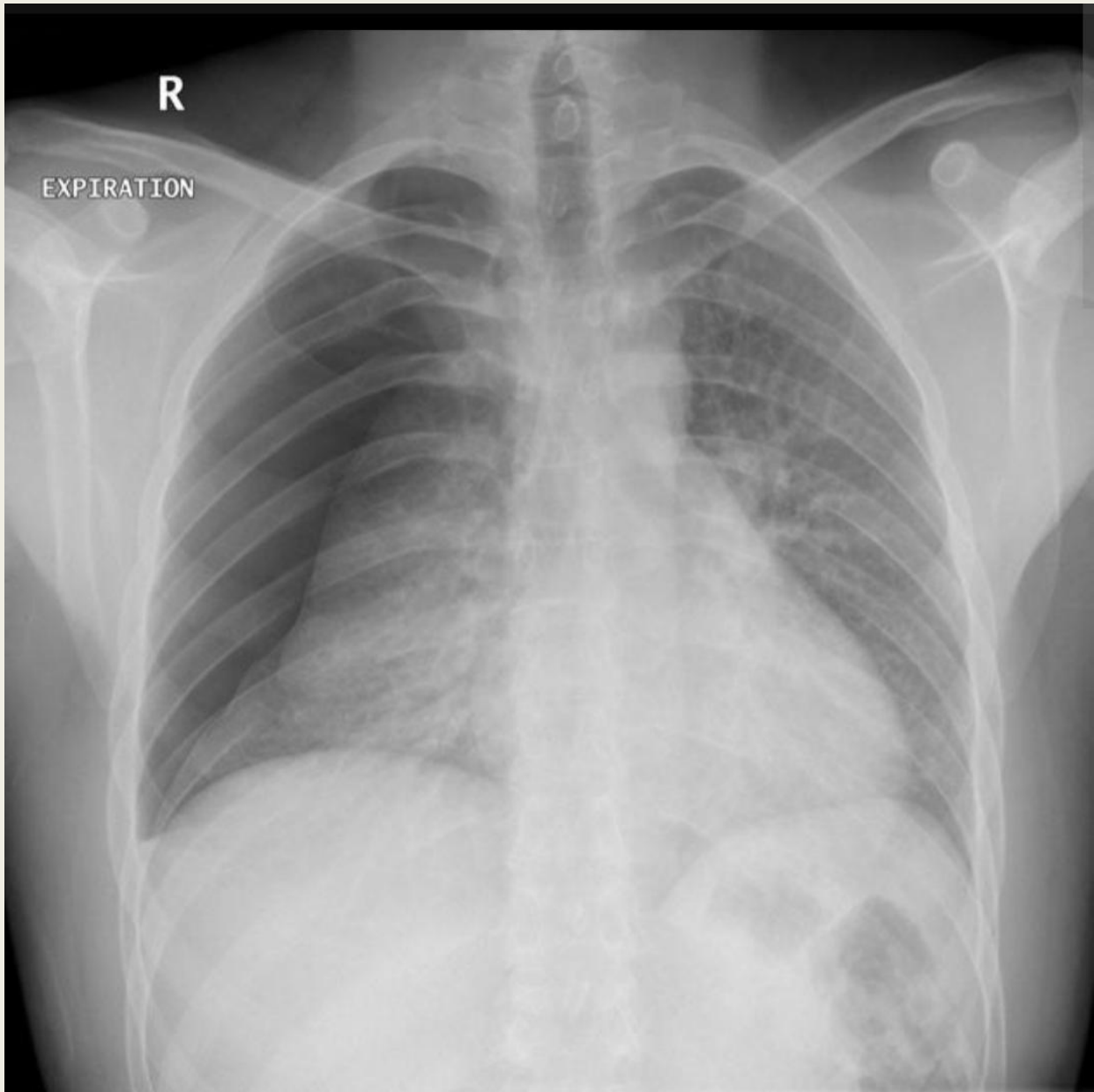

L
Exspiration

IN cases where a pneumothorax is not clearly present on standard frontal chest radiography a number of techniques can be employed:

- lateral decubitus radiograph:
  - should be done with the suspected side up
  - the lung will then 'fall' away from the chest wall
- expiratory chest radiograph:
  - lung becomes smaller and denser

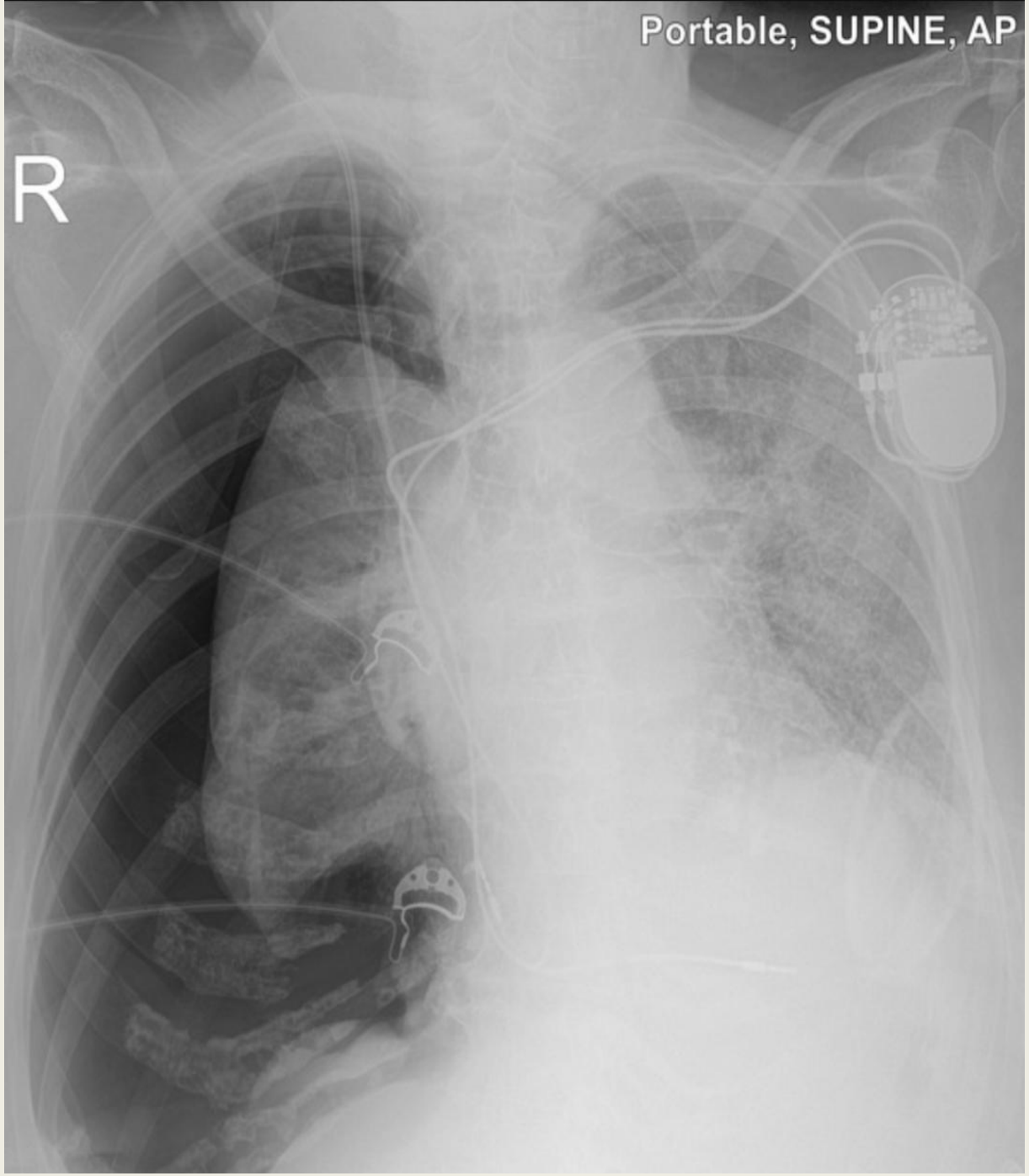

R DECUBITUS
Horizontal Beam
MOBILE


R
INSPIRATION


R
EXPIRATION

Tension pneumothorax

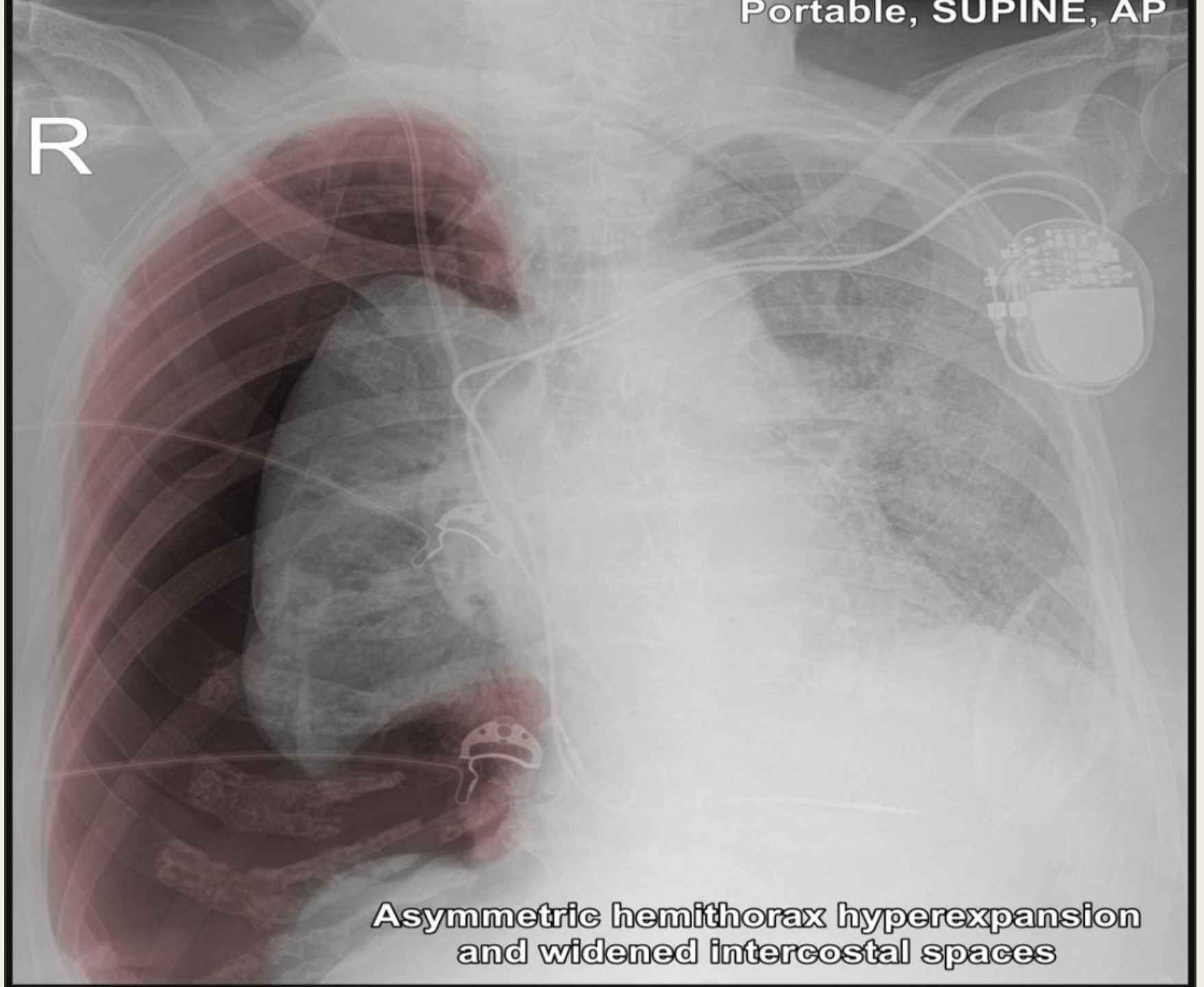
- Occur when intrapleural air accumulates progressively with hemodynamic compromise.
- It is a life-threatening occurrence requiring both rapid recognition and prompt treatment to avoid a cardiorespiratory arrest.

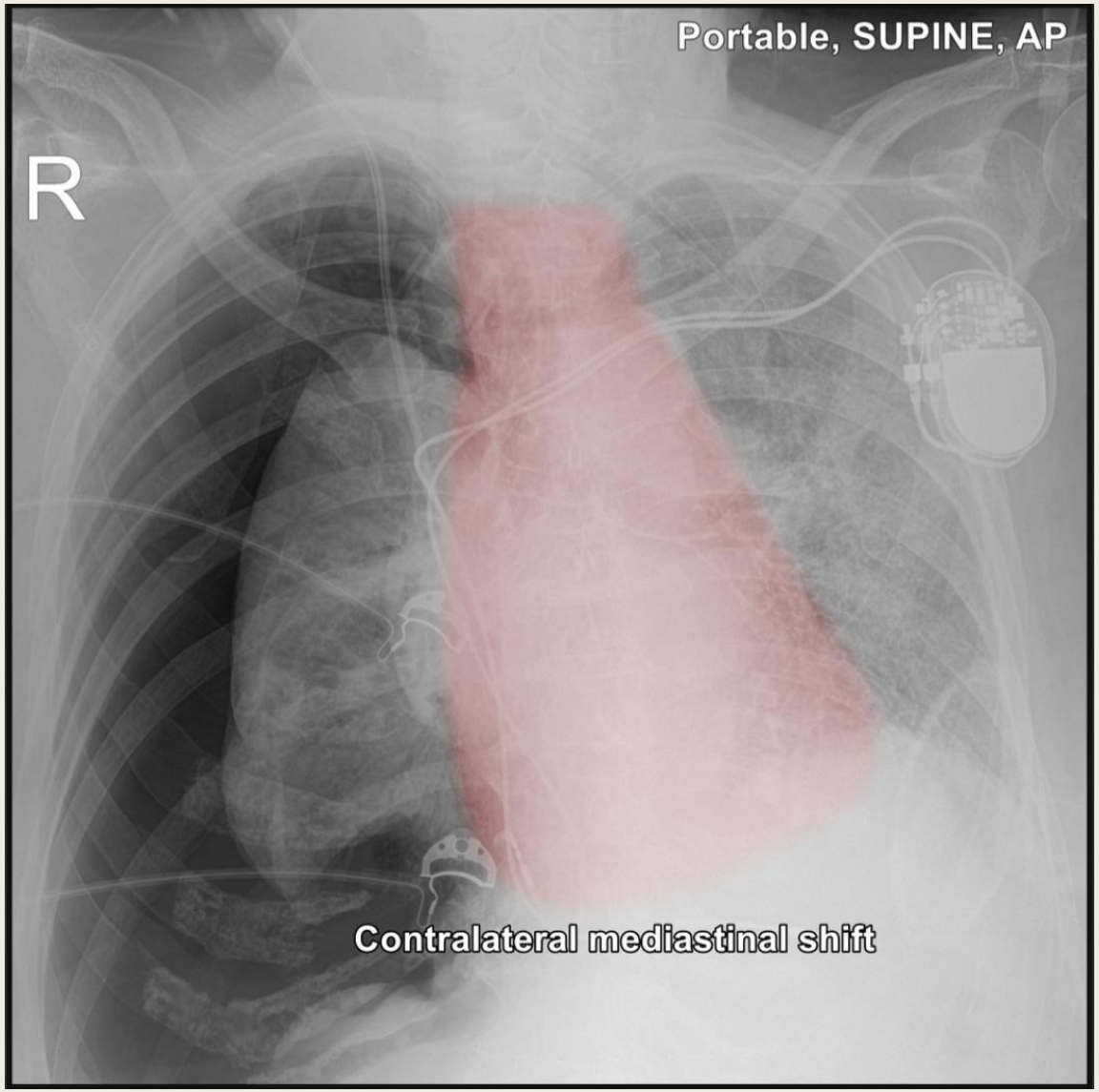

Portable, SUPINE, AP
R

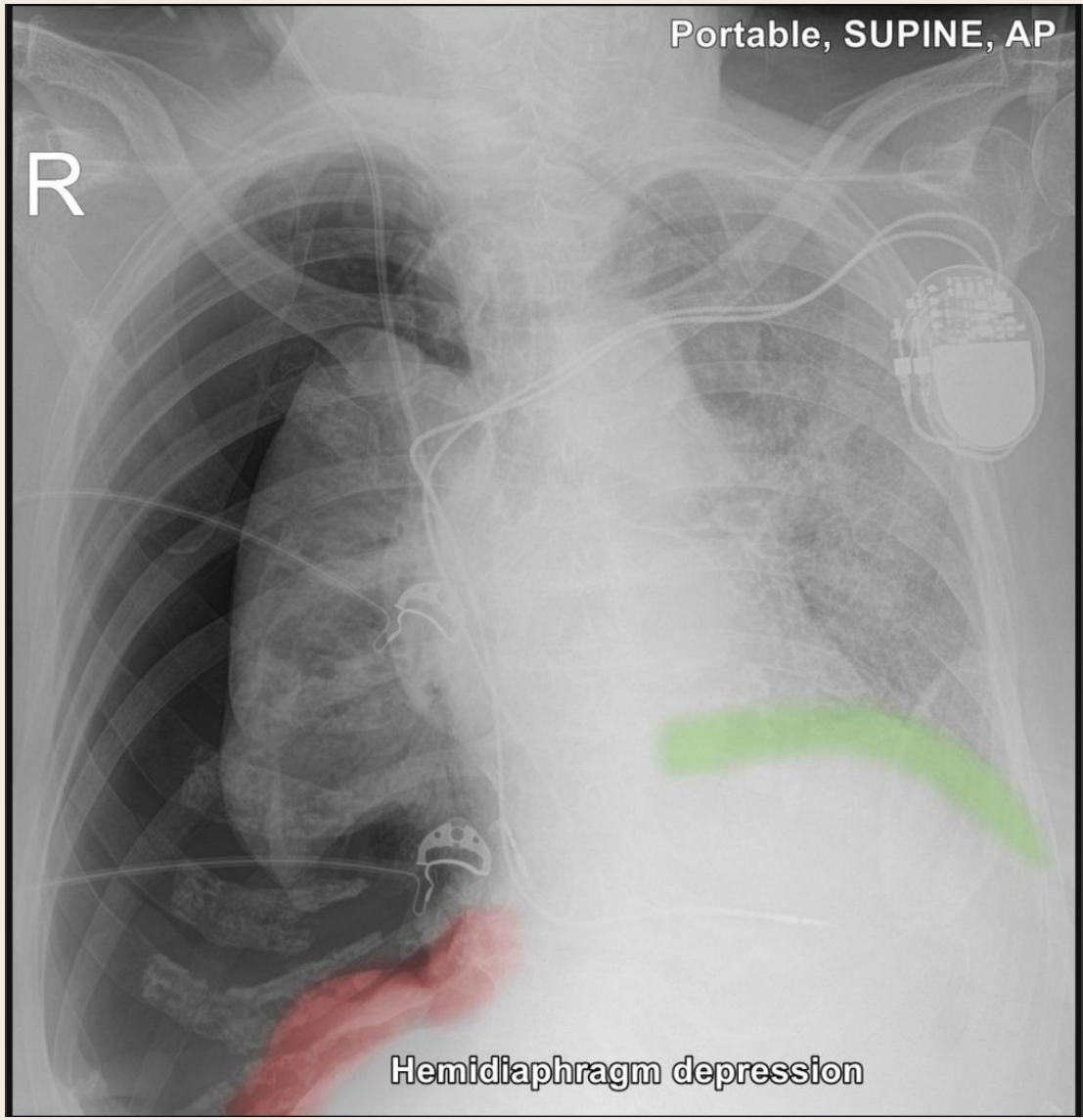
Radiographic features

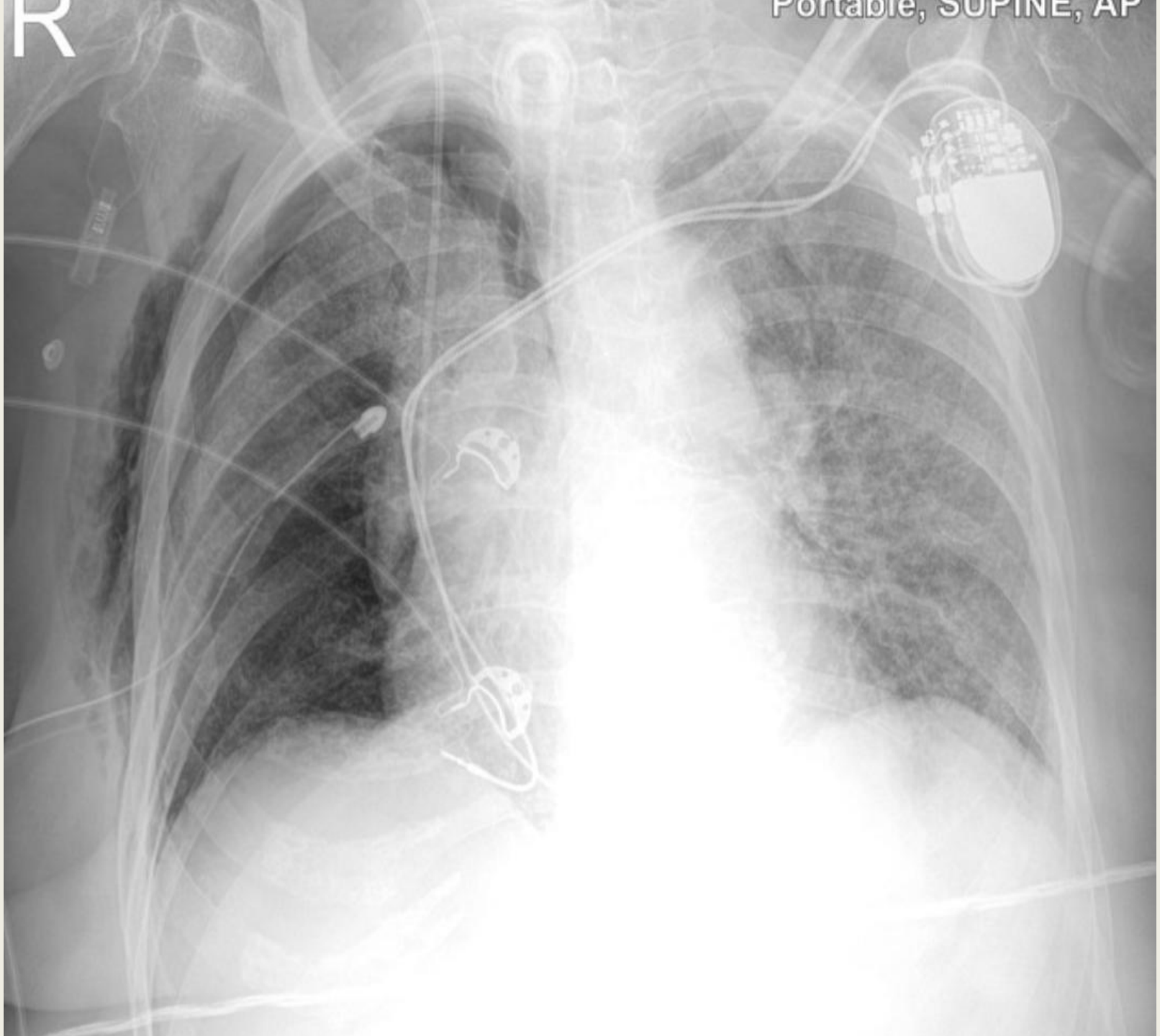
- A tension pneumothorax will have the same features as a simple pneumothorax with a number of additional features, helpful in identifying tension. These additional signs indicate hyperexpansion of the hemithorax:

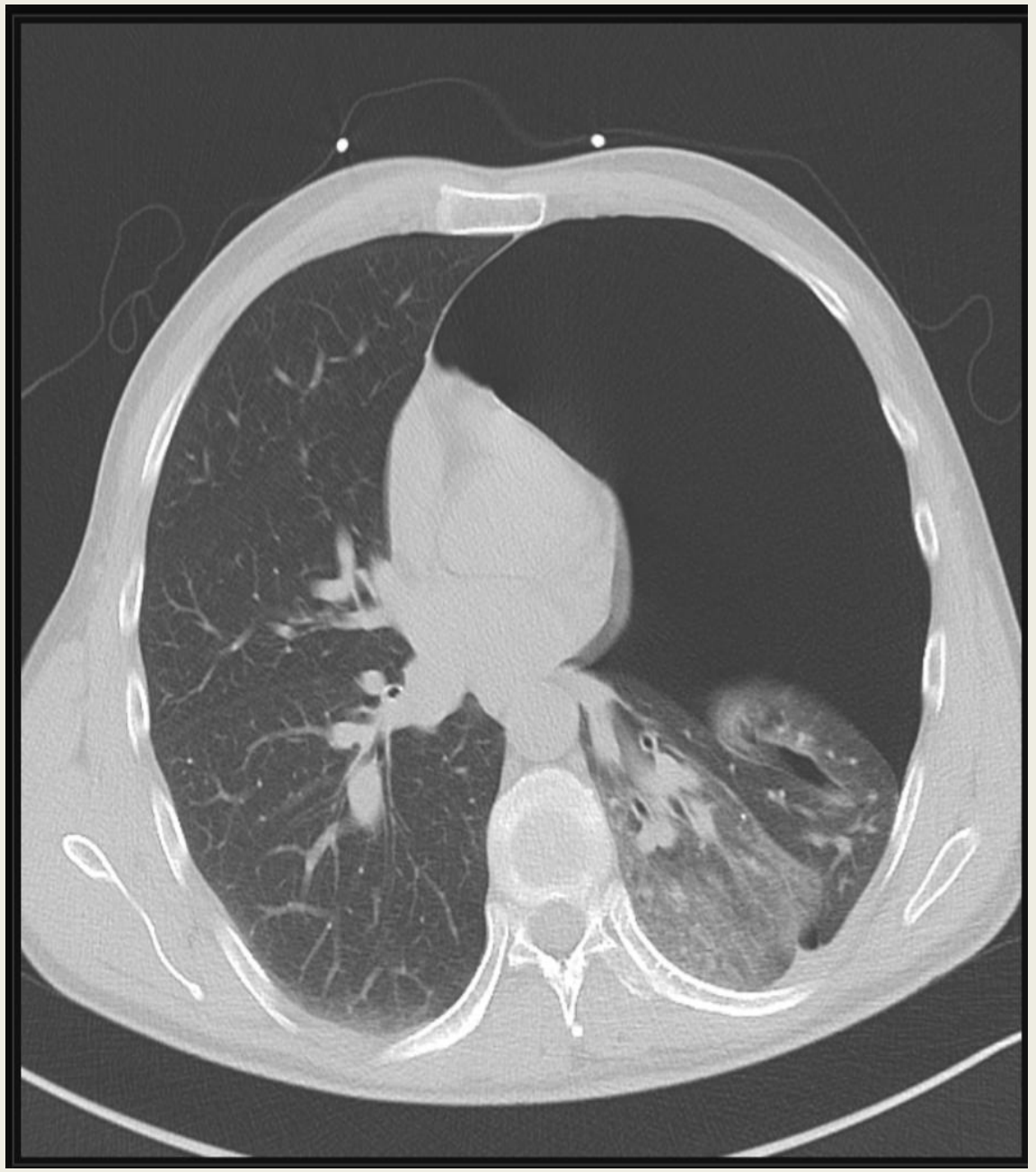
1. Ipsilateral increased intercostal spaces
2. contralateral shift of the mediastinum
3. depression of the hemidiaphragm


Portable, SUPINE, AP
R
Asymmetric hemithorax hyperexpansion
and widened intercostal spaces


Portable, SUPINE, AP
R
Contralateral mediastinal shift


Portable, SUPINE, AP
R
Hemidiaphragm depression


R
Portable, SUPINE, AP

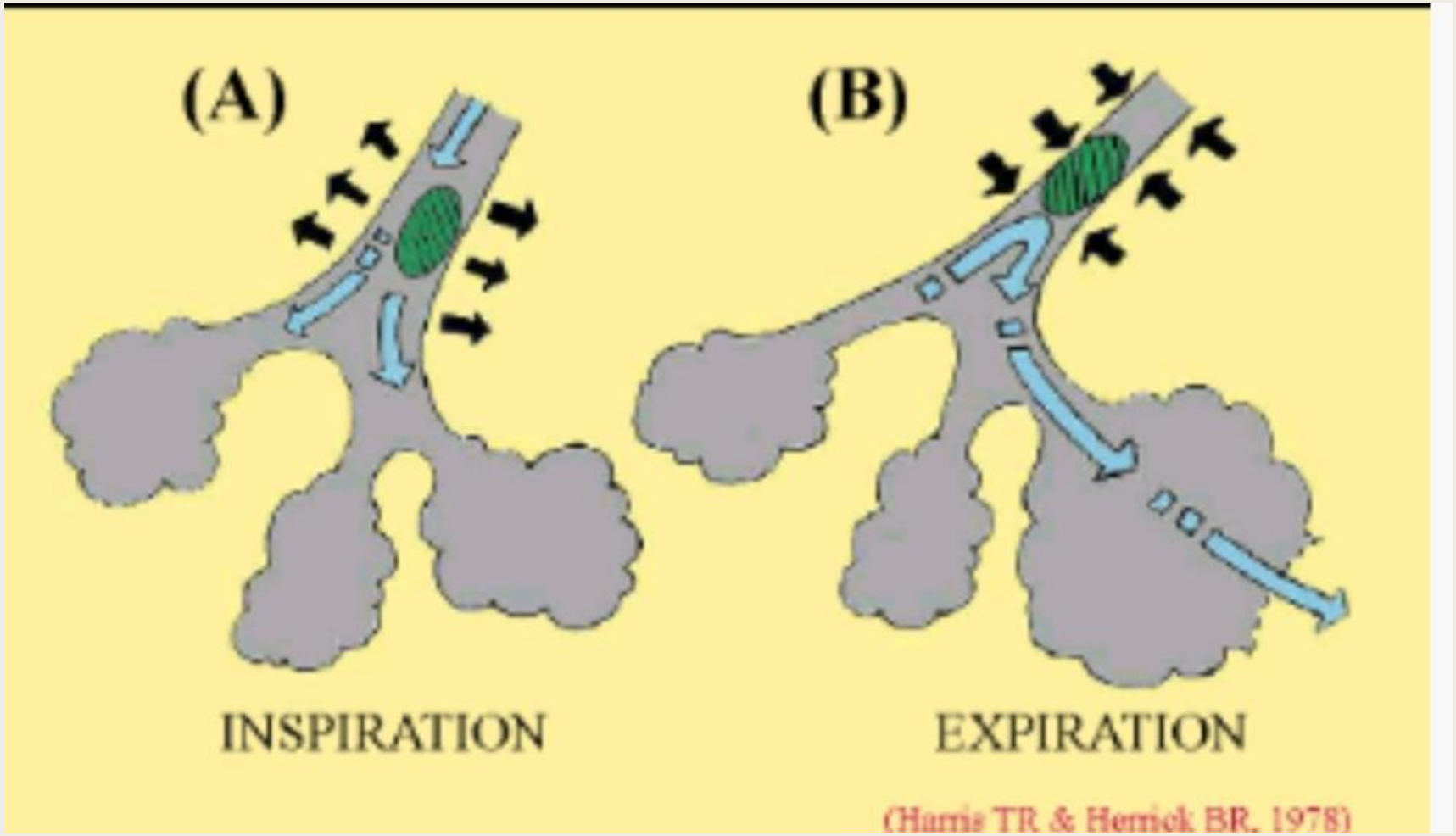


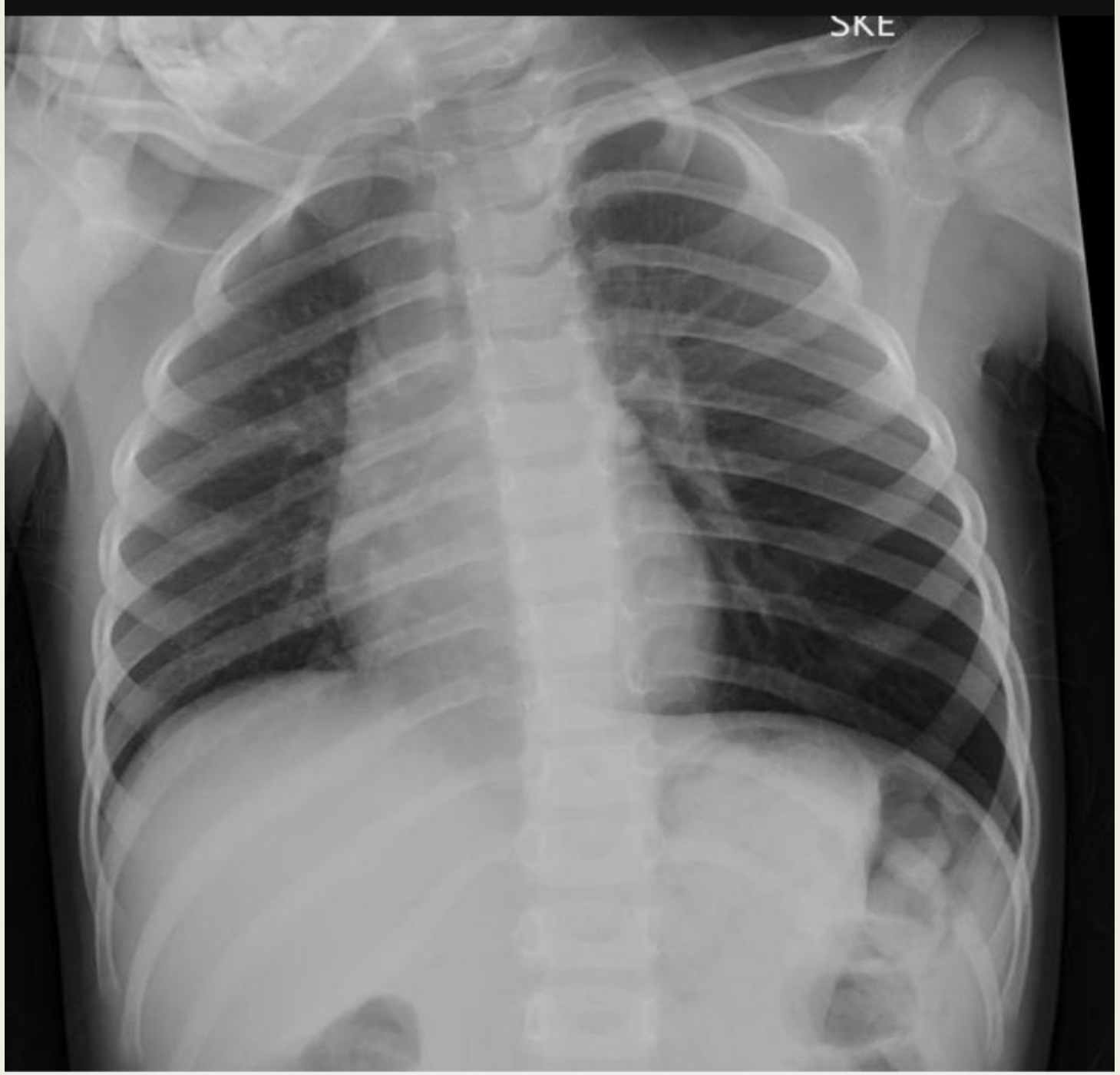
Airway foreign bodies

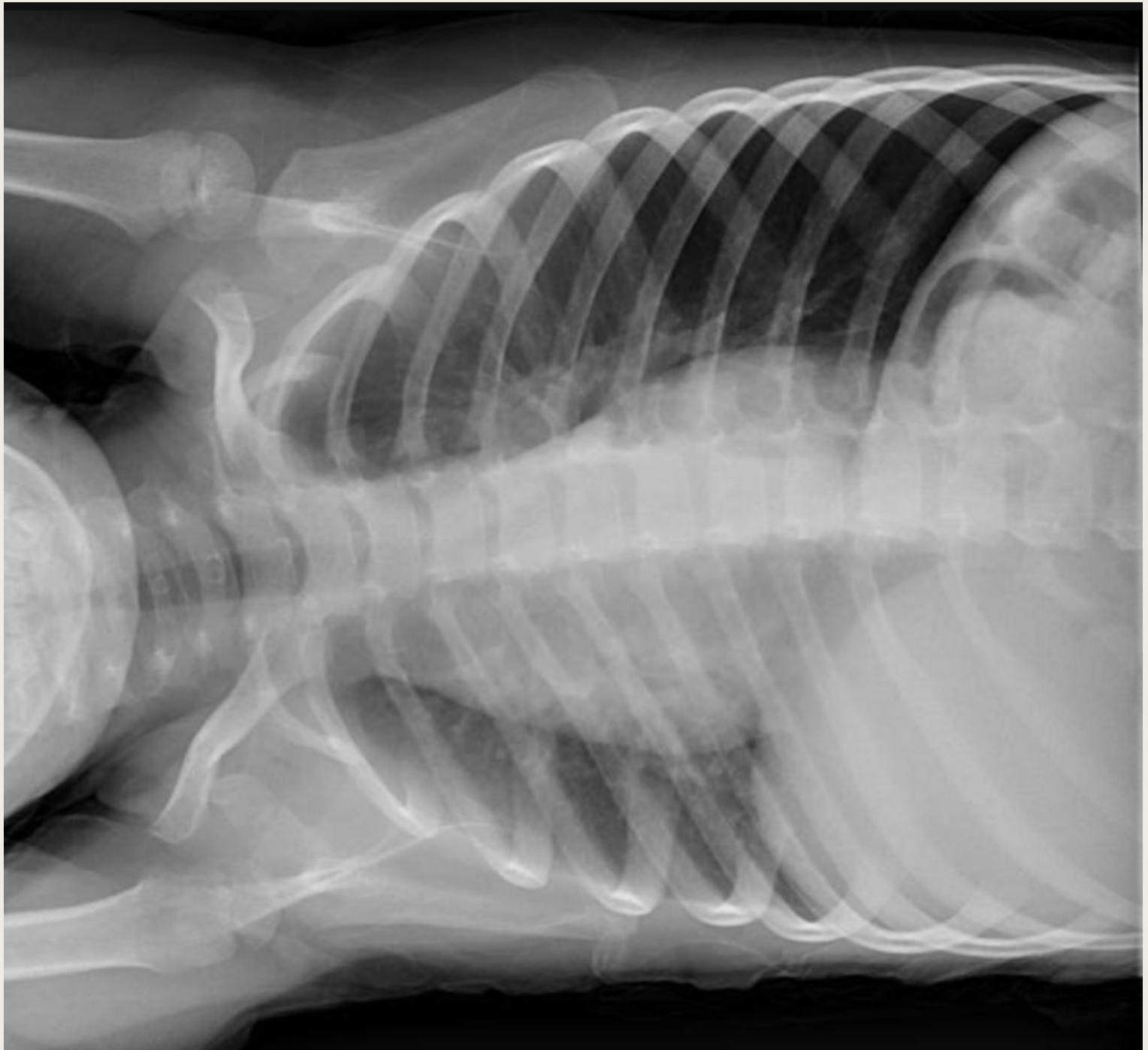
- Airway foreign bodies in children are potentially fatal, which is why immediate recognition is important. Unfortunately, delayed diagnosis is common.
- The hallmark of an aspirated foreign body is a lung volume that does not change during the respiratory cycle . Medical imaging departments may have a dedicated suspected foreign body inhalation series.

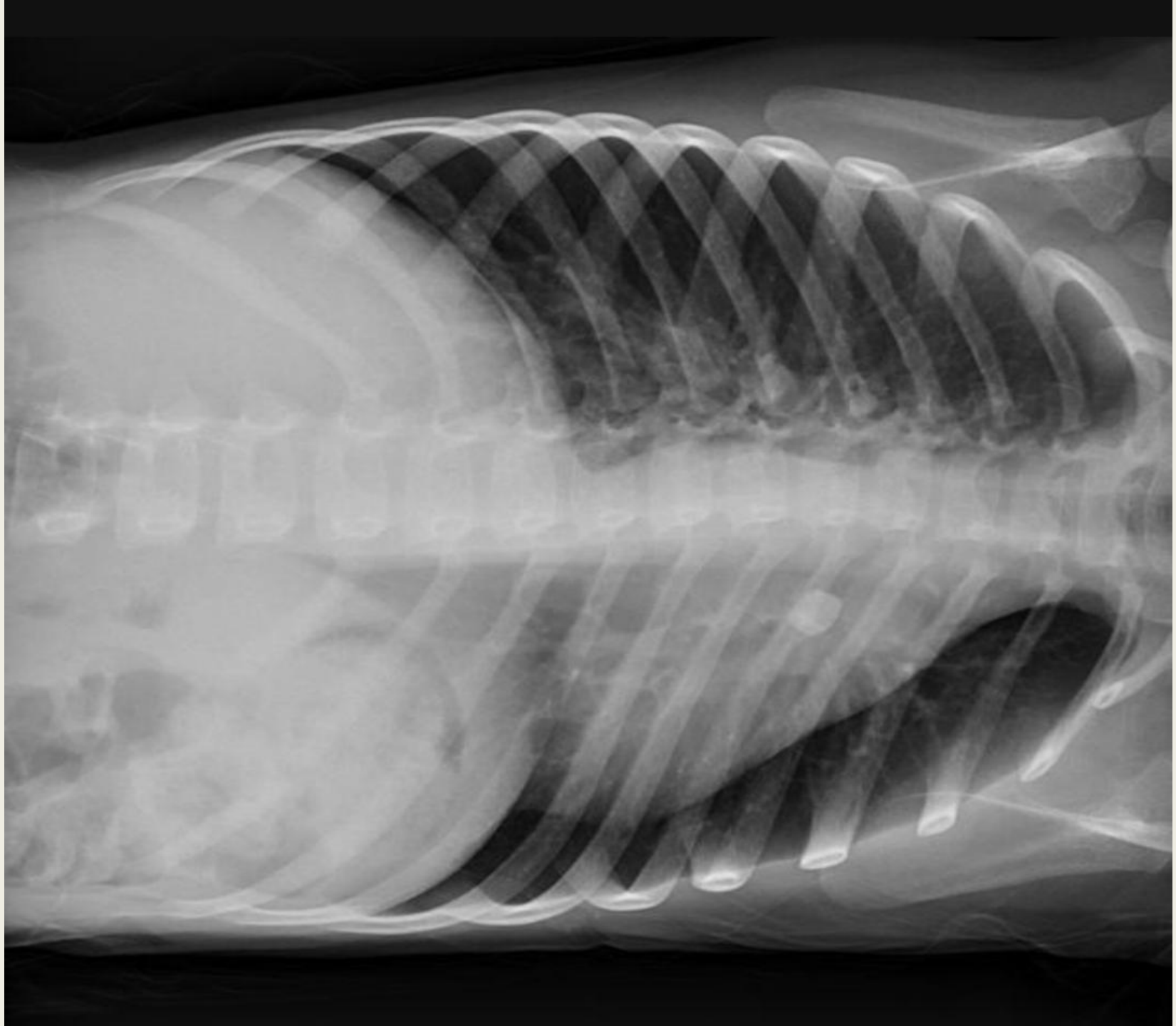
1. the chest x-ray will be normal in ~) 35%range (%40-30of patients
2. the majority of foreign bodies are radiolucent
3. unilateral emphysema or atelectasis are the most common findings

1. The patient should be radiographed on expiration: this will exaggerate the differences between the lungs
2. the normal lung should appear smaller and denser than the affected lung
3. due to the check valve mechanism, air enters the bronchus around the foreign body but cannot exit, the affected lung will usually appear overinflated and hyperlucent, with concomitant rib flaring and a depressed ipsilateral hemidiaphragm
4. in uncooperative patients, bilateral decubitus views can be performed, which will demonstrate air trapping on the affected side


(A)
(B)
INSPIRATION
EXPIRATION
(Harris TR & Herrick BR, 1978)


SKE





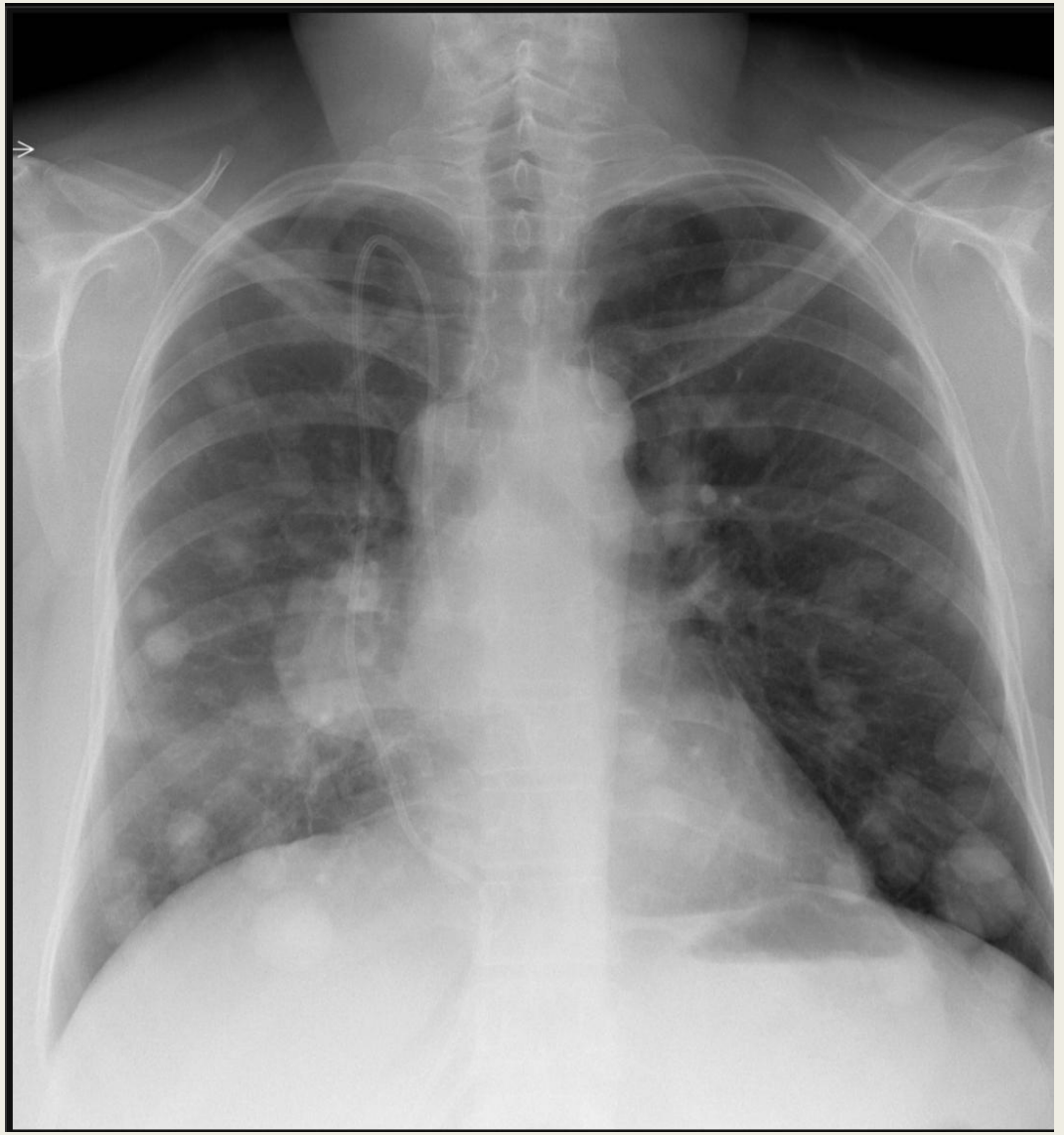
Metastases

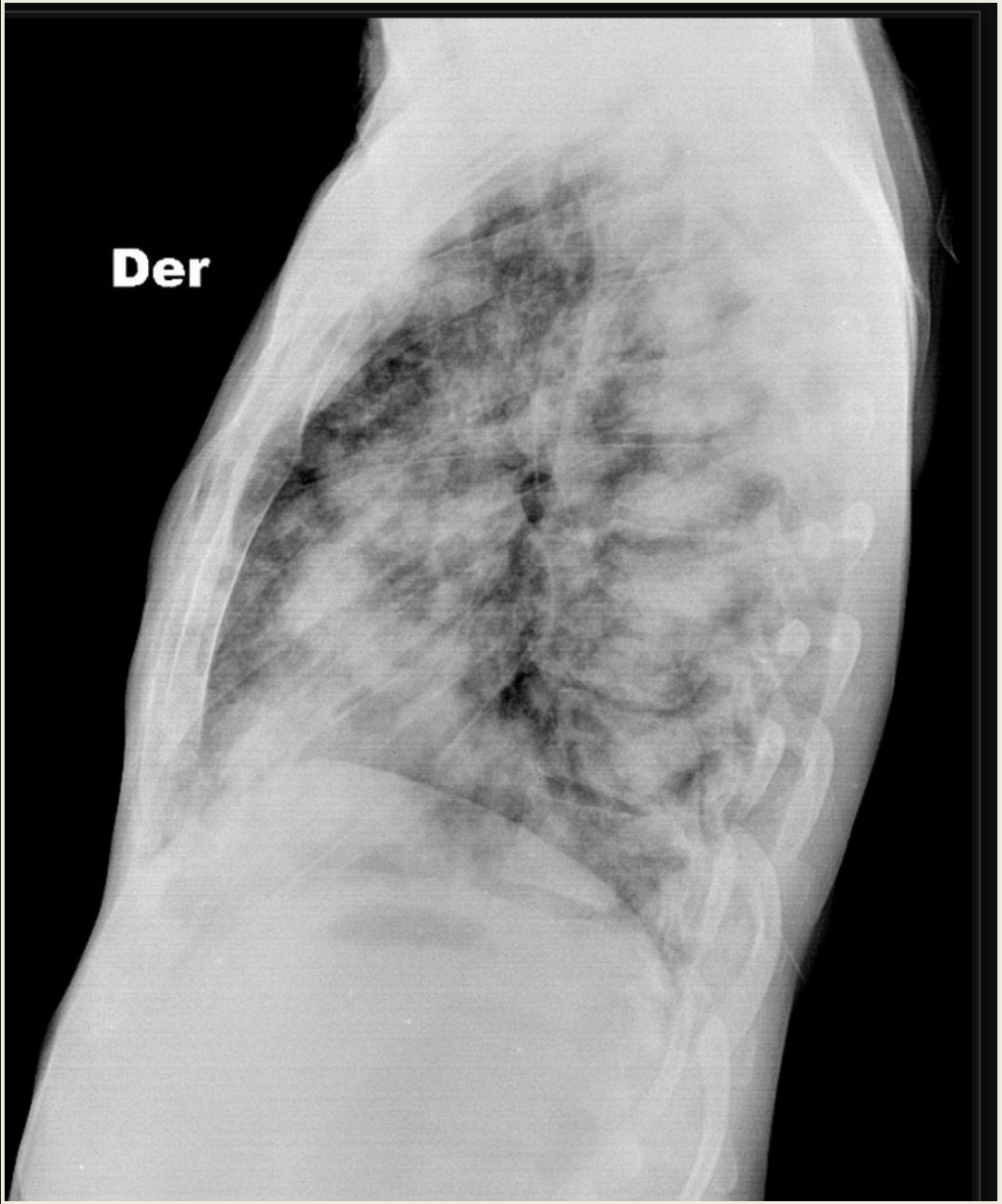
- **Pulmonary metastases** refer to distant tumor spread from a variety of primary tumors to the lungs via the blood or lymphatics.
- The most common malignancies to present with pulmonary metastases:

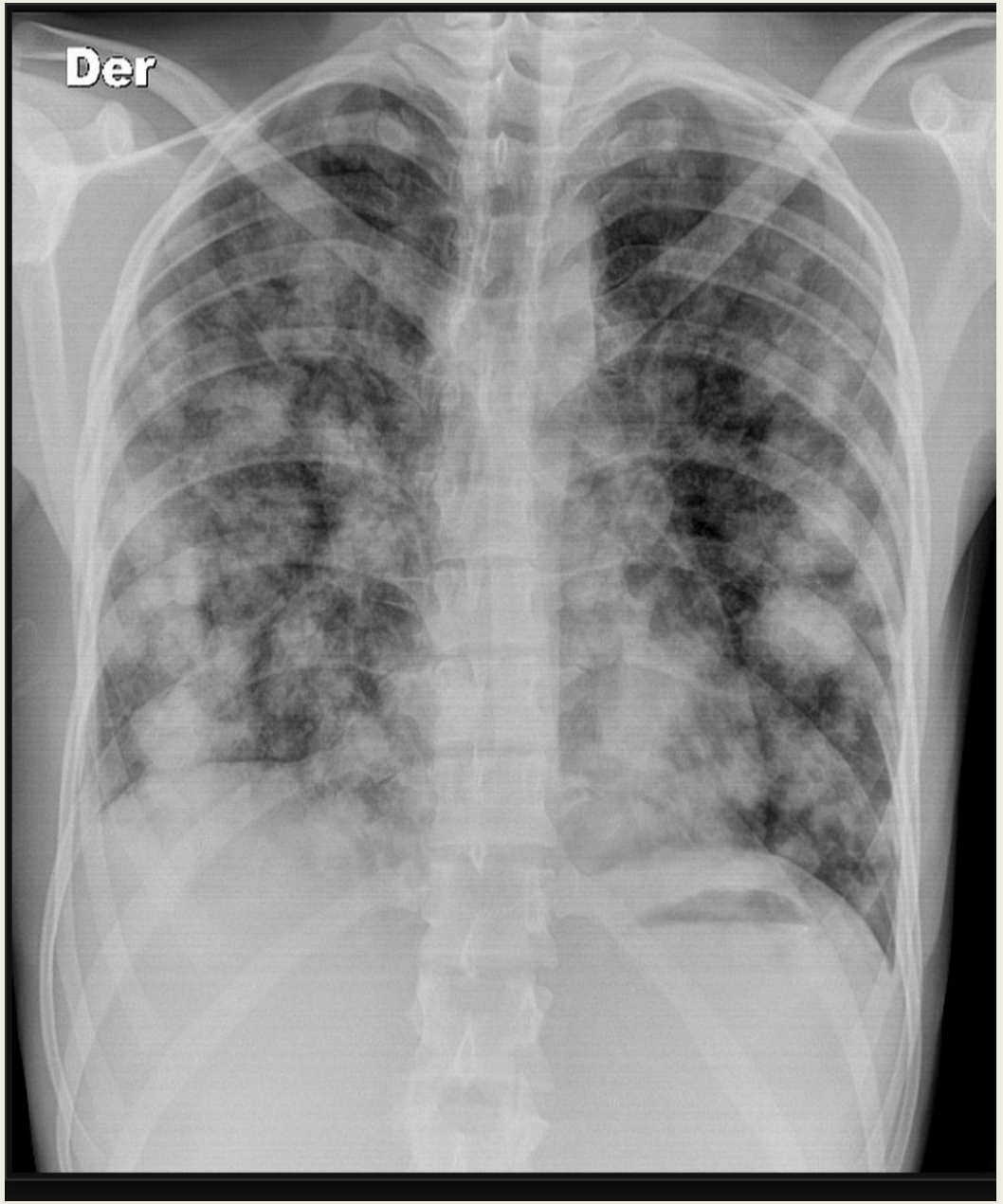
1. Lung cancer (most common primary site(
2. colorectal cancer
3. renal cell carcinoma
4. pancreatic cancer
5. breast cancer

Plain radiograph

- Plain films are insensitive, although frequently able to make the diagnosis, as often pulmonary metastases are large and numerous.
- Cannonball metastases refer to multiple large, well-circumscribed, round pulmonary metastases that appear not unsurprisingly like cannonballs




Der


Der

Cannonball