

# Radiology Team 429

## **RADIOLOGIC DESCRIPTION OF Chest and CVS DISEASES**



# Radiology team 429

In this team we used the outlines from the:

- Doctor's slides
  - Lecture notes
  - 427 Radiology team
  - Diagnostic Imaging –PETER ARMSTRONG – 6<sup>Th</sup> Edition
- 
- Sorry we don't hold responsibility for any missing information or perhaps – perhaps -wrong material.
  - We tried our best to present this lecture in the best way, and we hope what we wrote is enough to cover the subjects.

Team Leaders:

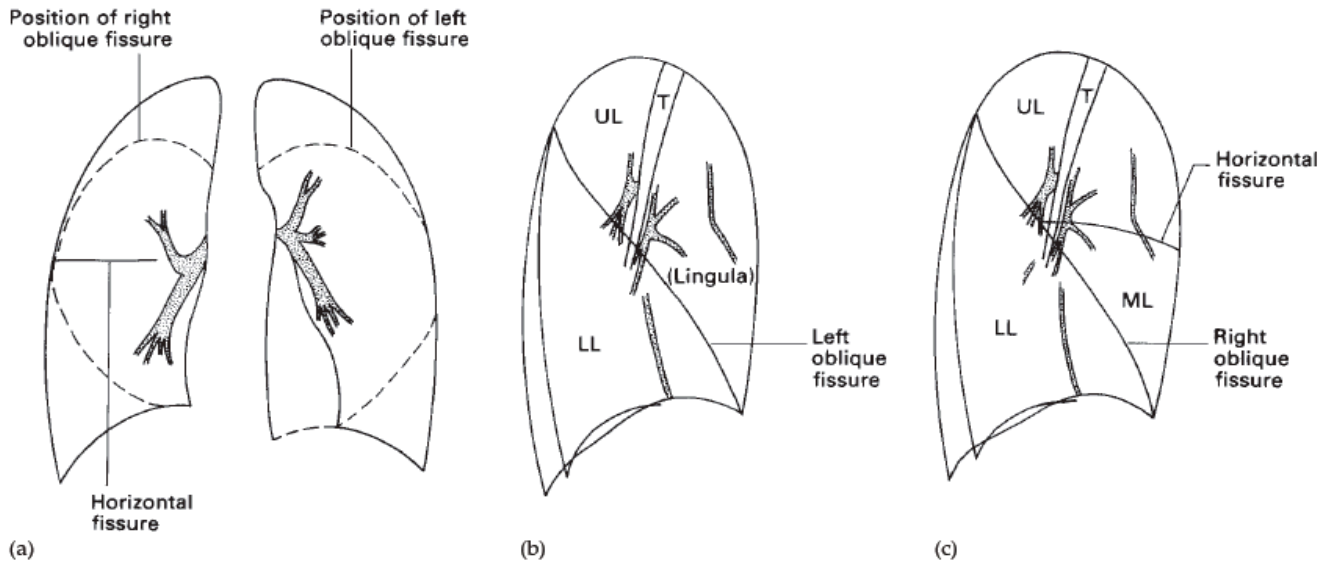
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Best Wishes : )

# Normal Anatomy



**Fig. 2.15** Position of the lobes and fissures. (a) The oblique (major) fissure is similar on the two sides. The oblique fissures are not visible on the frontal view; their position is indicated by dotted lines. (b) In the left lung the oblique fissure separates the upper lobe (UL) and lower lobe (LL). (c) In the right lung, there is an extra fissure – the horizontal (minor) fissure, which separates the upper lobe (UL) and middle lobe (ML). (The lingular segments of the upper lobe are analogous to the segments of the middle lobe.) T, trachea.

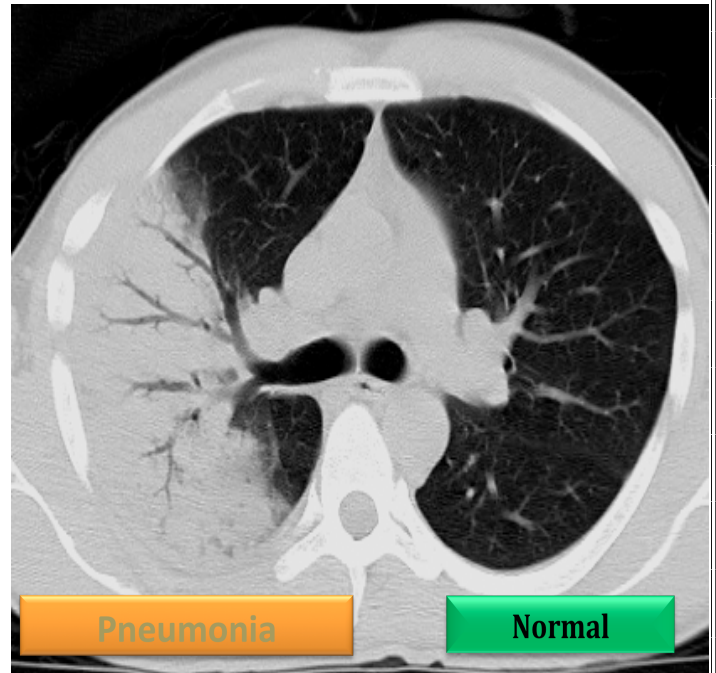
Terminology  
Radiological signs of lung disease

|                           | <b>Atelectasis</b>   | <b>Consolidation</b>  |
|---------------------------|--|---|
| <b>Definition</b>         | <ul style="list-style-type: none"> <li>Also known as pulmonary collapse</li> <li>Means <u>loss of volume</u> in a lobe, segment or sub segment of the lung</li> </ul>  | <ul style="list-style-type: none"> <li>Also known as Air-space filling</li> <li>Means loss of air in lobe, segment or sub segment of the lung</li> <li>The air in the alveoli is replaced by fluid such as exudate or infiltrates</li> </ul>  |
| <b>Radiological Signs</b> | <ul style="list-style-type: none"> <li>Displacement of structures</li> <li>The shadow of the collapsed lobe</li> <li>Accompanied by consolidation almost invariably</li> <li>The silhouette sign. The silhouette sign not only helps diagnose lobar collapse but also helps to decide which lobe is collapsed.</li> <li>Collapse of the anteriorly located lobes (upper and middle) obliterates portions of the mediastinal and heart outlines, whereas collapse of the lower lobes obscures the outline of the adjacent diaphragm and descending aorta</li> </ul> | <ul style="list-style-type: none"> <li>A shadow with ill-defined borders</li> <li>An air bronchogram:<br/>Normally, it is not possible to identify air in bronchi within normally aerated lung, because the walls of the normal bronchi are too thin and airfilled bronchi surrounded by air in the alveoli, but if the alveoli are filled with fluid, the air in the bronchi <u>contrasts</u> with the fluid in the adjacent lung. This sign is seen to <u>great advantage on CT</u>.</li> <li>The silhouette sign, namely loss of visualization of the adjacent mediastinal or diaphragm outline</li> </ul> |
| <b>Most Common Cause</b>  | <ul style="list-style-type: none"> <li>Bronchial obstruction</li> <li>Pneumothorax</li> <li>Pleural effusion</li> </ul>  | <ul style="list-style-type: none"> <li>Pneumonia</li> <li>Infarction</li> <li>Contusion</li> <li>Immunological Disorders</li> </ul>   |
| <b>Differences</b>        | <ul style="list-style-type: none"> <li>Volume loss</li> <li>Associated ipsilateral shift</li> <li>Linear, wedge shaped</li> <li>Apex at hilum</li> </ul>   | <ul style="list-style-type: none"> <li>Normal or increased volume</li> <li>No shift or if present then contralateral</li> <li>Consolidation, air space process</li> <li>Not centered at hilum</li> </ul>  |



### Air bronchogram sign:

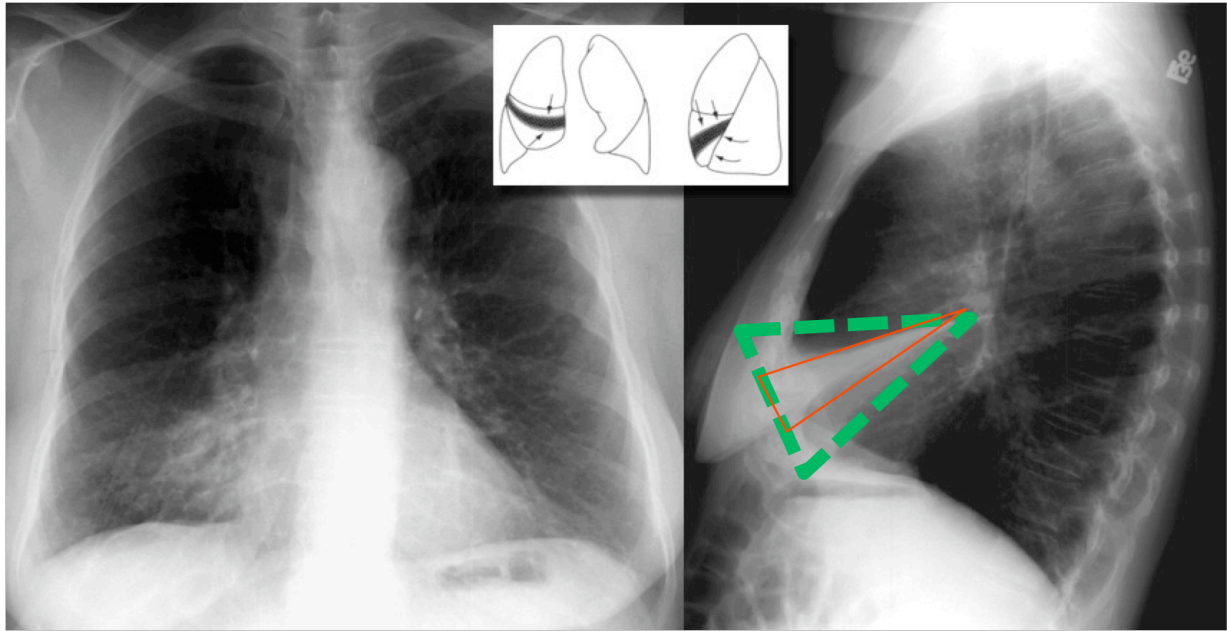
- On a normal CXR, we can visualize the air-filled trachea, mainstem bronchi and initial portions of the lobar bronchi. Further branchings should only be seen with the injection of contrast during a bronchogram. (appears white bronchial tree with a black background)
- When air can be visualized in the more peripheral intrapulmonary bronchi, this is known as the 'air-bronchogram sign'. This abnormality is usually caused by an infiltrate/consolidation that surrounds the bronchi (black bronchial tree with a white background → inflammatory tissue “**sign of consolidation**”



## Diseases

### 1) Lobar Atelectasis:

- When a lobe collapses, the unobstructed lobe(s) on the side of the collapse undergoes compensatory expansion.
- The displaced (shifted) fissure is seen as a well-defined boundary to an airless lobe in an x-ray
- The mediastinum and diaphragm may move towards the collapsed lobe.
- As lobar collapse is such an important and often difficult diagnosis to make on chest radiographs
- CT shows lobar collapse very well, but is rarely necessary simply to diagnose a collapsed lobe.
- With collapse of the whole of one lung, the entire hemithorax is opaque and there is substantial mediastinal and tracheal shift



The green triangular is the normal right middle lobe but with the pneumonia it shrunk and became smaller b/c of loss of air and it became the **red triangular**

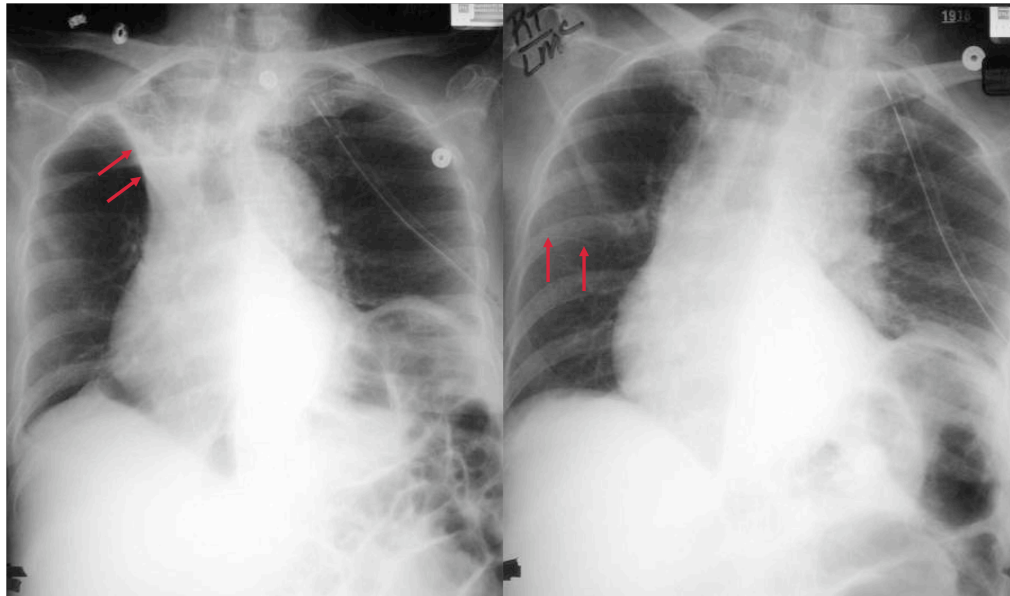
## Summary

### Atelectasis

Best sign – shift of a fissure: a fissure as a trigger if there 's a loss in volume b/c it's related to all lung segments

- Rapid development and clearance
- Air bronchograms if non-obstructive
- Secondary signs:
  - Mediastinal shift
  - Elevated diaphragm
  - Ribs closer together
  - Vague increased density

### A. Right Upper Lobe Atelectasis :



Right upper lobe consolidation and the transverse fissure is shifted upward **(right)** After treatment **(left)**

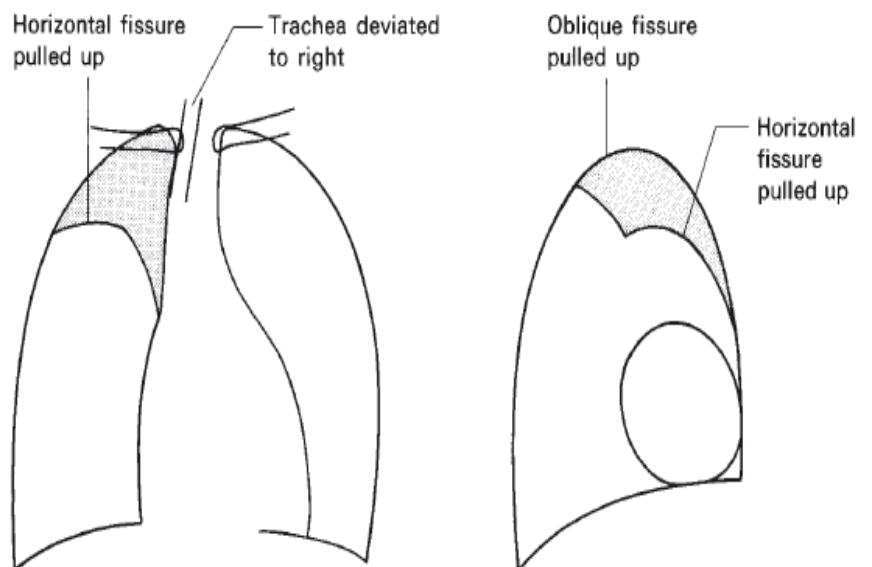
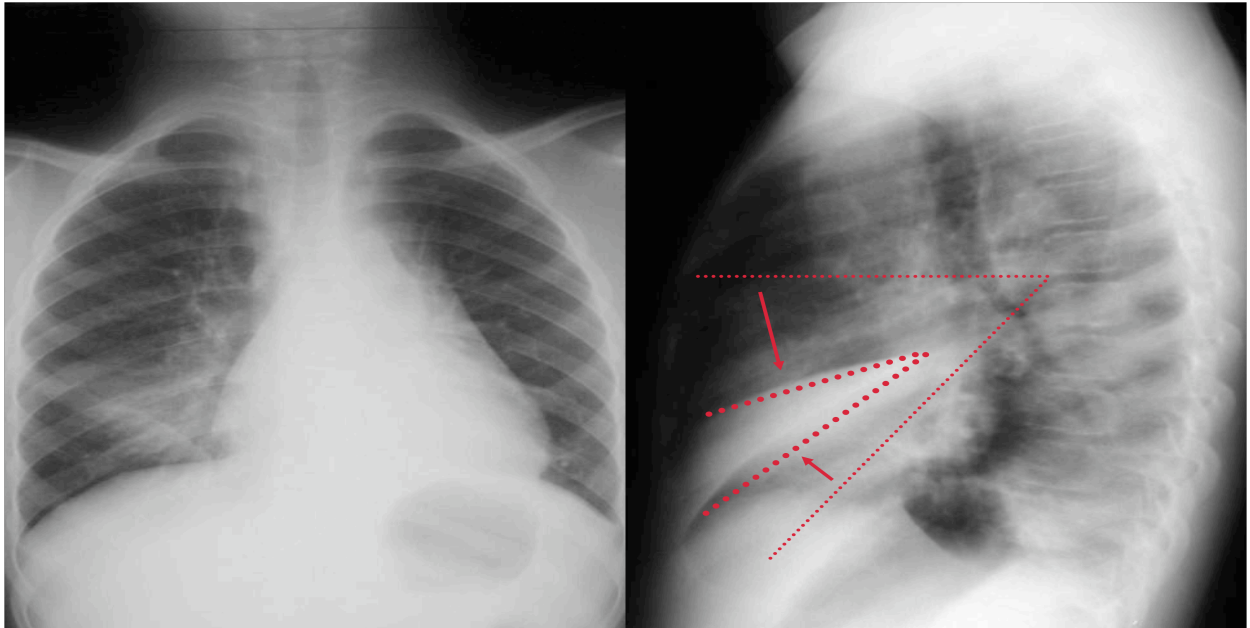


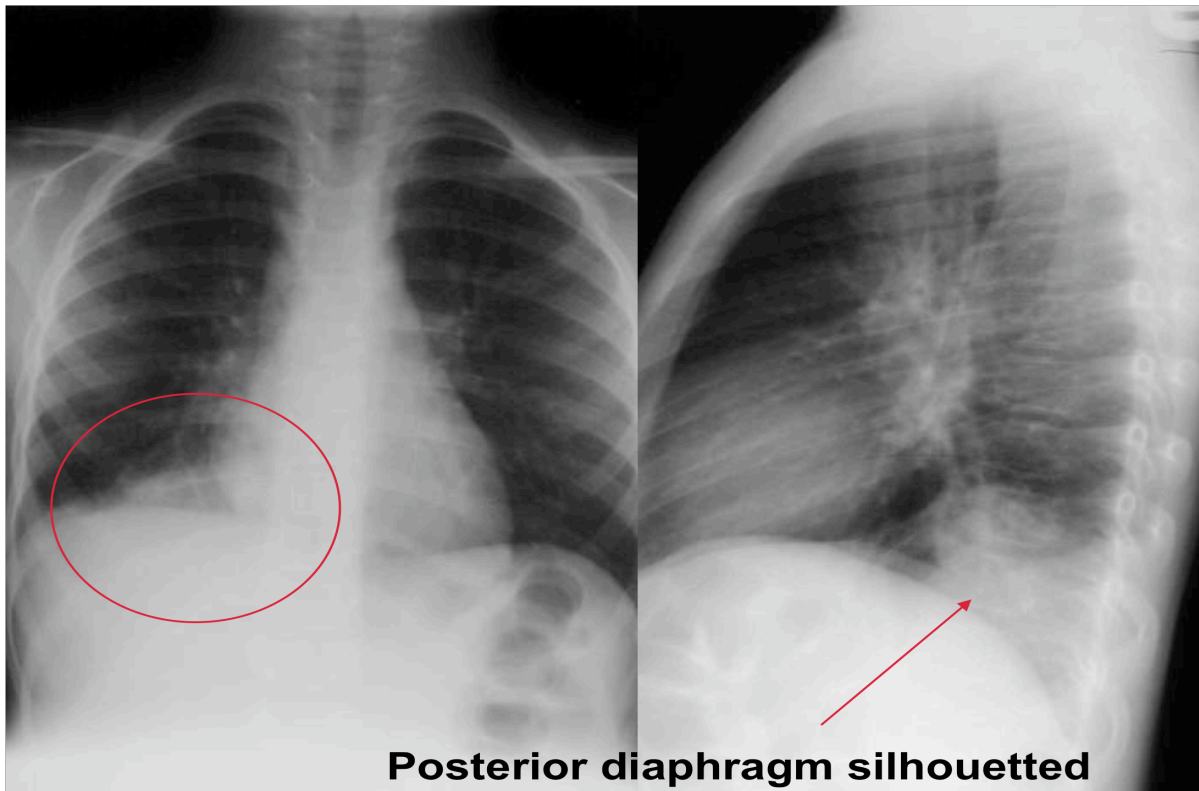
Fig. 2.23 Collapse of the right upper lobe. Note the elevated horizontal fissure.

### B. Right Middle Lobe Atelectasis:

Consolidation on the middle lobe and collapsing of the transverse fissure



**C. Right Lower Lobe Atelectasis:**



**Posterior diaphragm silhouetted**



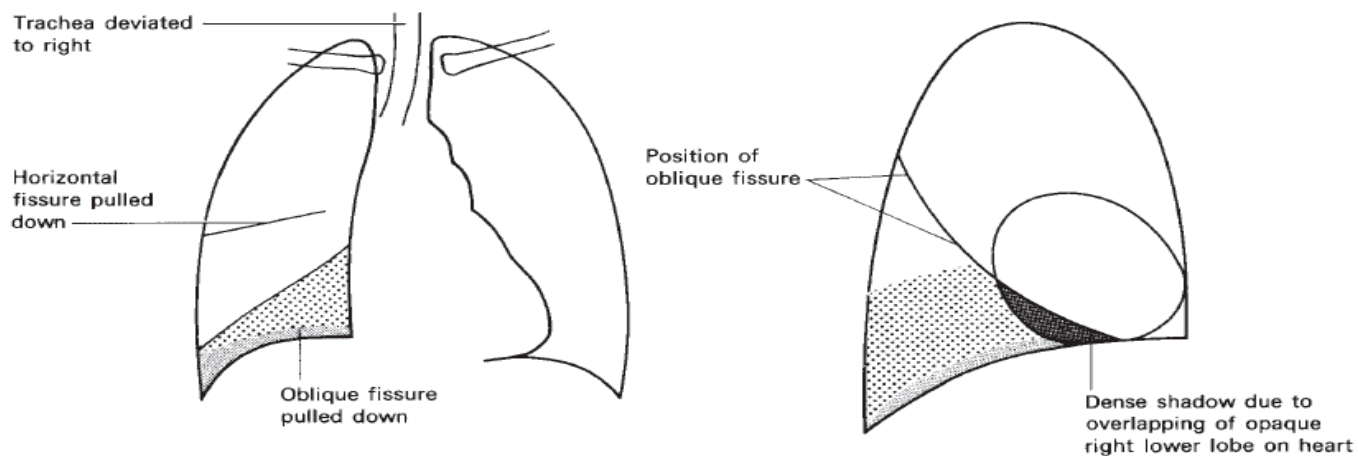


Fig. 2.22 Collapse of the right lower lobe. (In this example the apical segment is relatively well aerated.)

#### D. Left Upper Lobe :

On the lateral view you can see the oblique fissure is shifted anteriorly

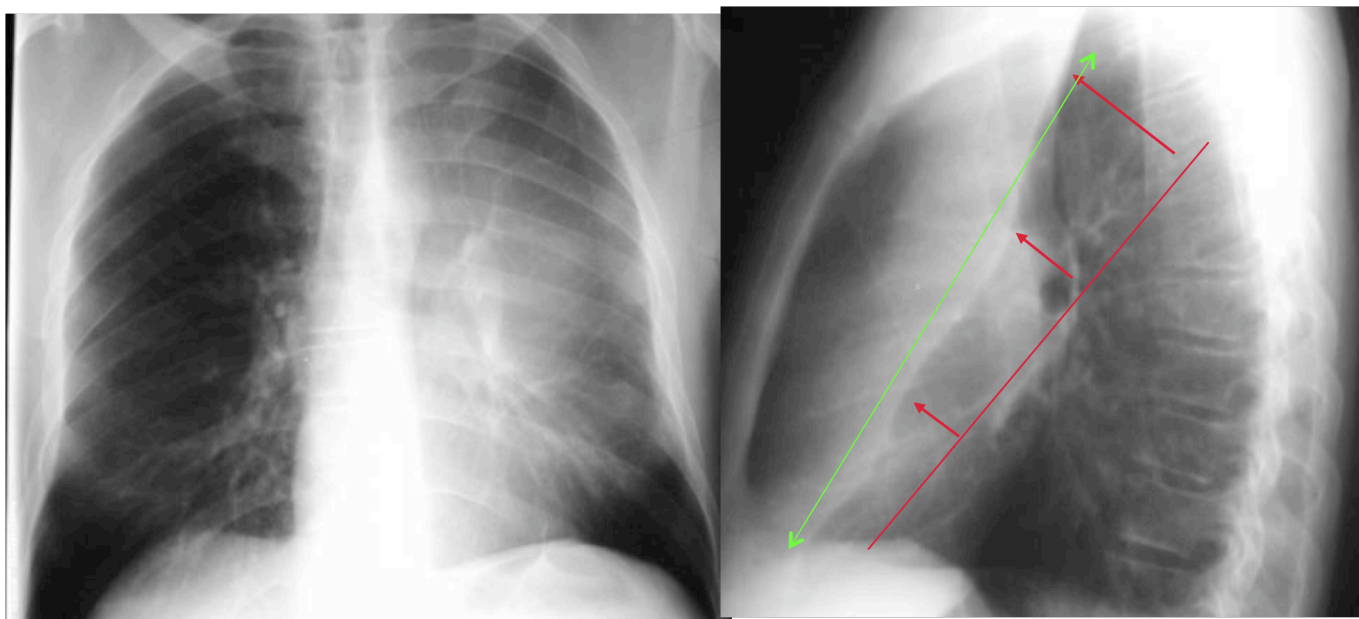
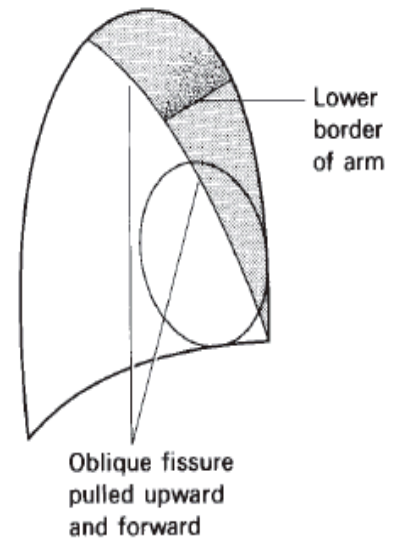


Fig. 2.24 Collapse of the left upper lobe. Note that the lower border of the collapsed lobe is ill defined on the posteroanterior view and that the upper two-thirds of the left mediastinal and heart borders are invisible, but that the aortic knuckle and descending aorta are identifiable. (The visible portions of the aorta have been drawn in for greater clarity.)



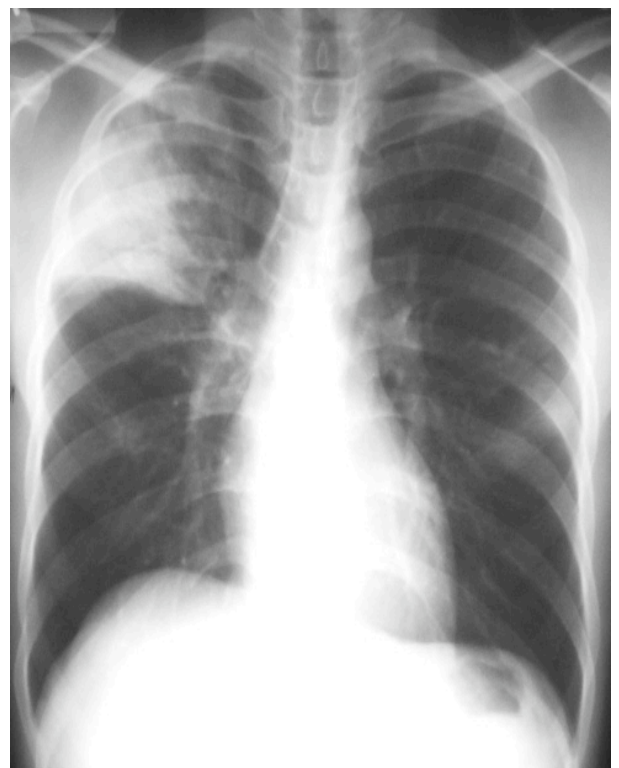
### Summary

| Lobe    | Direction of collapse             | Shift of fissures  |
|---------|-----------------------------------|--|
| RUL/LUL | Superiorly, medially, anteriorly  | On right, minor fissure shifts upward and medially (PA)  |
| RML     | Inferiorly and medially           | Minor fissure shifts downward (PA)                       |
| RLL/LLL | Inferiorly, medially, posteriorly | Major/oblique fissures shift downward and backward (LAT) |

## 2) pneumonia :

- Consolidation of a whole lobe, or the majority of a lobe, is virtually diagnostic of bacterial pneumonia. Lobar consolidation produces an opaque lobe, except for air bronchograms.
- May be accompanied by loss of volume of the affected lobe, a feature that is particularly common in children

Air-space filling. In this case, the consolidation in the right upper lobe is due to pneumonia



## Summary

### Pneumonia

Signs:

- Air bronchogram
- **Silhouette** “positive” or “negative”
- Dense hilum
- “Spine” sign

All are signs of any air space process

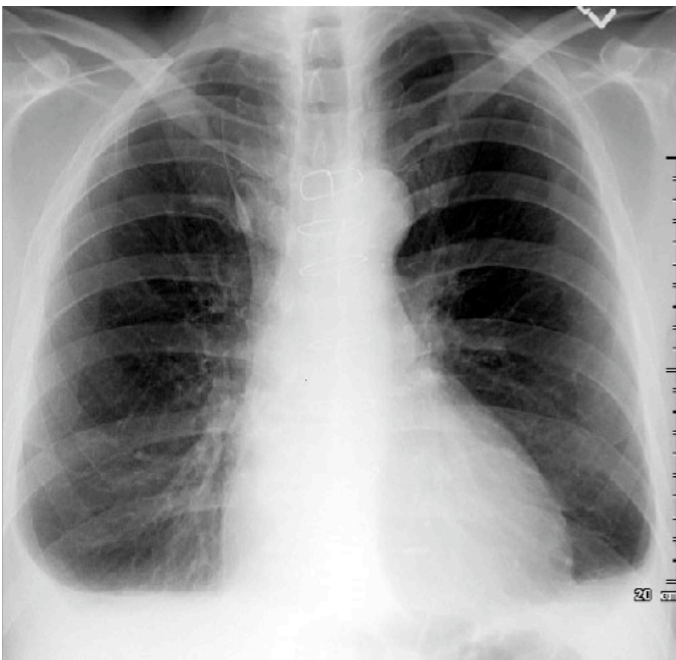
**Pseudomonas pneumonia** :organism that cause pneumonia.

Dx of pneumonia depends on appropriate clinical scenario.

### 3) Pleural Effusion:

Pleural effusions may lie free within the pleural cavity, in which case the fluid falls to the most dependent portion of the pleura and always fills in the costophrenic angles.

Pleural effusion “Hydrothorax”: Blunting of the costophrenic angle “best seen at erect position PA”



## Summary

### Plueral Effusion

- On an upright film, an effusion will cause blunting on the lateral costophrenic sulci
- If it is large enough, it may reach the posterior costophrenic sulci
- Approximately 200 ml of fluid are needed to detect an effusion in the frontal film vs. approximately 75ml for the lateral

#### 4) Pneumothorax:

- A pneumothorax is defined as air inside the thoracic cavity but outside the lung.
- The majority of pneumothoraces occur in young people with no recognizable lung disease. These patients have small blebs or bullae at the periphery of their lungs, which burst.
- Some causes of spontaneous PTX are; idiopathic, asthma, COPD, pulmonary infection, neoplasm, Marfanâs syndrome, and smoking cocaine.
- The diagnosis of pneumothorax depends on recognizing:
  - A line of pleura due to the lung edge being separated from the chest wall, mediastinum or diaphragm by air

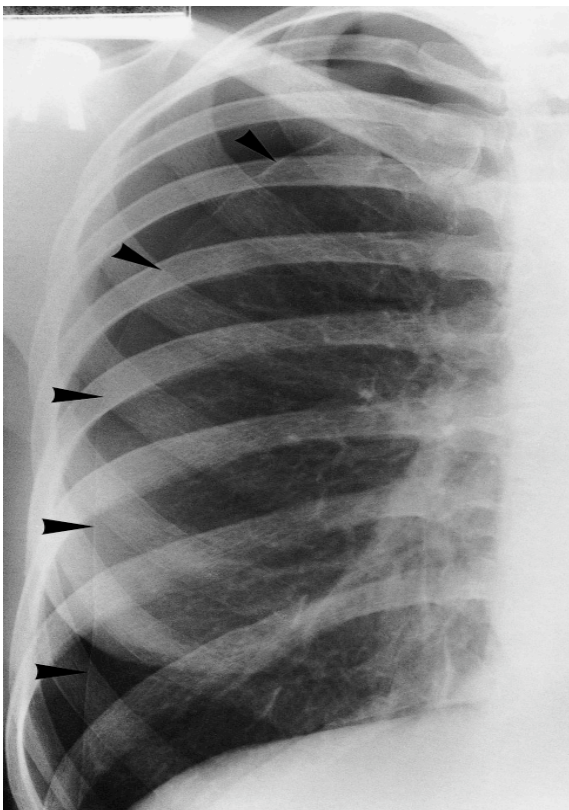
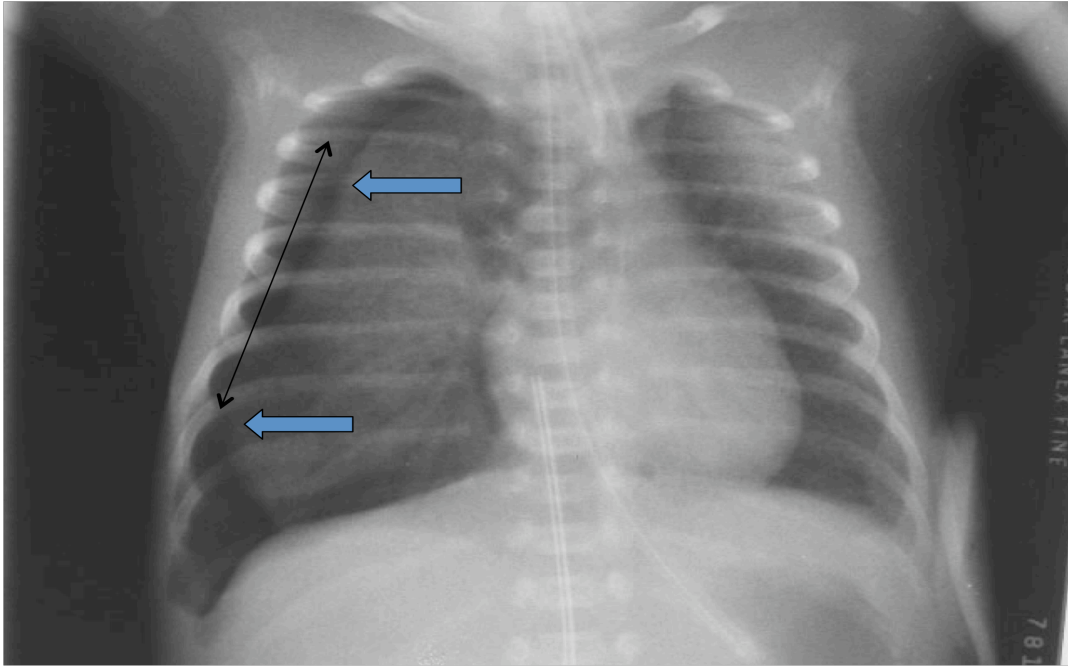
## Summary

### Pneumothorax

- The collection of air in the space around the lungs. This buildup of air puts pressure on the lung, so it cannot expand as much as it normally does when breathing
- Diagnosis: well-demarcated area devoid of lung markings, the clinically relevant tracheal deviation and movement of the heart away from the affected side.



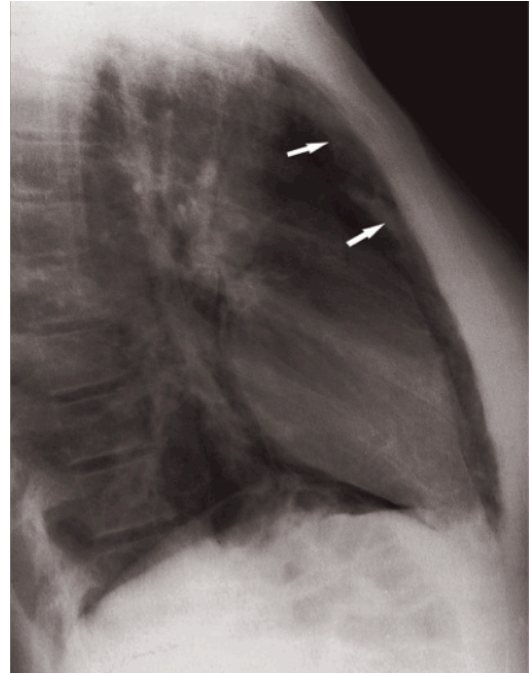
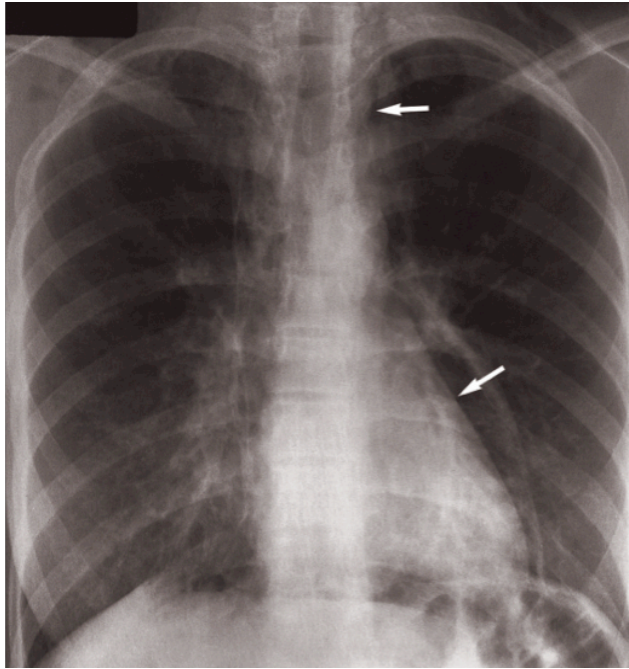
- Absence of vessel shadows outside this line and no lung markings



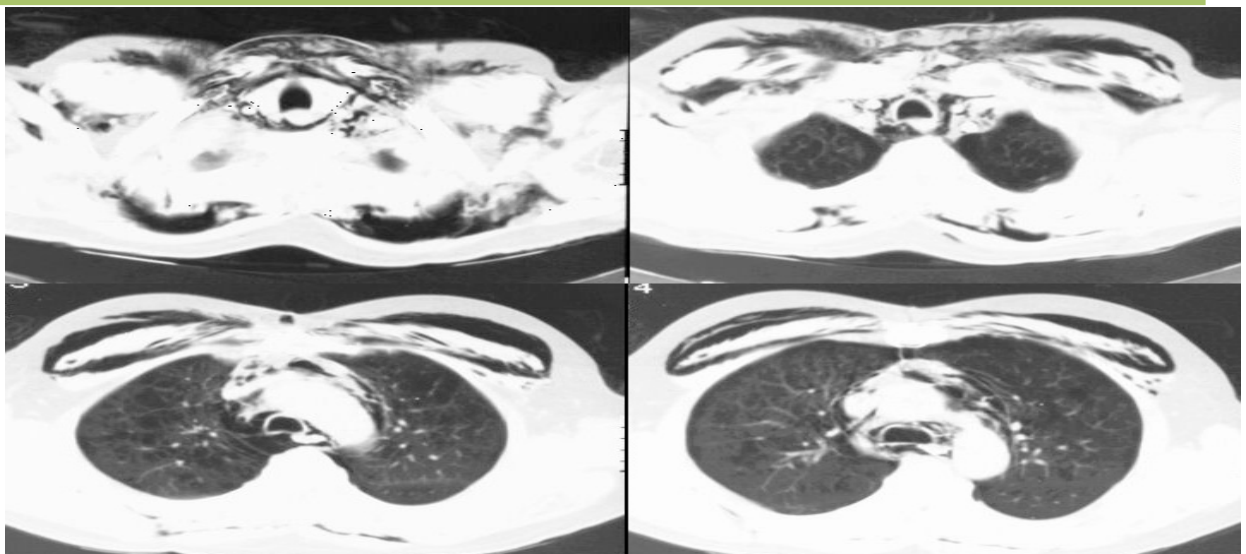
Pneumothorax. The pleural edge is **arrowed**. The diagnosis of pneumothorax requires the identification of this edge and a clear space beyond it.

### 5) Pneumomediastinum:

- Provided the air has not tracked into the mediastinum from the root of the neck, adjacent chest wall or retroperitoneum, air in the mediastinum indicates a tear in the oesophagus or an air leak from bronchi in the mediastinum or lung. These tears may be spontaneous or follow trauma, including barotrauma and trauma from endoscopy or swallowed foreign bodies.
- Spontaneous leakage from small bronchi in the lungs is most commonly seen in patients with asthma or following severe vomiting. The air, which tracks through the interstitial tissues of the lung into the mediastinum, is seen as fine streaks of transradiancy within the mediastinum, often extending upward into the neck

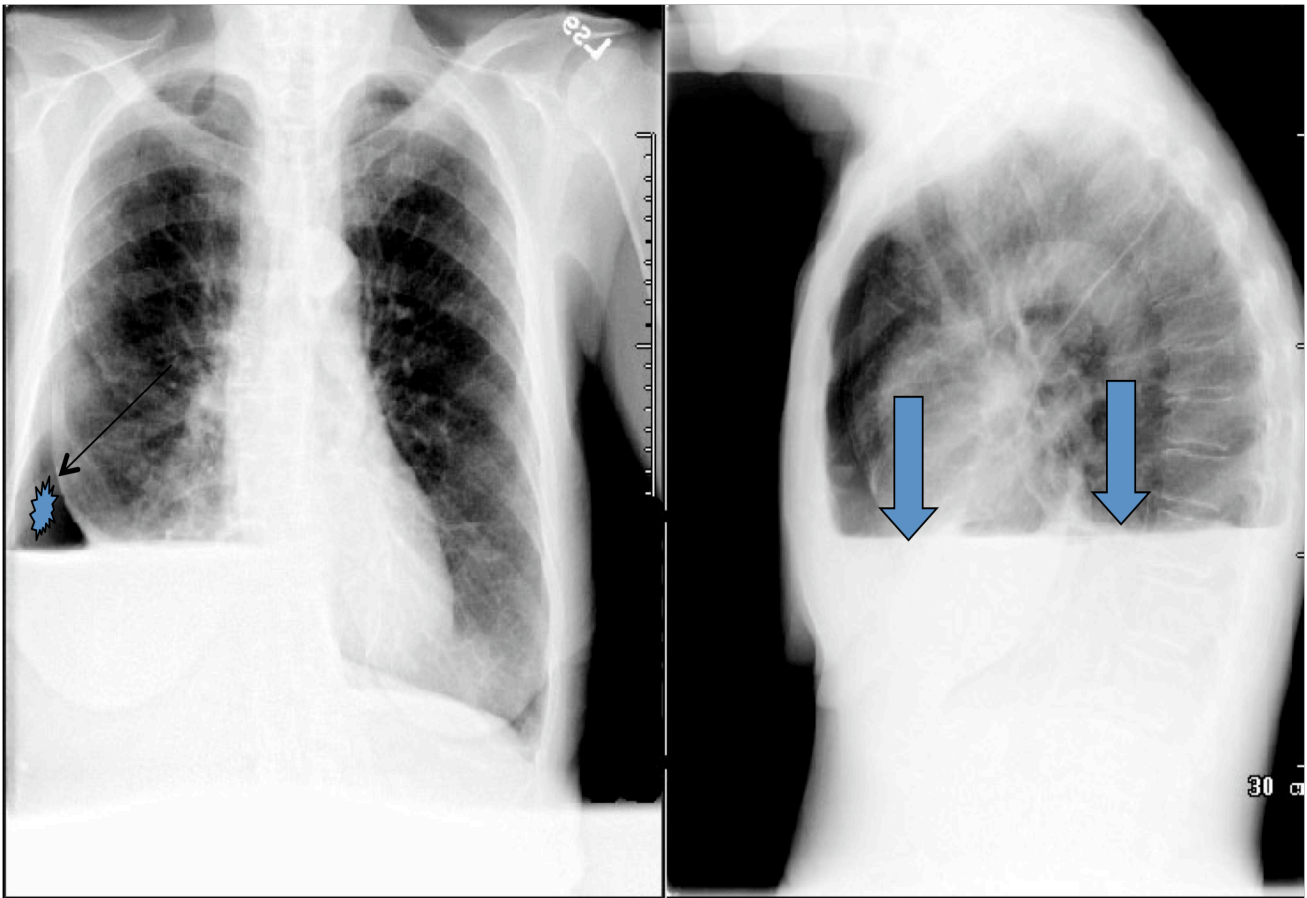


Pneumomediastinum showing air (arrows) in the mediastinum extending up into the neck



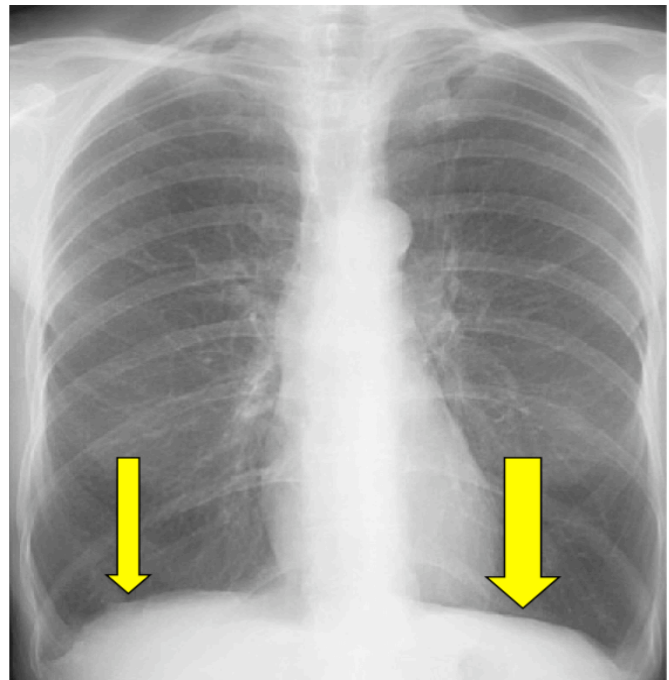
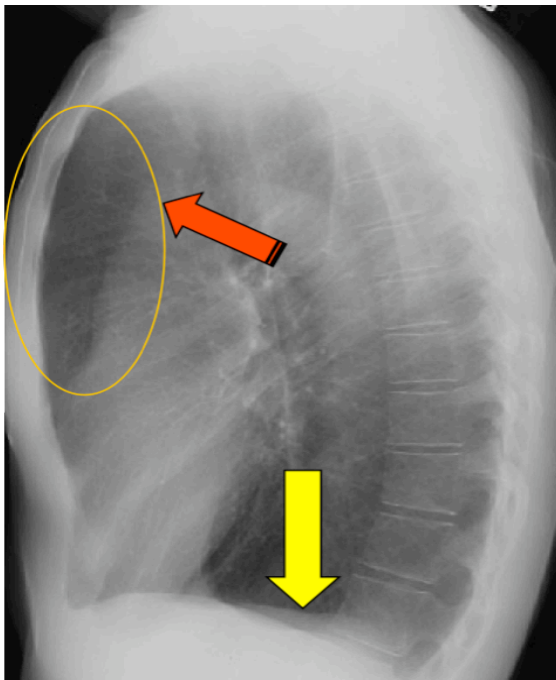
### 6) Hydro pneumothorax:

- Fluid in the pleural cavity, whether it be a pleural effusion, blood or pus, assumes a different shape in the presence of a pneumothorax. Causes loss of pressure in the pleural cavity.
- The diagnostic feature is the air–fluid level. Some fluid is present in the pleural cavity in most patients with pneumothorax. In spontaneous pneumothorax, the amount is usually small



## 7) Emphysema:

- Emphysema is loss of elastic recoil of the lung with destruction of pulmonary capillary bed and alveolar septa. It is caused most often by cigarette smoking and less commonly by alpha-1 antitrypsin deficiency.
- The radiological signs are:
  - Commonly seen on CXR as diffuse hyperinflation with flattening of diaphragms, increased retrosternal space, bullae (lucent, air-containing spaces that have no vessels that are not perfused)
  - Increased lung volume. The diaphragm is pushed down and becomes low and flat.



Emphysema is loss of elastic recoil of the lung with destruction of pulmonary capillary bed and alveolar septa: Flat diaphragmatic cupulae (yellow arrows)  
Increase retro sternal air (left)

**Done**