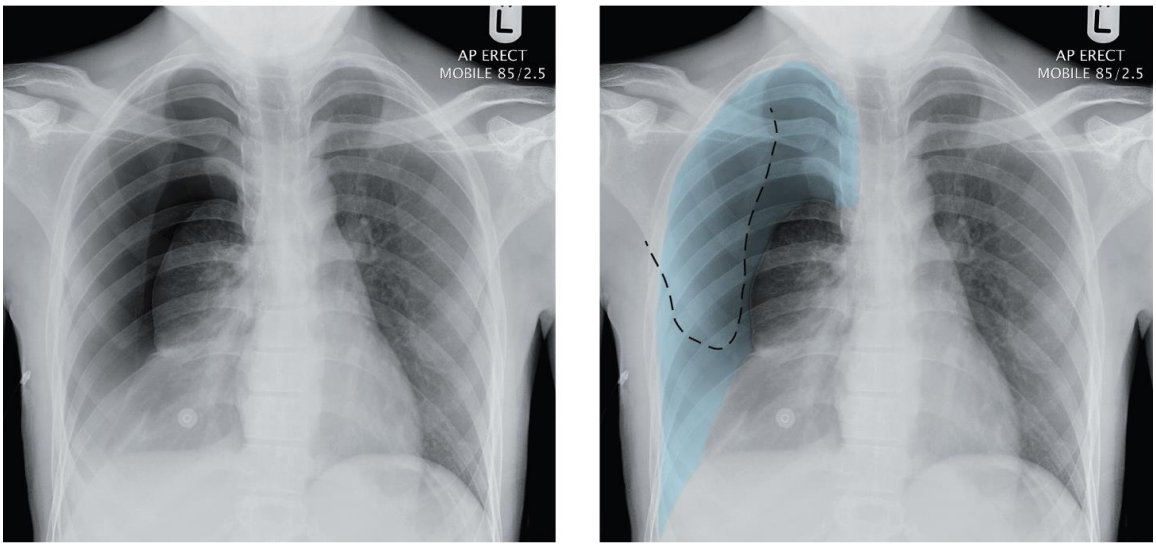
Internal Medicine Department

Radiology Teaching Booklet



Pneumothorax



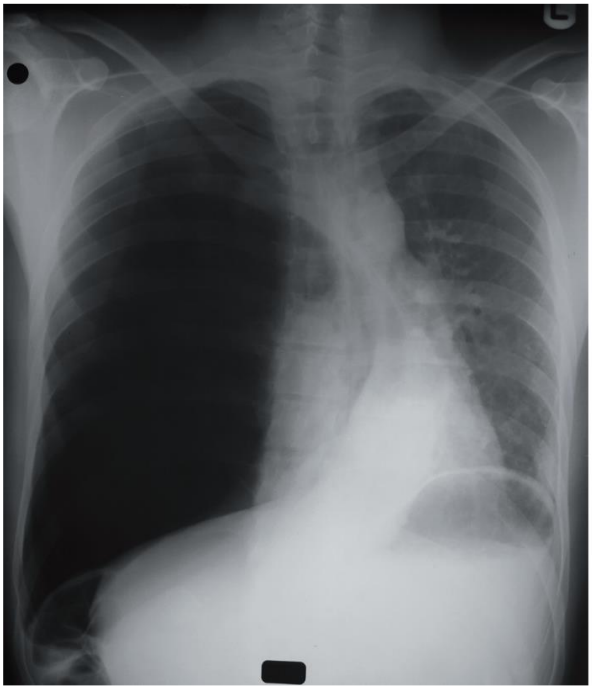
Two identical chest radiographs show:

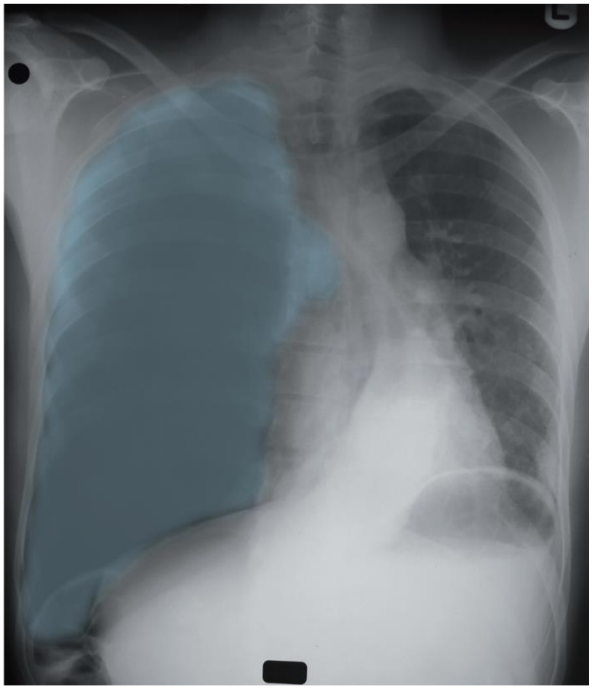
- A large right pneumothorax. The lung edge is seen and there are no lung markings beyond the lung edge.
- The vascular markings are more prominent in the opposite lung.
- The right radiograph shows the pneumothorax marked in blue. The right scapula is also outlined with a black dotted line to avoid confusion.




Two identical chest radiographs show:

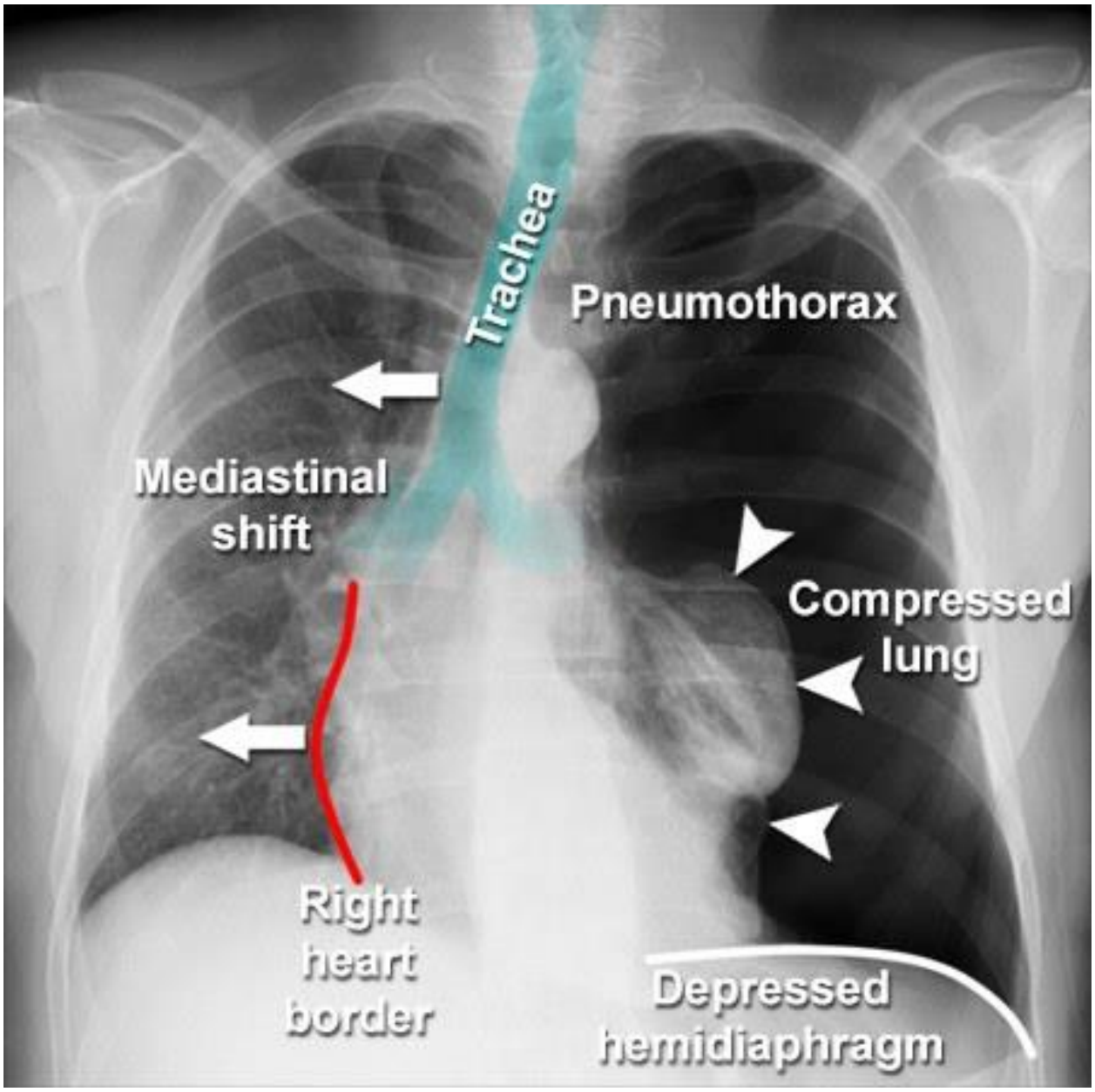
- a left tension pneumothorax.
- There is a depressed left hemidiaphragm, mediastinal shift, right tracheal deviation, and loss of normal lung markings as the tension pneumothorax occupies the whole hemithorax.
- The right radiograph shows the pneumothorax marked in blue.



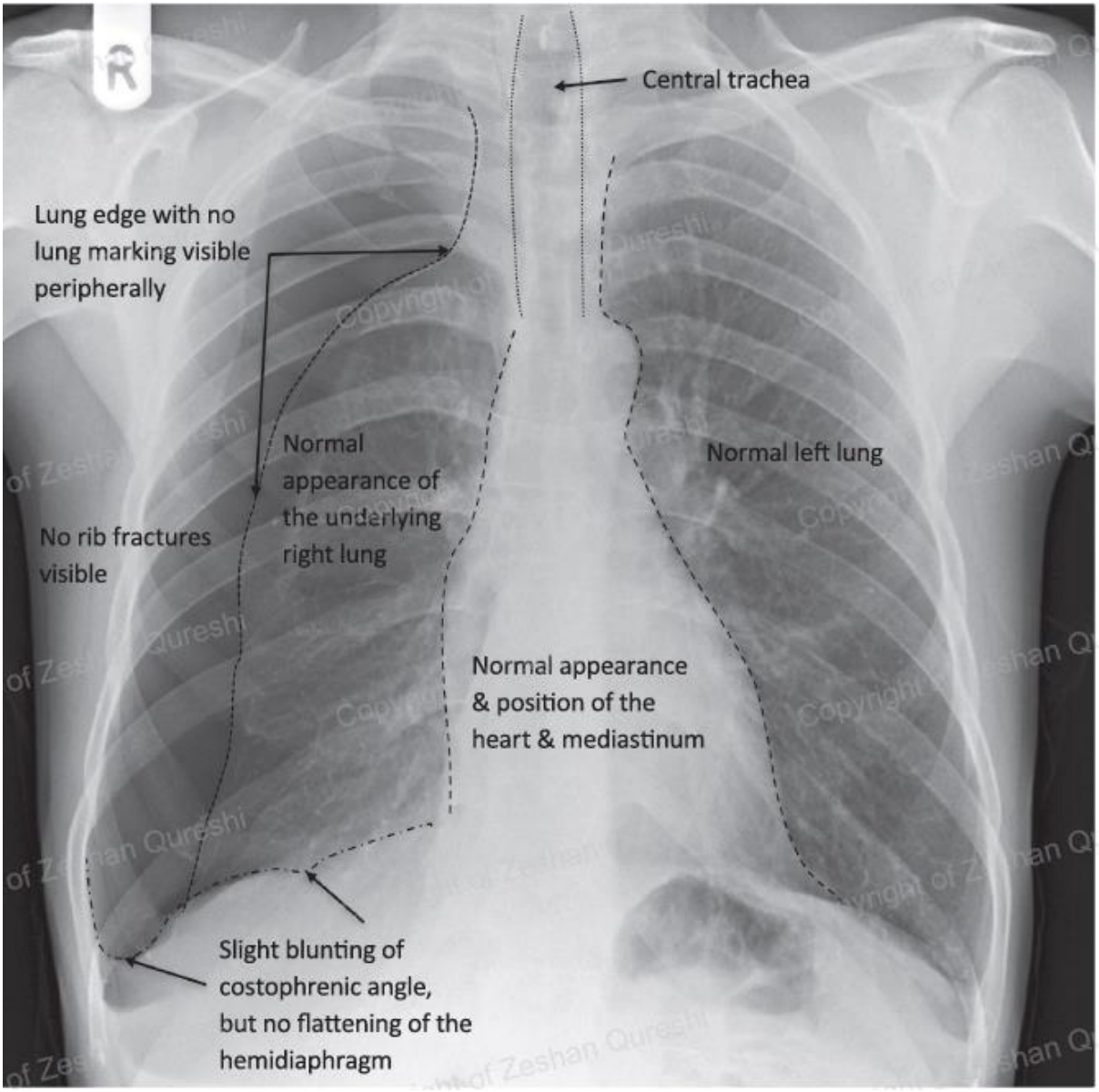


Two identical chest radiographs show:

- a right tension pneumothorax.
- The right radiograph shows the pneumothorax marked in blue.
- There is a depressed right hemidiaphragm and mediastinal shift to the left as the tension pneumothorax occupies the whole hemithorax.
- There are no lung markings in the space occupied by the tension pneumothorax.



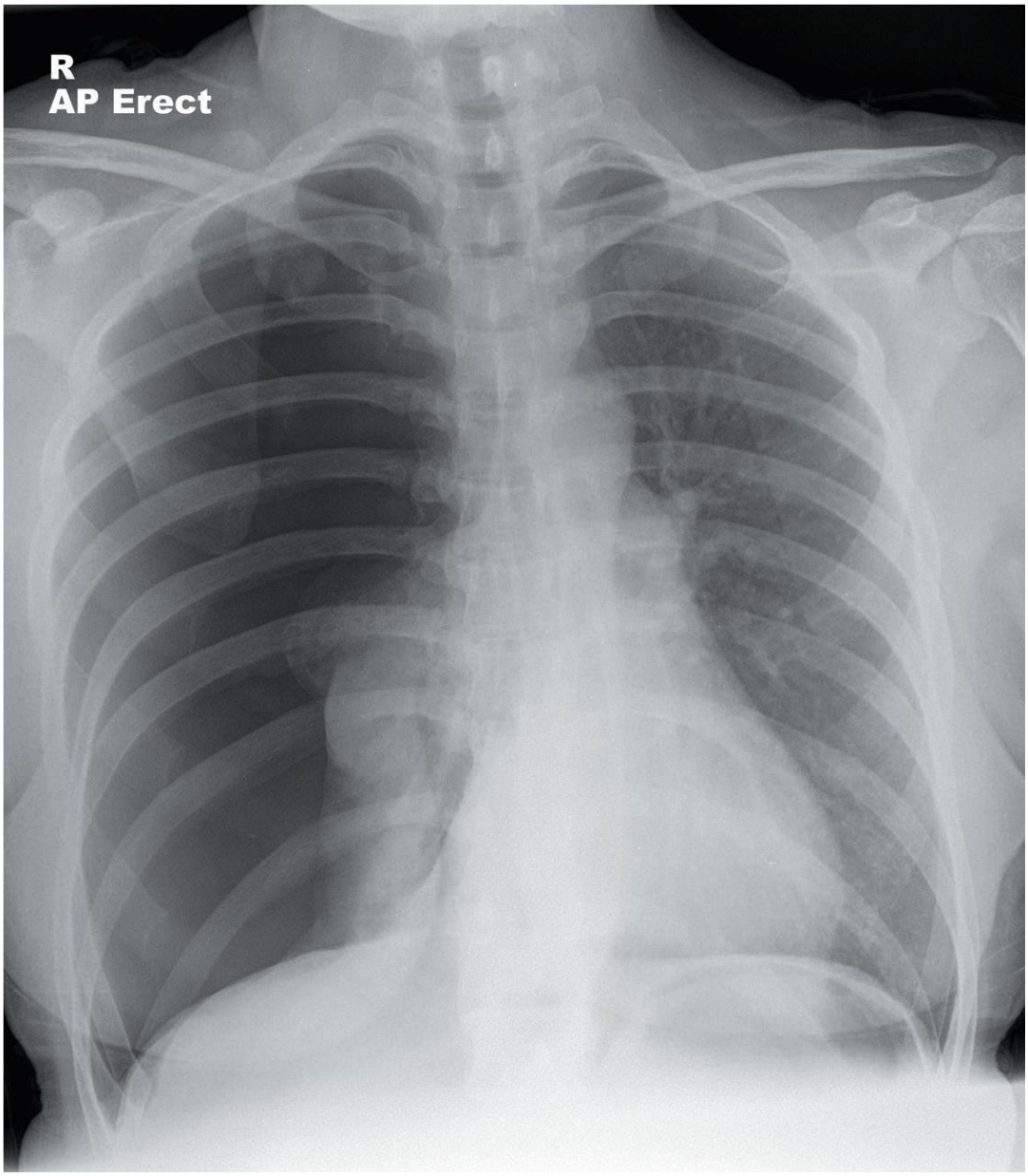
- This is a large left pneumothorax (greater than 2 cm width at the level of the hilum).
- There is also evidence of tension – the trachea and right heart border are shifted to the right and there is slight depression of the left hemidiaphragm.



- This chest X-ray shows a large right pneumothorax.
- There is no evidence of associated tension.
- There is no underlying cause discernible on this X-ray, suggesting that this is a primary spontaneous pneumothorax

Case:

A 30-year-old female presents to ED with sudden onset right-sided pleuritic chest pain and breathlessness. She has no significant past medical history. She is a non-smoker. On examination, she has saturations of 91% in air and is afebrile. There is increased resonance in the right hemithorax and reduced air entry. A chest X-ray is requested to assess for a possible pneumothorax.



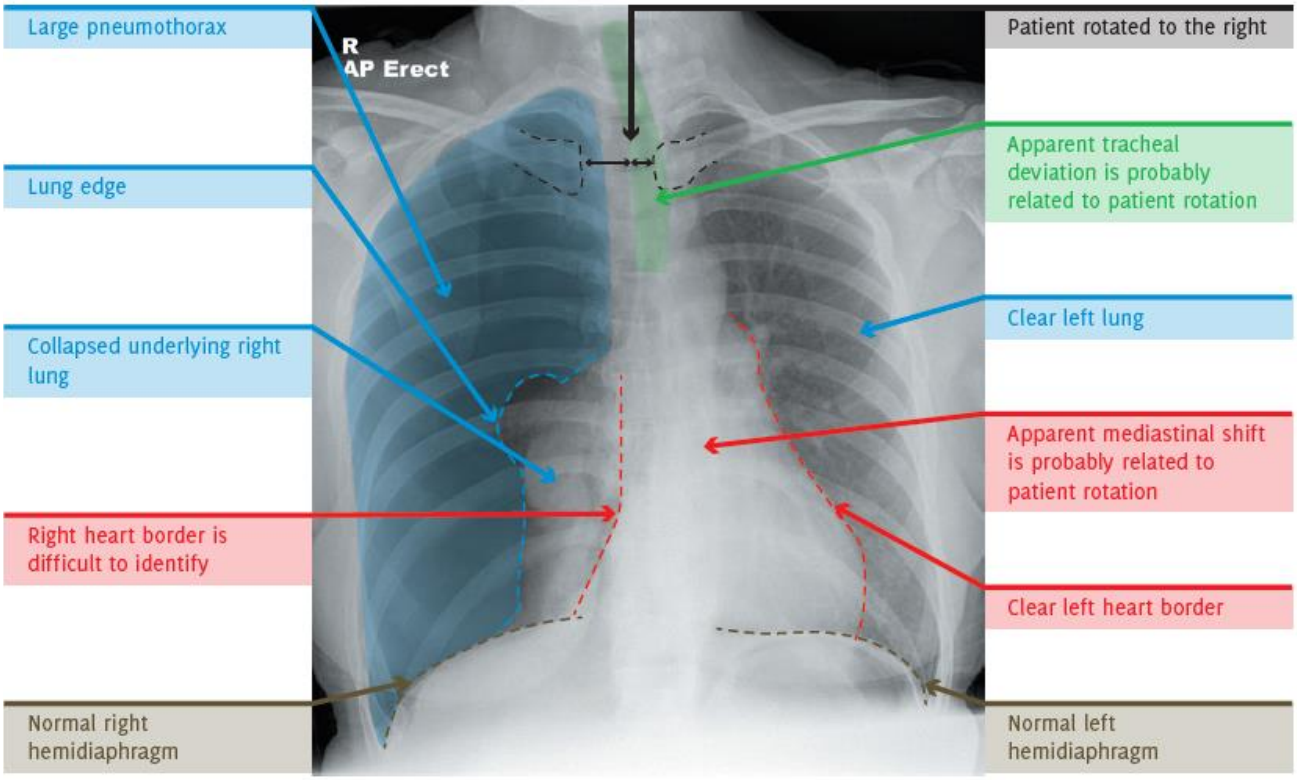
Lung Apices: Right pneumothorax. Normal left apex.

Hila: Right hilum is difficult to identify. Normal left hilum.

Behind Heart: Normal

Costophrenic Angles: Normal

Below the Diaphragm: Normal

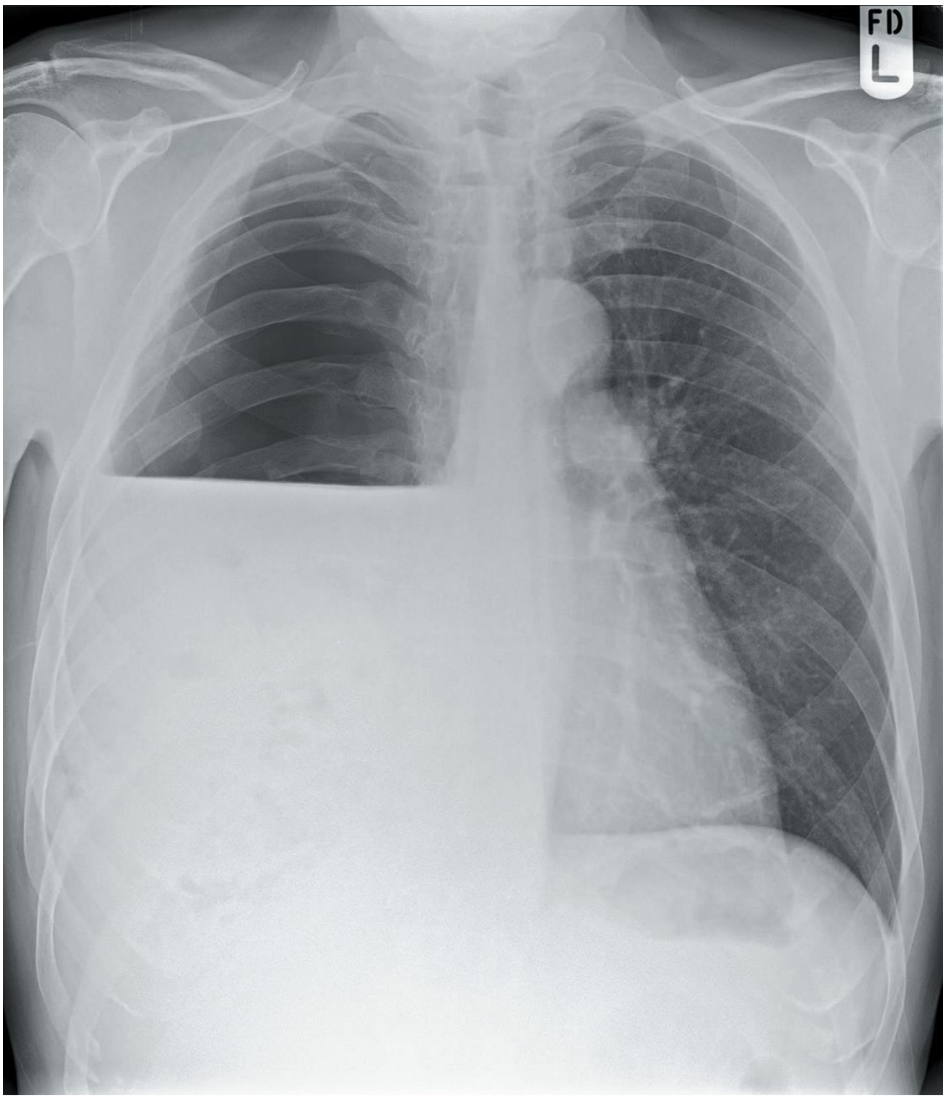


- This X-ray demonstrates a large right-sided pneumothorax with almost complete collapse of the underlying lung.
- The apparent mediastinal shift to the left is likely due to rotation. However, the patient should be assessed for clinical evidence of a tension pneumothorax.

Hydropneumothorax

Case:

A 53-year-old male presents to ED with fever, productive cough, and hemoptysis. He had a right-sided pneumonectomy 4 weeks earlier for lung cancer and had been recovering well until this point. On examination, he is febrile. There are no breath sounds on the right, with hyperresonance in the right upper zone and dullness to percussion in the right lower zone. A chest X-ray is requested to assess for possible pneumonia or bronchopleural fistula.



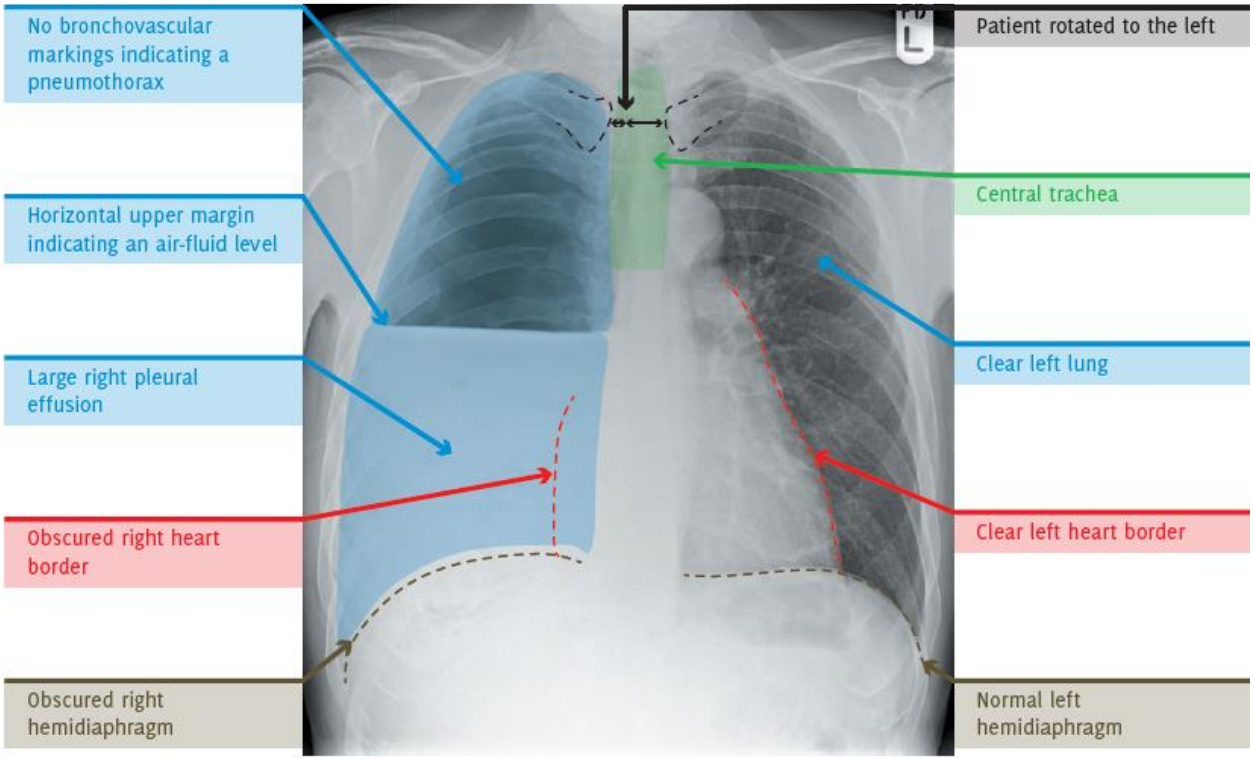
Lung Apices: Right-sided pneumothorax. Normal left apex

Hila: Right hilum not visible. Normal left hilum

Behind Heart: Right retrocardiac position obscured. Normal on the left

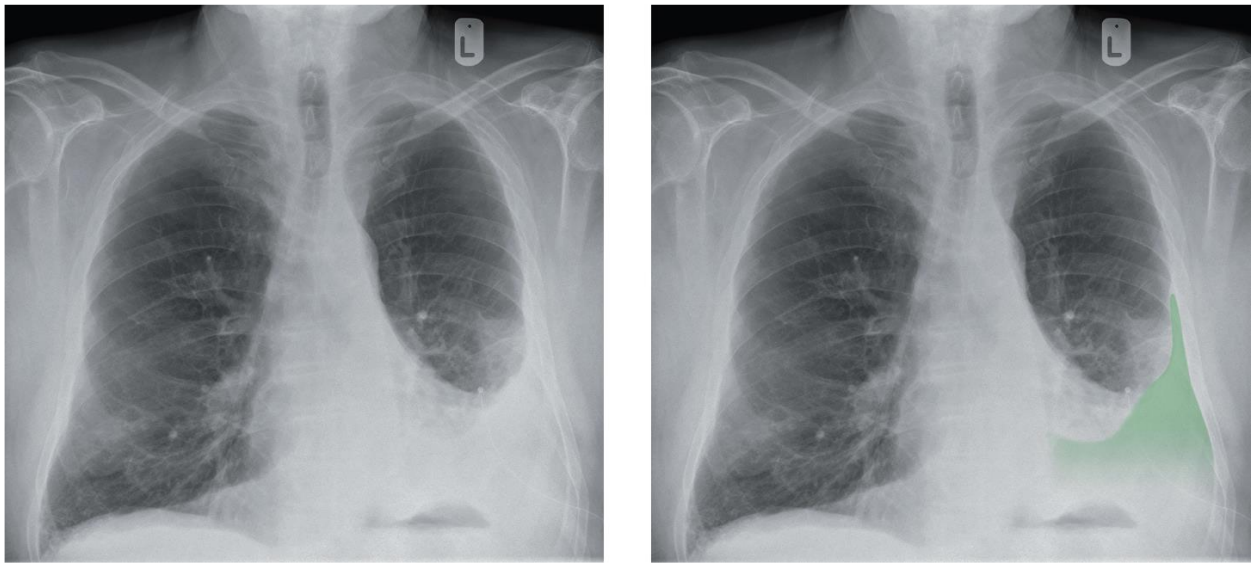
Costophrenic Angles: Right obscured. Normal left costophrenic angle

Below the Diaphragm: Normal

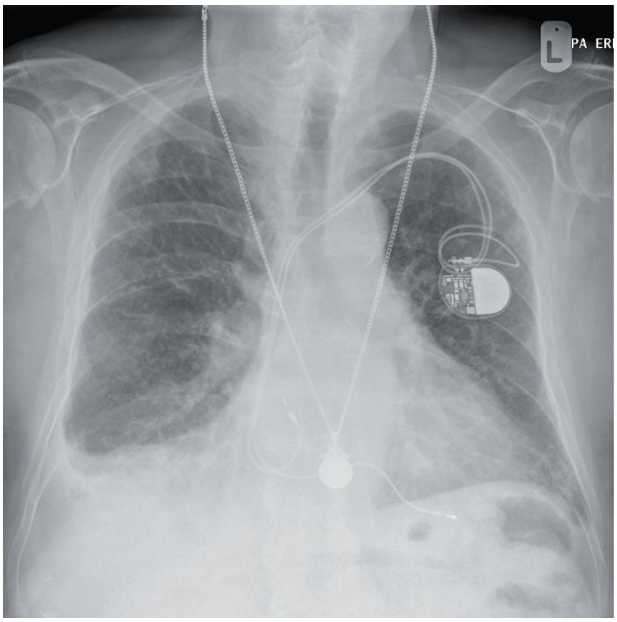


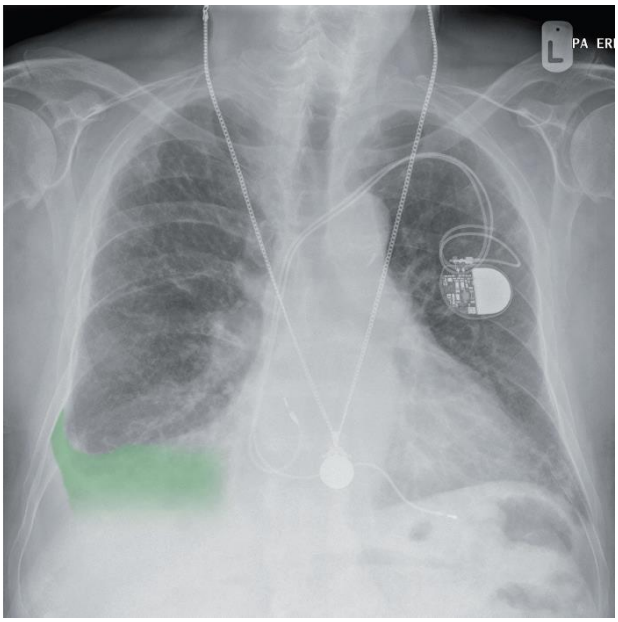
- This X-ray demonstrates a large right-sided hydropneumothorax, with an air-fluid level.

Pleural Effusion

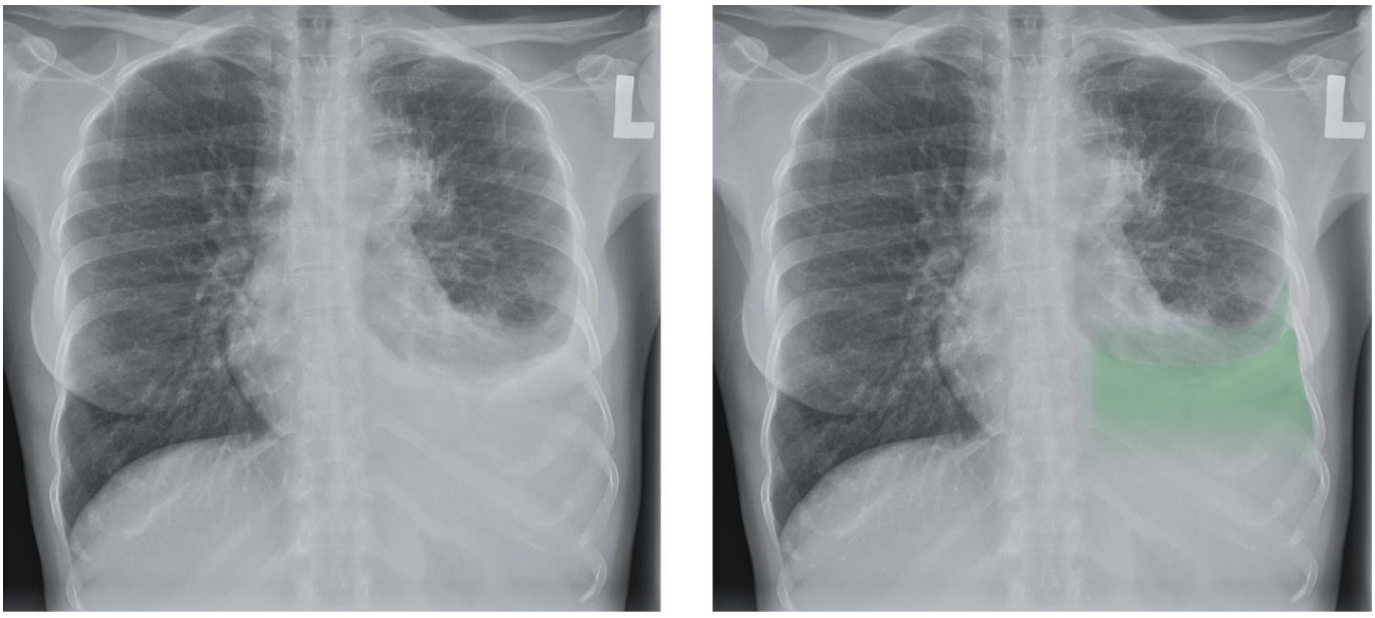


- Two identical chest radiographs of a patient with a left-sided pleural effusion.
- There is a loss of the left costophrenic angle and left hemidiaphragm.
- The upper edge is concave in shape, and a meniscus is seen laterally.
- The right radiograph shows the pleural effusion marked in green.

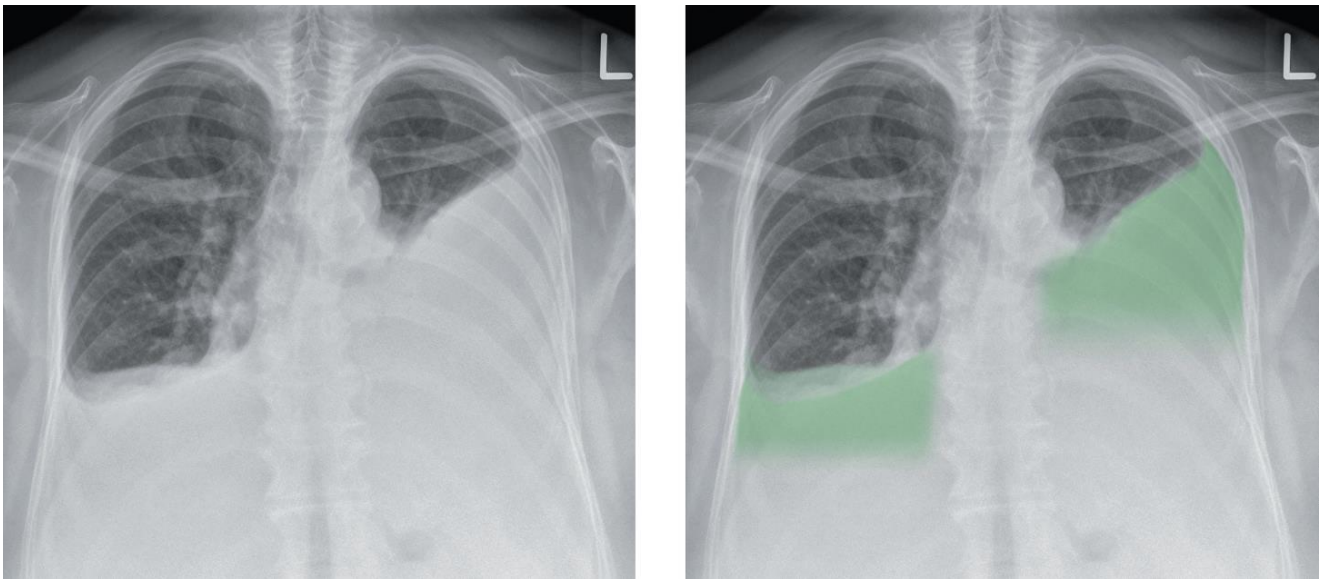




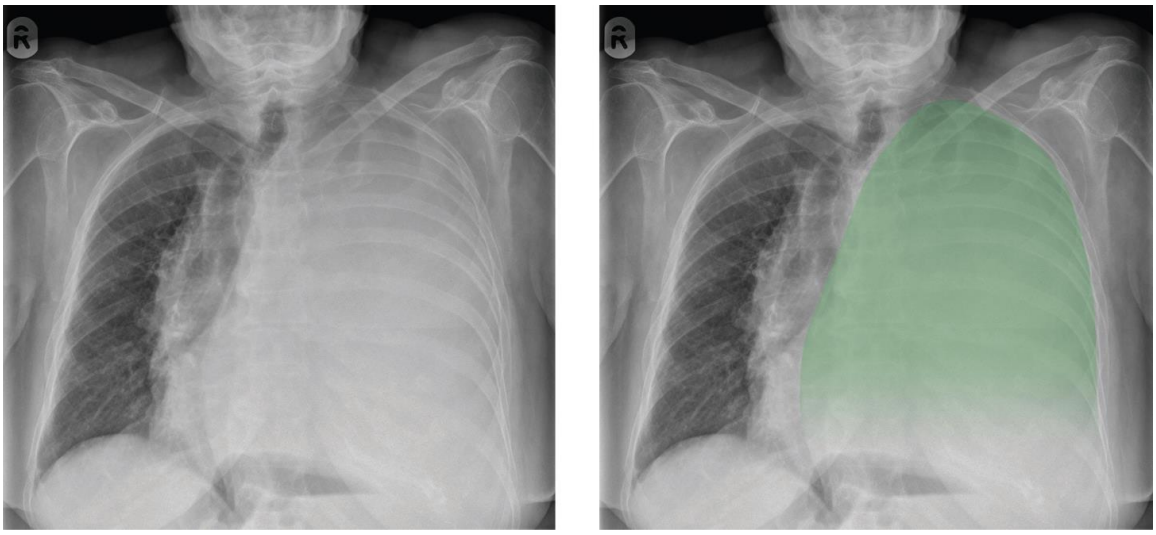
- Two identical chest radiographs of a patient with a right-sided pleural effusion.
- There is a loss of the right costophrenic angle and right hemidiaphragm.
- The upper edge is concave in shape and a meniscus is seen laterally.
- The right radiograph shows the pleural effusion marked in green.



- Two identical chest radiographs of a patient with a large left-sided pleural effusion.
- There is a loss of the left costophrenic angle and left hemidiaphragm.
- The upper edge is concave in shape and a meniscus is seen laterally.
- The effusion is a homogenous, dense opacity with no air bronchogram.
- The right radiograph shows the pleural effusion marked in green.



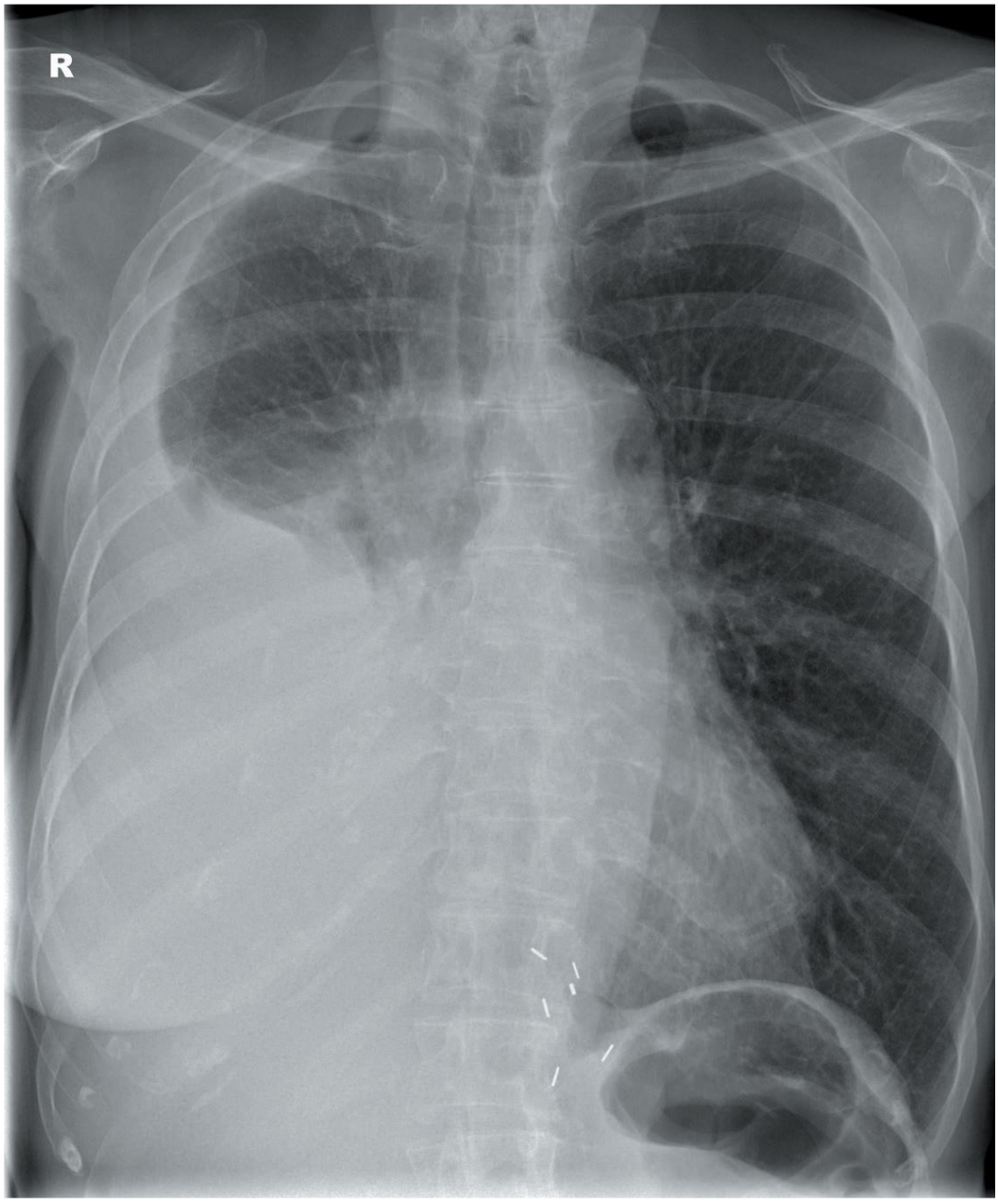
- Two identical chest radiographs of a patient with bilateral pleural effusions. The left-sided effusion is larger than the right.
- There is a loss of the left and right costophrenic angles and hemidiaphragms.
- The upper edge is concave in shape, and a meniscus is seen laterally. The effusion is a homogenous, dense opacity with no air bronchogram.
- The right radiograph shows the pleural effusions marked in green.



- Two identical chest radiographs of a patient with a massive left-sided pleural effusion.
- There is a loss of the left costophrenic angle and left hemidiaphragm.
- There is no meniscus as the pleural effusion extends all the way to the apex of the left lung.
- The effusion is a homogenous, dense opacity with no air bronchogram.
- the trachea and mediastinum are pushed away from the increased density.
- The right radiograph shows the pleural effusion marked in green.

Case:

A 65-year-old female presents to ED with progressive shortness of breath. She has a history of breast cancer. On examination, there is dullness to percussion and reduced air entry in the right middle and lower zones. A chest X-ray is requested to assess for possible pneumonia, collapse or effusion.



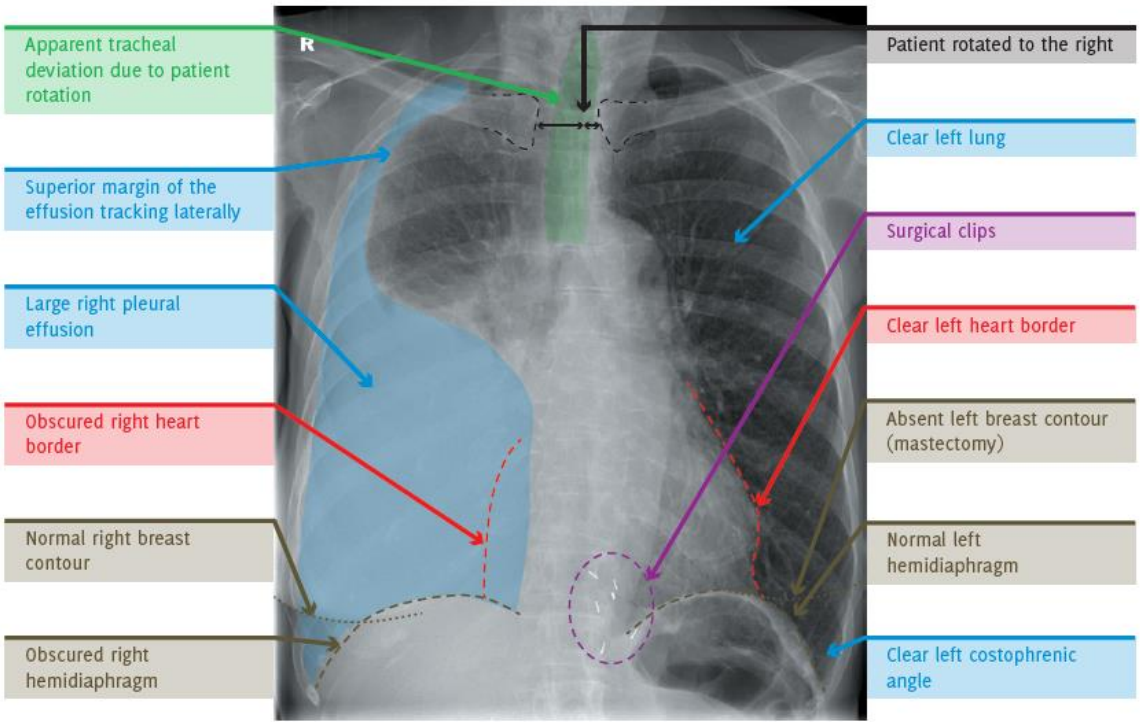
Lung Apices: Opacification tracking up laterally to the right apex. Normal left apex
Hila: Obscured right hilum, normal left hilum

Behind Heart: Right retrocardiac position obscured.

Normal on the left Costophrenic Angles: Obscured right costophrenic angle.

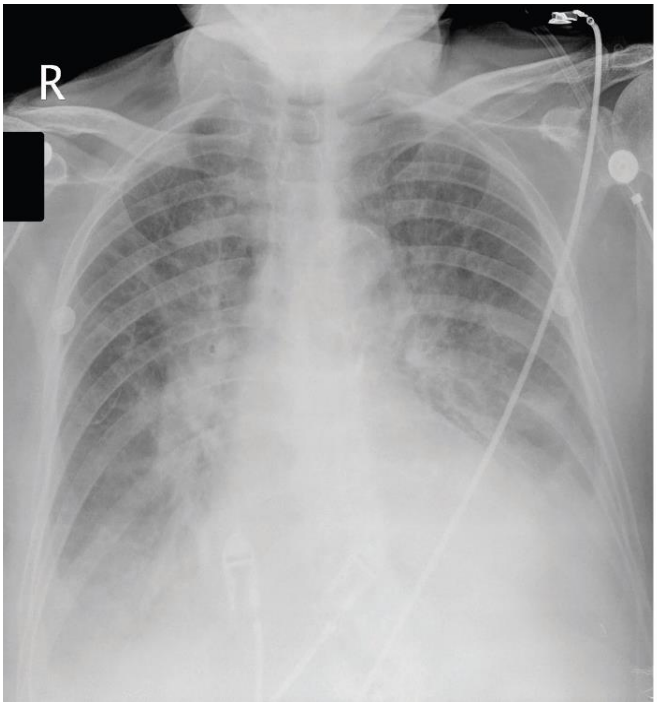
Normal left costophrenic angle

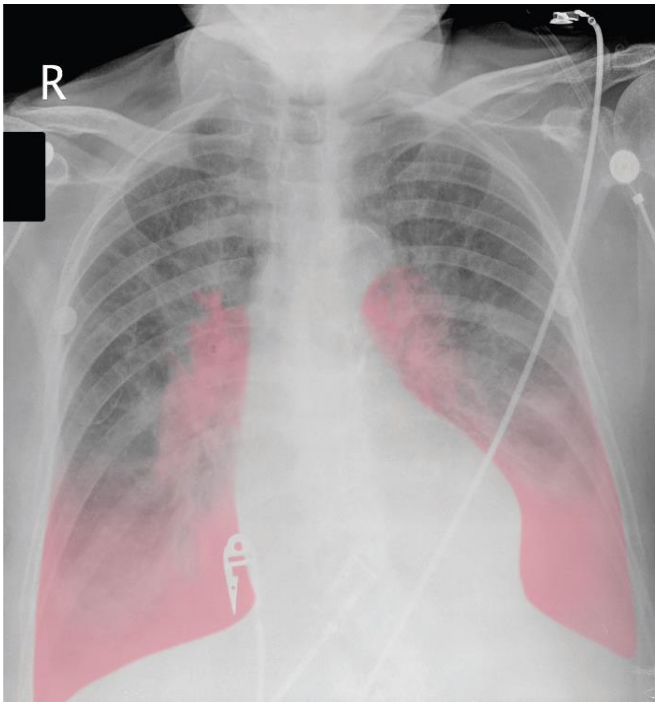
Below the Diaphragm: Normal



- This X-ray demonstrates a large right-sided pleural effusion extending up toward the right apex.
- Given the previous left mastectomy, the findings are suspicious for malignant pleural effusion.

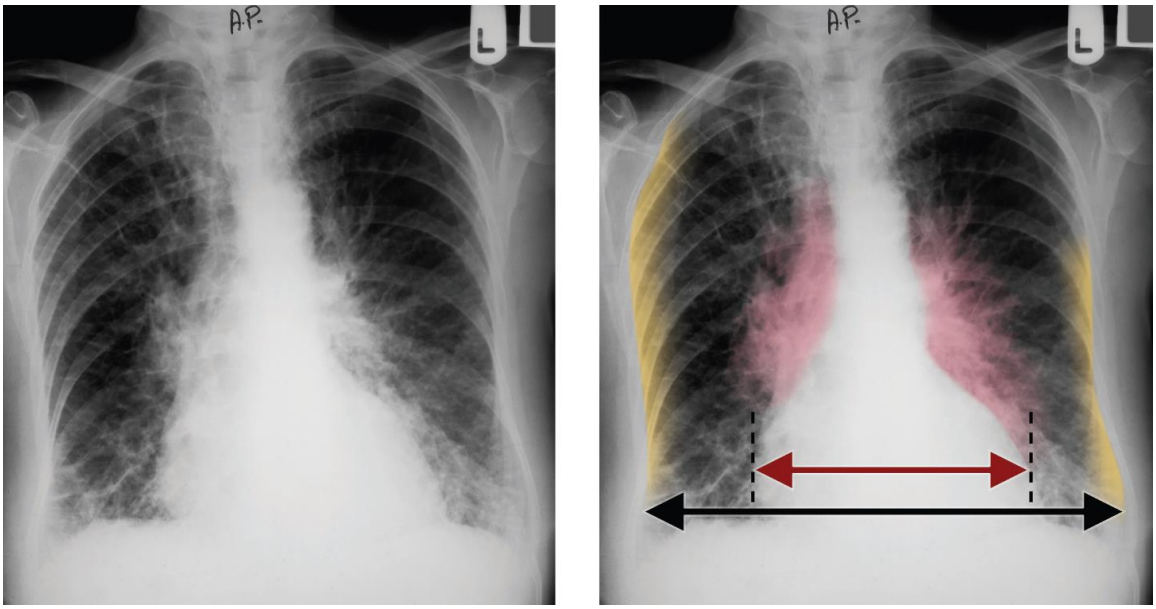
Pulmonary Edema & Heart Failure



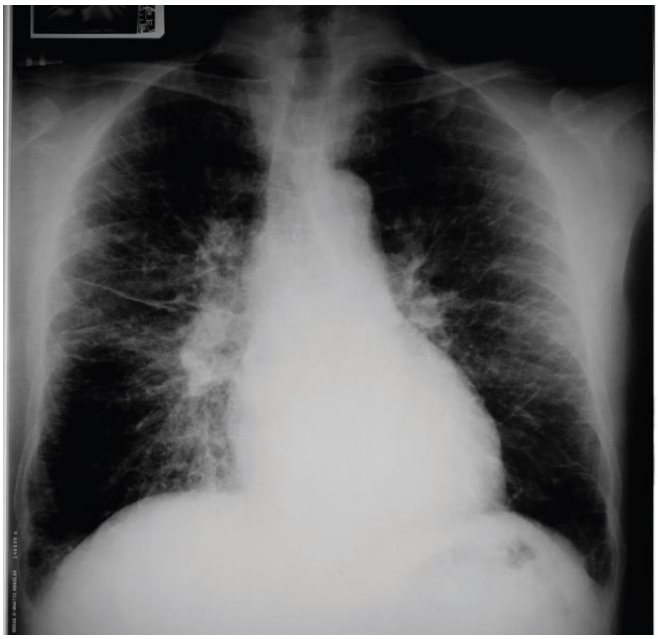


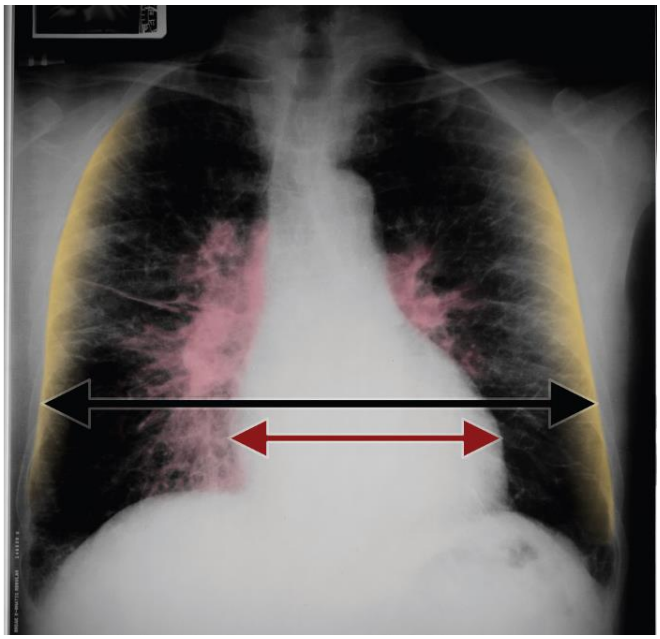
Two identical chest radiographs show:

- bilateral pulmonary edema.
- There is symmetrical, diffuse ‘ fuzzy ’ shadowing, particularly in the mid - and lower zones, and peri-hilar haziness.
- The right radiograph shows pulmonary edema marked in pink.

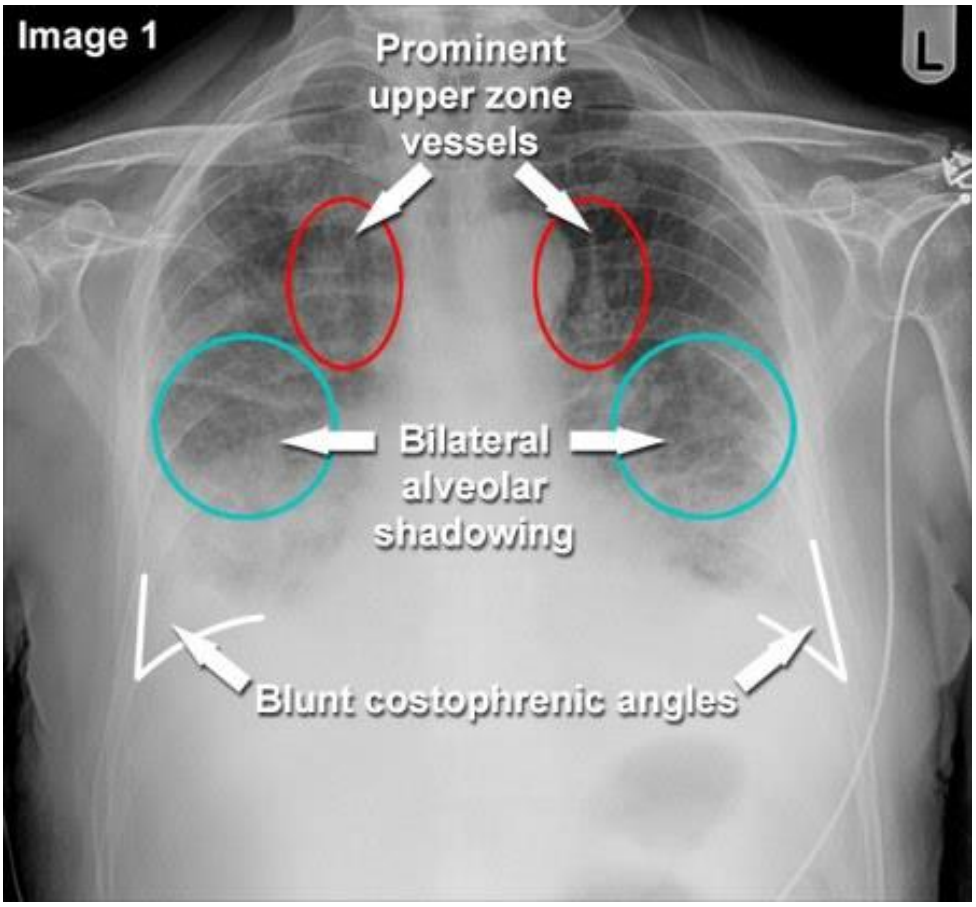


- Two identical PA chest radiographs showing heart failure.
- The right radiograph shows pulmonary edema marked in pink and septal lines marked in yellow.
- The black dotted lines mark the edge of the heart. The shorter red arrow marks the width of the heart. The longer black arrow marks the width of the thoracic cavity. The width of the heart is greater than half the width of the thoracic cavity,
- Therefore, there is also cardiomegaly.





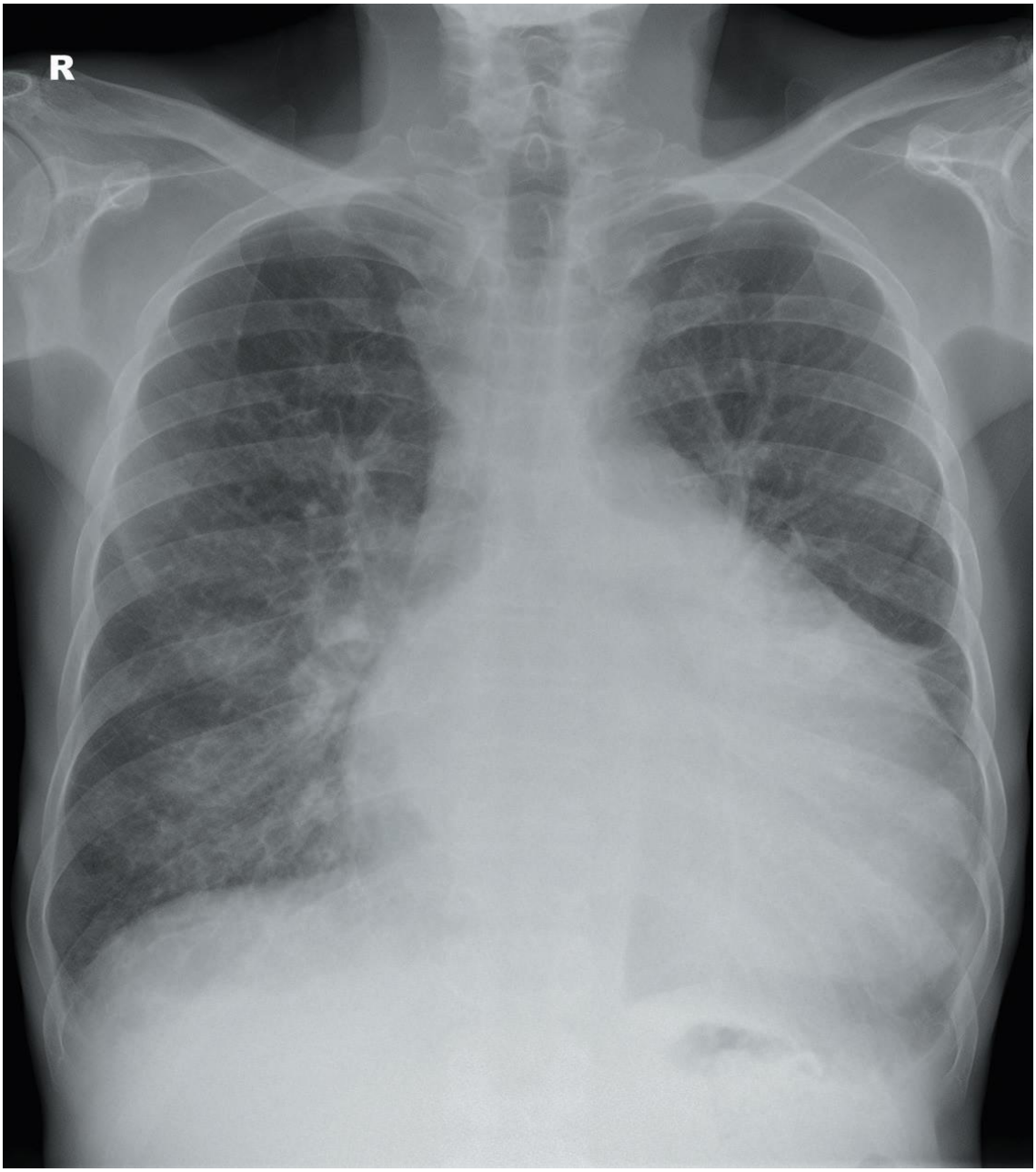
- Two identical PA chest radiographs showing congestive heart failure.
- The right radiograph shows pulmonary edema marked in pink and septal lines marked in yellow.
- The black dotted lines mark the edge of the heart. The shorter red arrow marks the width of the heart. The longer black arrow marks the width of the thoracic cavity. The width of the heart is greater than half the width of the thoracic cavity,
- therefore, there is also cardiomegaly.



- shows classic features of severe pulmonary edema; the upper zone vessels are enlarged, indicating pulmonary venous hypertension; bilateral shadowing indicates alveolar edema and bilateral costophrenic blunting indicates pleural effusions.

Case:

A 55-year-old male is admitted via ED to the coronary care unit after an acute presentation of shortness of breath. He has a history of dilated cardiomyopathy. Initial chest X-ray showed evidence of heart failure, and he is therefore being treated with oxygen and diuretics. A repeat chest X-ray is requested following 2 days of treatment to assess for any radiological response to treatment.



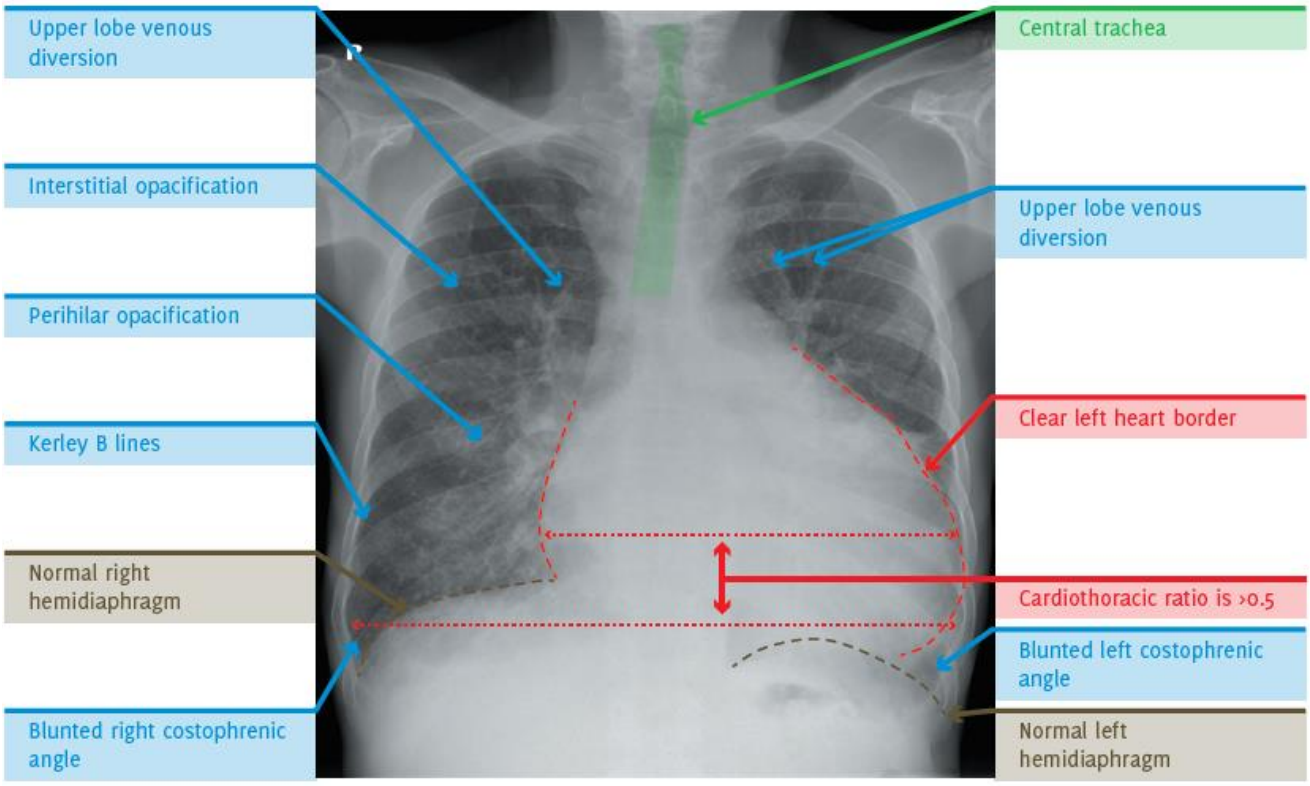
Lung Apices: Upper lobe venous diversion

Hila: Normal right hilum; the left is obscured.

Behind Heart: Normal

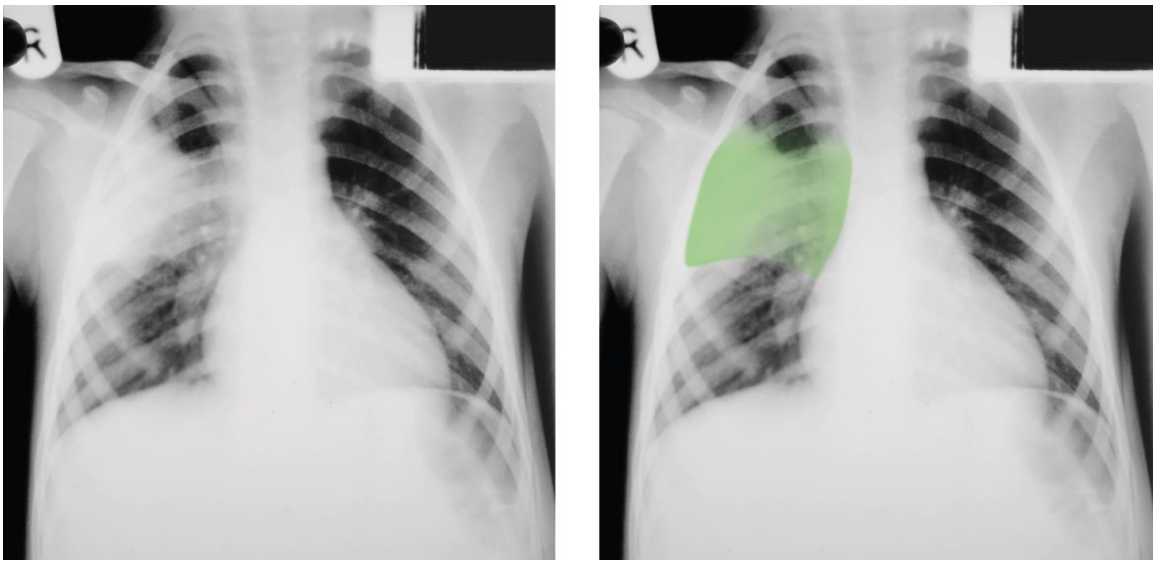
Costophrenic Angles: Blunting consistent with small effusions

Below the Diaphragm: Normal



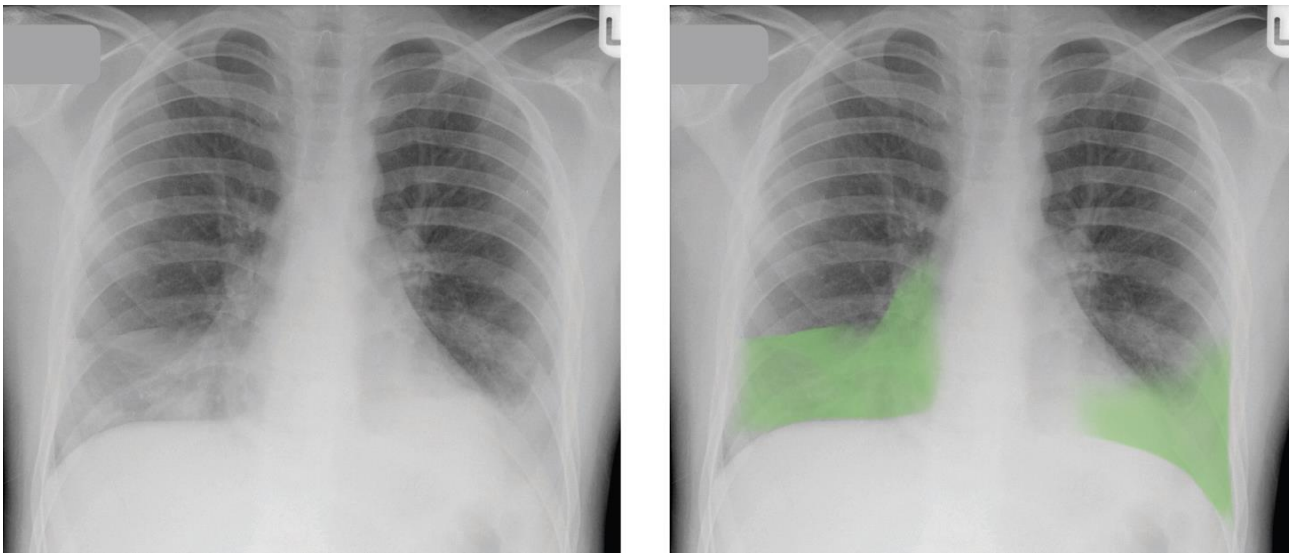
- This X-ray demonstrates cardiomegaly in keeping with the known history of dilated cardiomyopathy.
- The upper lobe venous blood diversion, interstitial markings, and small pleural effusions are in keeping with pulmonary edema.

Pneumonia



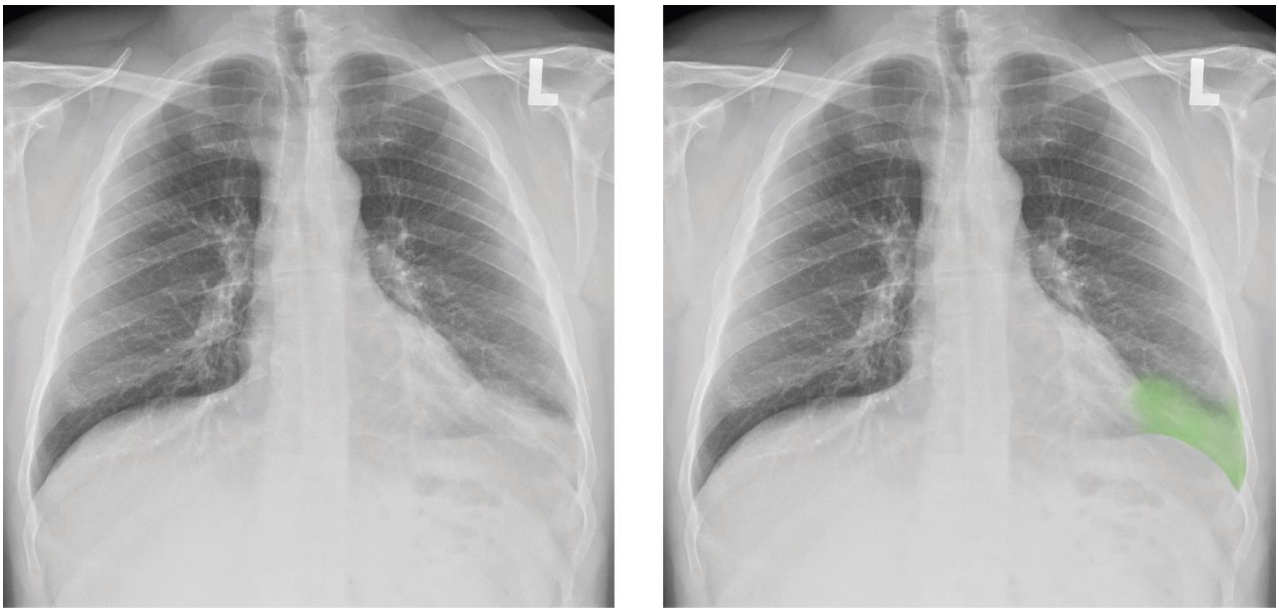
Two identical chest radiographs showing:

- right upper lobe consolidation with sparing of the apical segment.
- The patchy airspace shadowing corresponds to the right upper lobe, and there is no loss of lung volume.
- The right radiograph shows the consolidation marked in green.



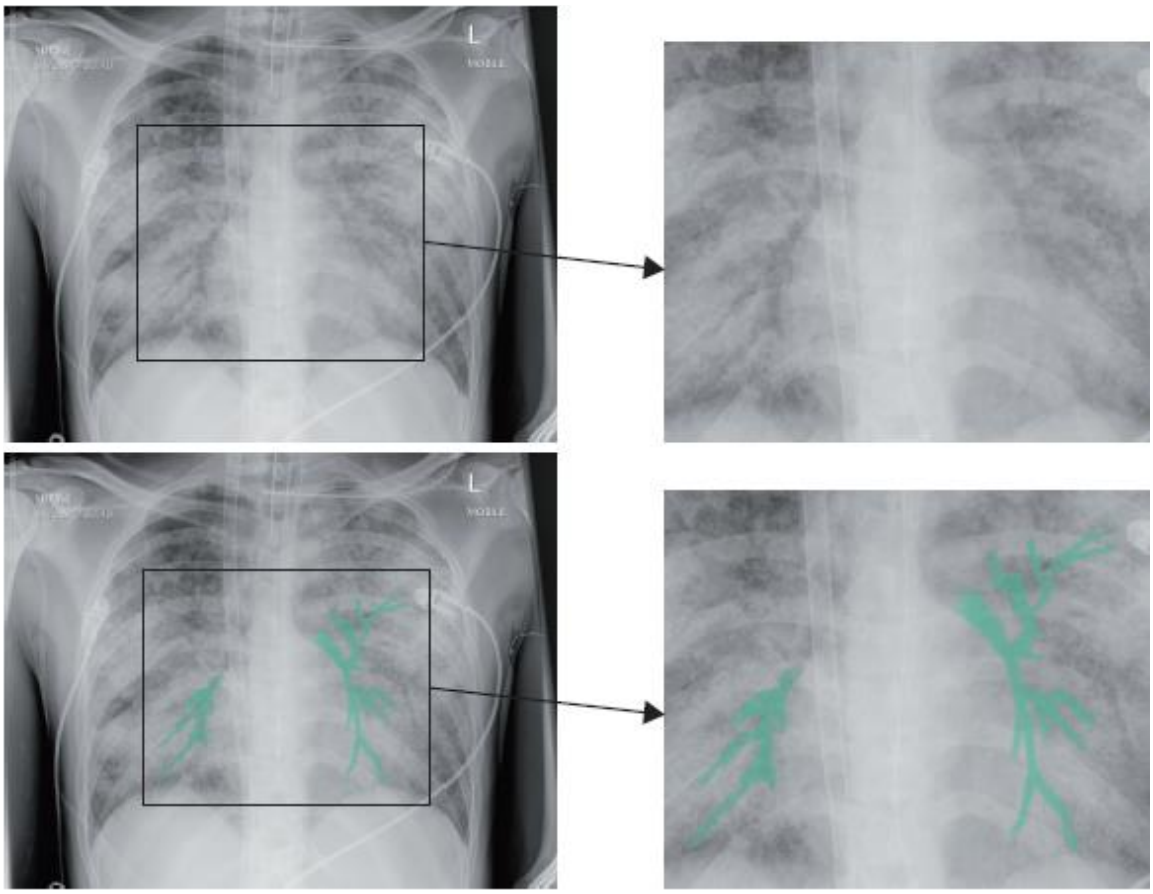
Two identical chest radiographs showing:

- middle lobe and left lower lobe consolidation.
- The patchy airspace shadowing corresponds to the middle lobe and left lower lobe, and there is no loss of lung volume.
- We know the consolidation is in the middle lobe as there is a loss of the right heart border, and the superior border is the horizontal fissure. We know the consolidation is in the left lower lobe as there is a loss of definition of the left hemidiaphragm, and the left heart border is still visible.
- The right radiograph shows the consolidation marked in green.

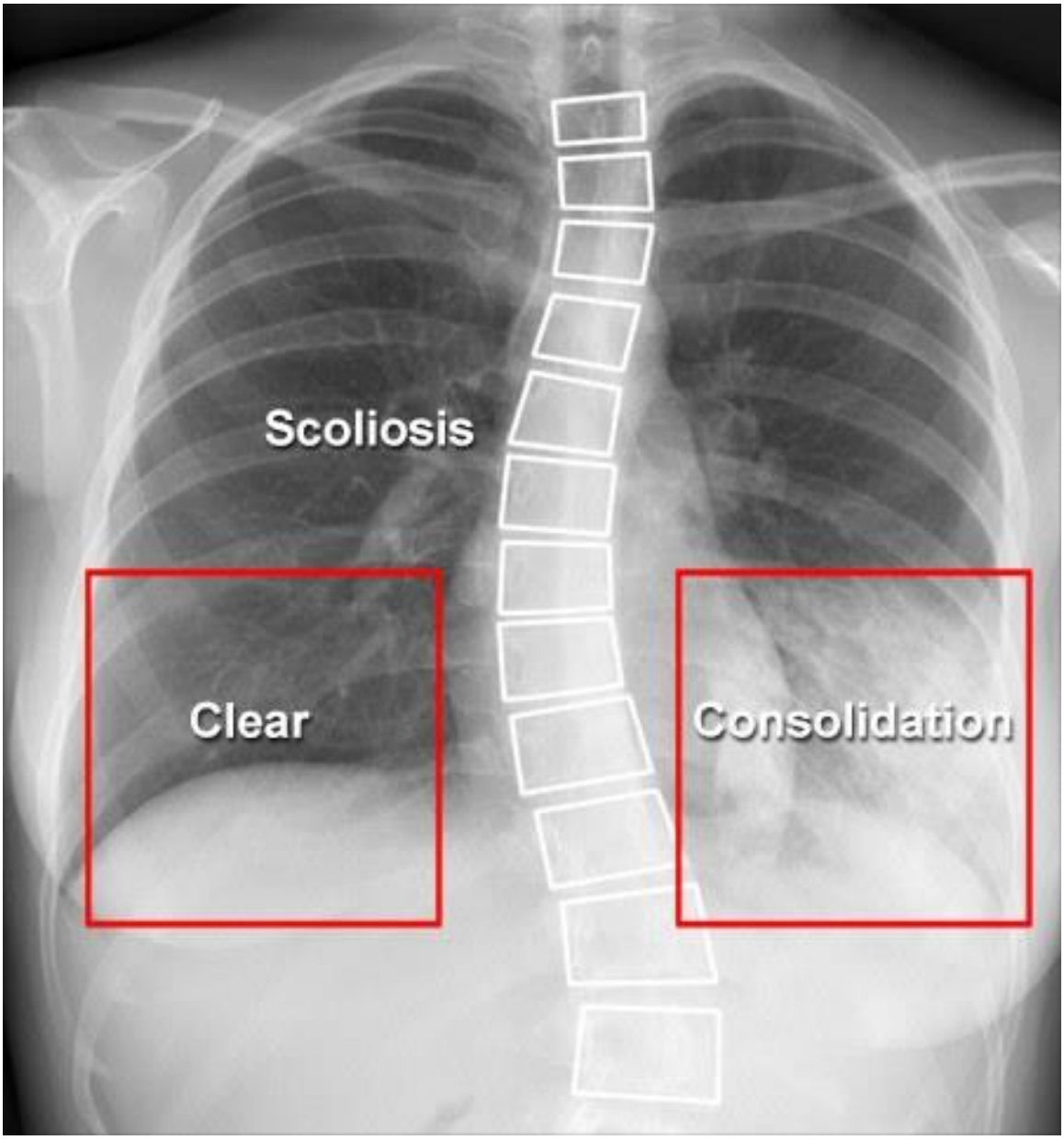


Two identical chest radiographs showing:

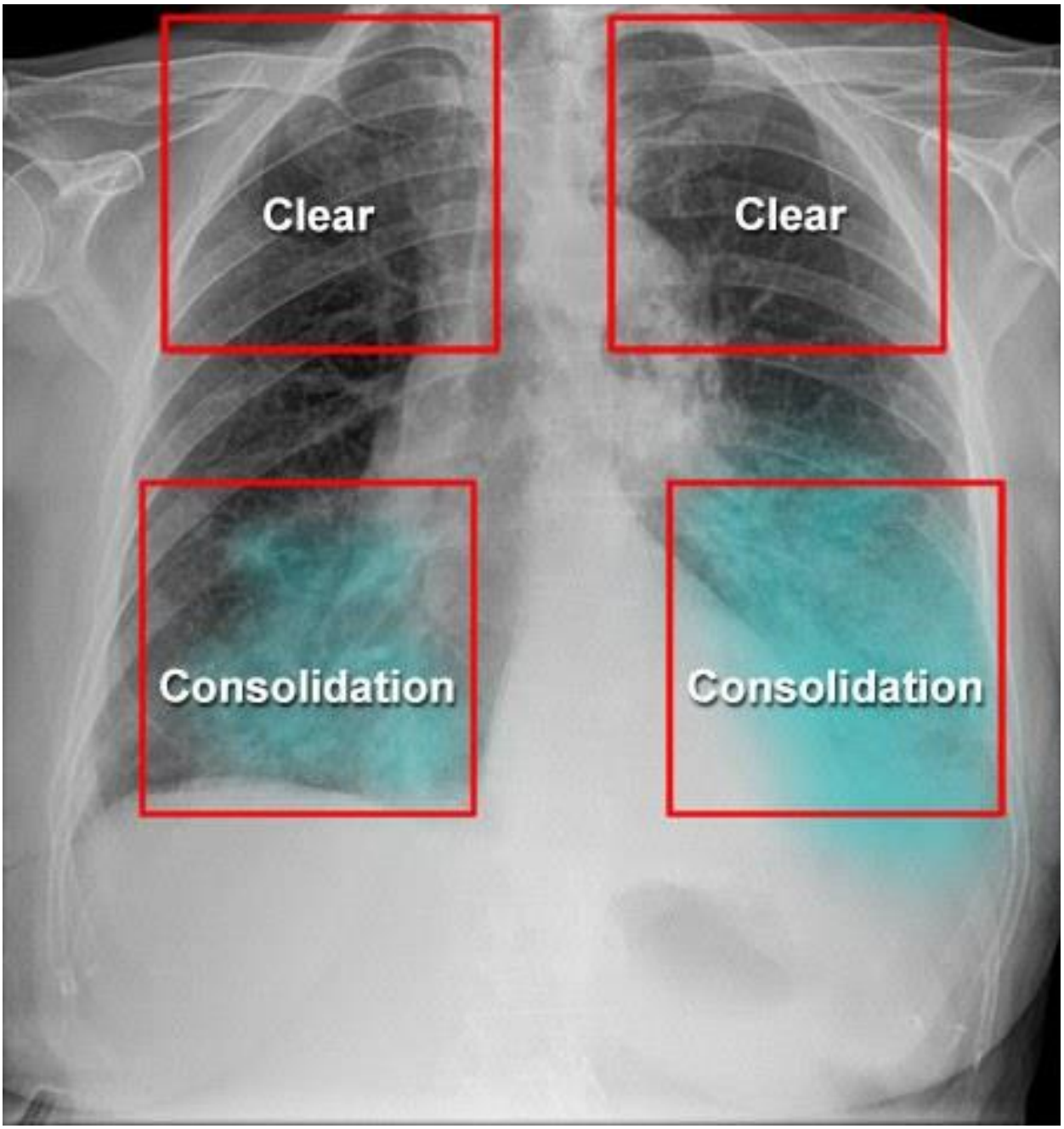
- left lower lobe consolidation.
- The patchy airspace shadowing corresponds to the left lower lobe, and there is no loss of lung volume. We know the consolidation is in the left lower lobe as there is a loss of definition of the left hemidiaphragm.
- The right radiograph shows the consolidation marked in green.



Two identical chest radiographs. This is an example of an air bronchogram caused by severe bilateral consolidation. The air bronchogram is marked in green on the inferior radiograph.



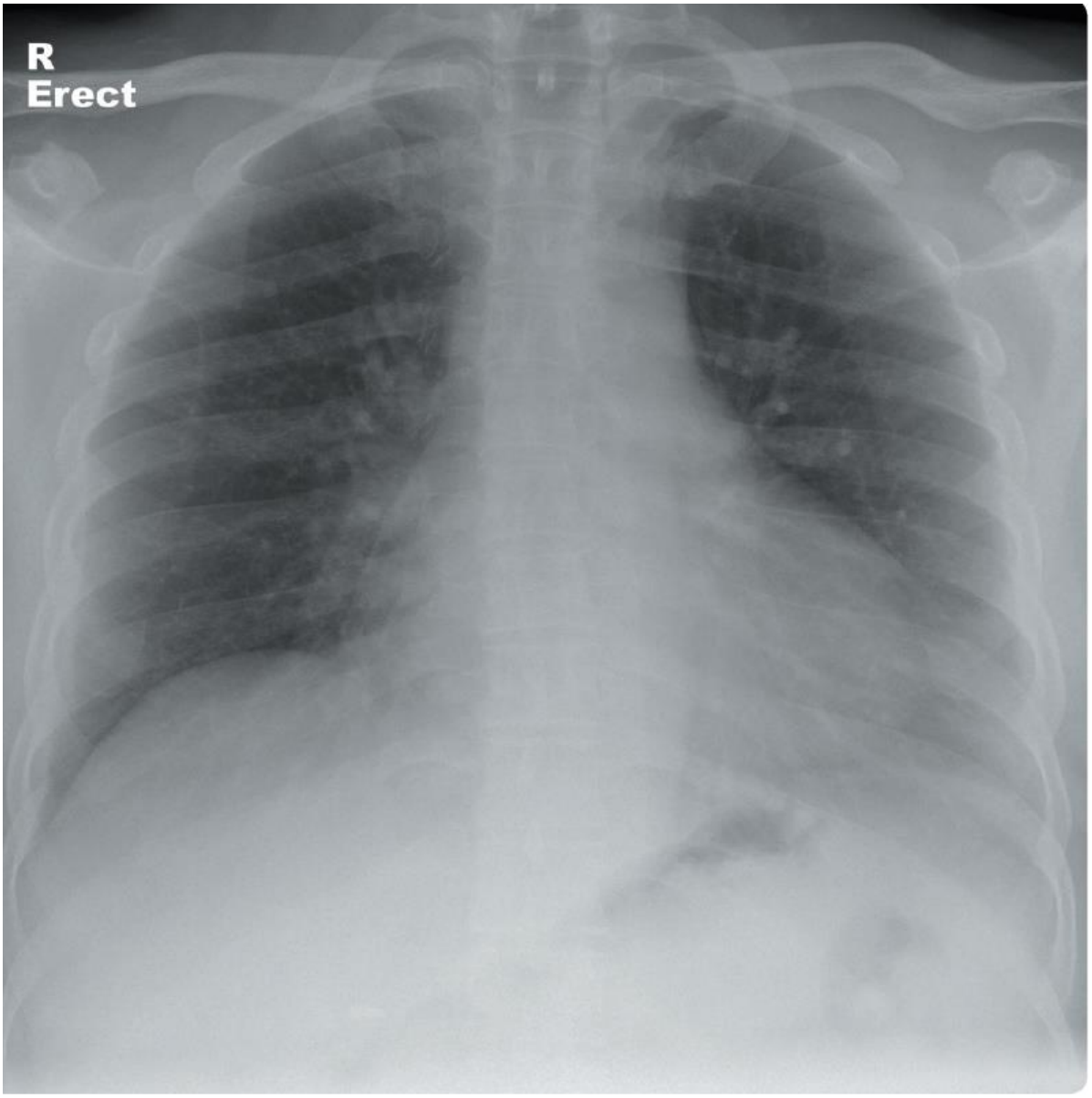
Increased density with air bronchogram in the left lower zone indicates consolidation.



- The image shows dense consolidation in the lower zones, worse on the left.
- In this clinical context, the most likely cause is aspiration pneumonia.

Case:

A 40-year-old male presents to ED with shortness of breath. He has been off work for a week with a productive cough and feeling feverish. On examination, he has saturations of 98% in air and is febrile at 39°C. There is decreased air entry, dullness to percussion, and crackles in the left lower zone. A chest X-ray is requested to assess for possible pneumonia, effusion, or collapse.



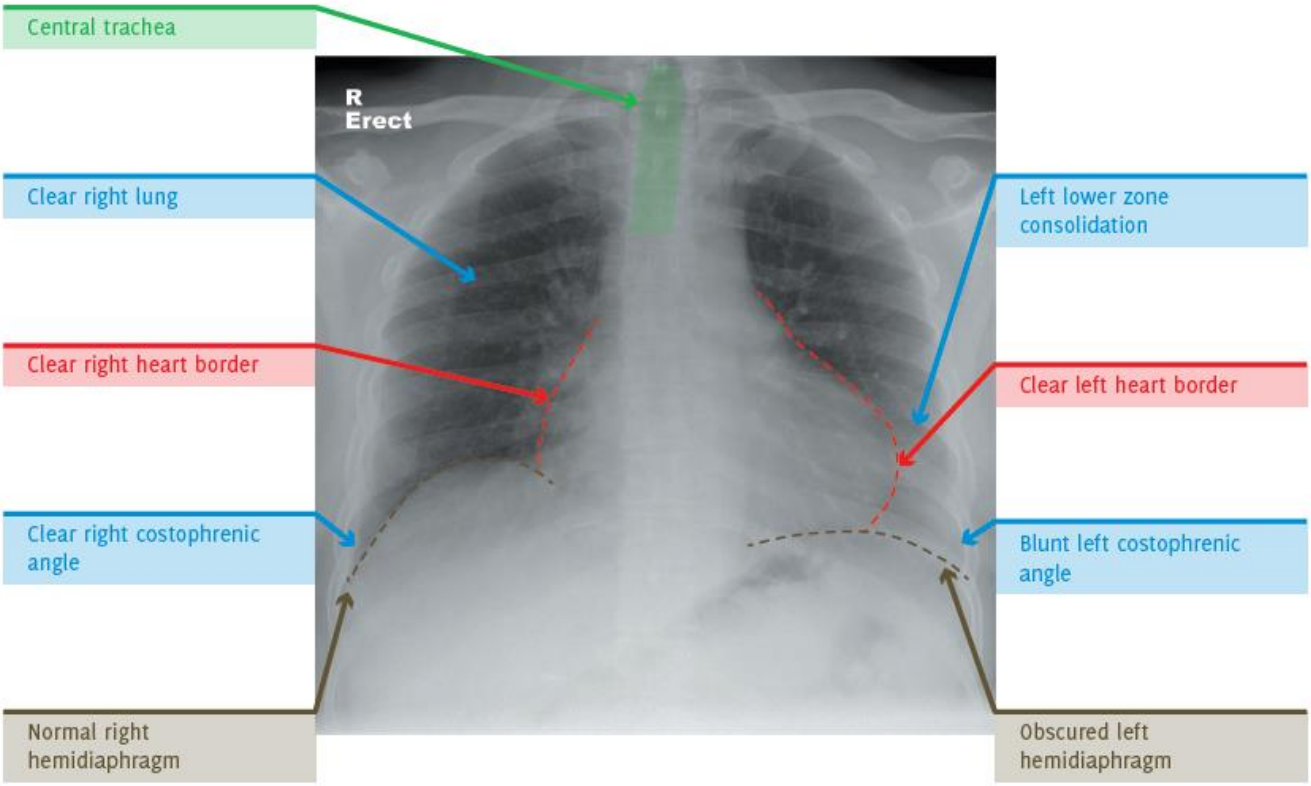
Lung Apices: Normal

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Left costophrenic angle blunting

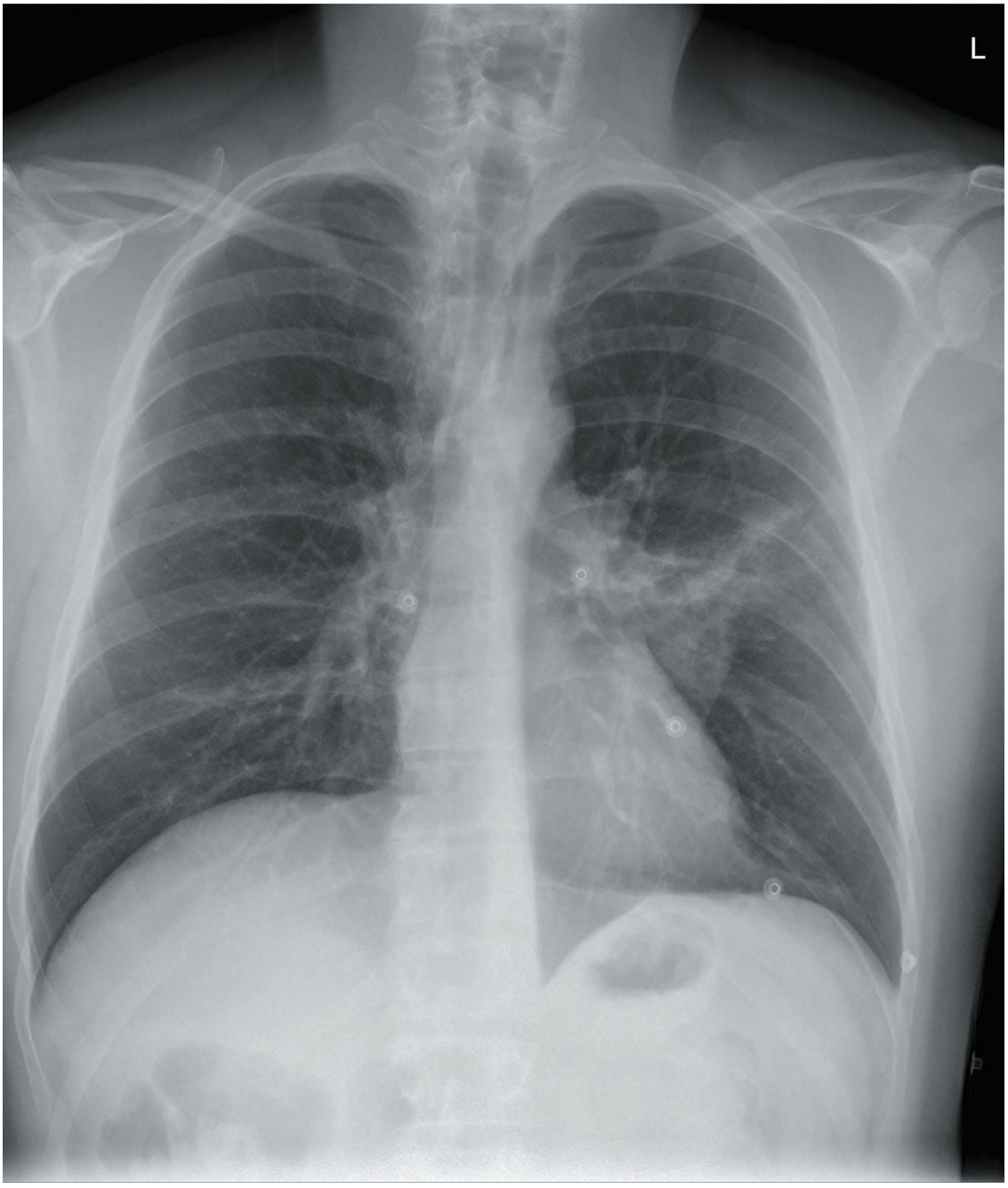
Below the Diaphragm: Normal



- This X-ray demonstrates consolidation in the left lower zone. The consolidation obscures the left hemidiaphragm but not the left heart border consistent with left lower lobe pneumonia.
- There may be a small left pleural effusion.

Case:

A 35-year-old male presents to ED with fever, and a productive cough with green sputum. On examination, he is febrile with a temperature of 38.9°C. There is dullness to percussion and crackles in the left midzone. A chest X-ray is requested to assess for possible pneumonia.



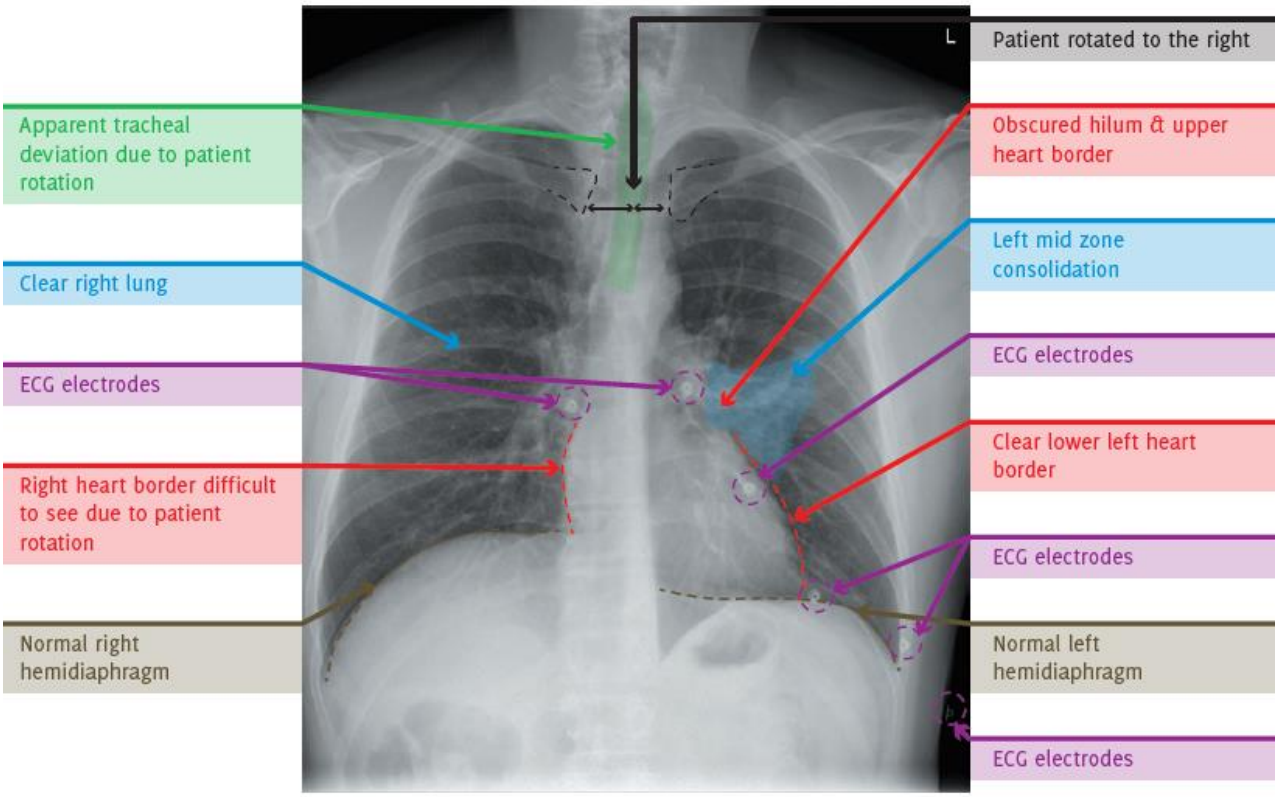
Lung Apices: Normal

Hila: The left hilum is obscured by consolidation. Normal right hilum

Behind Heart: Normal

Costophrenic Angles: Normal

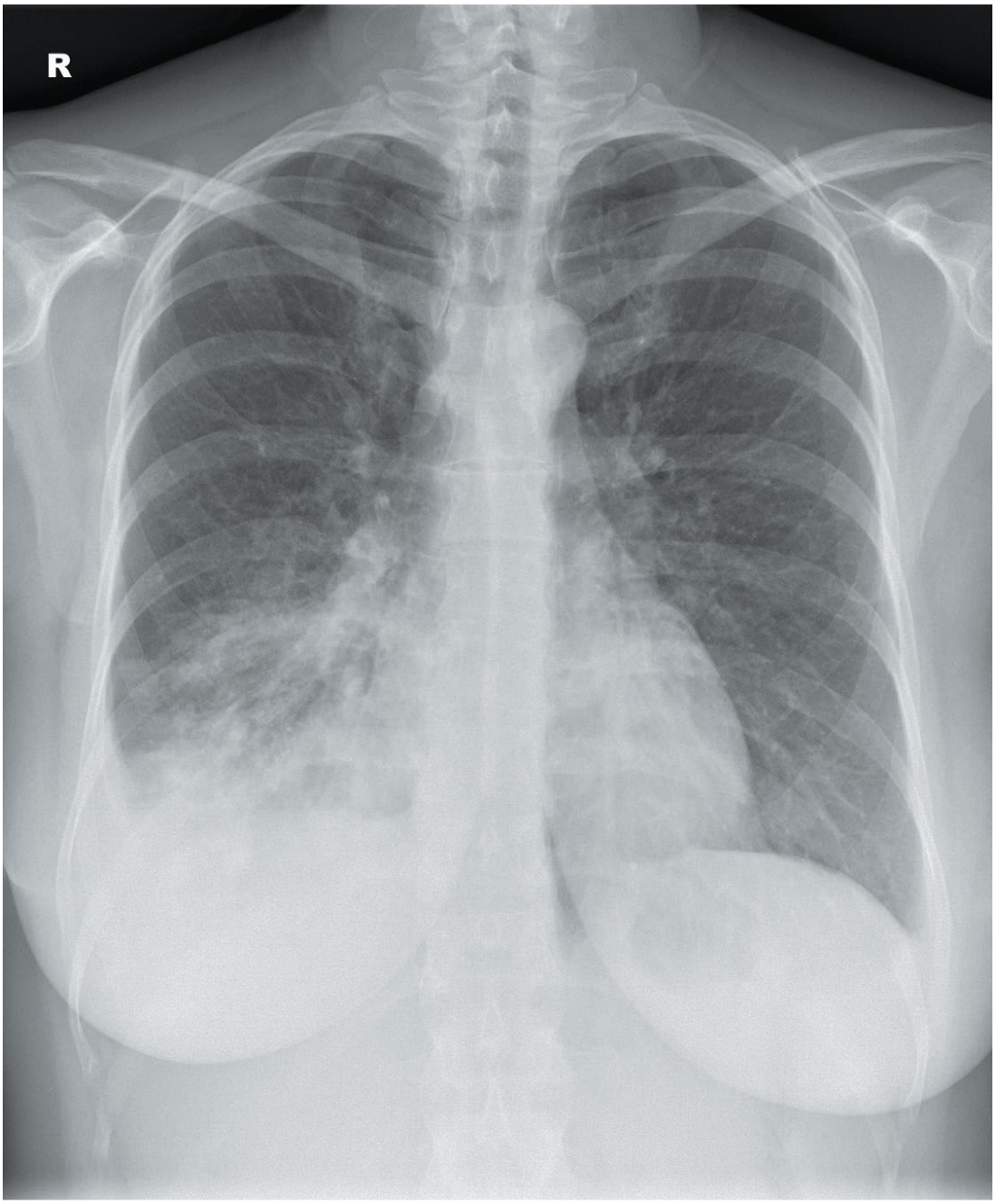
Below the Diaphragm: Normal



- This X-ray demonstrates left mid-zone consolidation, which partially obscures the left heart border.
- The findings are in keeping with pneumonia affecting the lingual segment of the left upper lobe.

Case:

A 40-year-old female presents to ED with a 1 weak history of cough and fever. On examination, she has saturations of 85% in air and is febrile. There is dullness to percussion and crackles in the right lower zone. A chest X-ray is performed to assess for possible pneumonia, collapse, or effusion.



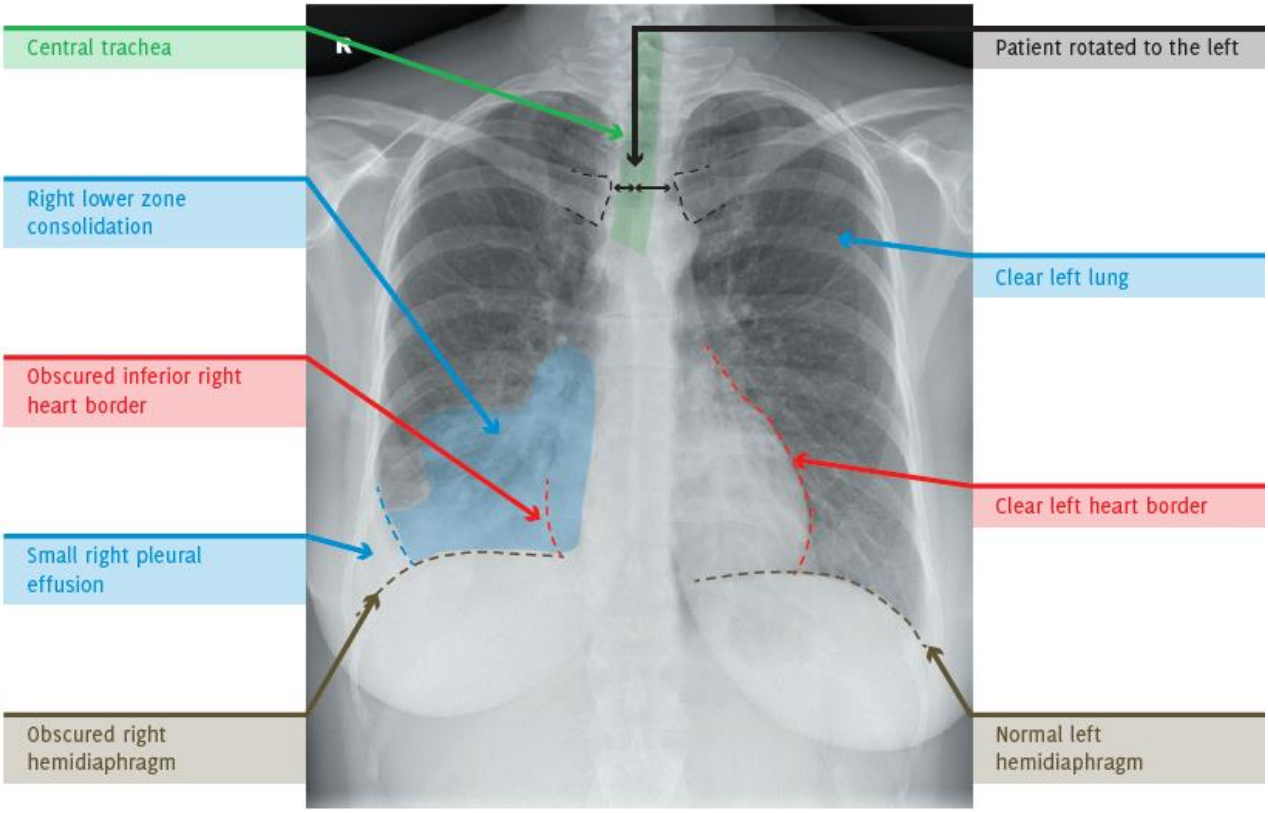
Lung Apices: Normal

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Blunted right costophrenic angle. Normal left costophrenic angle

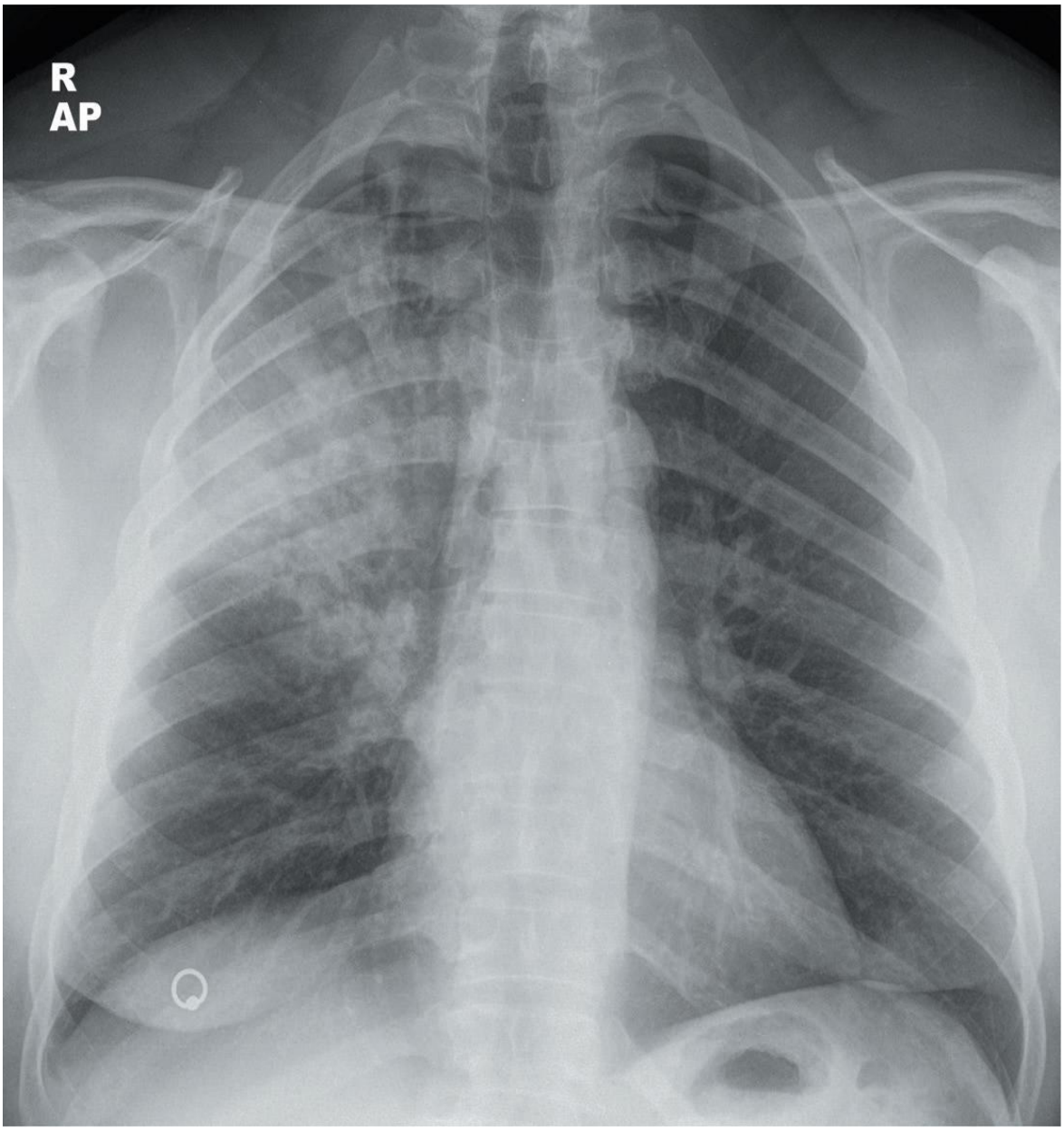
Below the Diaphragm: Normal



- This X-ray demonstrates right lower zone consolidation which obscures the right hemidiaphragm, consistent with right lower lobe pneumonia.
- There may also be pneumonia affecting the right middle lobe, as the right heart border appears partially obscured.
- A small right parapneumonic effusion is also present.

Case:

A 55-year-old female develops a cough productive of ‘nasty sputum.’ She is a non-smoker. On examination, she has saturations of 91% in air and is febrile. There is dullness to percussion and coarse crackles in the right upper and mid zones. A chest X-ray is requested to assess for possible pneumonia or collapse.



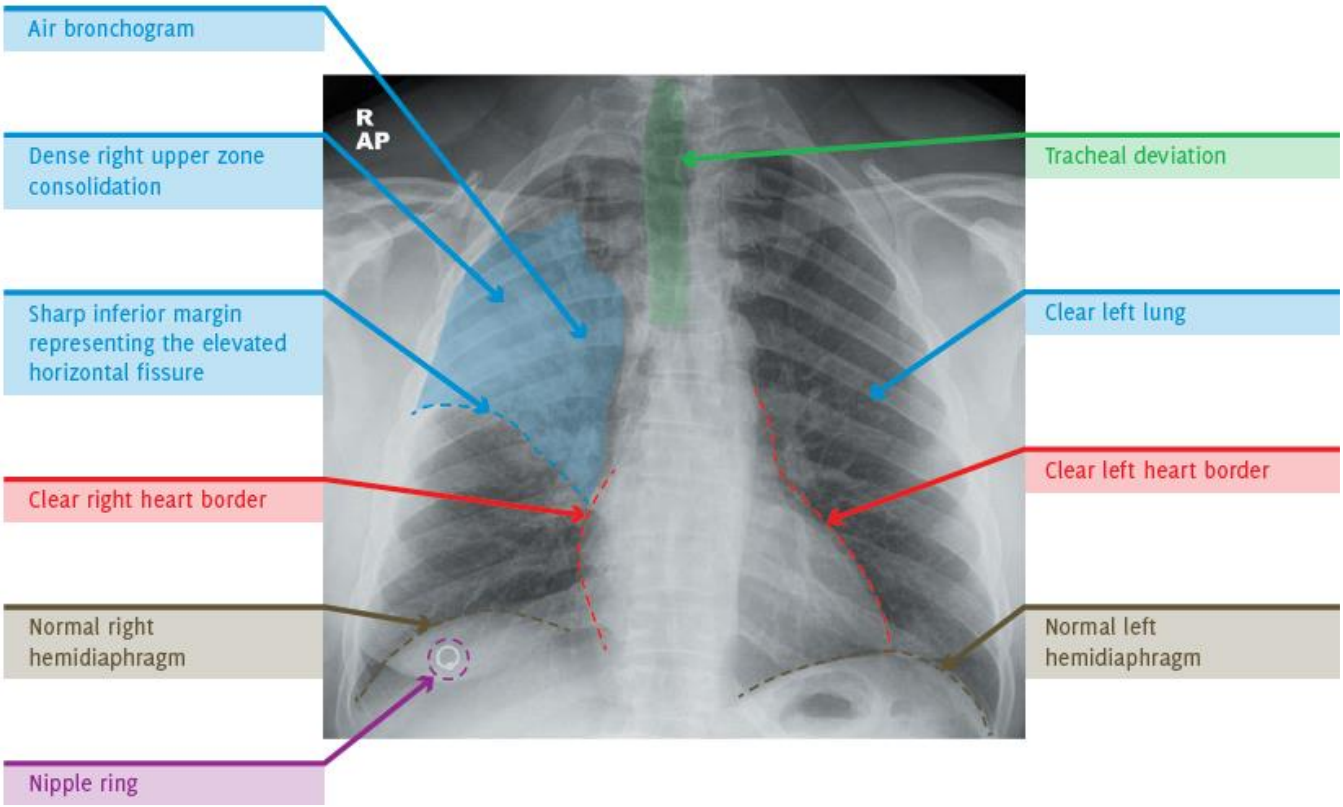
Lung Apices: Heterogeneous right apical consolidation. Normal left apex

Hila: Normal

Behind Heart: Normal

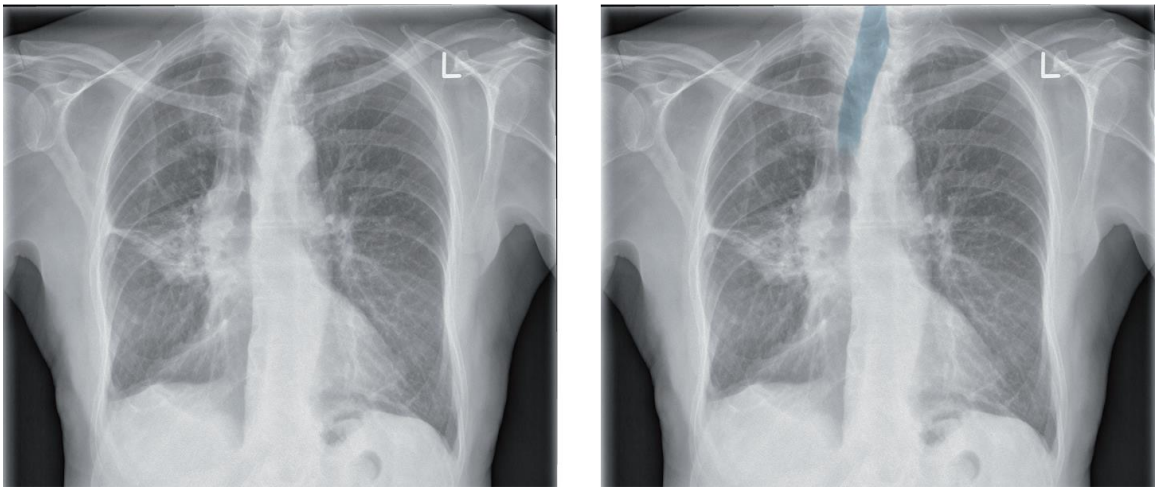
Costophrenic Angles: Normal

Below the Diaphragm: Normal

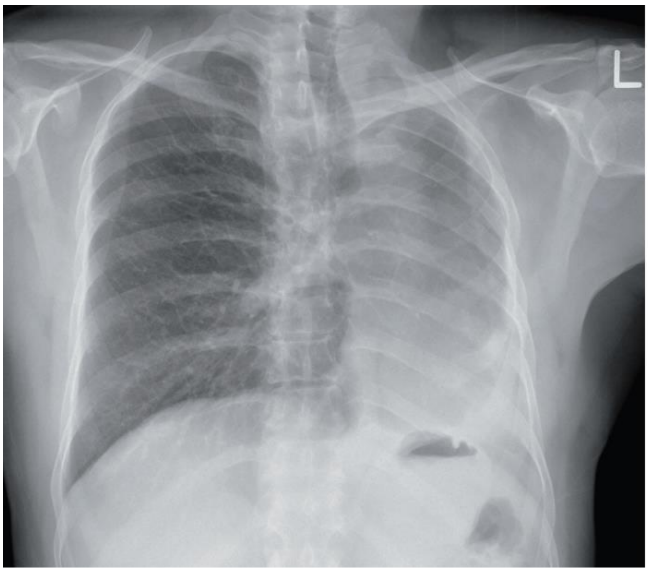


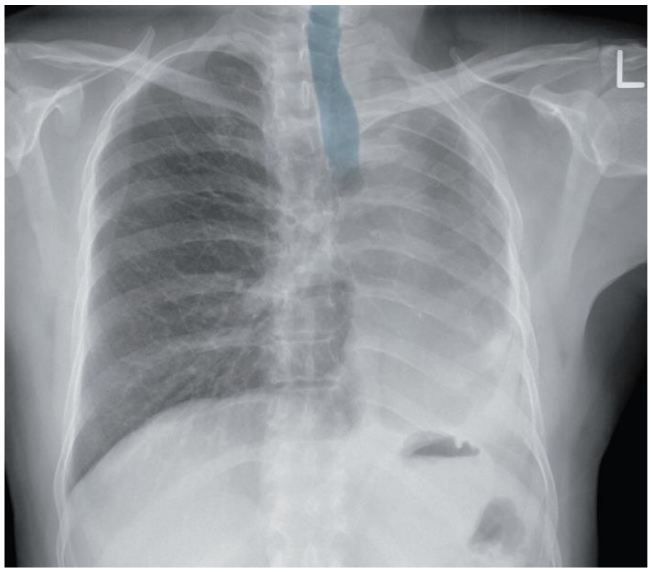
- This X-ray demonstrates extensive heterogeneous right upper zone consolidation in keeping with pneumonia. The consolidation has a relatively abrupt inferior margin which represents the horizontal fissure, indicating this is right upper lobe pneumonia.
- There is mild tracheal deviation and elevation of the horizontal fissure, indicating concomitant volume loss/ partial collapse.

Atelectasis (Lung Collapse)



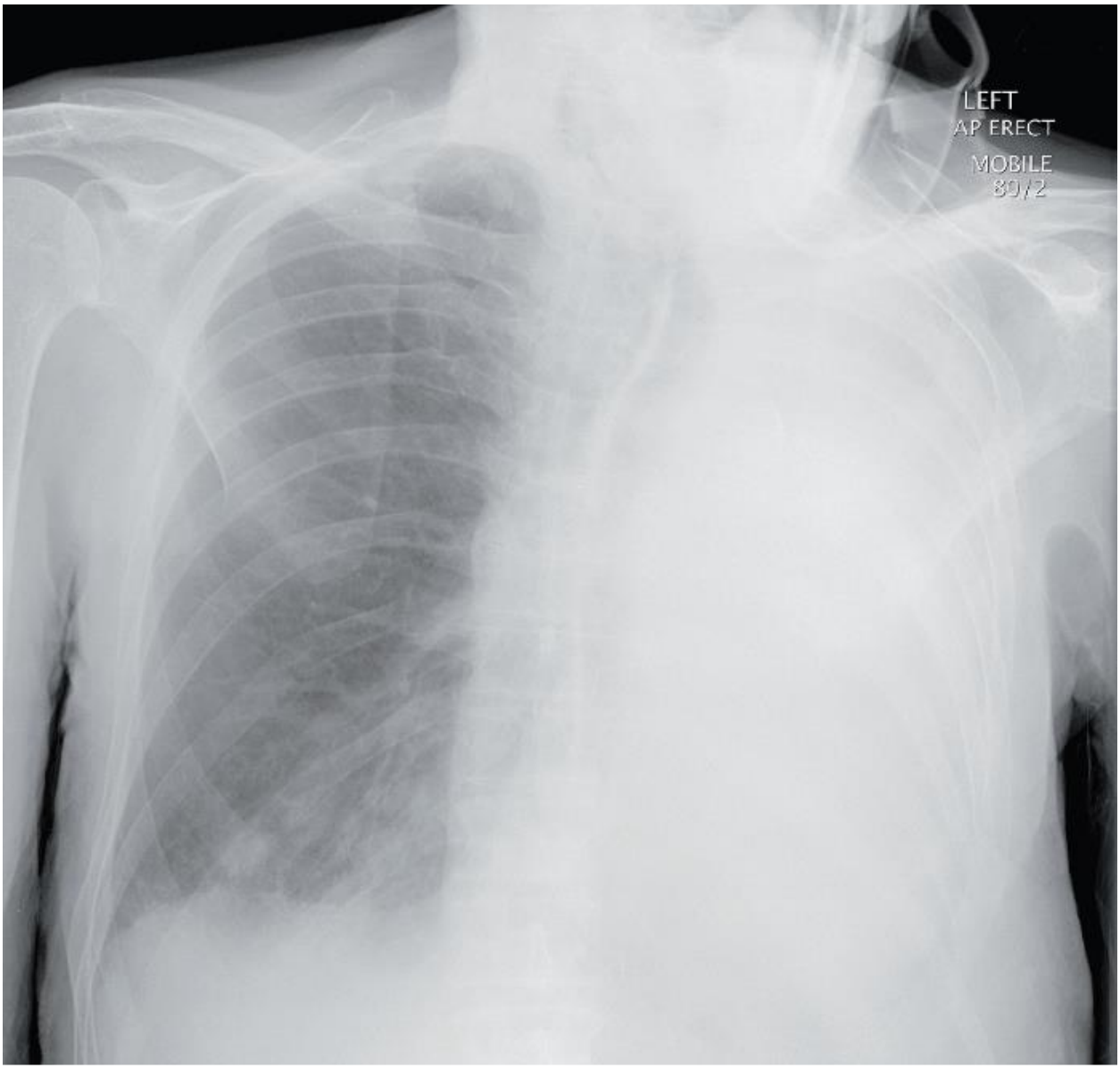
- Two identical chest radiographs showing right tracheal deviation.
- The trachea is shown in blue on the right radiograph. (You can also see: mass lesion in the right lung and hilum, with resultant middle lobe collapse, pulling the trachea to the right.).





Two identical chest radiographs showing:

- near complete collapse of the left lung.
- There is increased density throughout the entire left lung and signs of decreased lung volume, such as displacement of the heart/mediastinum/hila towards the collapsed lung and left tracheal deviation. The deviated trachea is marked in blue.

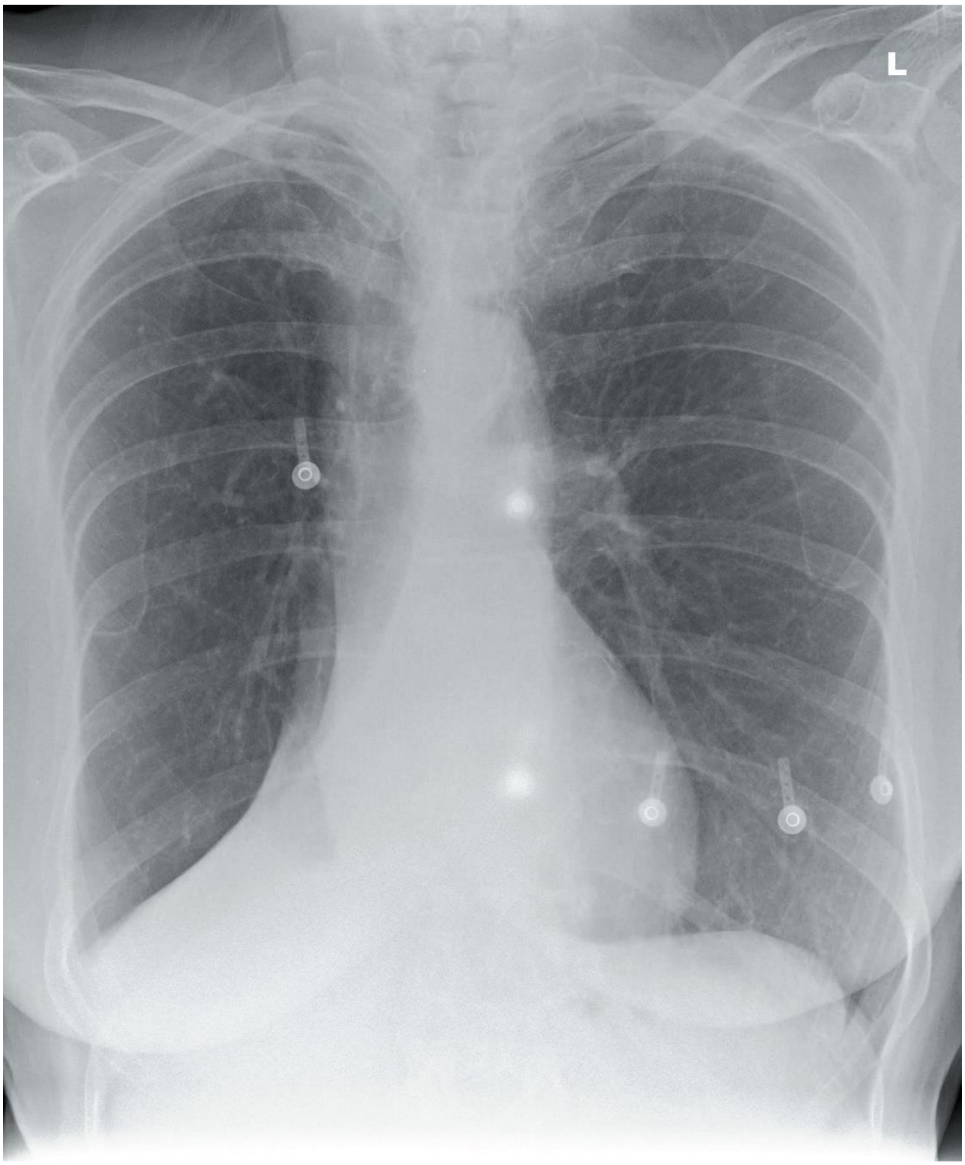


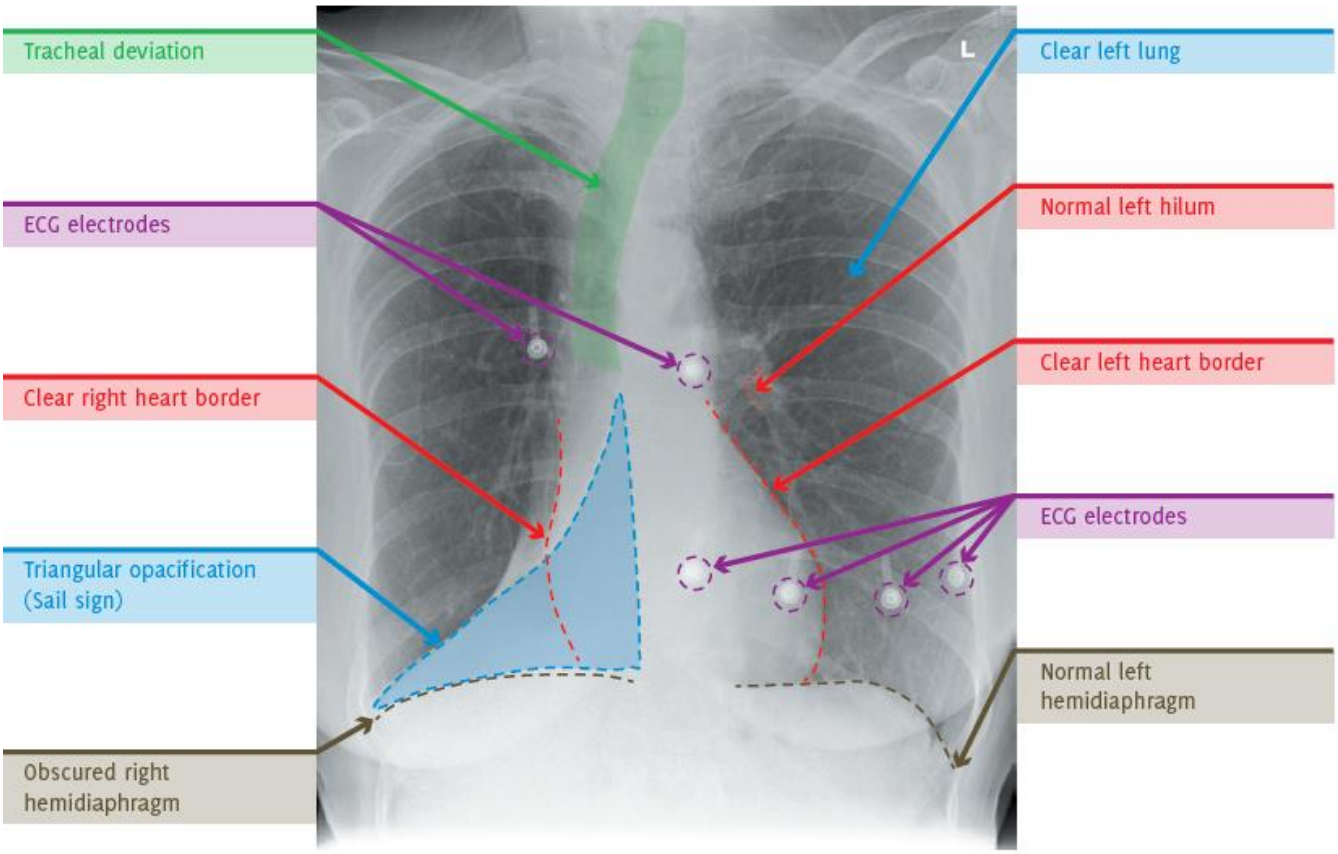
A chest radiograph showing:

- complete collapse of the left lung.
- There is increased density throughout the entire left lung and signs of decreased lung volume, such as displacement of the mediastinum/hila towards the collapsed lung and left tracheal deviation.

Case:

A 50-year-old female presents to the ED with shortness of breath. She has an 80-pack-year smoking history. On examination, the lungs are resonant throughout, with good air entry bilaterally. There is tar staining on the fingernails. A chest X-ray is requested.

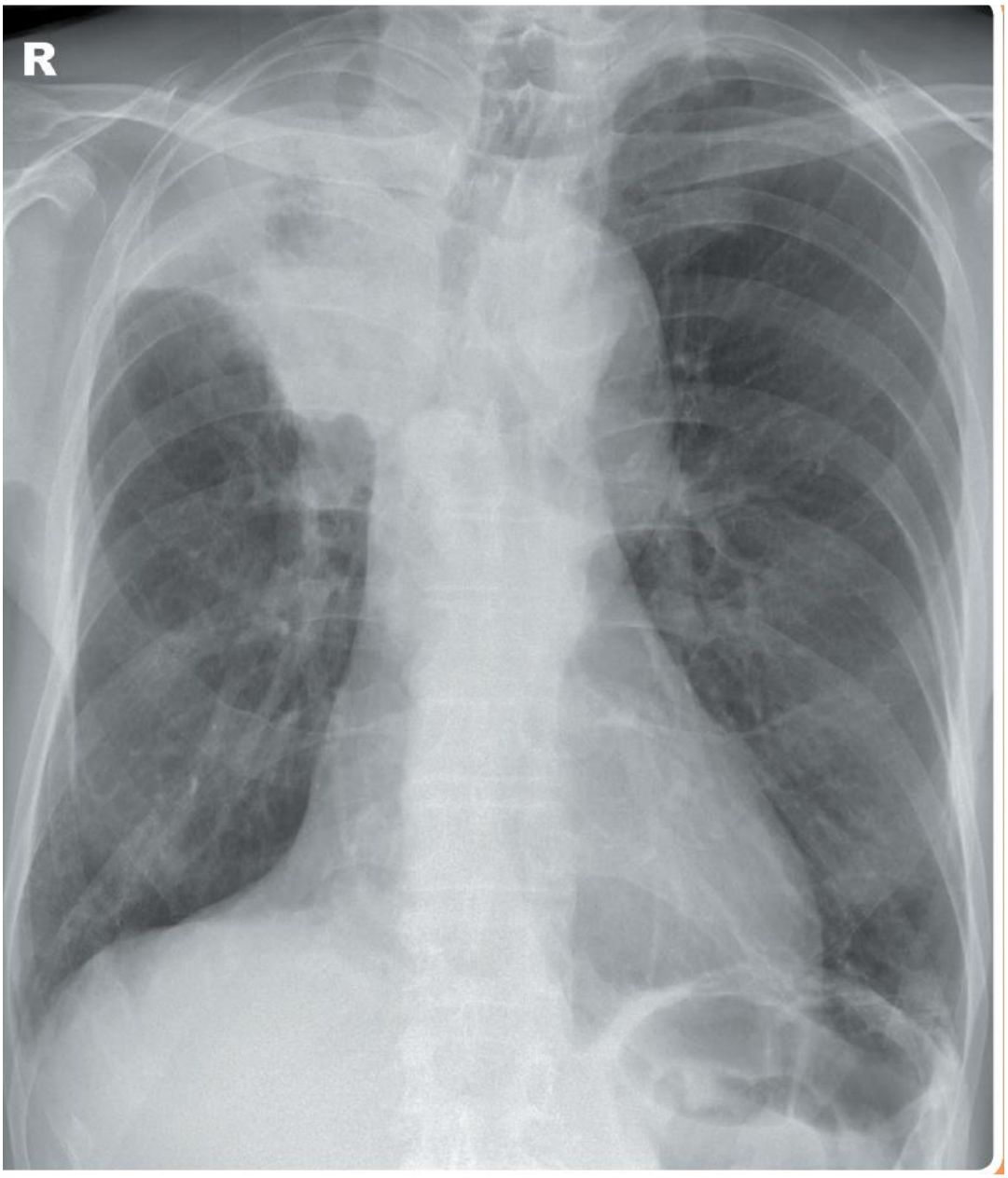




- This X-ray shows a right lower lobe collapse (increased triangular opacity medially in the right lower zone, which obscured the right hemidiaphragm – sail sign).
- There is resultant right-sided volume loss with probable depression of the right hilum.
- No definite mass can be seen.

Case:

A 43-year-old female presents to ED with worsening shortness of breath and inspiratory chest pain. She has had a cough for the last few weeks as well as general flu-like symptoms. She has a 30-pack-year smoking history. On examination, saturations are 91% in air, and she is afebrile. There is reduced air entry in the right upper zone, with associated dullness to percussion. A chest X-ray is requested to assess for possible malignancy, collapse, or consolidation.



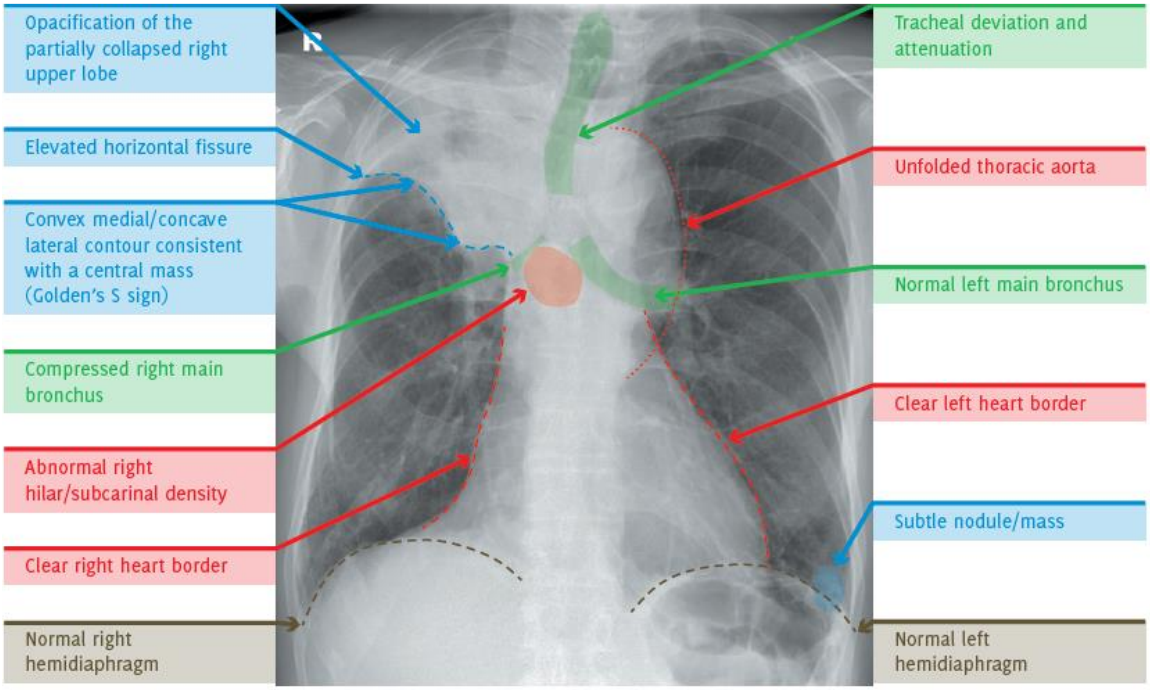
Lung Apices: Opacification of the right apex.

Hila: Elevated, bulky right hilum. Normal left hilum

Behind Heart: Normal

Costophrenic Angles: Rounded opacity at the left costophrenic angle

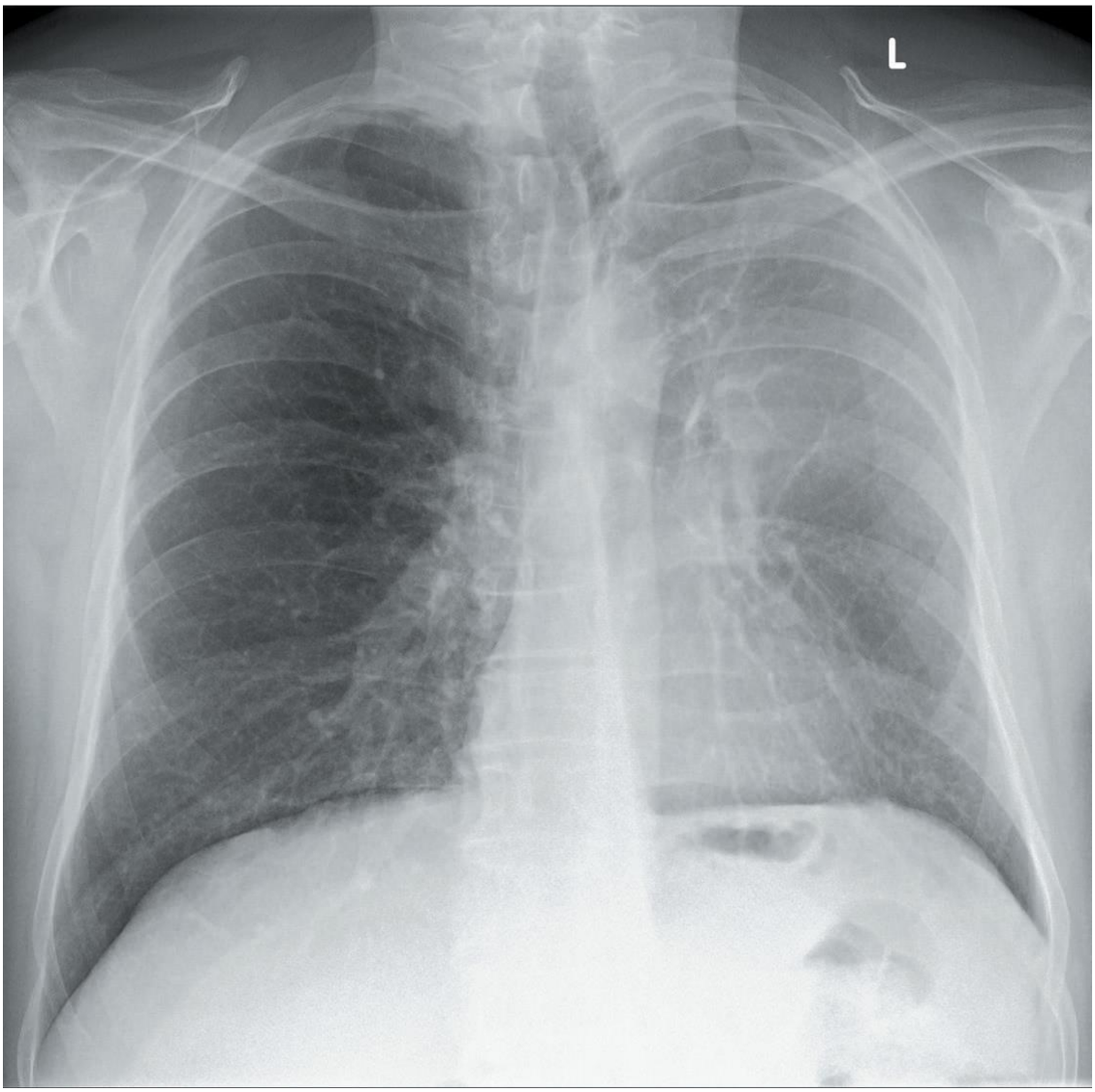
Below the Diaphragm: Normal



- This X-ray demonstrates a right upper lobe collapse (Increased opacity in the right upper zone, concave inferior margin representing the displaced horizontal fissure)
- There is resultant volume loss demonstrated by tracheal deviation and Elevation of the right hilum.

Case:

A 31-year-old male is brought to the ED with acute onset breathlessness and wheezing. He is a known asthmatic, on regular inhaled corticosteroid therapy and a ß2 agonist when required. On examination, he is apyrexia land widespread wheeze. There is decreased air entry on the left side, and the lungs are resonant throughout. An urgent chest X-ray is requested to assess for a possible pneumothorax.



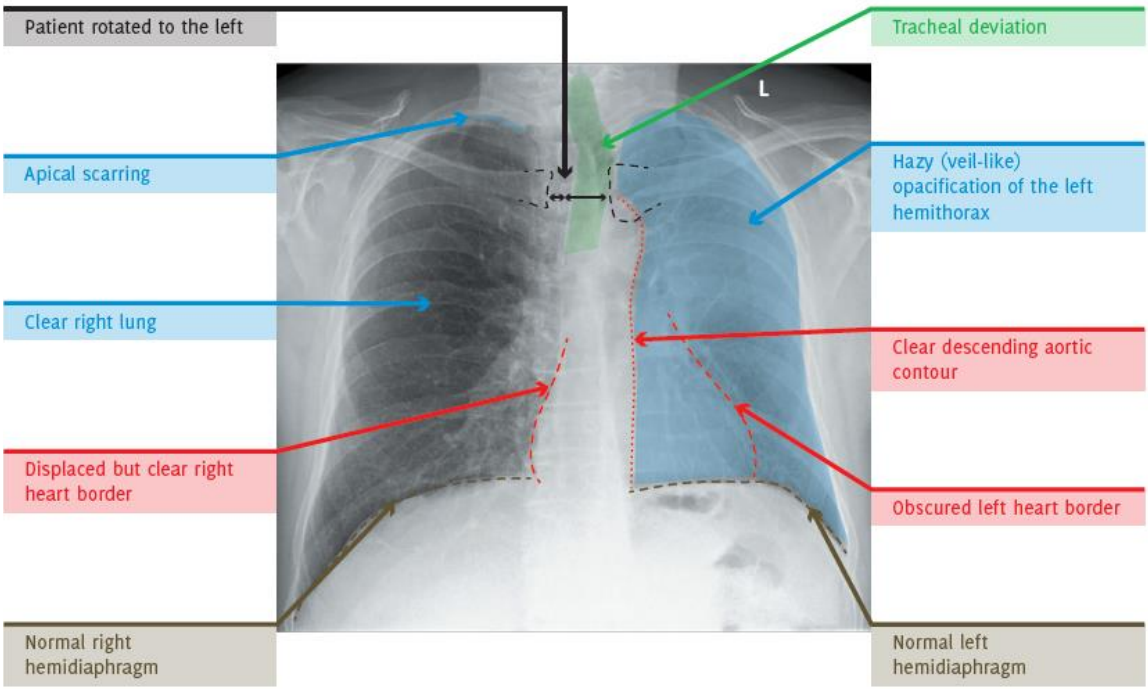
Lung Apices: Left apical opacification. Right apical scarring

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Normal

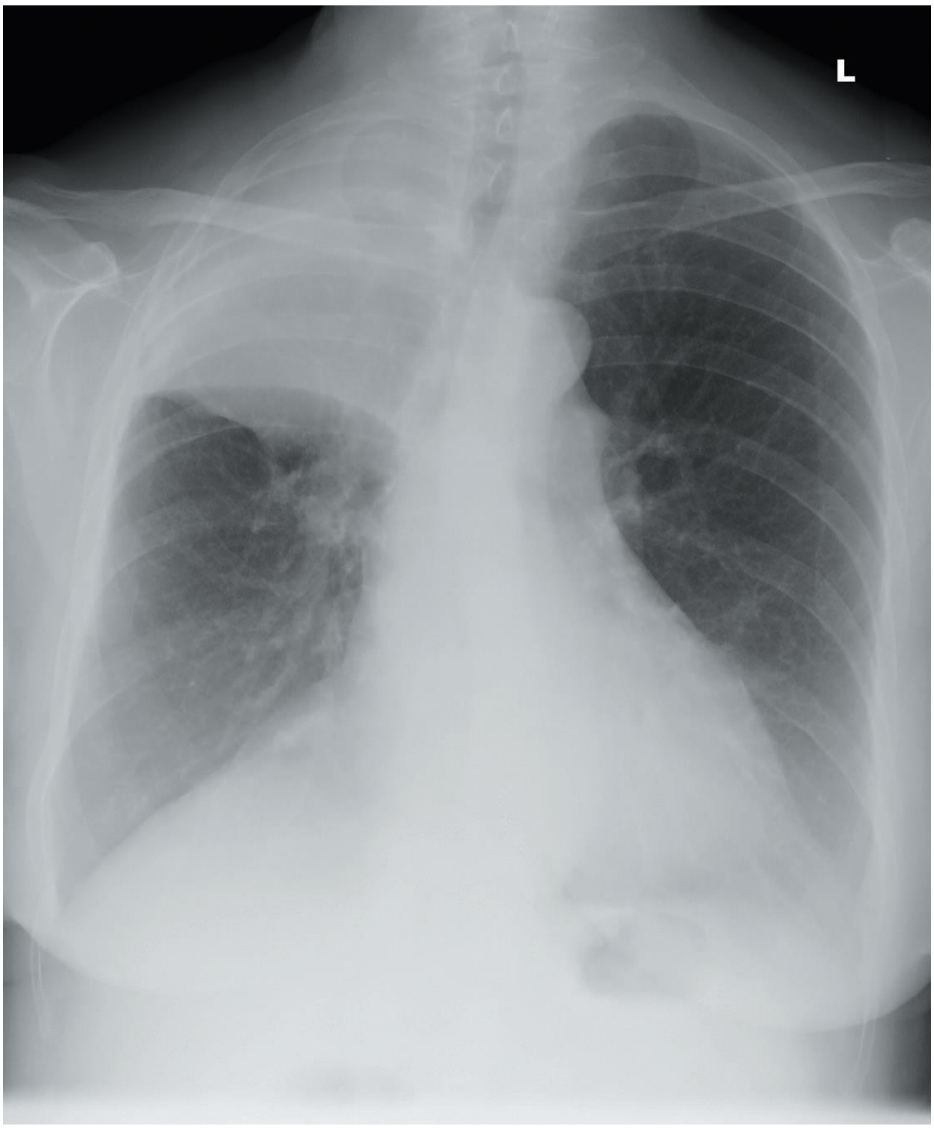
Below the Diaphragm: Normal



This X-ray shows a left upper lobe collapse ('veil like' opacification of the left hemithorax) with resultant volume loss demonstrated by mediastinal shift to the left.

Case:

An 81-year-old female presents to ED with a 2-week history of progressive shortness of breath. She also reports lethargy and weight loss. She has a 50 pack-year smoking history. On examination, she has saturations of 92% in 2L of oxygen, and is afebrile. There is scattered diffuse expiratory wheezing with reduced air-entry in the right upper zone. In addition, a few crackles that quietened with deep coughing are heard in the right upper zone. A chest X-ray is requested to assess for possible pneumonia or malignancy.



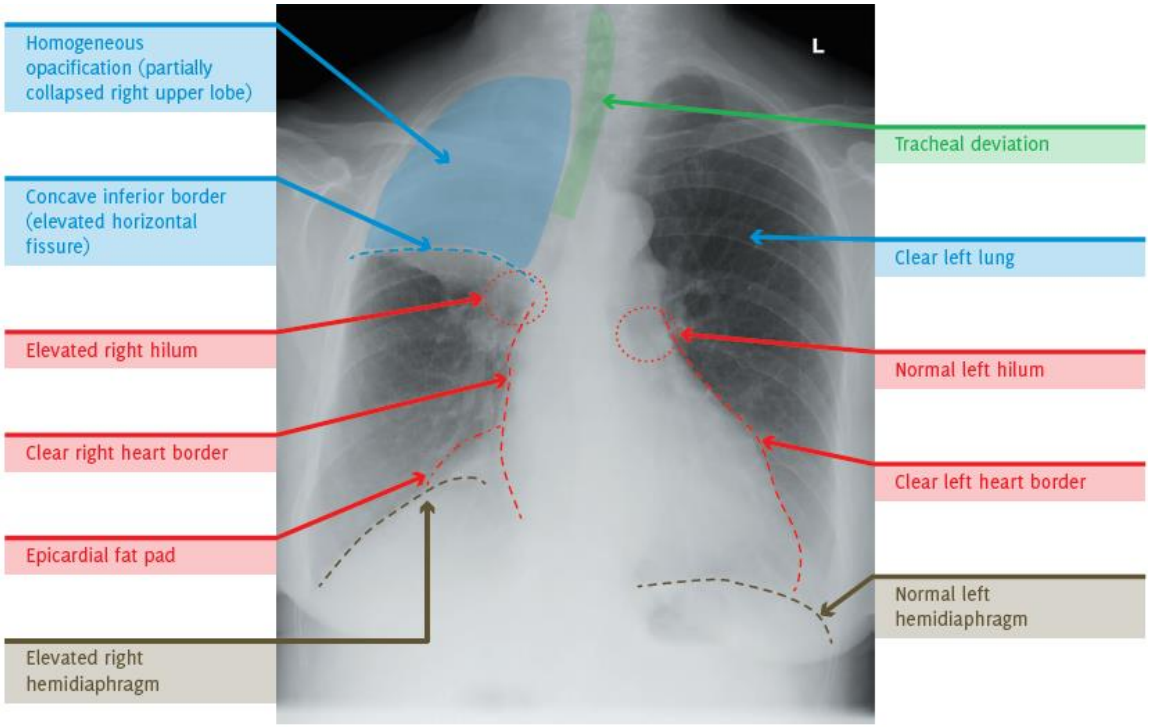
Lung Apices: Increased density in the right upper zone. Normal left apex

Hila: Right hilar elevation, but no hilar mass visible. Normal left hilum

Behind Heart: Normal

Costophrenic Angles: Normal

Below the Diaphragm: Normal

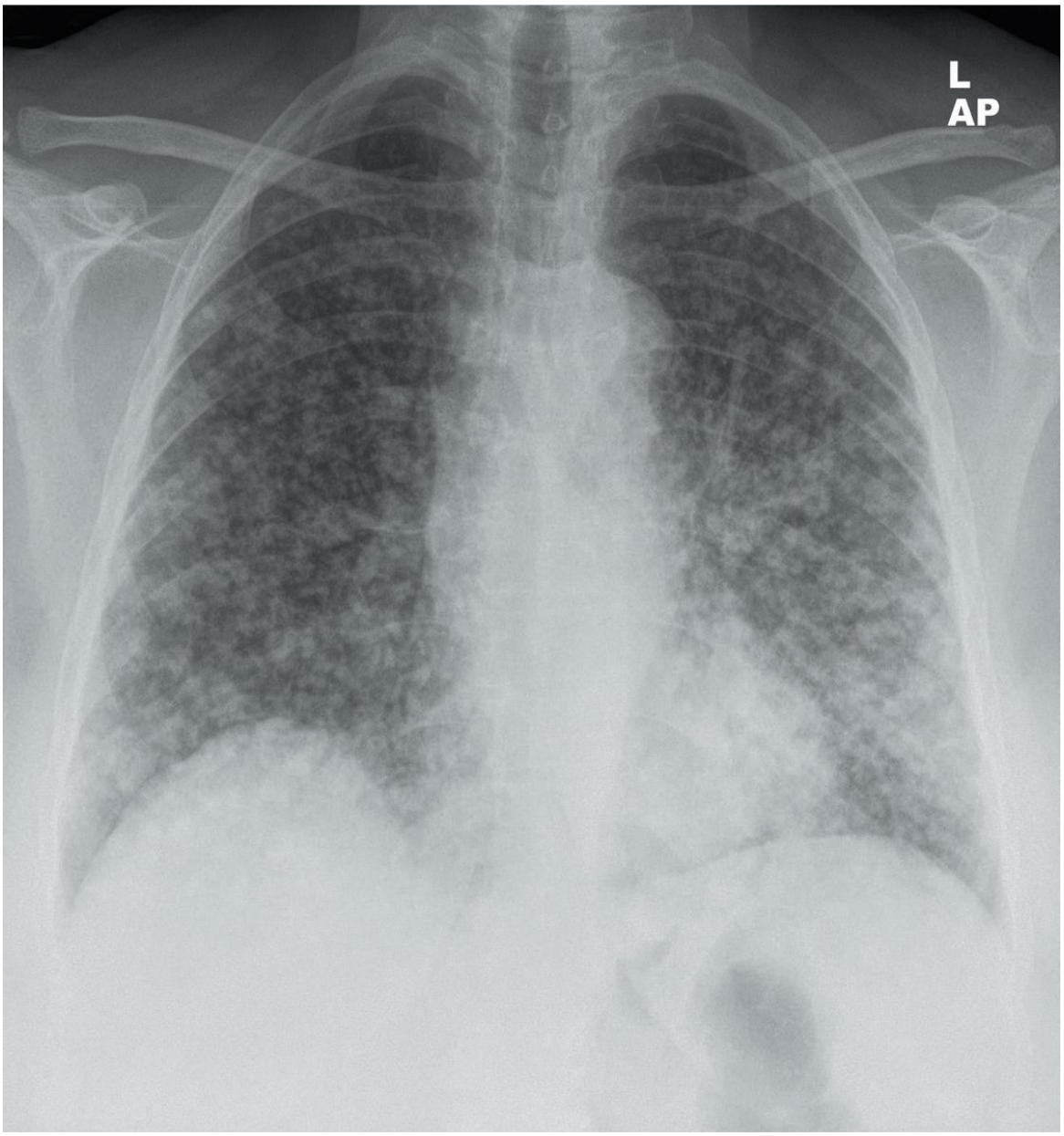


- This X-ray demonstrates a right upper lobe collapse (homogeneous opacity in the right upper zone, concave inferior margin representing the displaced horizontal fissure) with resultant volume loss demonstrated by tracheal deviation and elevation of the right hilum and hemidiaphragm.

Tuberculosis

Case:

A 60-year-old female presents to ED with general fatigue, fevers, and a productive cough. There is no significant past medical history. On examination, she has saturations of 85% in air and is febrile with a temperature of 39.5°C. There are scattered crackles throughout the lungs. A chest X-ray is requested to assess for possible pneumonia.



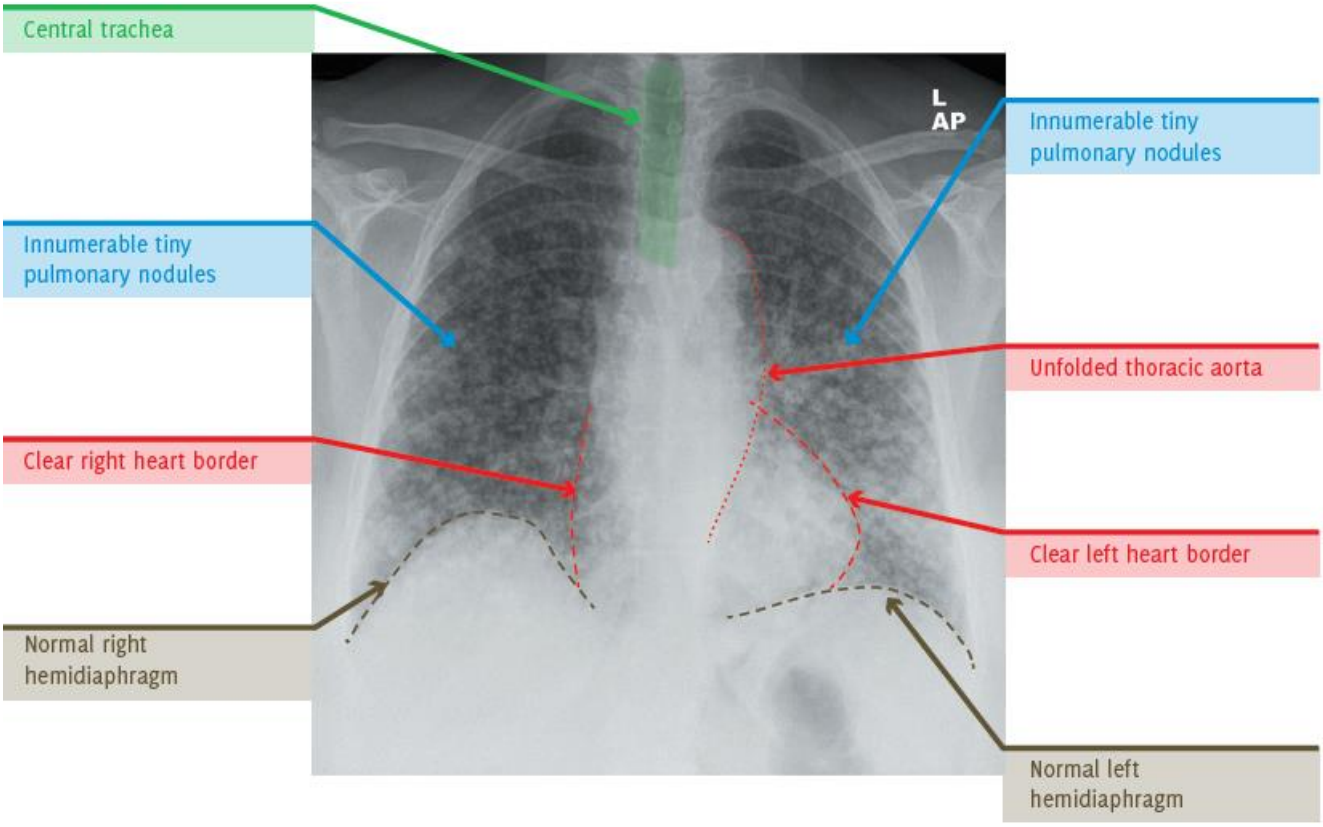
Lung Apices: Multiple small pulmonary nodules

Hila: Normal

Behind Heart: Multiple small pulmonary nodules

Costophrenic Angles: Normal

Below the Diaphragm: Normal

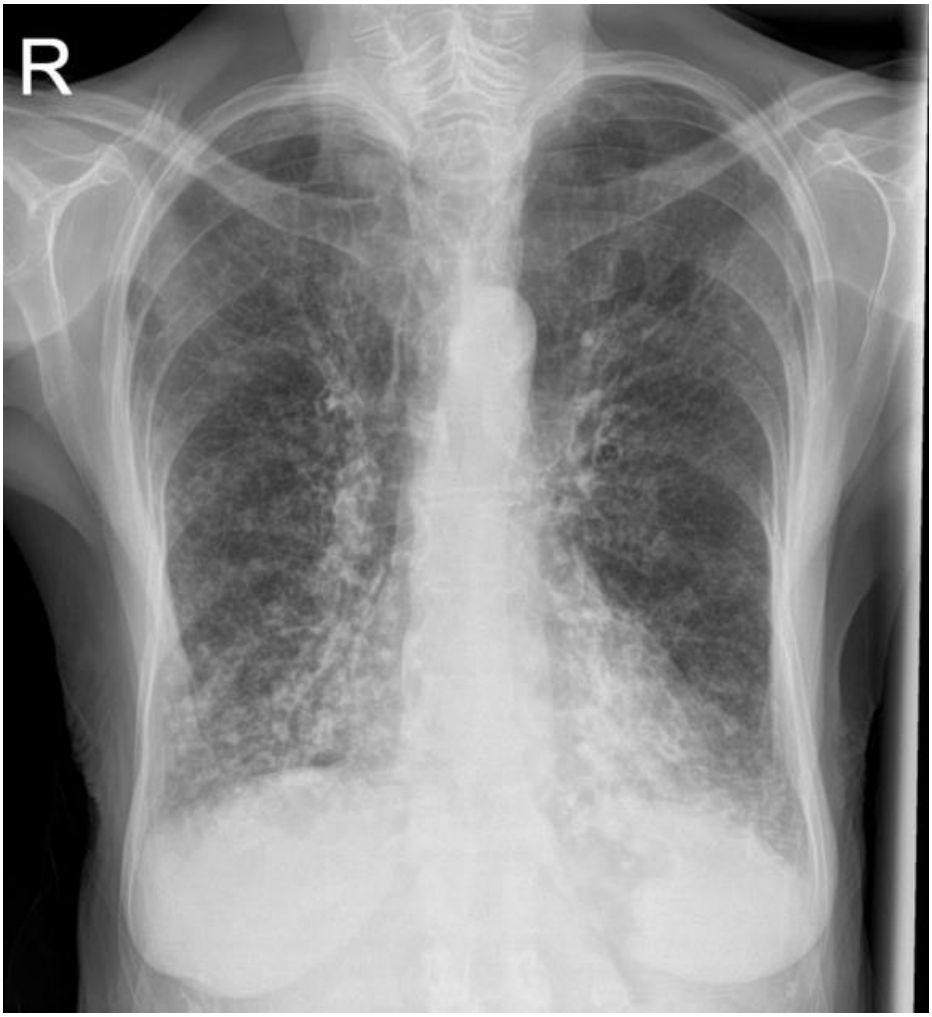


- This X-ray demonstrates innumerable small non-calcified pulmonary (miliary) nodules throughout both lungs.
- The patient is unwell making metastases or infection, such as TB (miliary TB) or fungal infections, most likely.

Bronchiectasis

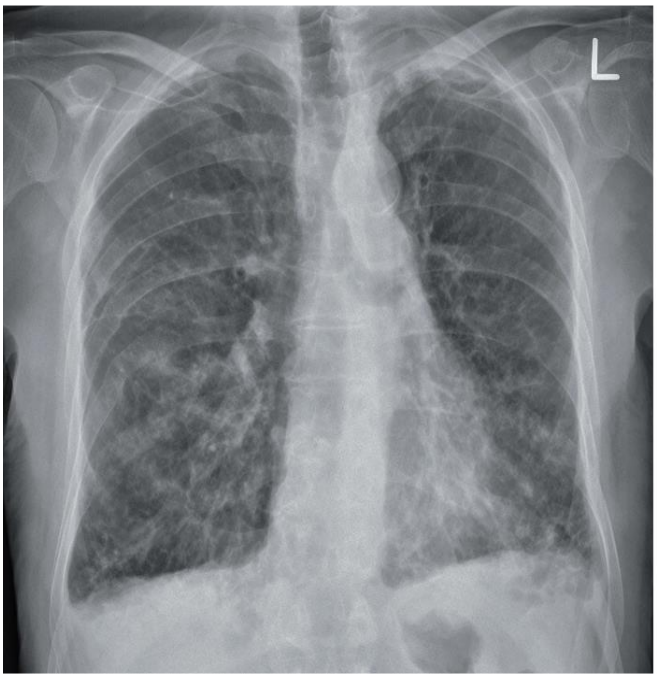
Case:

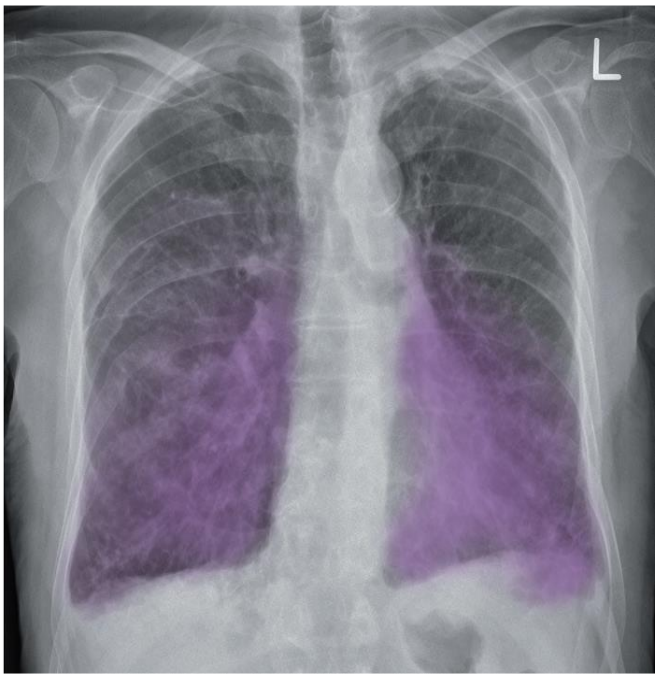
45-year-old female patient with cough associated with copious amounts of sputum. She has a history of recurrent chest infections.



- Coarse bronchovascular markings, most pronounced in the lower zones bilaterally (tram-track sign).
- Lower zone nodular opacities, which likely represent mucoid impaction.
- Imaging features in keeping with severe bronchiectasis changes.

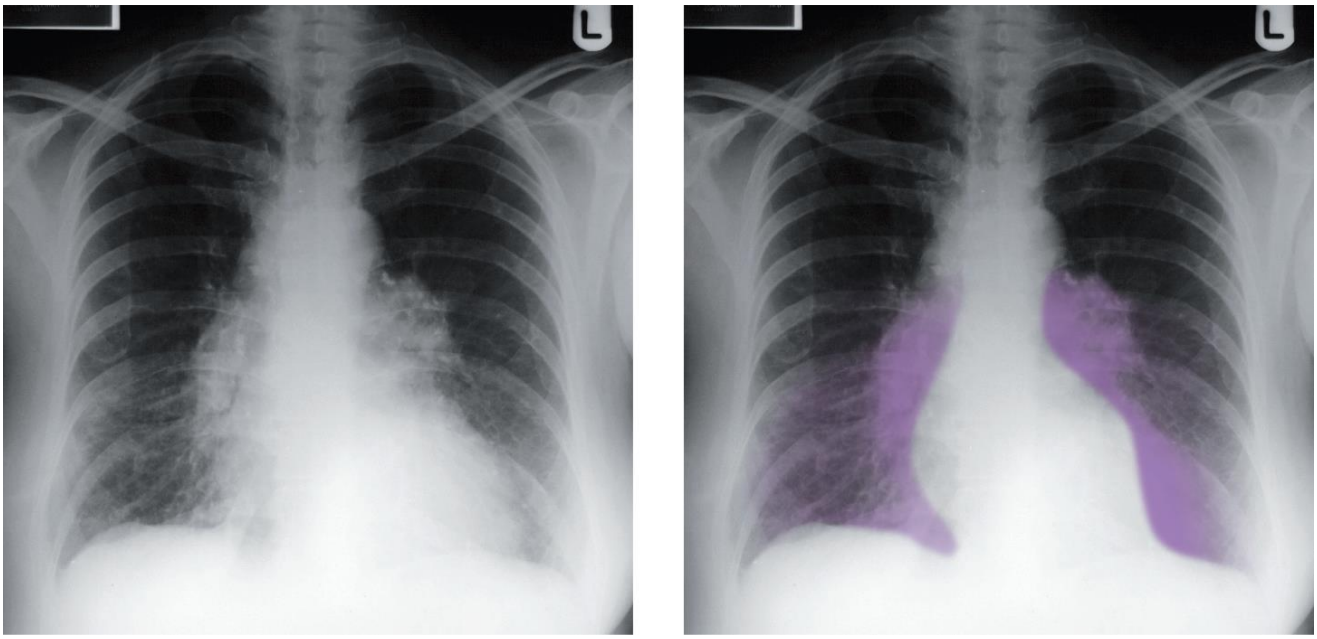
Pulmonary Fibrosis





Two identical chest radiographs showing:

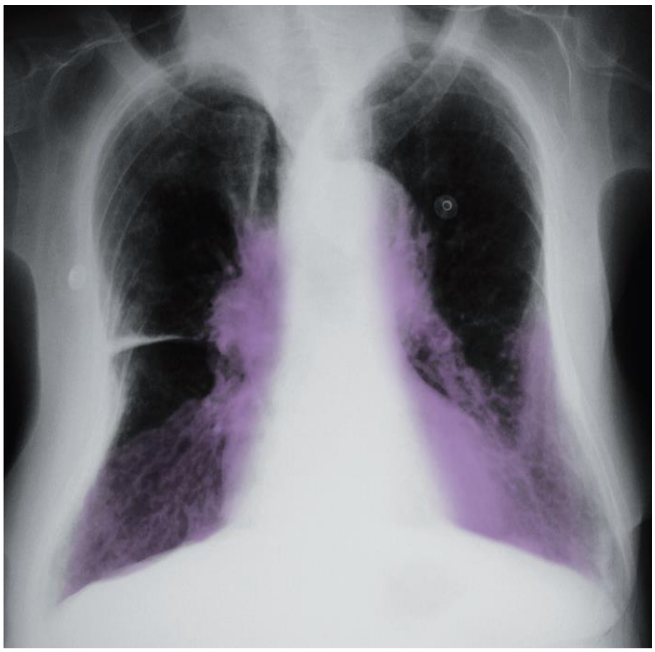
- coarse mid - and lower-zone fibrosis.
- There is reticulonodular type shadowing.
- The right radiograph shows the radiological features of fibrosis marked in purple.



Two identical chest radiographs showing:

- coarse mid - and lower-zone fibrosis.
- There is reticular type shadowing.
- The right radiograph shows the radiological features of fibrosis marked in purple.

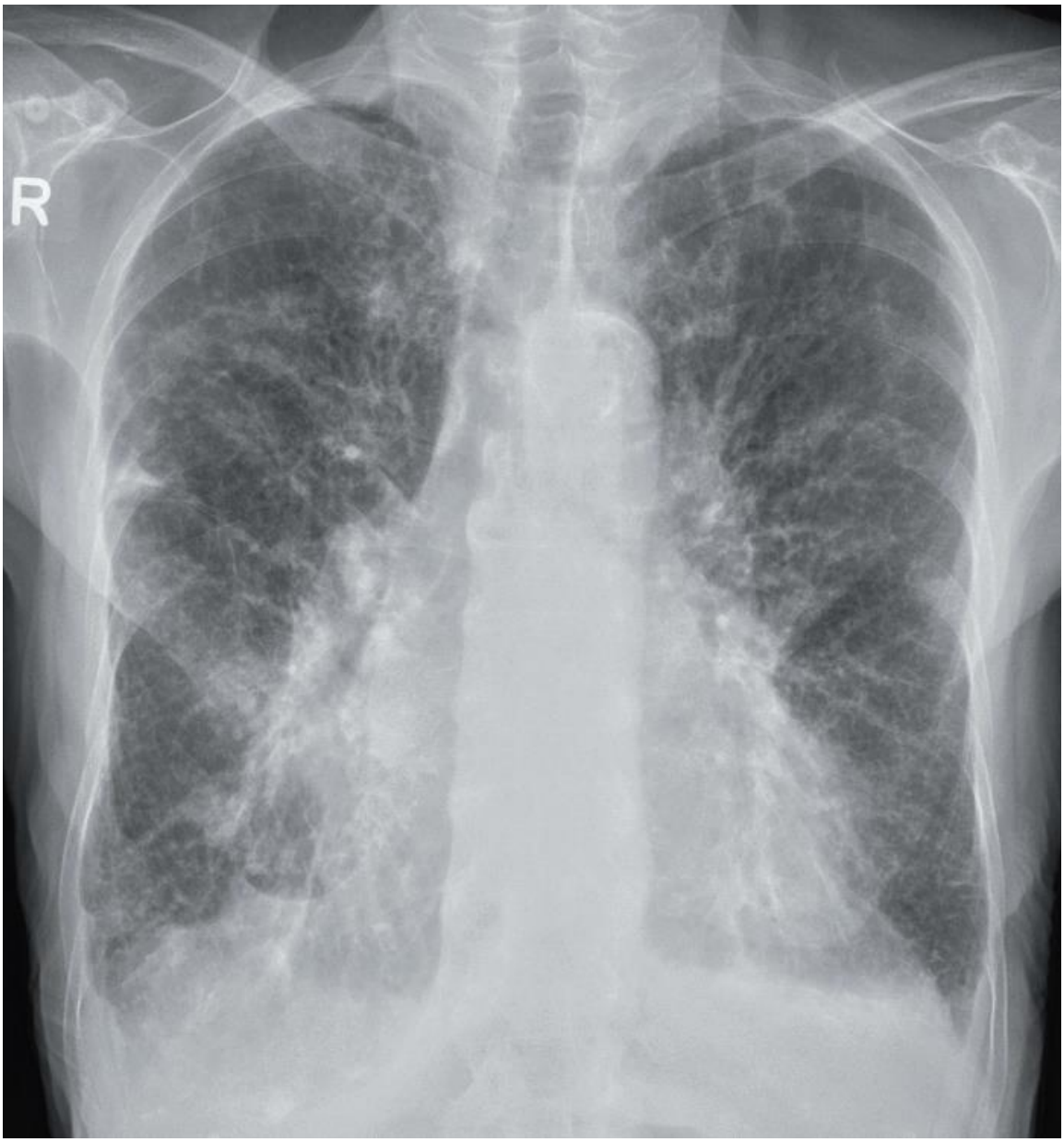




Two identical chest radiographs showing:

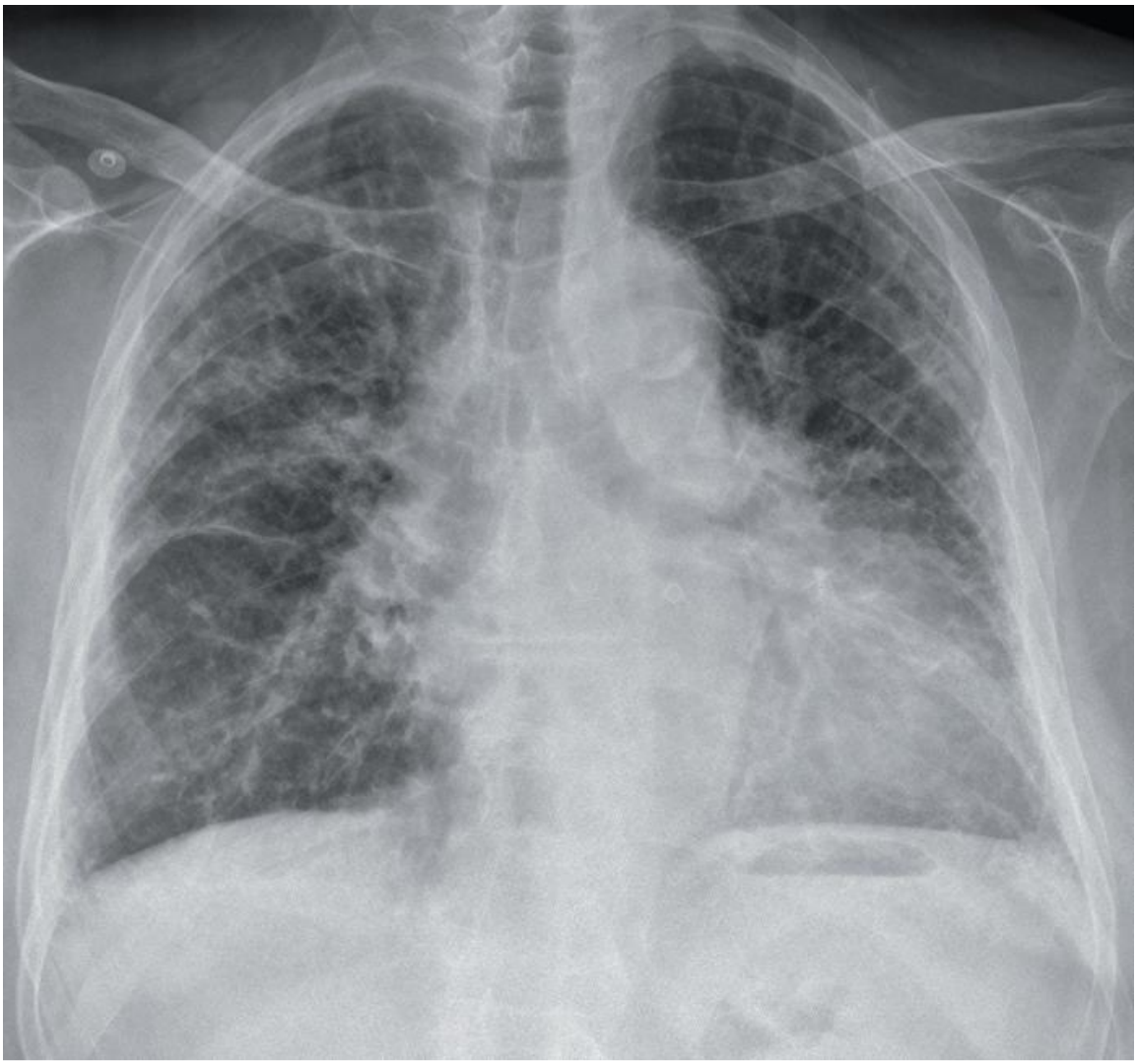
- coarse mid - and lower-zone fibrosis.
- There is reticular-type shadowing.

The right radiograph shows the radiological features of fibrosis marked in purple.



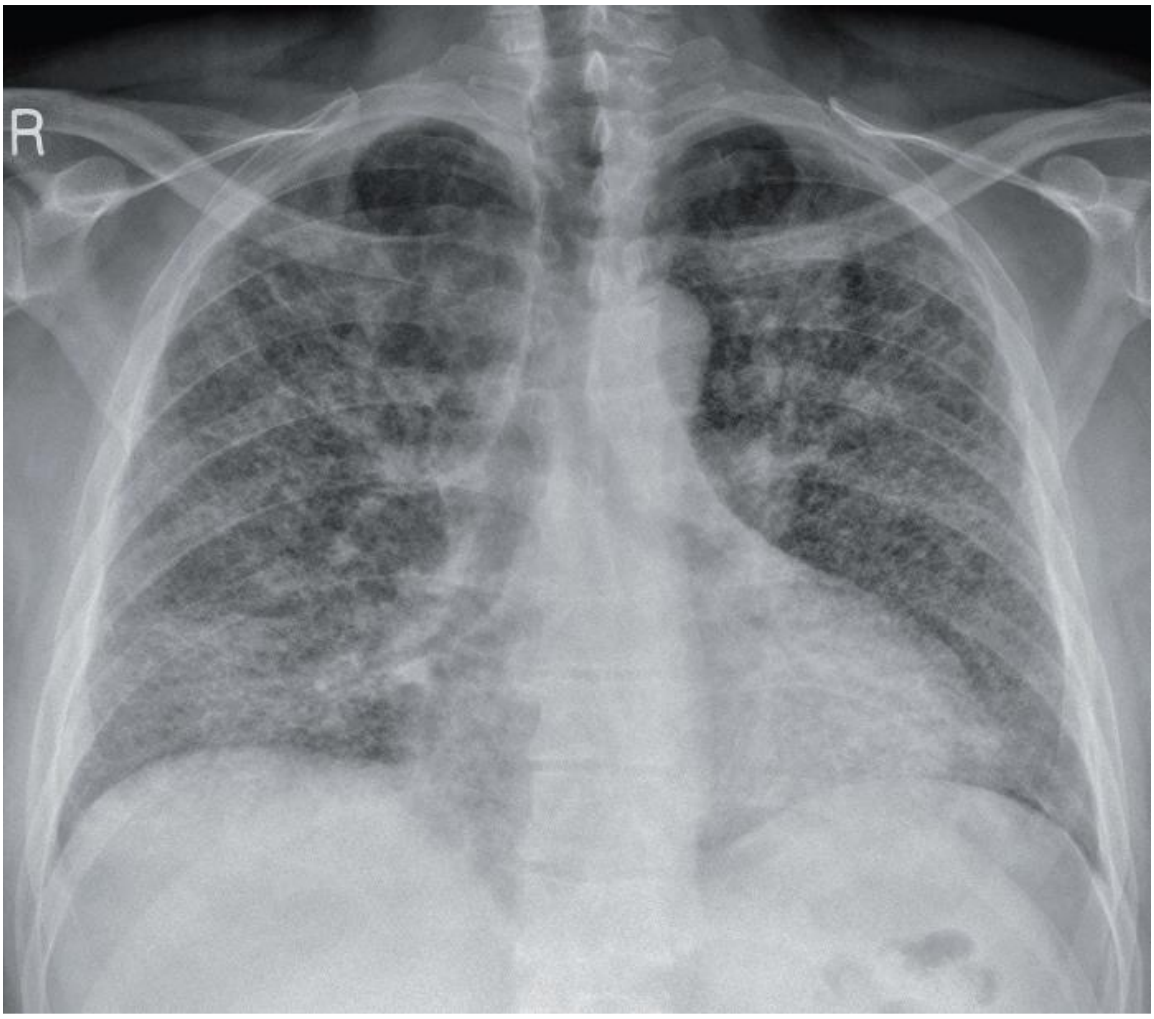
A chest radiograph showing:

Reticulonodular-type shadowing (fibrosis) throughout both lungs.



A chest radiograph showing:

- Reticulonodular-type shadowing (fibrosis) throughout both lungs.



A chest radiograph shows:

- reticulonodular - type -shadowing (fibrosis) throughout both lungs.

Case:

50-year-old ex-colliner presents with cough and shortness of breath.

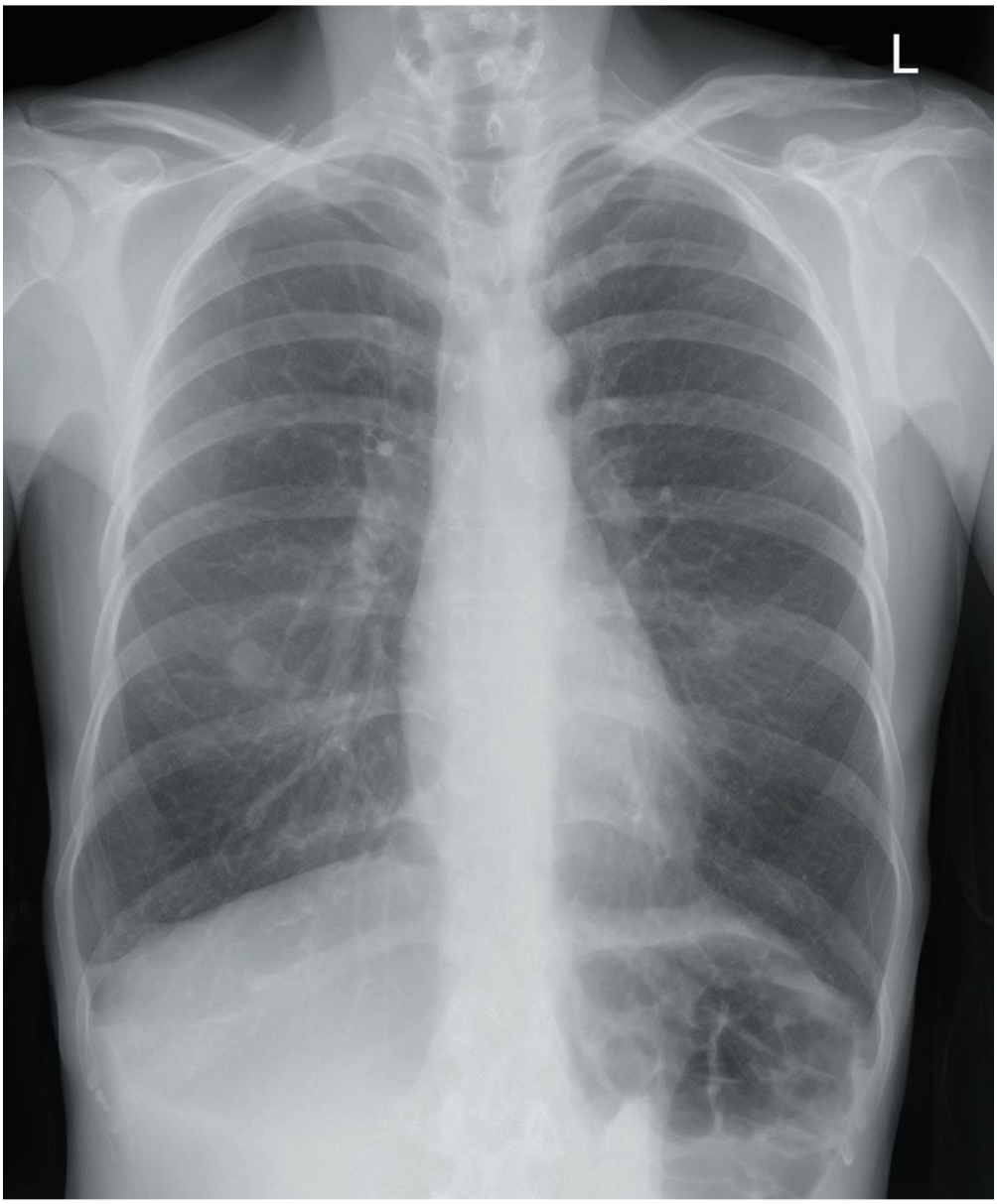


- Severe apical fibrosis and diffuse reticulonodular pattern in both lungs.

Chronic Obstructive Pulmonary Disease (COPD)

Case:

A 60-year-old female presents to her GP for a medical health insurance. She has a 50-pack-year smoking history. On examination, she has saturations of 99% in air and is afebrile. Lungs are resonant throughout, with diminished bilateral air entry. A chest X-ray is requested as part of the health insurance assessment.



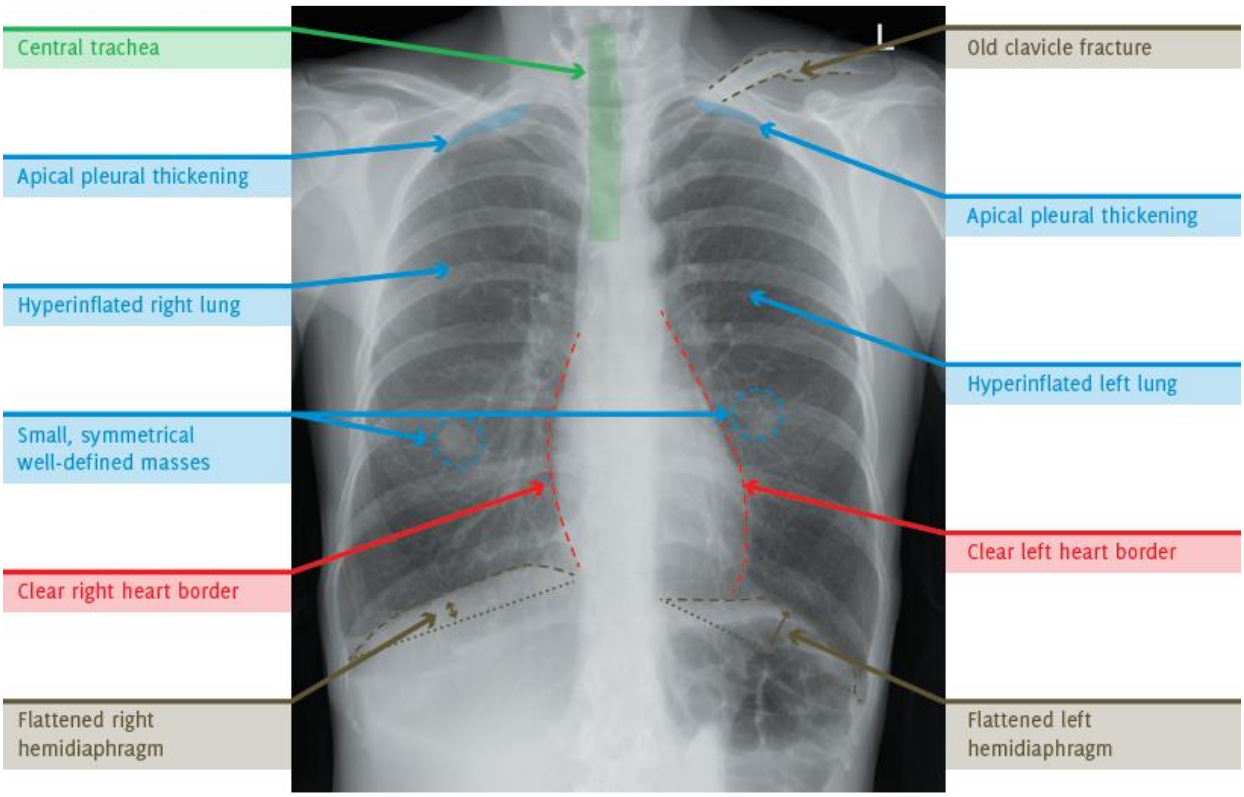
Lung Apices: Bi-apical pleural thickening

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Pleural thickening bilaterally

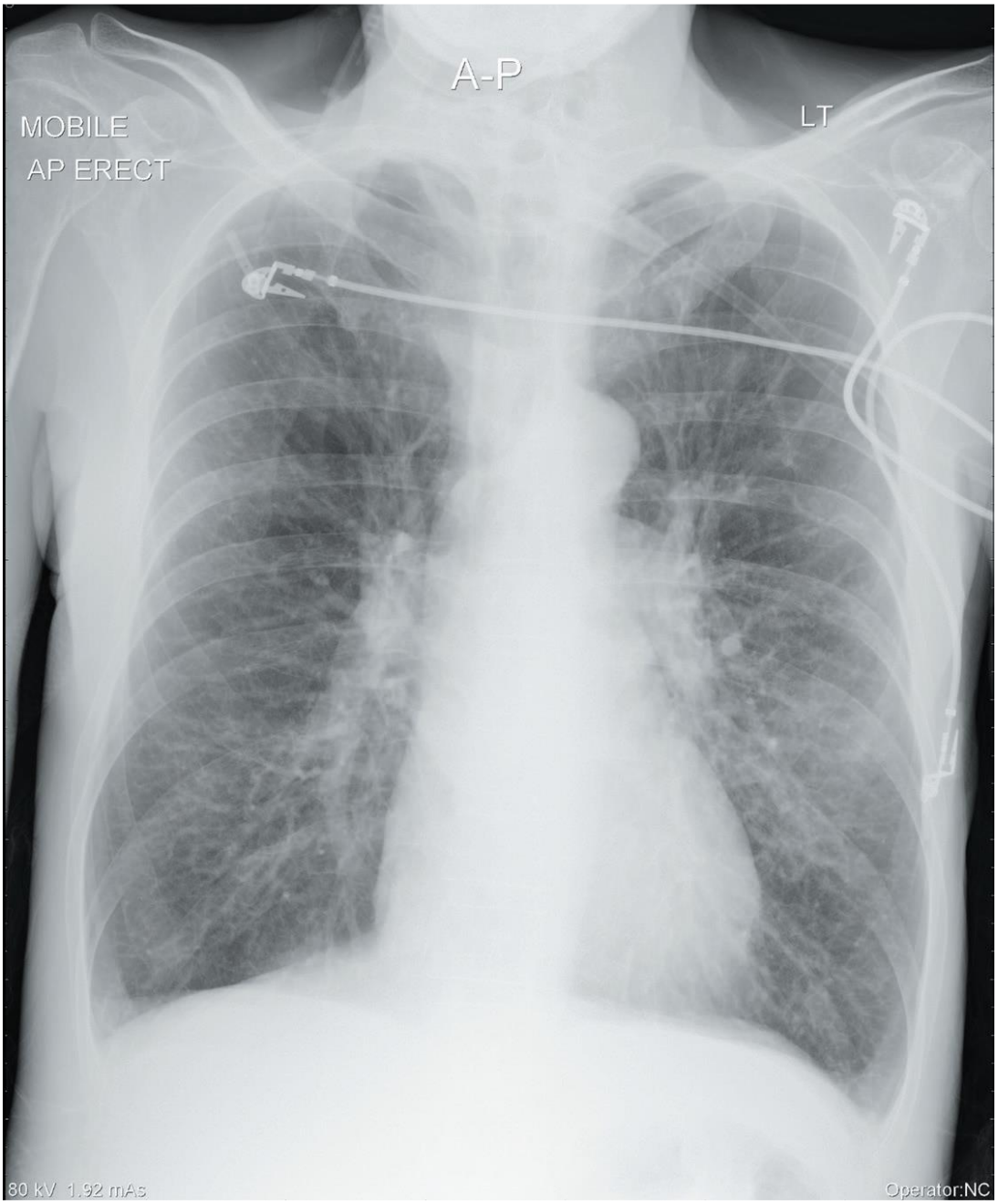
Below the Diaphragm: Normal



- This X-ray demonstrates hyperinflated lungs, in keeping with COPD.

Case:

A 62-year-old male presents to ED with acute-on-chronic shortness of breath. He has a 50-pack-year smoking history. On examination, he has saturations of 86% in air and is afebrile. There are bilateral crackles and wheezing throughout the lungs. A chest X-ray is requested to assess for possible pneumonia, effusion, or pulmonary edema.



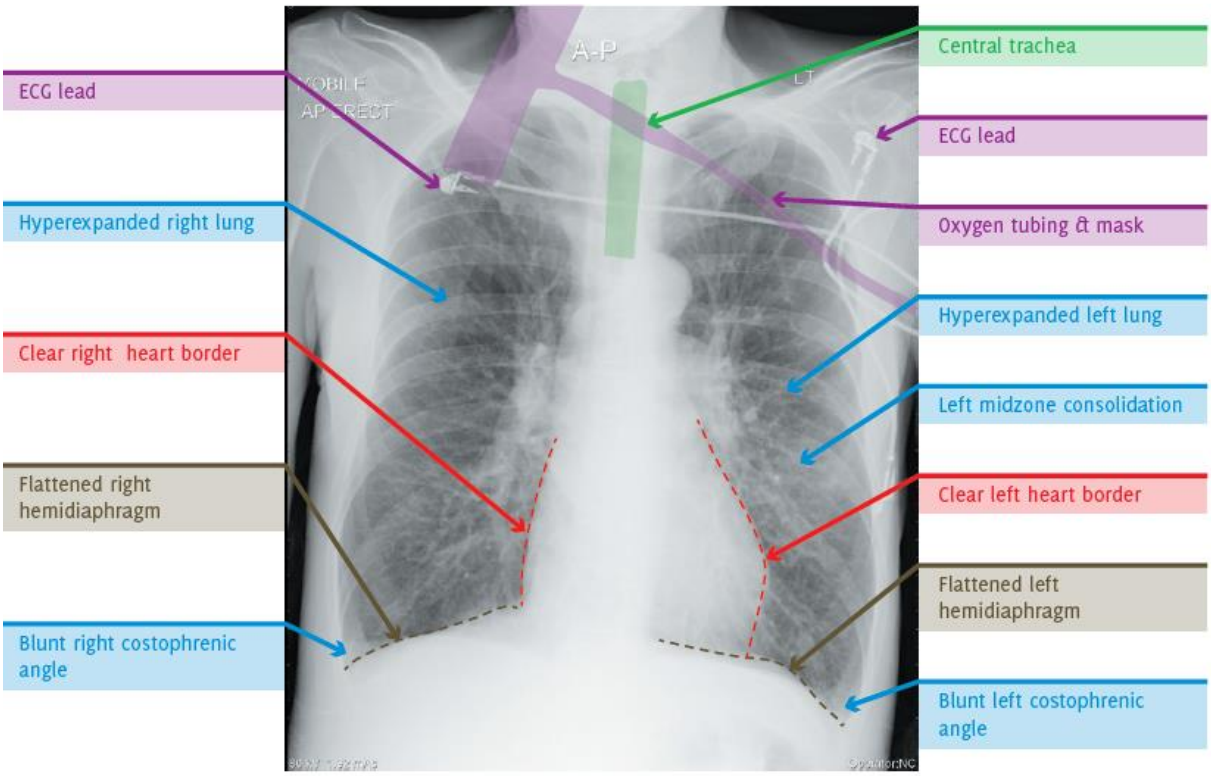
Lung Apices: Normal

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Bilateral blunting

Below the Diaphragm: Normal

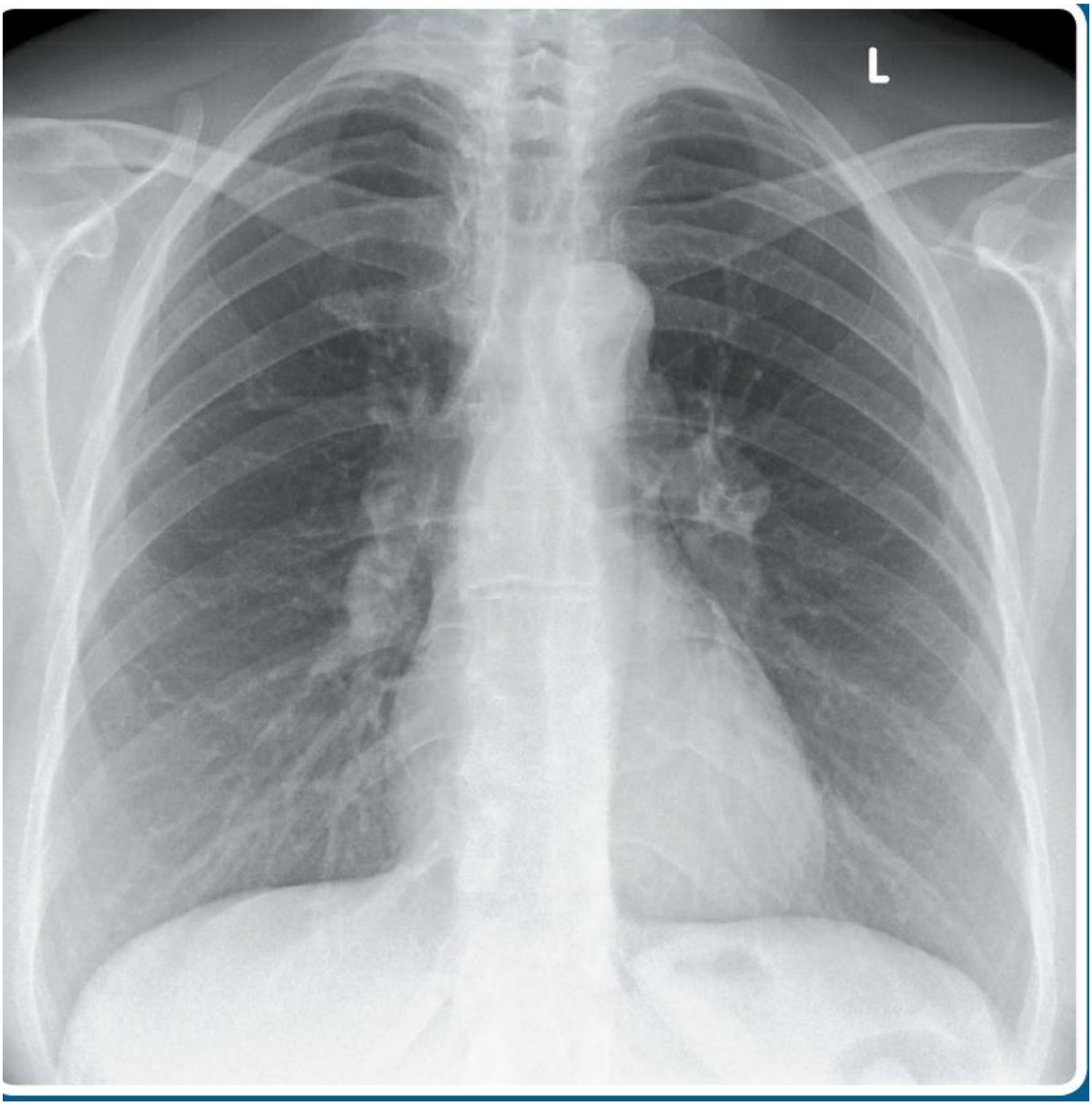


- This X-ray demonstrates generalized increased bronchovascular markings associated with hyperinflated lungs, consistent with COPD.
- Increased left midzone opacification is in keeping with consolidation.
- The blunted costophrenic angles may represent small effusions or pleural thickening.
- This is likely to be an infective exacerbation of COPD.

Sarcoidosis

Case:

A 28-year-old female presents to her GP feeling lethargic, breathless, and with a dry cough. On examination, she is afebrile. Lungs are resonant throughout, with good air entry bilaterally. She has enlarged lymph nodes in her neck. A chest X-ray is requested to assess for possible pneumonia, malignancy or an autoimmune disorder.



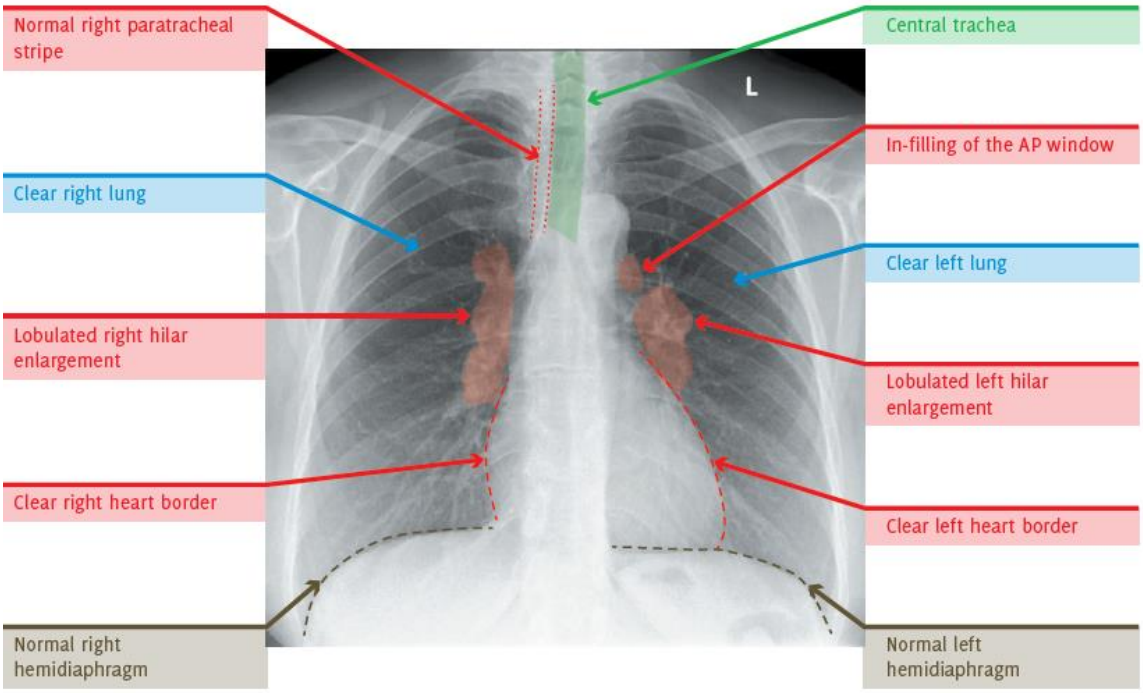
Lung Apices: Normal

Hila: Bilateral hilar and aortopulmonary window lymph nodes

Behind Heart: Normal

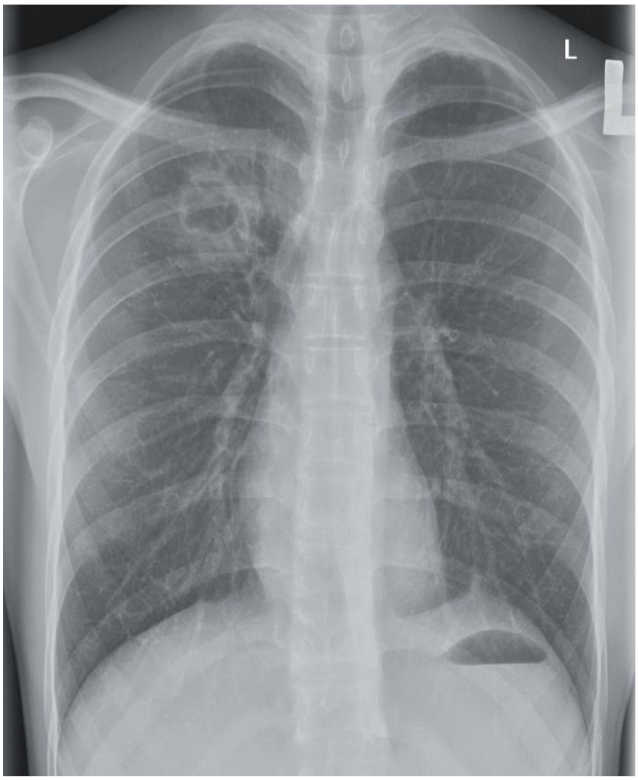
Costophrenic Angles: Normal

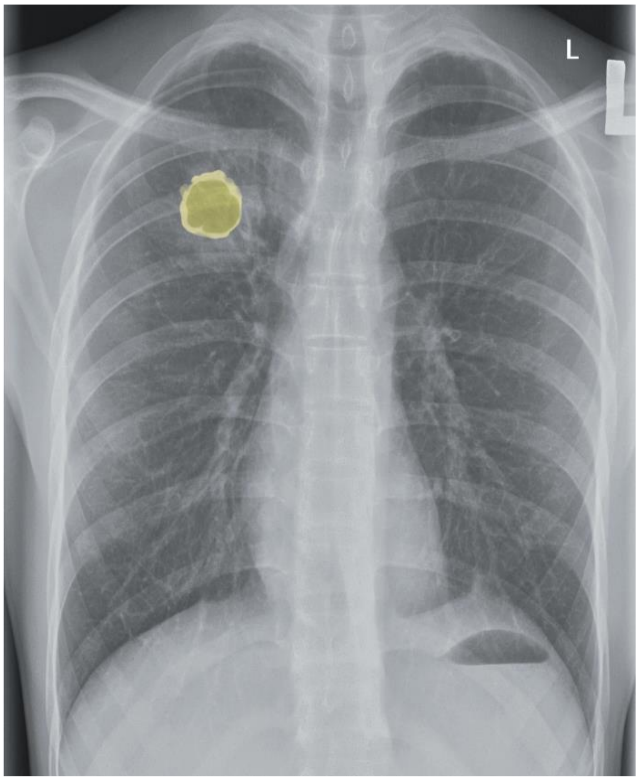
Below the Diaphragm: Normal



- This chest X-ray demonstrates symmetrical hilar lymph node enlargement, with further aortopulmonary window nodes.
- There is no widening of the right paratracheal stripe to indicate paratracheal lymph node enlargement and the lung parenchyma appears normal.
- In the context of the history, the findings are consistent with sarcoidosis (Stage I).
- The symmetrical hilar appearance makes other causes of lymph node enlargement, such as lymphoma and TB, unlikely.

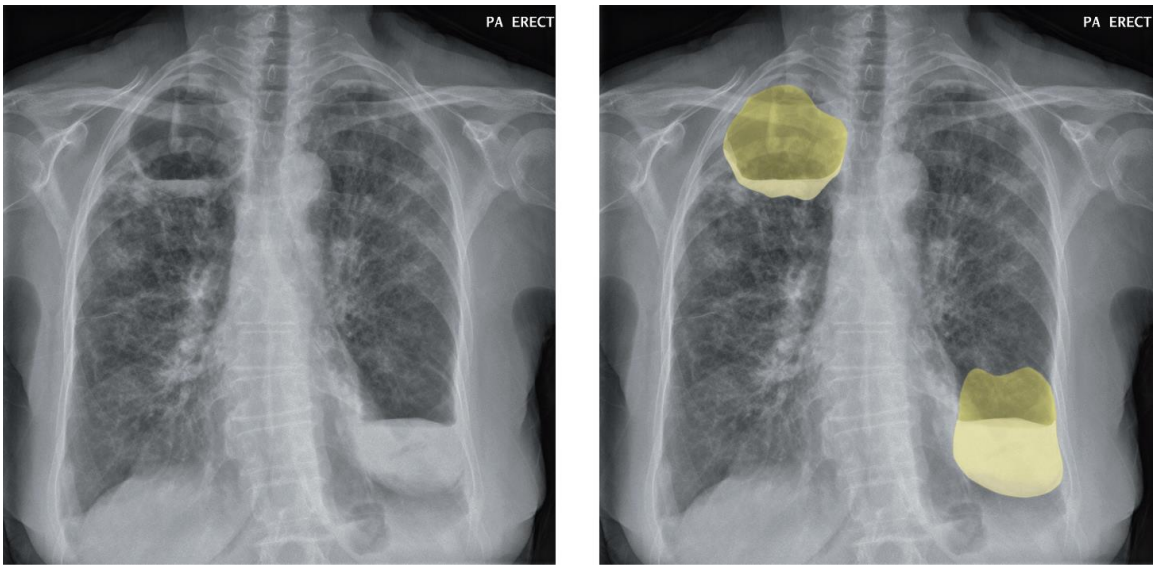
Cavitating Lesions





Two identical chest radiographs showing:

- a cavitating lung lesion in the right upper zone.
- It is likely to be a mass lesion as there are no features of consolidation or fibrosis.
- The right radiograph shows the cavity in yellow. The wall of the cavity is shown in light yellow.

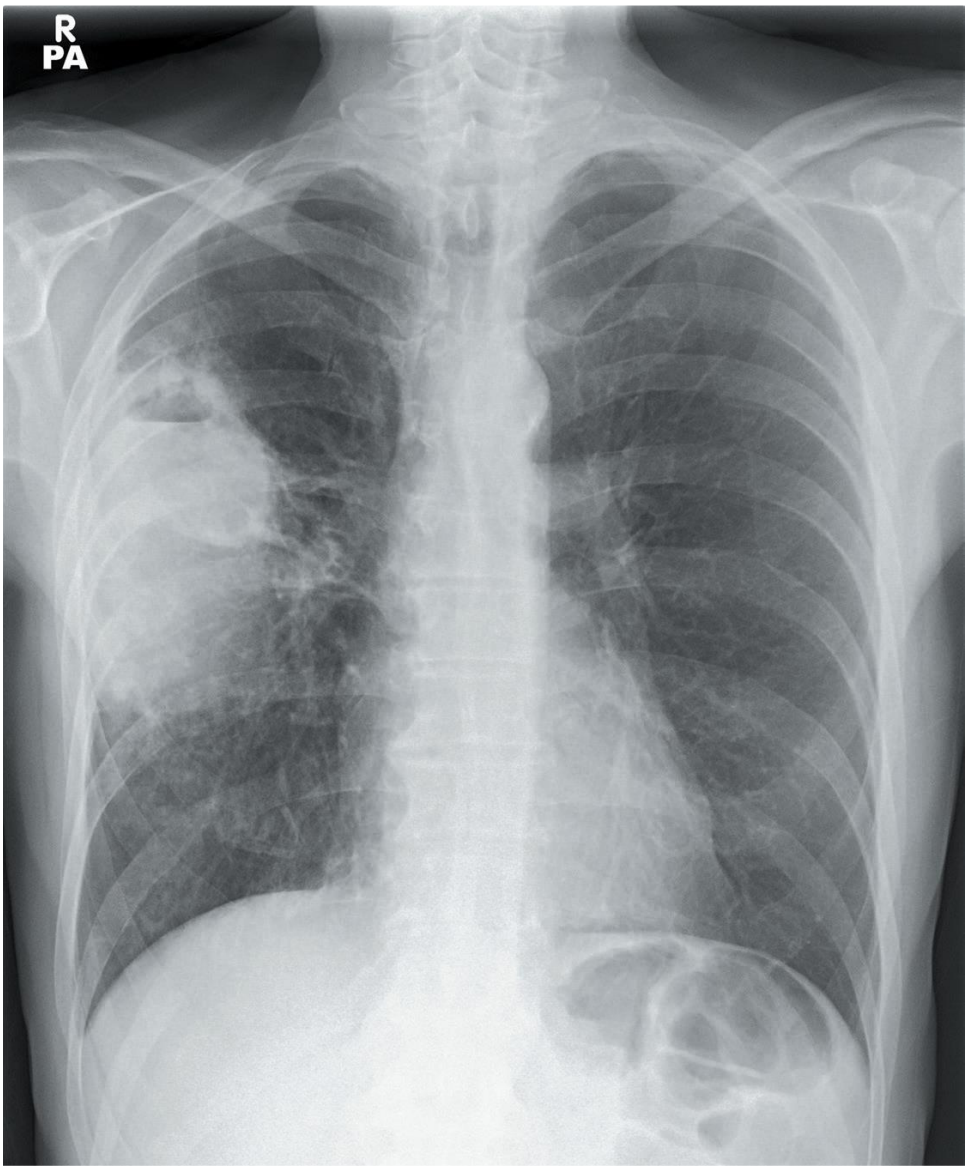


Two identical chest radiographs show:

- two cavitating lung lesions, one in the right upper lobe and the other in the left lower lobe.
- Both cavities are due to bullae, which have become infected. This explains the presence of both air and fluid.
- The right radiograph shows the cavities in yellow. The fluid within the cavities is shown in light yellow.

Case:

A 67-year-old male presents to ED with a productive cough, on a background of 2 weeks of nausea and vomiting. He has a history of dysphagia following a previous stroke. He is a non-smoker. On examination, he has saturations of 85% in air, and is febrile. There is dullness to percussion and coarse crackles in the right upper and mid zones. A chest X-ray is performed to assess for possible pneumonia or collapse.



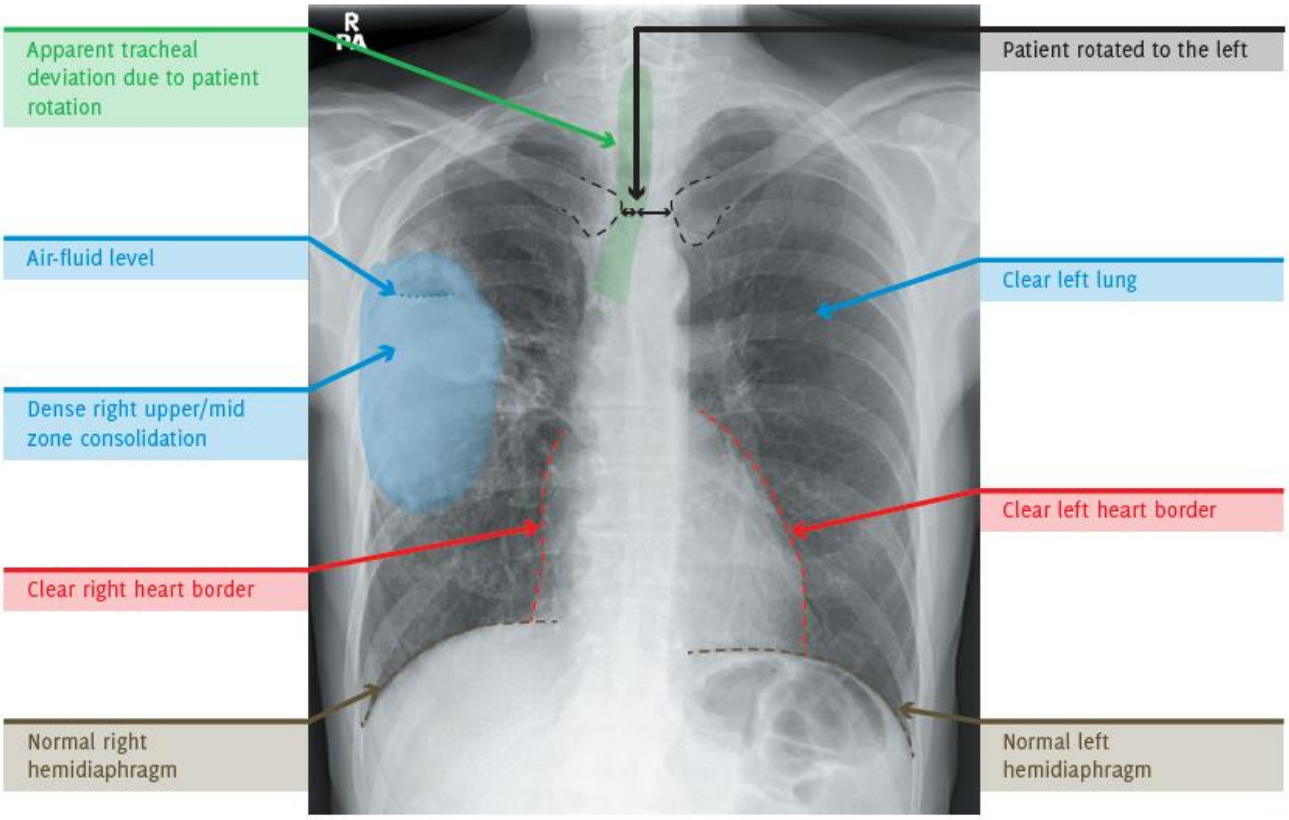
Lung Apices: Normal

Hila: Normal

Behind Heart: Normal

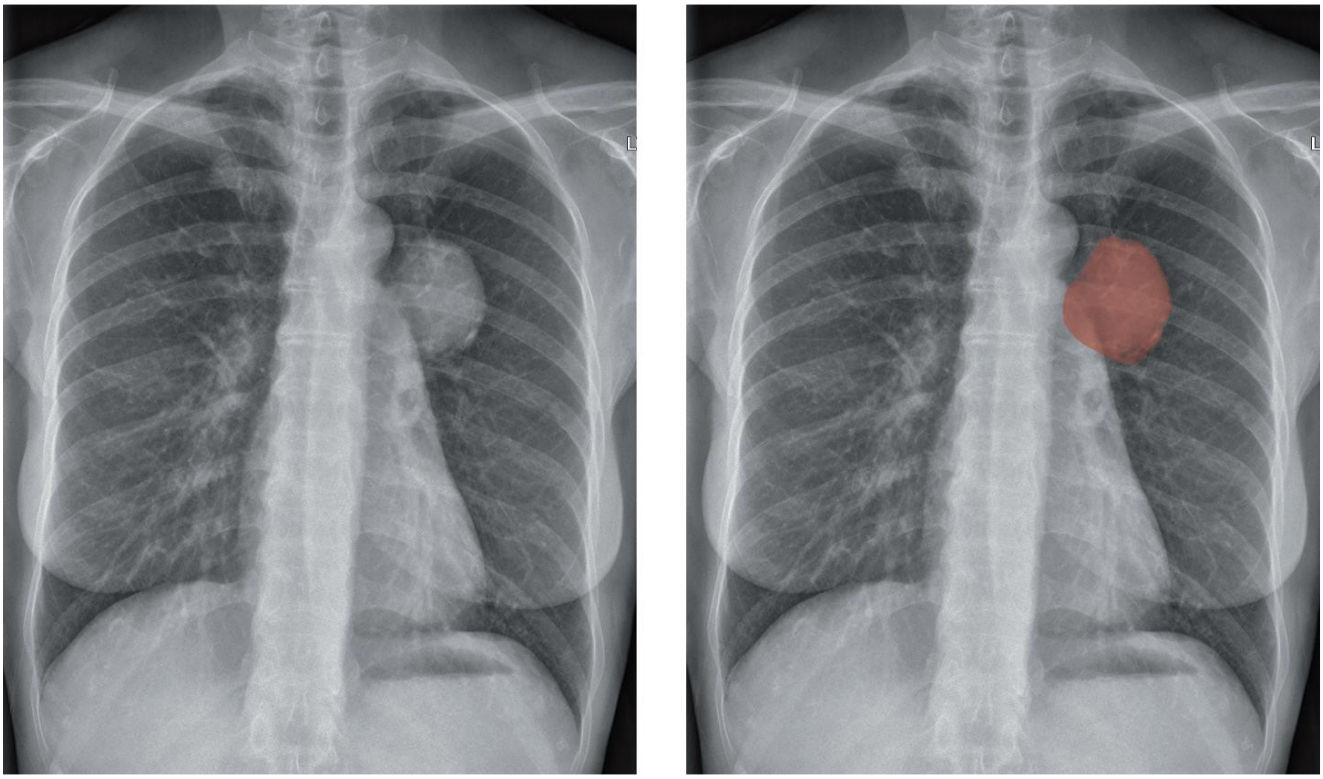
Costophrenic Angles: Normal

Below the Diaphragm: Normal

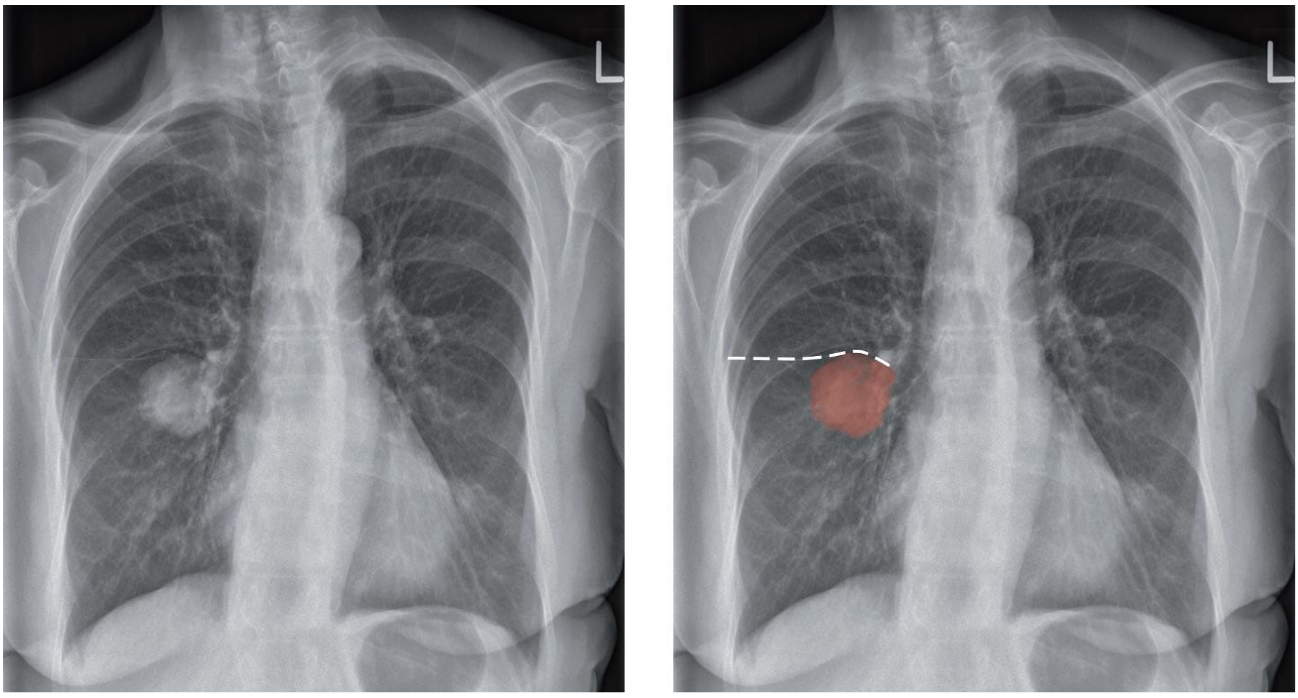


- This X-ray demonstrates consolidation in the right upper and mid-zone consistent with pneumonia.
- The air-fluid level is most likely in keeping with an abscess.

Pulmonary Mass Lesion



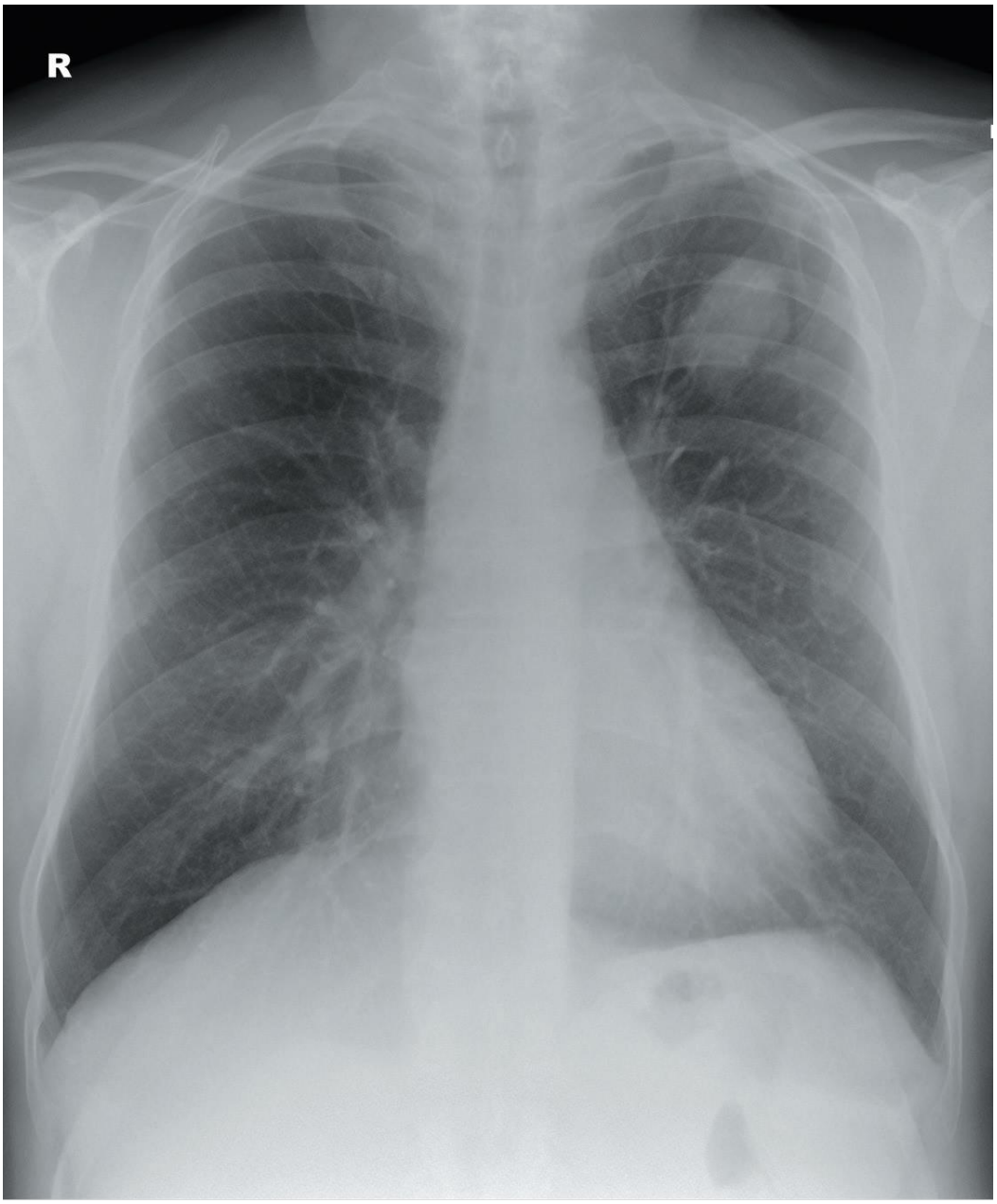
Two identical chest radiographs of a patient with a large mass lesion in the left lung. The right radiograph shows the mass marked in red.



- Two identical chest radiographs of a patient with a large mass lesion in the middle lobe.
- The right radiograph shows the mass marked in red. The white dotted line indicates the position of the horizontal fissure.

Case:

A 68-year-old male presents to pre-operative assessment clinic before a cholecystectomy. He has a 60-pack-year smoking history. Lungs are resonant throughout, with good bilateral air entry. A routine preoperative chest X-ray is requested to assess for any underlying lung pathology.



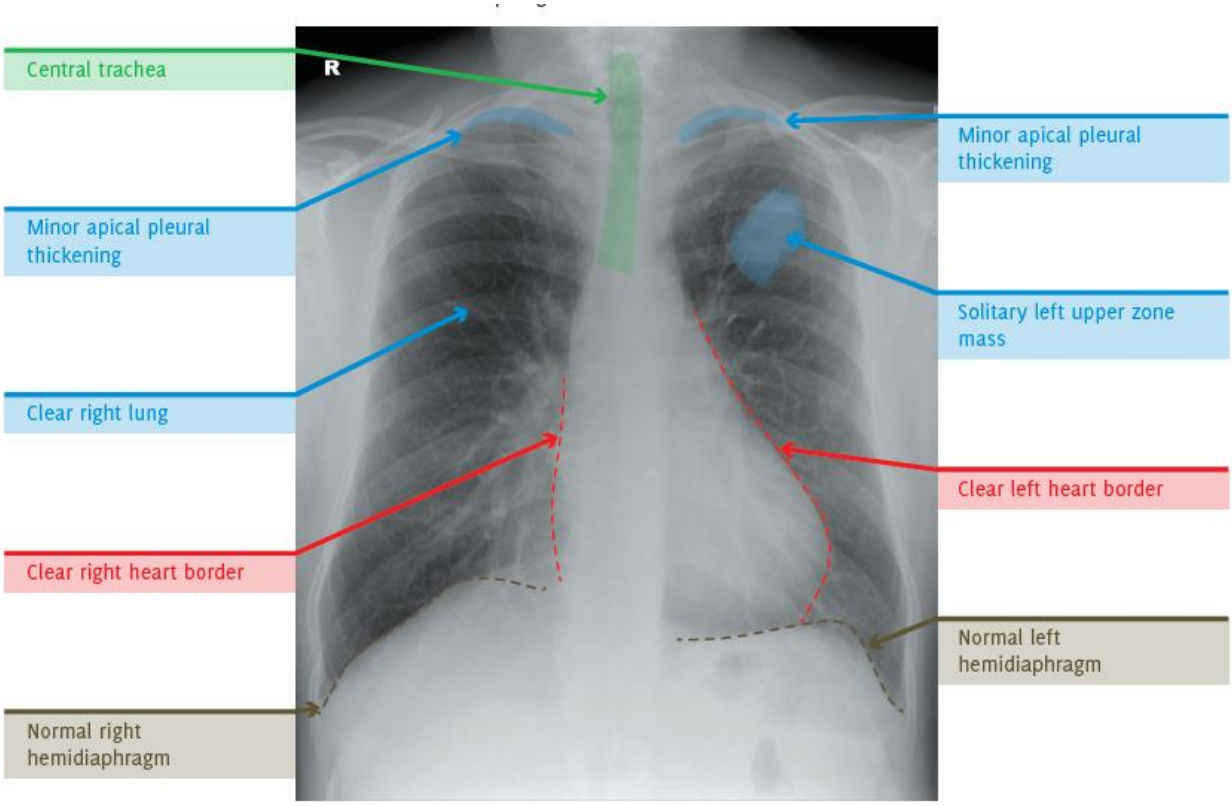
Lung Apices: Mild apical pleural thickening

Hila: Normal

Behind Heart: Normal

Costophrenic Angles: Normal

Below the Diaphragm: Normal



- This X-ray demonstrates a solitary mass in the left upper zone, which is highly suspicious for lung malignancy.