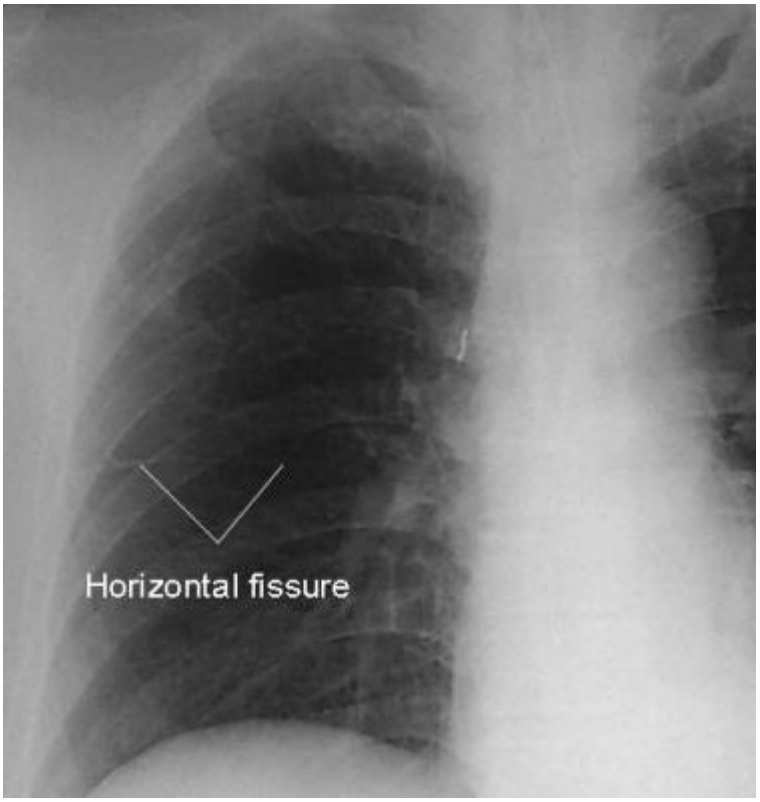
Lungs

Coming BASIC courses:
January: Hong Kong, Perth, Coimbatore
February: Epping, Melbourne, Sydney

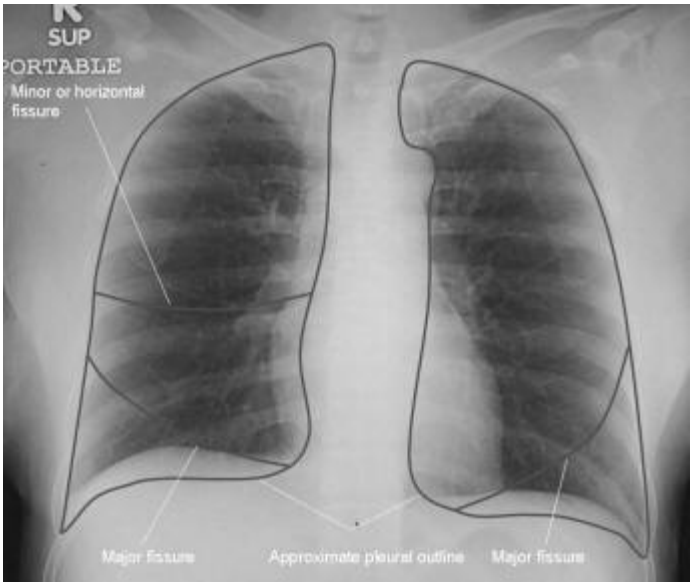
The right lung has 3 lobes: Right upper lobe, middle and lower lobe.

The left lung has 2 lobes: Left upper lobe (the lingula anatomically corresponds to the middle lobe on the right) and lower lobe.

Lobes are separated by fissures - the right major fissure separates the right upper and middle lobes from the right lower lobe. The right minor (horizontal) fissure separates the right upper lobe from the right middle lobe. The left major fissure separates the left upper lobe and lower lobe. Segmental anatomy has little relevance in plain chest radiography.



The position of the various lobes on the frontal CXR is illustrated below.



The figures illustrate the CXR appearance of consolidation of different lobes. Because of the loss of the solid-gas interface the heart borders or diaphragms may be obscured by consolidation of adjacent lobes

Right upper, middle and lower lobe consolidation (from left to right)

Left upper lobe,lingula and left lower lobe consolidation (from left to right)

Pulmonary infiltrates

An infiltrate is the filling of airspaces with fluid (pulmonary oedema), inflammatory exudates (white cells or pus, protein and immunological substances), or cells (malignant cells, red cells or haemorrhage) that fill a region of lung and increase the visual impression of increased soft tissue density.

Atelectasis/collapse

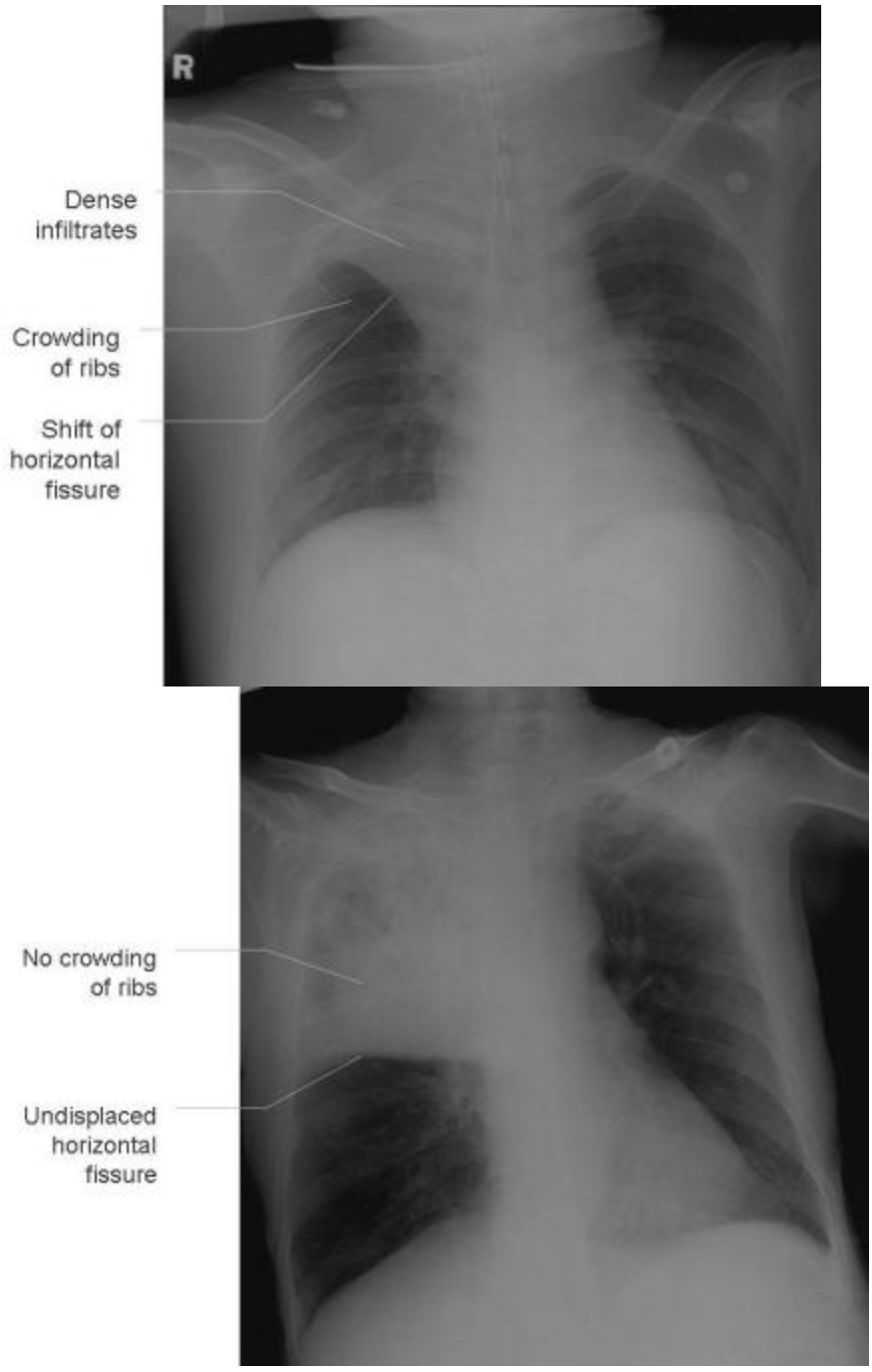
Atelectasis is the collapse of the airspaces which also results in the visual impression of increased soft tissue density. This makes it impossible to distinguish infiltrates from atelectasis on the basis of visual density alone. Considering other factors is therefore required. Atelectasis must have volume loss by definition (collapse of airspaces must reduce lung volume), whereas infiltrate does not.

Atelectasis in ICU patients occurs most frequently in the left lower lobe, probably because the heart in the supine position compresses the lower lobe bronchus. The following signs of atelectasis can be seen:

- Mild atelectasis – usually not clinically important
- Basilar shadowing or linear streaks called subsegmental or “discoid” atelectasis
- Severe atelectasis
  - Opacification of all or a whole lobe or several segments of a lobe, associated with volume loss:
    - crowding of vessels
    - crowding of ribs
    - shift of structures such as interlobar fissures or the hilum towards areas of lung volume loss
    - elevation of the hemidiaphragm
  - Compensatory hyperinflation of adjoining lung may occur.

Major differentiating factors between atelectasis and pneumonia:

Atelectasis/collapse	**Consolidation**
Loss of lung volume Anatomy shifts towards atelectasis Linear, smooth, wedge-shaped Apex of opacity starts at hilum	Normal lung volume No anatomical shift Consolidation
Air bronchograms can occur in both.	



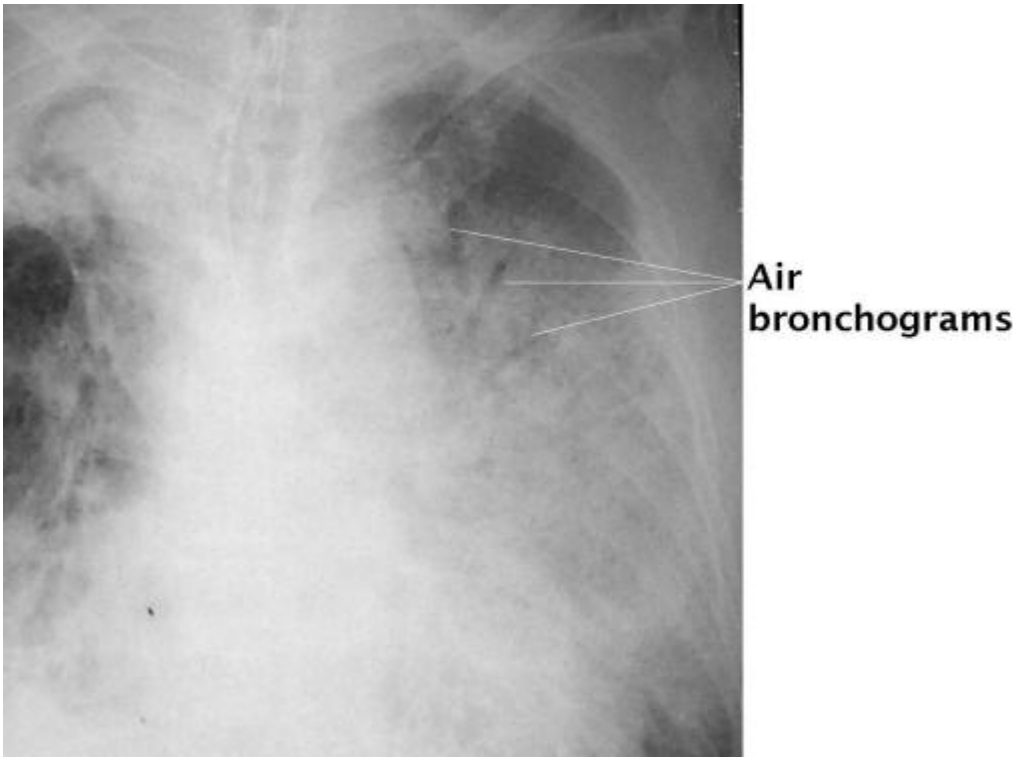
Right upper lobe collapse (left) and consolidation (right)

Pneumonia

- Severe pneumonia is classically manifested by airspace disease and consolidation (alveoli and bronchioles that are completely filled with bacteria or other microorganisms, white cells and inflammatory debris)
- Air bronchograms may occur (air in larger bronchi, outlined by consolidated

surrounding parenchyma)

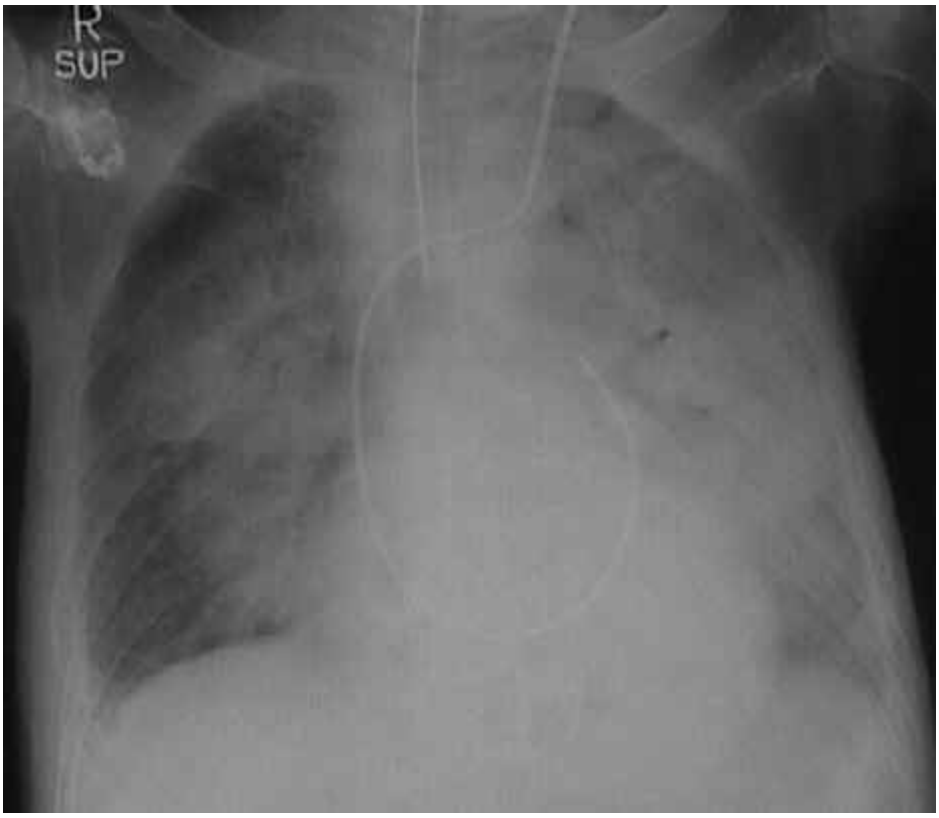
- Other radiographic features include:
  - interstitial infiltrates that may be the only manifestation or may coexist with consolidative changes.
  - ± associated parapneumonic effusion
- Radioopaque masses, such as tumours can be difficult to distinguish from patches of consolidation, but are generally more well-defined.
- In aspiration pneumonia the lobes affected are dependent of the gravitational flow of aspirated contents:
  - erect patients: right lower lobe
  - supine patients: posterior segment of upper lobe and superior segment of lower lobe
- Upper lobe pathology should always lead to the consideration of tuberculosis (TB) as a possibility.
- Pneumonia may be complicated by cavitation or destruction of the lung tissue, creating abscesses.



Acute Respiratory Distress Syndrome (ARDS)

ARDS is an acute response to systemic inflammation. It is difficult to distinguish from cardiogenic pulmonary oedema or pneumonia. While cardiogenic pulmonary edema typically begins centrally in the bilateral perihilar areas, ARDS usually causes more uniform opacification. Pleural effusions are not typical of ARDS but often present in

CHF. Kerley B lines are common in CHF but not in ARDS, while air bronchograms can be found in both. The distinction from pneumonia is on the basis of non-radiological investigations.



Acute respiratory distress syndrome. The patient is intubated and has a pulmonary artery catheter in situ

Pulmonary oedema

Pulmonary oedema is transudate fluid collecting in the lung tissue. Three mechanisms lead to pulmonary edema. These are:
1. Increased hydrostatic gradient
2. Diminished oncotic pressure
3. Increased capillary permeability due to endothelial injury

Any one or more often a combination of these mechanisms will cause fluid to enter the alveolar space.

When the capacity of the the lymphatic system is overwhelmed, interstitial oedema results. The classic Kerley lines are made by the thickening of the interlobular septa that carry the lymphatics (Kerley B lines are short thin lines, 1.5 to 2cm in length, seen in the periphery of the lower lung, extending to the pleura). As fluid continues to accumulate, it leaks into the pleural space resulting in pleural effusions and into the alveolar spaces causing the classic alveolar pattern of pareynchymal pulmonary

edema.

Congestive heart failure is the most common cause of acute pulmonary oedema, and has additional features to the above because of the mechanism of causation that is primarily the increased hydrostatic gradient. It is often associated with cardiomegaly – difficult to determine on an AP film. Better indications are that the upper lobe blood vessels become more prominent due to vascular congestion (upper lobe blood diversion). The interstitial edema that results from transudation of fluid also affects the interstitium around the vessels and causes an apparent increase in diameter, causing an elevated arteriole to bronchiole ratio. Transudation fluid may also outline the bronchi that run with the vessels, causing peribronchial cuffing.

Note causes of non-cardiogenic pulmonary oedema include aspiration, transfusion reaction, neurogenic, ARDS, renal or hepatic disorders, inhalation of toxins, allergic alveolitis.

Note: A hallmark of pulmonary oedema is it's ability to clear rapidly – within hours. This may help to distinguish it from pneumonia, ARDS or haemorrhage.

Pulmonary haemorrhage

Presents radiographically like any other alveolar infiltrate (pneumonia, edema). Pulmonary hemorrhage is often resolves more quickly than other alveolar densities such as pneumonia, but not as quickly as improving pulmonary oedema.

Lung Anatomy

Introduction

If you are learning patterns of collapse and consolidation you must learn the lobar anatomy and fissures of the lung first. One of the difficulties with learning lobar anatomy is that the descriptive terms (upper, middle and lower) are very approximate to the point of being misleading. Consider the size and shape of the right lower lobe shown below. It could have been justifiably named the posterior lobe rather than the lower lobe!

Right Lung

The right lung has 3 lobes and two fissures

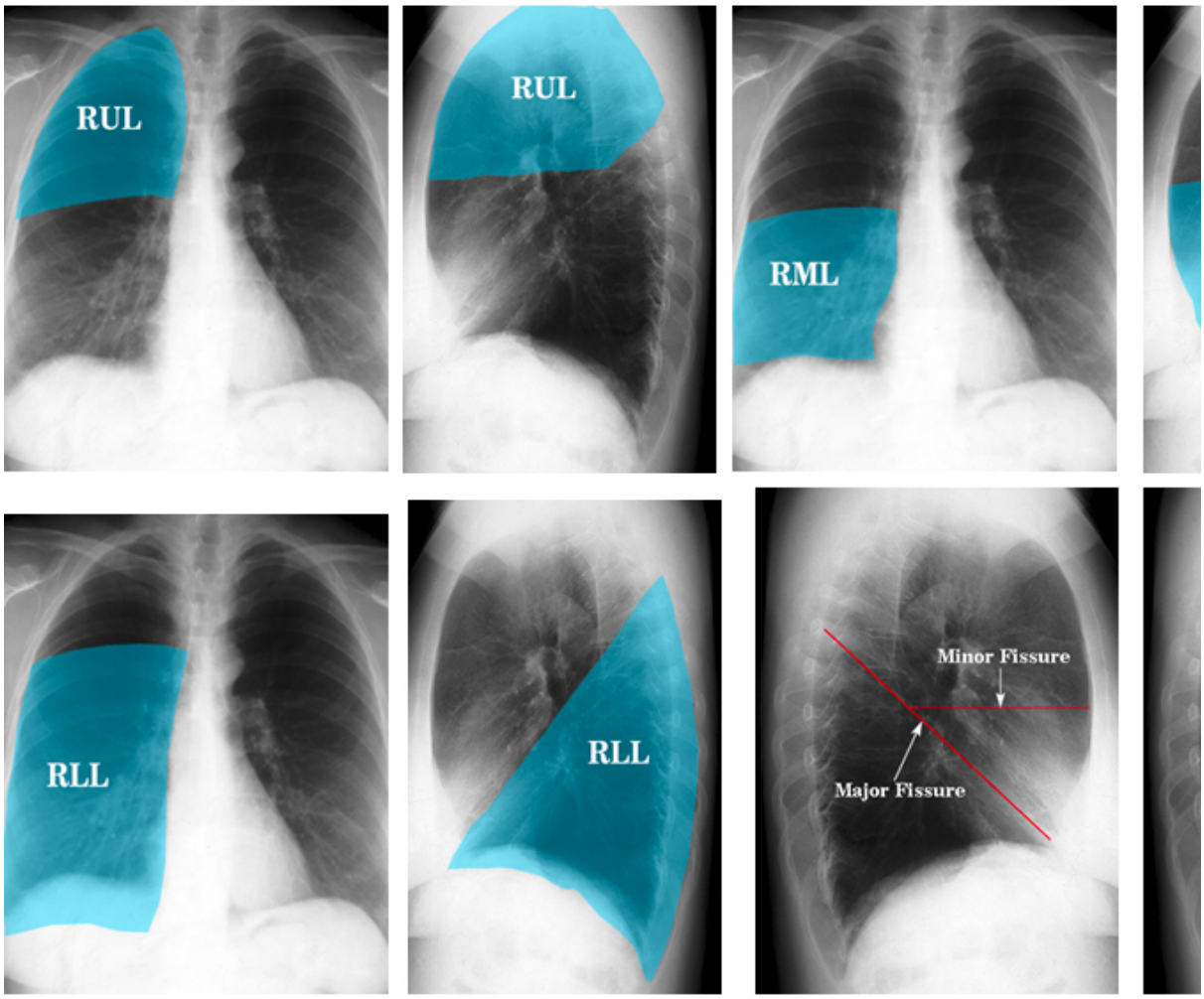
Lobes

- Right Upper Lobe (RUL)
- Right Middle Lobe (RML)
- Right Lower Lobe (RLL)

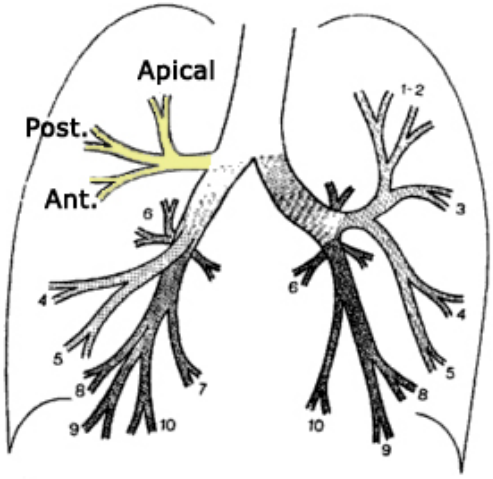
Fissures

- Major Fissure (aka oblique fissure)
- minor fissure (horizontal fissure)

The lobes of the lung are further divided into segments. If you are a high achiever, you could learn the segments of the lobes. This can be useful when interpreting consolidation patterns on plain film chest X-ray images- involvement of different segments of a lobe will produce different patterns of consolidation.



The Right Upper Lobe



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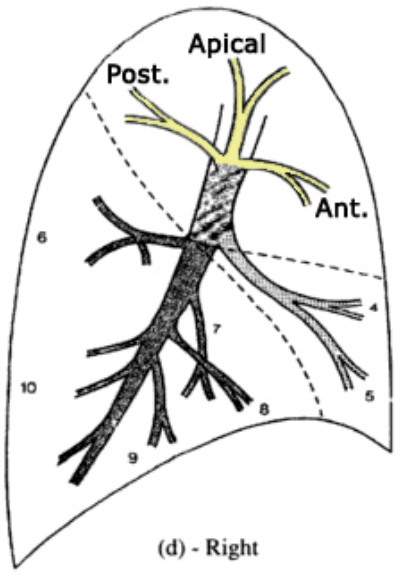
The RUL is comprised of three segments: apical, posterior, and anterior



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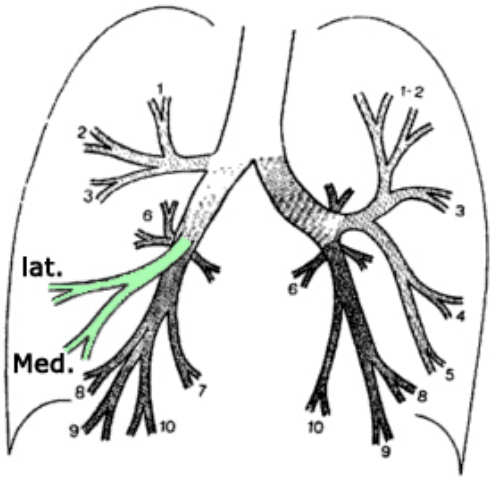
The Right Middle Lobe



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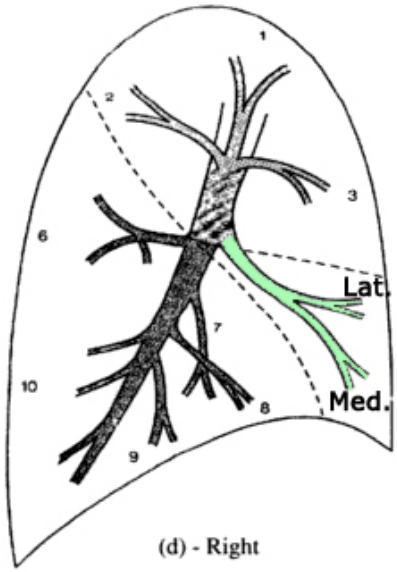
The right middle lobe has two pulmonary segments which are situated side by side; the more lateral segment, approximates the size of its adjacent neighbor (medial segment). The medial segment abuts the right heart border medially , while lateral segment extends to and comprises a portion of the lateral border of the right lung. http://lib.cpums.edu.cn/jiepou/tupu/atlas/www.vh.org/adult/provider/radiology/LungAnatomy/RightLung/RtLungSegAnat.html.

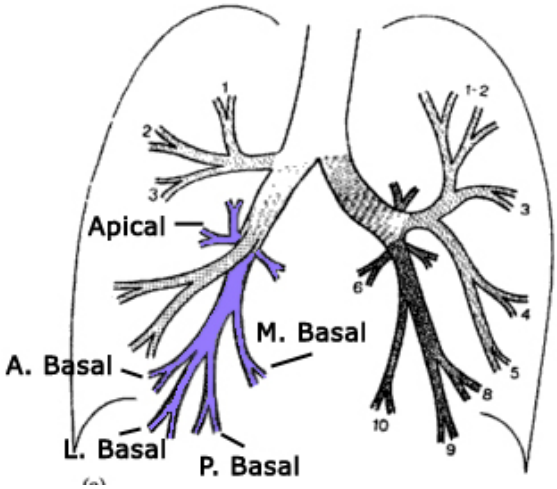
When viewing chest radiographs with pathology involving the right middle lobe, it is important to think about the shape and position of the RML in three dimensions. This may not be easy at first. Note the description of the lobes is very approximate.



(d) - Right

adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

The Right Lower Lobe



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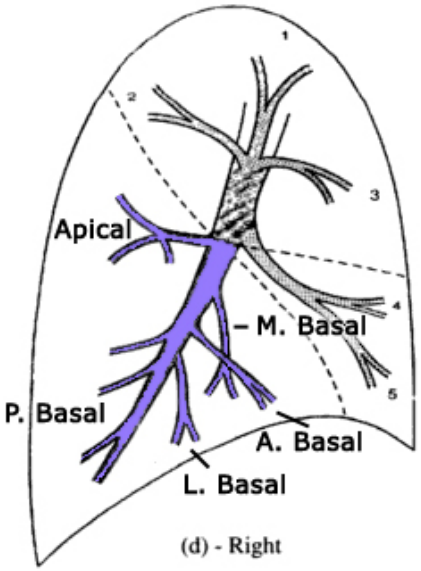
The right lower lobe is comprised of five pulmonary segments. It is a large lobe and will provide varying patterns of consolidation depending on which segments are involved



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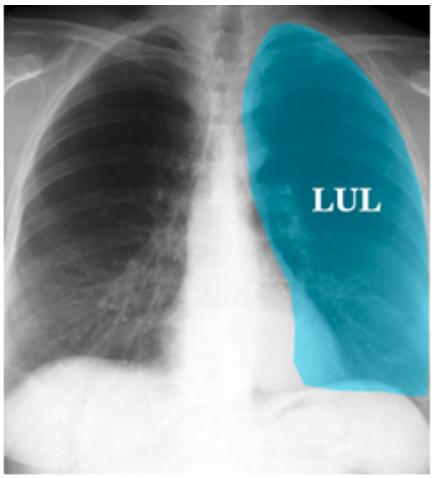
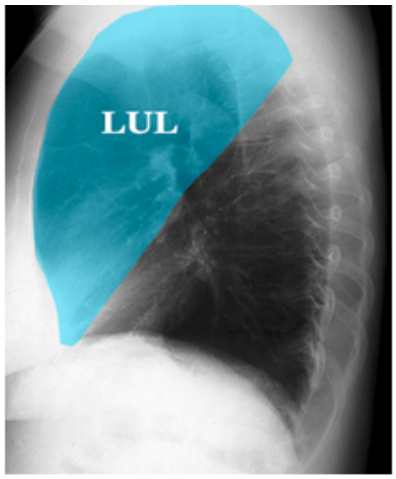
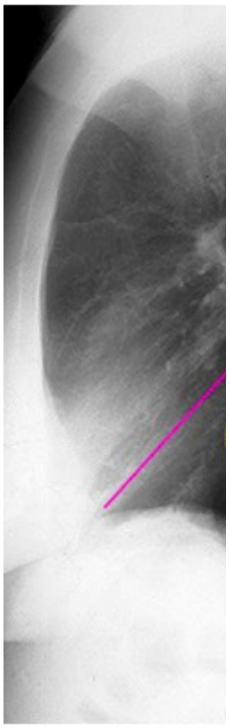
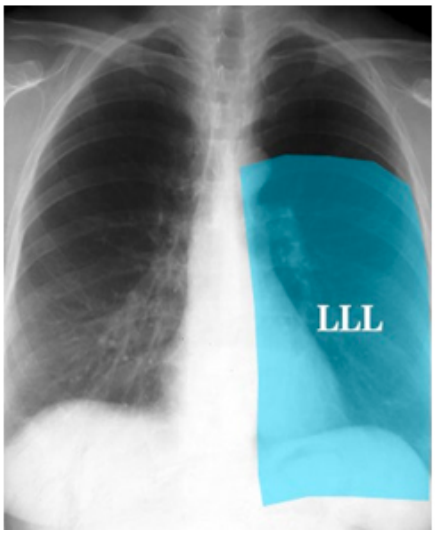
Note that consolidation of the apical segment will not result in loss of the diaphragmatic outline.

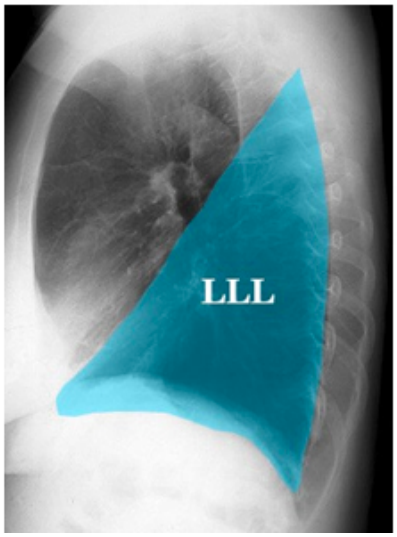
The Left Lung











The left Lung is Comprised of two lobes which are divided by one fissure

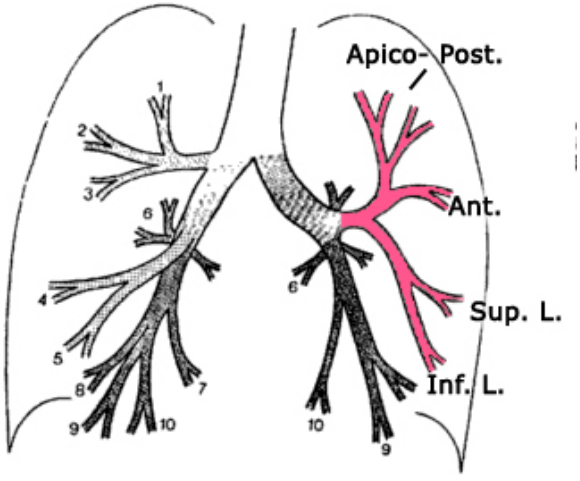
Lobes

Left Upper Lobe (LUL)
Left Lower Lobe (LLL)

Fissures

Major Fissure

The Left Upper Lobe (LUL)

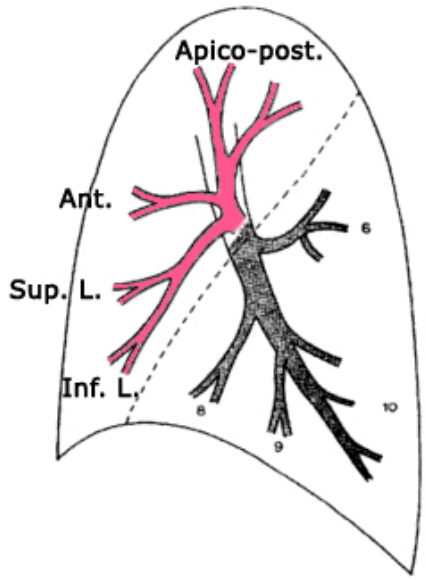


adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together

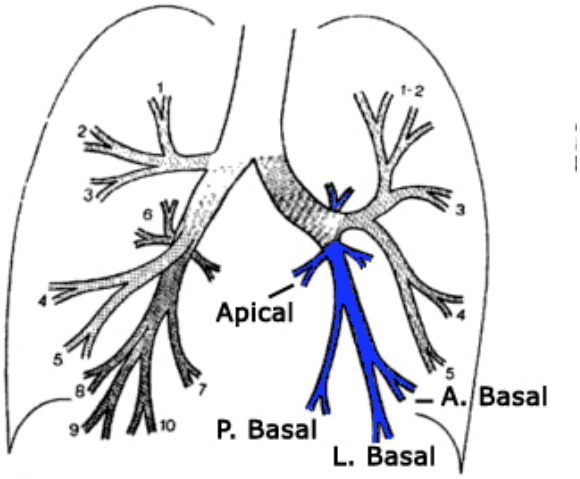
On the left there is no middle lobe; the anatomical equivalent region corresponding to the right middle lobe is known as the lingula, and like the RML, is also composed of two segments. Unlike their counterparts on the right however, the segments are stacked one on top of another, rather than side.

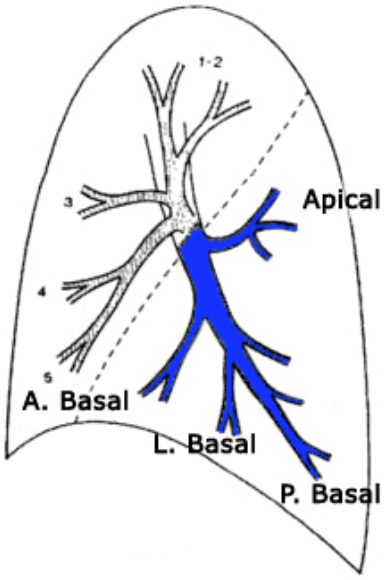
http://lib.cpums.edu.cn/jiepou/tupu/atlas/www.vh.org/adult/provider/radiology/LungAnatomy/RightLung/RtLungSegAnat.html.

Note that upper lobe pathology could appear very low on a chest X-ray

with an Extensive Illustrative Collection of Radiographs CRC Press, 2002	image. The upper lobe is the anterior lobe as much as it is the upper lobe.
 adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002	

The Left Lower Lobe

 adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002	



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Why is the Horizontal Fissure not always Seen on PA/AP Chest Images?

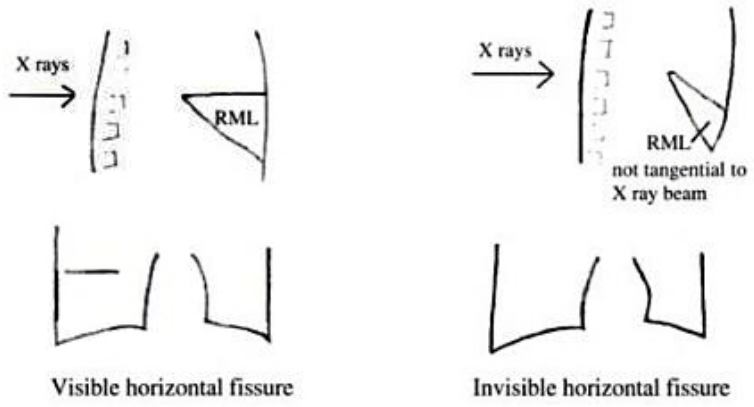


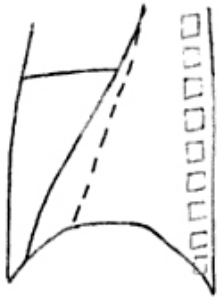
Fig. 1.2 The visibility of the horizontal (or lesser) fissure on frontal radiographs depends on how tangential the fissure is to the x-ray beam.

By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

There are probably three commmon relevant factors. The first is that there is variability in the orientation of the horizontal fissure between individuals. Of particular relevance is the variability of the hporizontal fissures *horizontalness*. Secondly, and possibly more importantly, patients are not always perfectly erect for PA/AP chest radiography. For example, apart from

	normal random variation in the way patients stand, patients with large protruding stomachs will tend to lean forward for erect PA chest radiography. A third factor is the presence of disease which either pushes or pulls the fissure.

How do you distinguish between the right and Left Oblique Fissures on a Lateral Chest Image?

The right oblique fissure usually has a more oblique course than that of the left, probably due to the mass of the heart being on the left. right ---------- left - - - - - - - -  Fig. 1.4 Normal fissures on lateral radiographs. By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002	This graphic is self explanatory

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Patterns of Consolidation

Introduction

For those with an interest in plain film image interpretation, patterns of collapse and consolidation are a very good place to start learning. Plain film chest interpretation is something of a *holy grail* for radiographers. It might appear to be too difficult to contemplate, but as with most seemingly insurmountable tasks, if you take it a step at a time, you will succeed. This page provides an introduction to the topic.

The Meaning of the Term 'Consolidation'

One of the unfortunate aspects of the term *consolidation* is that its meaning can be different depending on who is using the term. When a clinician uses the term consolidation, he/she is usually referring to a consolidation associated with acute pneumonia. Thus, the term consolidation and pneumonia have very similar meaning and are almost used interchangeably. Strictly speaking, the term consolidation does not imply any particular aetiology or pathology. Acute pneumonia is the commonest cause but not the only cause of consolidation. (other causes include chronic pneumonia, pulmonary oedema and neoplasm). Thus when a radiologist has reported a chest X-ray examination and notes the presence of consolidation he/she is simply stating that some of the lung airspace has been replaced by a fluid. Sutton, Textbook of Radiology, 2nd ed.,1975,

This is a basic video that explains consolidation in simple terms

Notes

- The term consolidation, when used by a radiologist, does not imply any particular aetiology or pathology. Acute pneumonia is the commonest cause but not the only cause of consolidation. (other causes include chronic pneumonia, pulmonary oedema and neoplasm)
- Consolidation may be complete or incomplete
- The distribution of the consolidation can vary widely.
- A consolidation could be described as “patchy”, “homogenous”, or generalised”.
- A consolidation may be described as focal or by the lobe or segment of lobe affected

Sutton, Textbook of Radiology, 2nd ed.,1975, p325

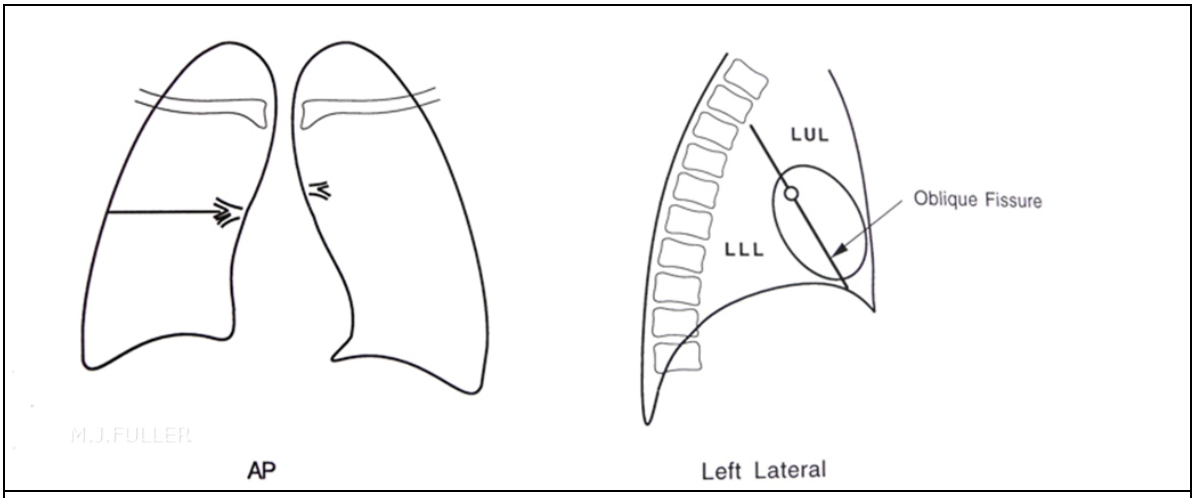
Silhouette Sign

Silhouette sign is possibly the most important sign in localising a consolidation and is similarly important in identifying the presence of lung consolidation. The visibility of the borders of thoracic structures such as the heart and diaphragm is dependent on the presence of adjacent air-filled lung. This is not a tricky or sophisticated concept- airfilled lung adjacent to a soft tissue structure like the heart will result in a sharp, clearly defined border between the two structures. This situation may not occur in the presence of any lung disease which causes the airspaces of the lung to fill with fluid- the heart border adjacent to the diseased lung may become obliterated if there is no adjacent air-filled lung to define it.

Anatomy

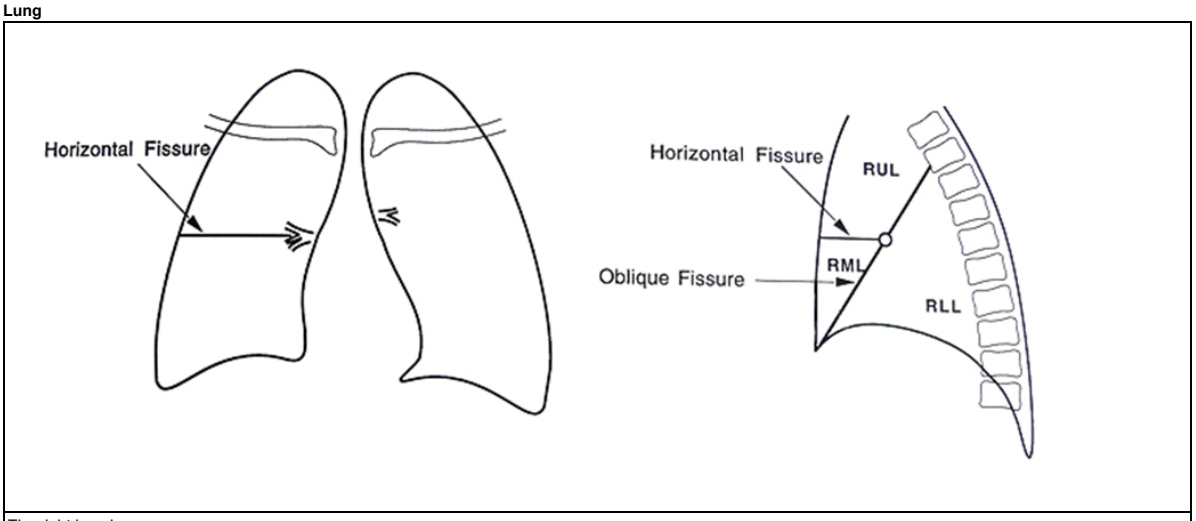
Patterns of collapse and consolidation can definitely not be learned without learning lung anatomy first.

Left Lung



The left lung has
•1 fissure
•2 lobes

Right Lung



The right lung has
•2 fissures
•3 lobes

Plain Film Appearances of Lung Consolidation

Radiological appearances common to all lobes are:

1.Abnormal lung opacity
2.Increase in the size and number of lung markings
3.Loss of clarity of the diaphragm on the AP and/or lateral views
4.Loss of clarity of the heart border on the AP and/or lateral views
5.Air bronchogram lines
6.Loss of the normal darkening inferiorly of the thoracic vertebral bodies on the lateral view
7.Opacification of the lung behind the heart shadow or below the diaphragms

1.Abnormal lung opacity---------->

.

2.Increase in the size and number of lung markings

.

3.Loss of clarity of the diaphragm on the AP and/or lateral views

.

4.Loss of clarity of the heart border on the AP and/or lateral views--------->

.

5.Air bronchogram lines

.

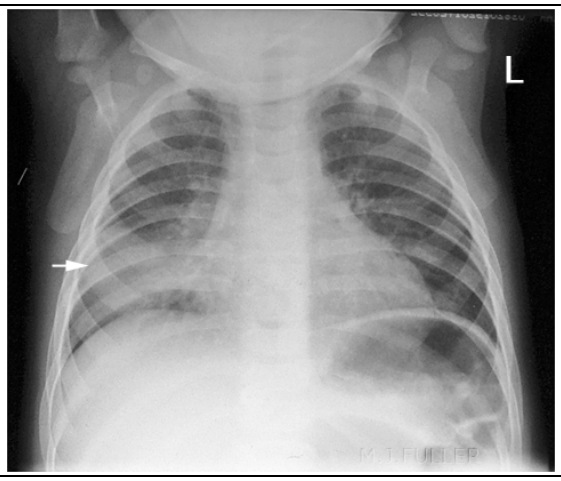
6.Loss of the normal darkening of the thoracic vertebral bodies on the lateral view

.

7.Opacification of the lung behind the heart shadow

Notes

There is abnormal opacity on the right (arrowed). There is also loss of clarity of the right heart border known as ***silhouette sign***.



1.Abnormal lung opacity ---------->

.

2.Increase in the size and number of lung markings

.

3.Loss of clarity of the diaphragm on the AP and/or lateral views----->

.

4.Loss of clarity of the heart border on the AP and/or lateral views

.

5.Air bronchogram lines

.

6.Loss of the normal darkening of the thoracic vertebral bodies on the lateral view ---------->

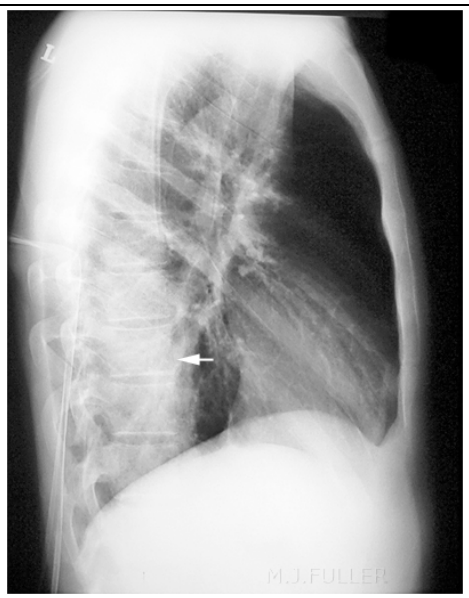
.

7.Opacification of the lung behind the heart shadow

Notes

On a lateral chest X-ray image, the thoracic vertebral bodies should appear to darken evenly as you look down the image. This image shows the vertebral bodies become lighter as you move down the image (arrowed). This is caused by consolidation within the left lower lobe. Note also that the right hemidiaphragm is clearly seen and the left hemidiaphragm is only visualised anteriorly (silhouette sign)

Benjamin Felson (Chest Roentgenology. W.B. Saunders. 1973. p24) notes that "Equal or greater density of the lower vertebal bodies indicates a pathologic process, even if it is otherwise invisible...".



1.Abnormal lung opacity---------->

.

2.Increase in the size and number of lung markings

.

3.Loss of clarity of the diaphragm on the AP and/or lateral views

.

4.Loss of clarity of the heart border on the AP and/or lateral views----->

.

5.Air bronchogram lines---------->

.

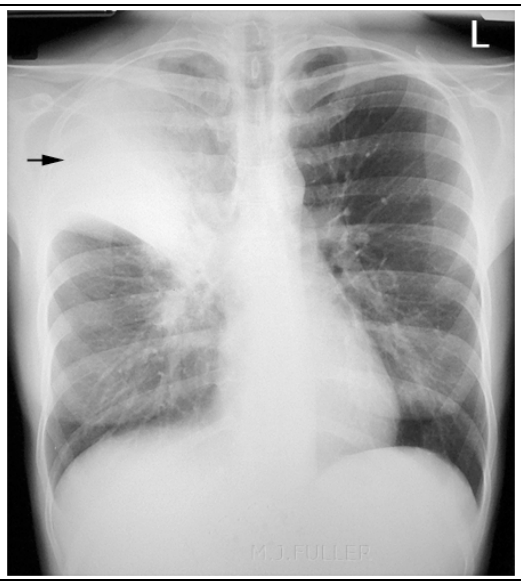
6.Loss of the normal darkening of the thoracic vertebral bodies on the lateral view

.

7.Opacification of the lung behind the heart shadow

Notes

There is a dense opacity within the right upper lobe of the lung (arrowed). There are also **air-bronchogram lines** and the horizontal fissure has been pulled up by partial collapse of the right upper lobe. There is some loss of definition of the upper right heart border (**silhouette sign**).



1.Abnormal lung opacity---------->

.

2.Increase in the size and number of lung markings---------->

.

3.Loss of clarity of the diaphragm on the AP and/or lateral views

.

4.Loss of clarity of the heart border on the AP and/or lateral views----->

.

5.Air bronchogram lines---------->

.

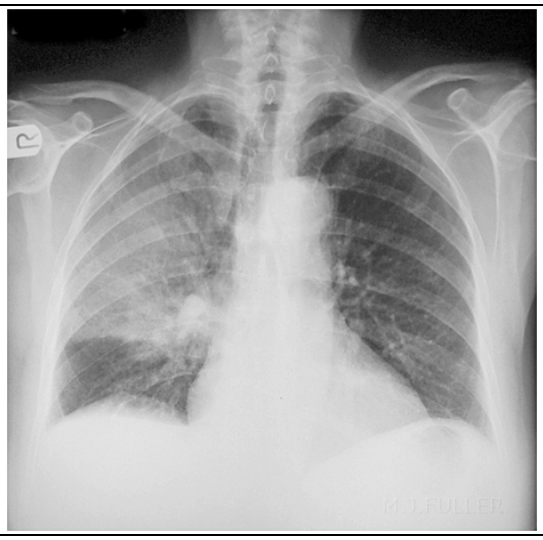
6.Loss of the normal darkening of the thoracic vertebral bodies on the lateral view

.

7.Opacification of the lung behind the heart shadow

Notes

There is abnormal opacity within the right upper lobe. There are **air-bronchogram lines**. There also appears to be an increase in the number of lung markings, particularly in the peri-hilar region of the right.



1.Abnormal lung opacity---------->

.

2.Increase in the size and number of lung markings

.

3.Loss of clarity of the diaphragm on the AP and/or lateral views

.

4.Loss of clarity of the heart border on the AP and/or lateral views

.

5.Air bronchogram lines---------->

.

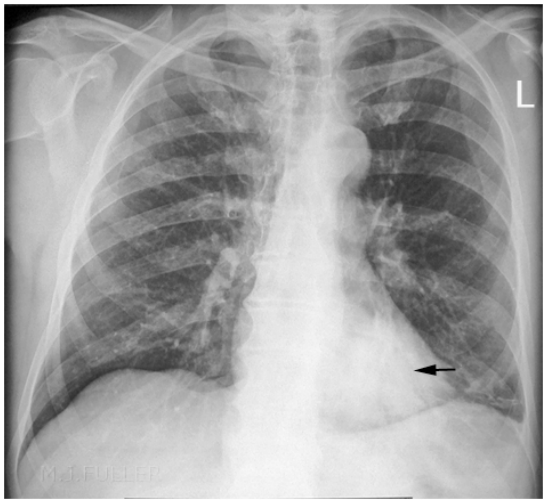
6.Loss of the normal darkening of the thoracic vertebral bodies on the lateral view

.

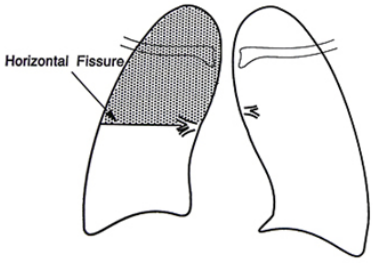
7.Opacification of the lung behind the heart shadow---------->

Notes

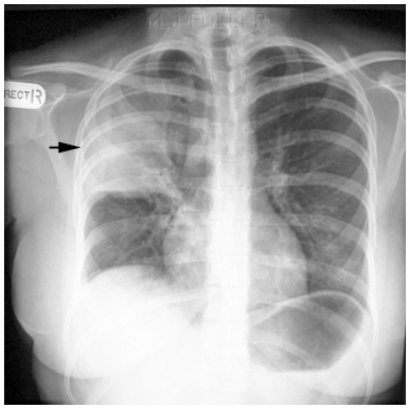
There is abnormal opacity behind the left heart shadow (arrowed). There are also air-bronchogram lines and loss of the left paraspinal stripe



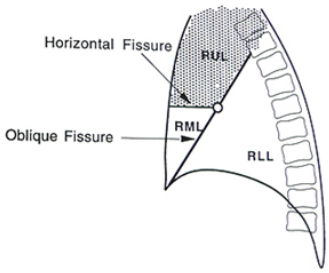
Right Upper Lobe (RUL) Consolidation



RUL consolidation will be seen as an increased opacity within the shaded area.
Opacity may be sharply bordered by the horizontal fissure
Some loss of outline of the upper right heart border may be apparent



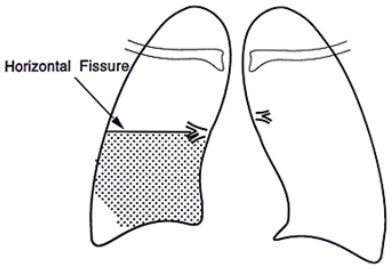
- Dense opacity seen above the horizontal fissure.
- Air-bronchogram line



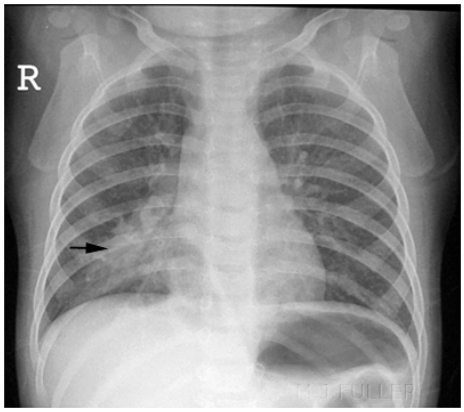
In the lateral view, there will be increased density in the RUL which may be sharply bordered by the horizontal and/or oblique fissure(s).

- Dense opacity in the RUL sharply bordered by the horizontal and oblique fissures

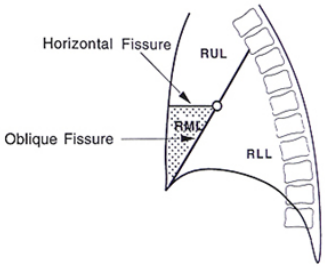
Right Middle Lobe (RML) Consolidation



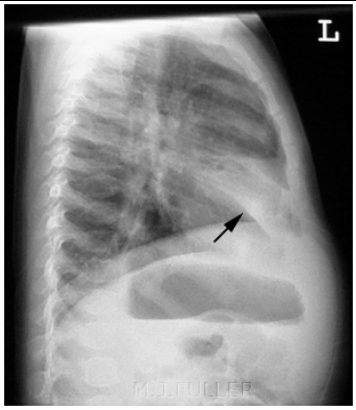
•Seen as an area of increased opacity in the shaded area
•Loss of the definition of the right heart border is often seen



- RML opacification
- Loss of adjacent right heart border

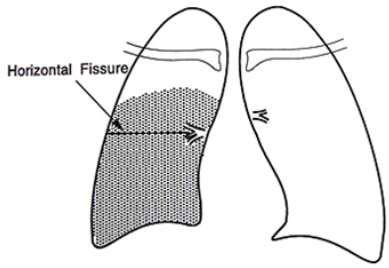


•RML consolidation is characteristically seen as a wedge opacity in the lateral view
•May be sharply bordered by the horizontal and oblique fissures
•(collapse of the lingula segment of the LUL has a similar appearance)

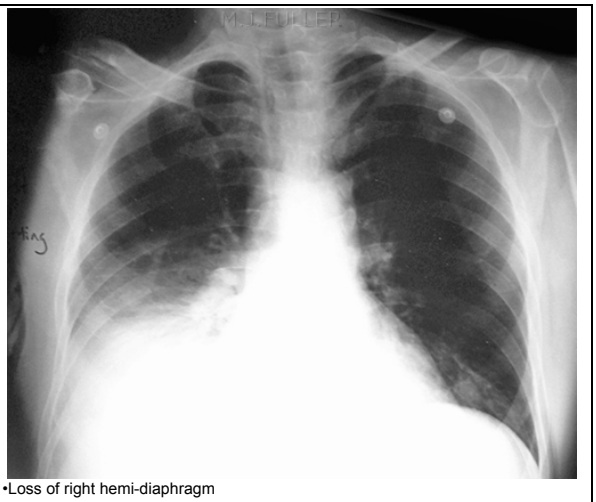


- Wedge shaped opacity characteristic of RML consolidation(black arrow)
- lingula segment consolidation can have a similar appearance on the lateral view
- some RML collapse also present

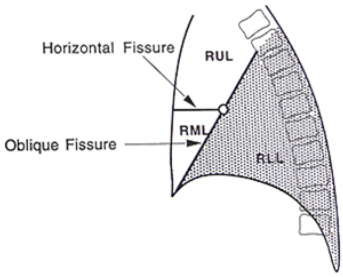
Right Lower Lobe (RLL) Consolidation



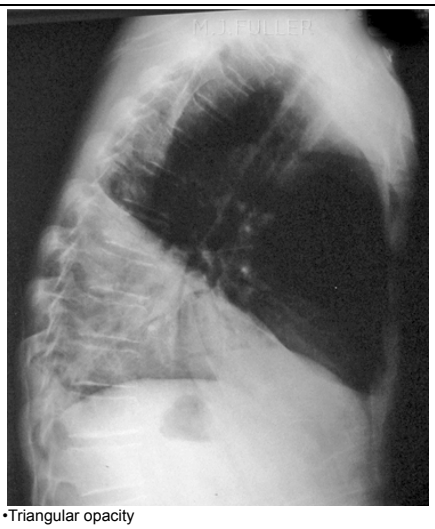
•Appears as an area of increased opacity within the RLL
•Some loss of the hemi-diaphragm is commonly seen



•Loss of right hemi-diaphragm
•Dense opacity in RLL
•Some loss of right heart border

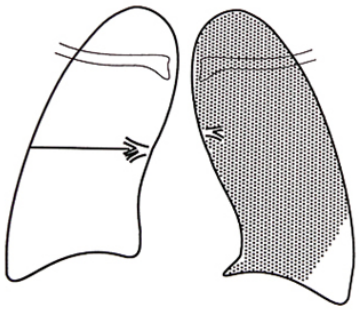


•Increased opacity within the RLL
•Commonly seen with loss of the right hemi-diaphragm

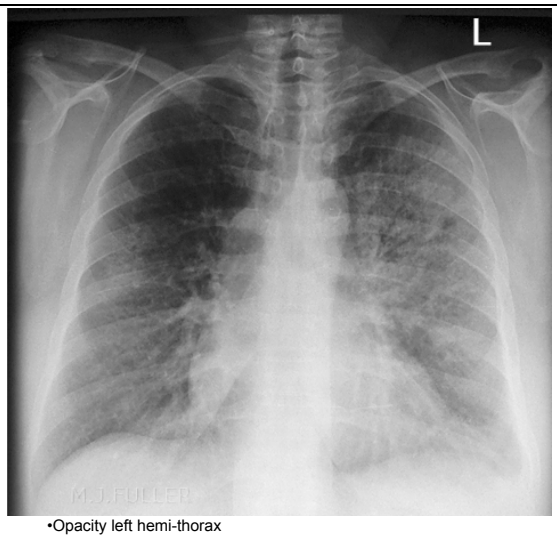


•Triangular opacity
•Loss of right hemi-diaphragm

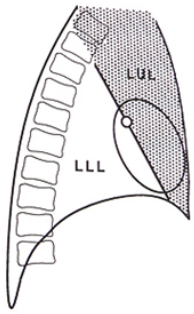
Left Upper Lobe (LUL) Consolidation



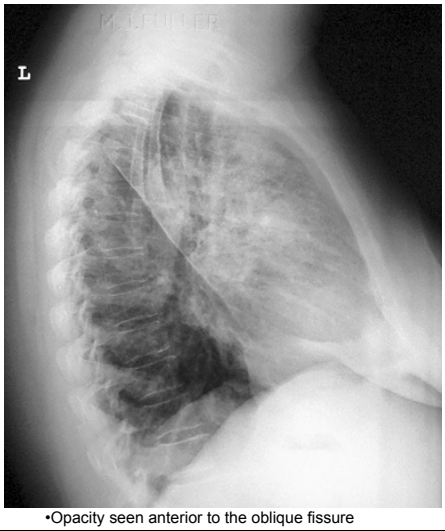
•Appears as an area of increased opacity within the LUL
•Characteristically not a dense opacity on the PA view
•Often loss of the upper mediastinal contour



•Opacity left hemi-thorax
•Air-bronchogram lines
•Some loss of left heart border

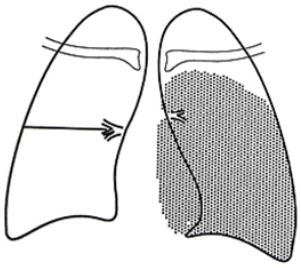


•Can be sharply bordered by the oblique fissure
•Does not involve the diaphragm

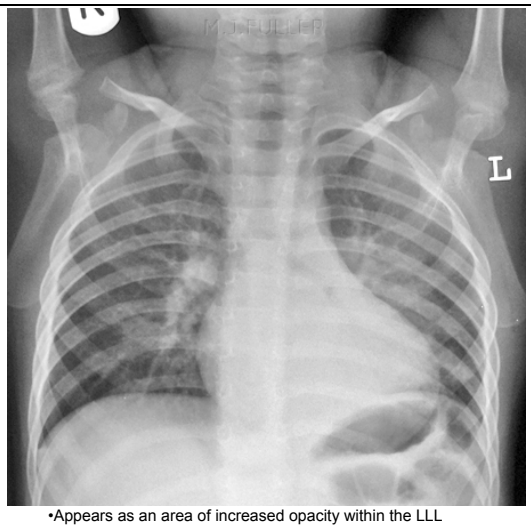


•Opacity seen anterior to the oblique fissure

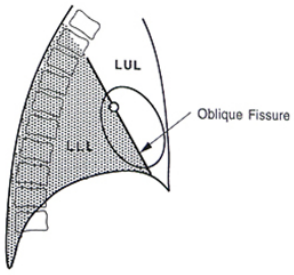
Left Lower Lobe (LLL) Consolidation



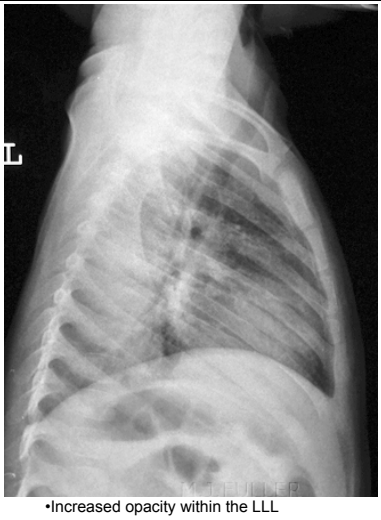
•Appears as an area of increased opacity within the LLL
•Some loss of the hemi-diaphragm is commonly seen
•May be increased density behind left heart shadow



•Appears as an area of increased opacity within the LLL
•Some loss of the hemi-diaphragm medially is seen
•increased density behind left heart shadow



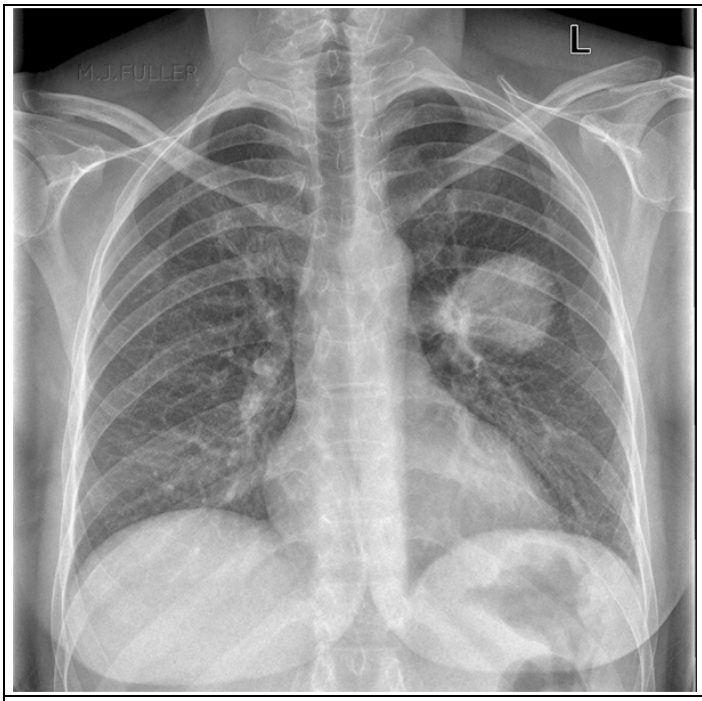
•Increased opacity within the LLL
•Commonly seen with loss of the Left hemi-diaphragm
•May be sharply delineated by oblique fissure



•Increased opacity within the LLL
•Loss of the normal darkening of the t spine some loss of the left hemi-diaphragm posteriorly

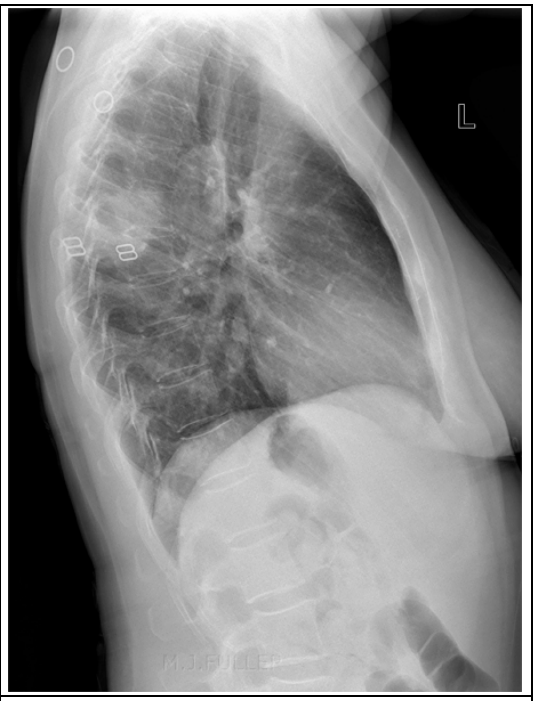
Round Pneumonia

A special case of consolidation is known as round pneumonia. This is where there has been a focus of infection in the lung with local spread.



This patient presented with pyrexia of unknown origin (PUO). There is a dense opacity in the mid/upper region of the left lung. In a patient who presents with pyrexia, round pneumonia must be considered.

Neoplasm cannot be excluded but is unlikely. There is a suggestion of an airbronchogram within the lesion. This excludes a solid tumour and also excludes a cystic lesion.



The lesion is shown to be posterior, possibly in the superior segment of the lower lobe.

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Latest page update: made by AndyC , Feb 8 2010, 7:34 AM EST (about this update - complete history)

AndyC

Keyword tags: air bronchogram air-bronchogram consolidation fissure lobe pneumonia round pneumonia silhouette sign

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Lateral Chest Case 15
Lateral Chest Case 6
Notes on Chest Radiography
Paediatric Chest Immobilisation Devices
Lateral Chest Case 14
False Consolidation
Lateral Chest Case 1
Lateral Chest Case 13

Left Upper Lobe Collapse

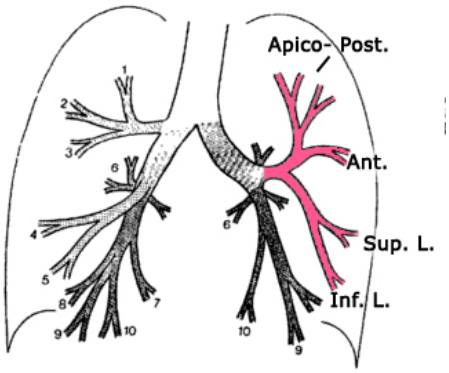
Introduction

The left upper lobe does not collapse in the same manner as the right upper lobe. This is a legacy of anatomy. There is no middle lobe on the left- the equivalent of the RML on the left is the lingula segment of the LUL.

Important Characteristics of all Lobar Collapse

1.Collapse and consolation can occur independently or together
2.Collapse can be partial or complete
3.It is often not clear to what extent the appearance is due to collapse or consolidation or both. The degrees of each are often unclear.
4.If a lobe is only partially collapsed and there is no accompanying consolidation, there may be no increase in opacity
5.In cases of pure collapse, only when the collapse is virtually complete will there be a significant increase in density of the affected lung

The Left Upper Lobe (LUL) Anatomy

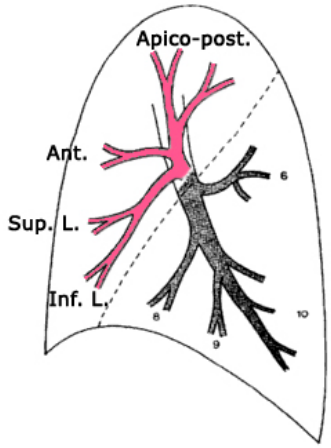


adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

On the left there is no middle lobe; the anatomical equivalent region corresponding to the right middle lobe is known as the lingula, and like the RML, is also composed of two segments. Unlike their counterparts on the right however, the segments are stacked one on top of another, rather than side.

http://lib.cpums.edu.cn/jiepou/tupu/atlas/www.vh.org/adult/provider/radiology/LungAnatomy/RightLung/RtLungSegAnat.html.

Note that upper lobe pathology could appear very low on a chest X-ray image. The upper lobe is the anterior lobe as much as it is the upper lobe.



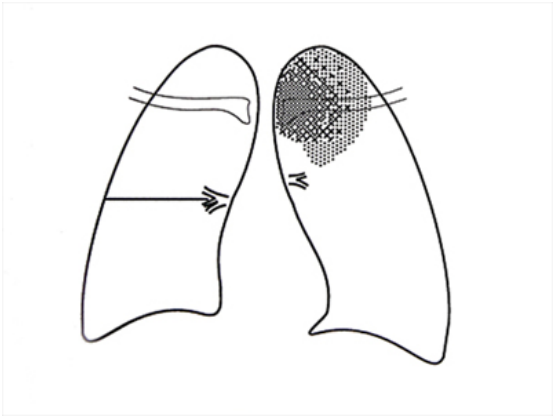
adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

More information on lung anatomy here

Plain Film Signs of LUL Collapse

- The PA view will show an area of increased opacity in the left upper lobe with an ill-defined margin.
- The increased opacity can be very subtle and may be most evident medially.
- Unlike RUL collapse, there is no sharply defined border- the abnormal increase in lung density merges into the normal lung below.
- The incease in lung density can be almost imperceptible on the PA view. The aortic knob is often obliterated.
- Similarly, the upper left cardiac shadow can be obliterated.
- The left hilum may be elevated
- There may be a lucent stripe between the medial edge of the collpased segment and the aortic arch. The is lower lube that has been pulled up by the collpased lung (**Luftsichel Sign**)

Plain Film Appearance



- The PA view will show an area of increased opacity in the left upper lobe with an ill-defined margin.
- The increased opacity can be very subtle and may be most evident medially.
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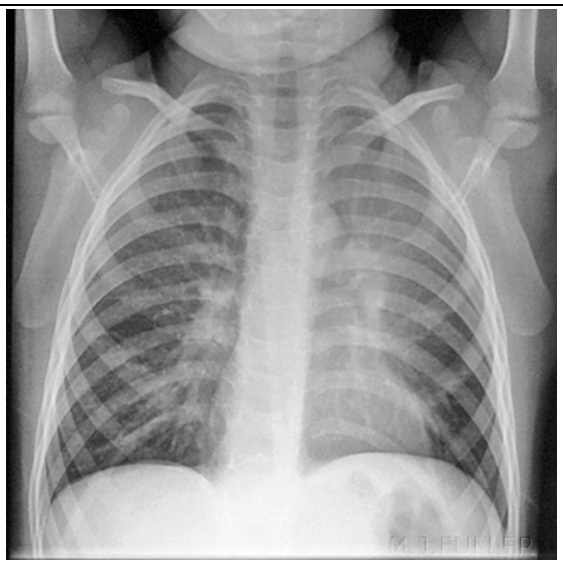
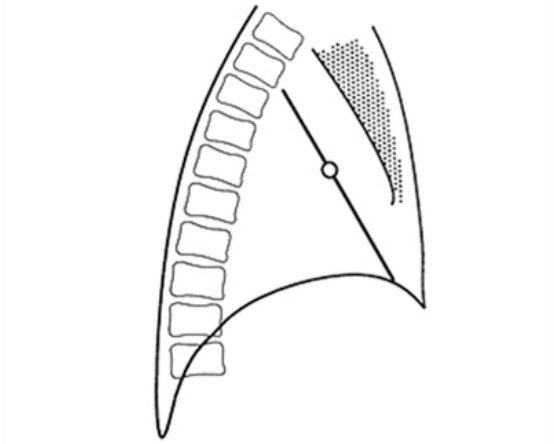
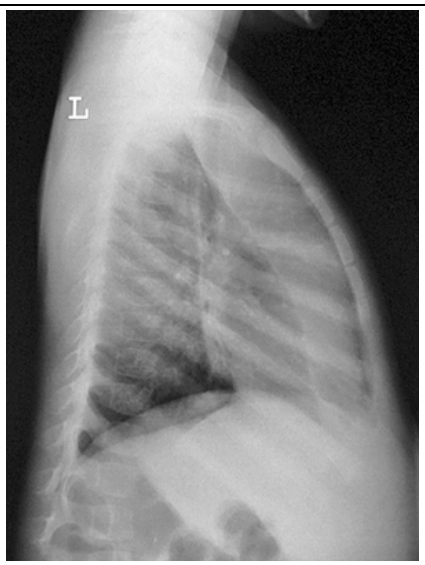
- The incease in lung density can be almost imperceptible on the PA view. The aortic knob is often obliterated.
- Similarly, the upper left cardiac shadow can be obliterated.
- The left hilum may be elevated



- The PA view will shows an area of increased opacity in the left upper lobe with an ill-defined margin.
- Note the loss of the heart shadow/mediastinum and the mediastinal shift
- ? The left hemidiaphragm is elevated.
- decrease in LLL lung markings
- ? Luftsichel Sign

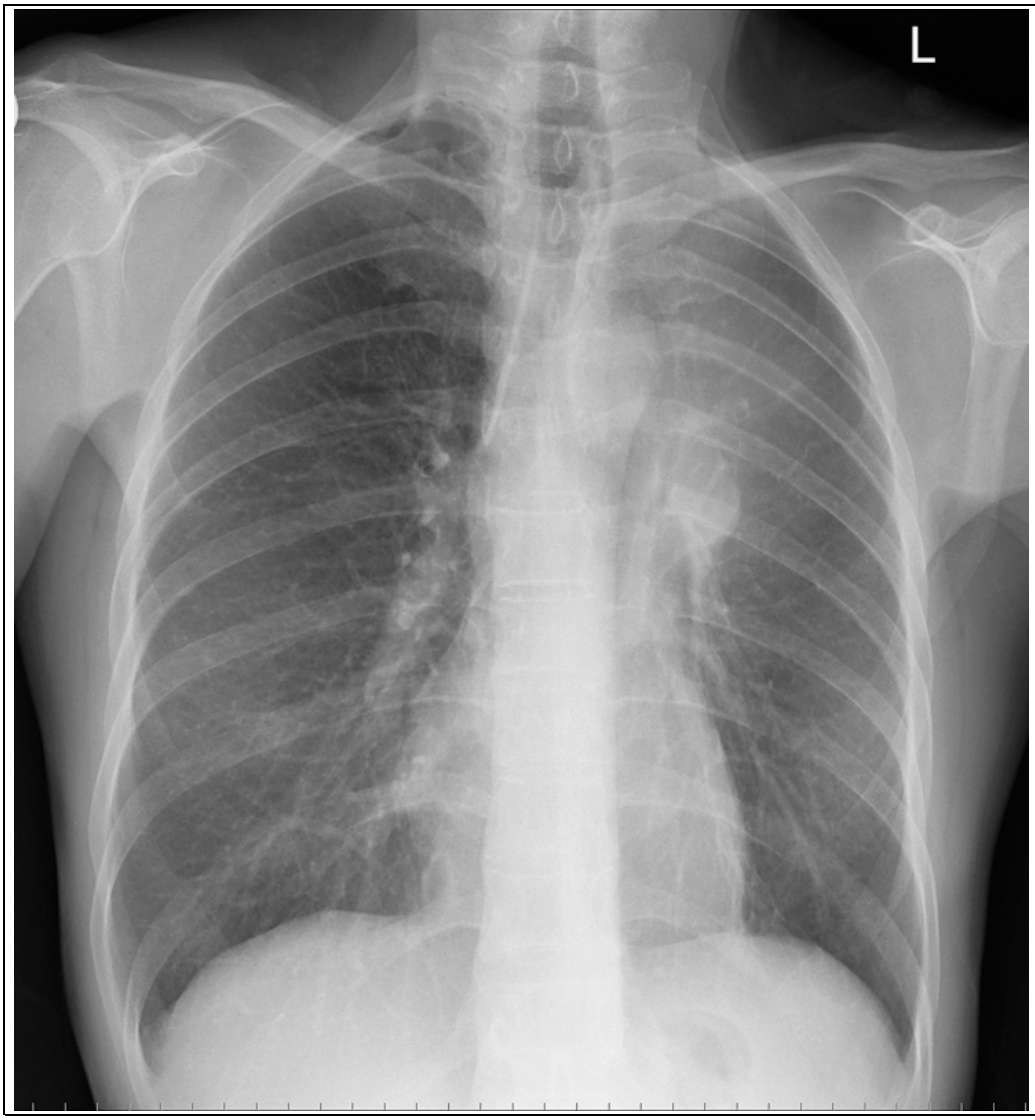


- The lateral view is usually definitive and often highly characteristic.
- As the LUL collapses, the fissure moves forward pivoting at its lowest point
- Note that a similar appearance can be seen in congenital absence of a lobe



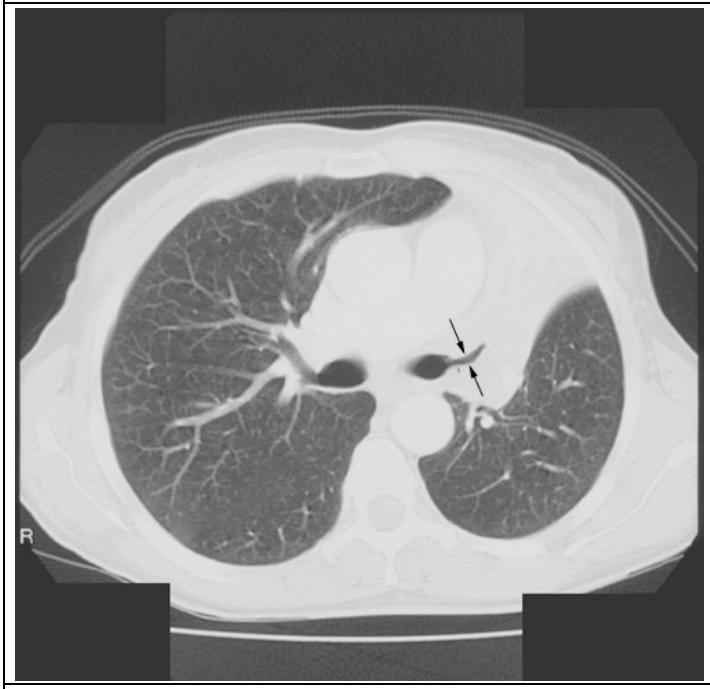
- The lateral view demonstrates the highly characteristic collapsed lobe which now lies parallel to the sternum
- The collapsed lobe follows the anterior chest wall to the diaphragm

Case 1



- This patients history is unknown.
- There is abnormal opacity demonstrated in the left upper chest.
- There is loss of visualistion of the upper mediastinum on the left
- There is evidence of compensatory emphysema on the left
- There is evidence of narrowing of the trachea from extrinsic compression on the left
- Appearances are suggestive of a LUL collapse associated with a tumour
- Luftsichel Sign

Note- this appearance is the same as *'S' sign of Golden* (LUL instead of RUL)

	There is evidence of LUL collapse.
	CT chest demonstrated obstruction of the LUL from a tumour.

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Latest page update: made by AndyC , Feb 8 2010, 7:33 AM EST (about this update - complete history)

AndyC

Keyword tags: chest X-ray collapse left upper lobe

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Right Lower Lobe Collapse	Right Middle Lobe Collapse	Paediatric Chest Immobilisation Devices
Lateral Chest Case 11	Right Upper Lobe Collapse	

Left Lower Lobe Collapse

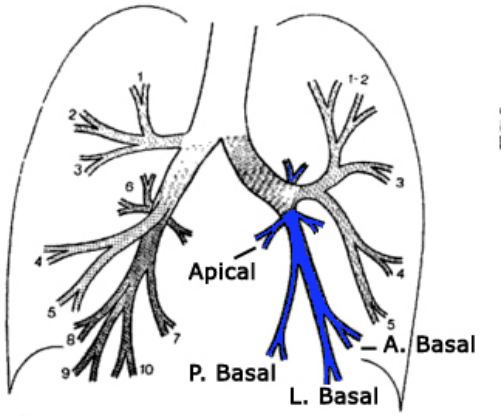
Introduction

The Left Lower Lobe collapse is sometimes missed because it can be hidden behind the heart shadow. This potential for diagnostic failure is increased if a lateral view is not included in the series.

Important Characteristics of all Lobar Collapse

1. Collapse and consolation can occur independently or together
2. Collapse can be partial or complete
3. It is often not clear to what extent the appearance is due to collapse or consolidation or both. The degrees of each are often unclear.
4. If a lobe is only partially collapsed and there is no accompanying consolidation, there may be no increase in opacity
5. In cases of pure collapse, only when the collapse is virtually complete will there be a significant increase in density of the affected lung

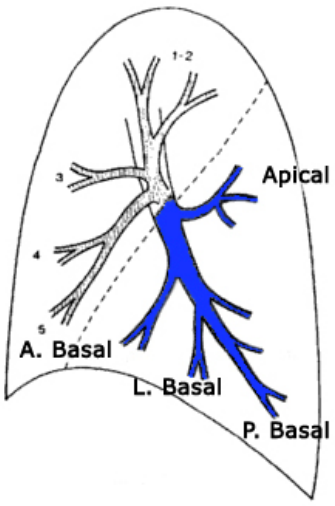
The Left Lower Lobe Anatomy



adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

The left lower lobe is similar in structure to the right lower lobe except that it has two segments combined- because the anterior and medial basal segments share a common bronchial supply, these two segments are characteristically combined, forming an anterior medial basal segment.

More information on lung anatomy here



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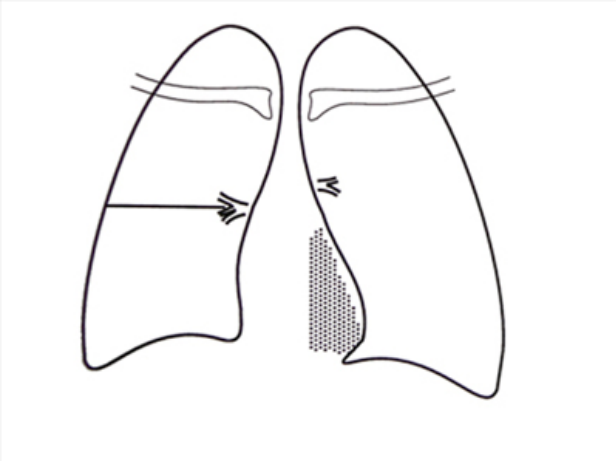
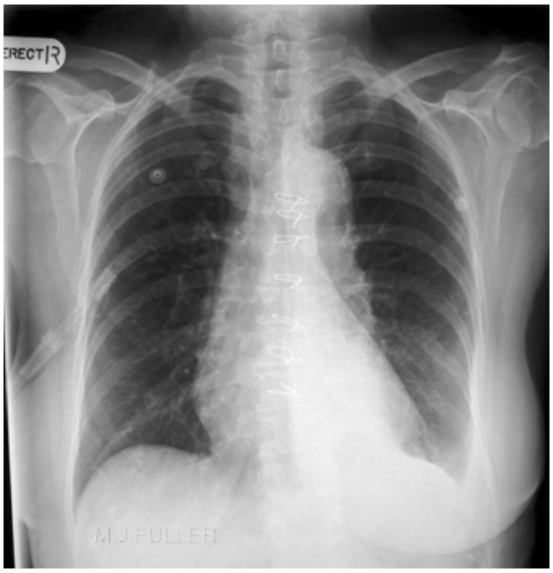
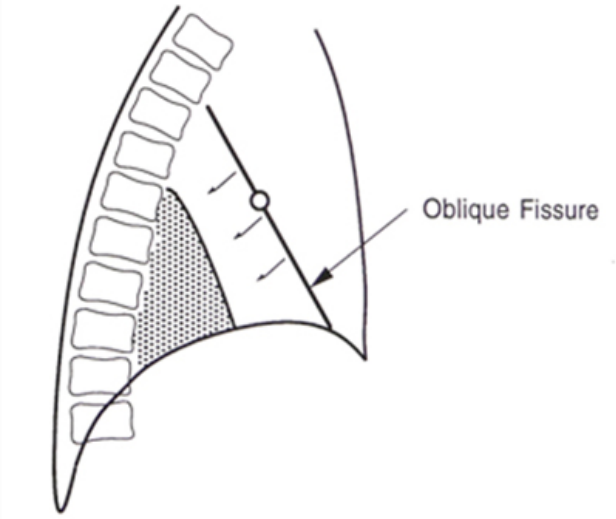
Plain Film Appearance

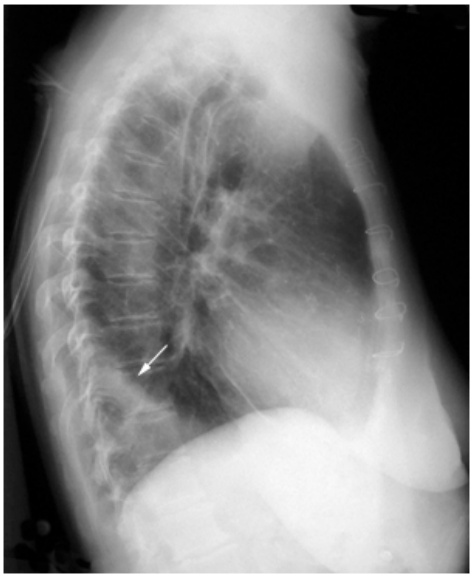


- The PA view will show a triangular area of increased opacity behind the left heart shadow.
- There may be loss of visualisation of the left hemi-diaphragm behind the heart
- There may be elevation of the left hemi-diaphragm





- In the lateral view, a triangular opacity will be seen at the base of the lung
- There may be loss of the normal darkening of the thoracic vertebral bodies inferiorly



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Keyword tags: chest X-ray collapse left lower lobe LLL

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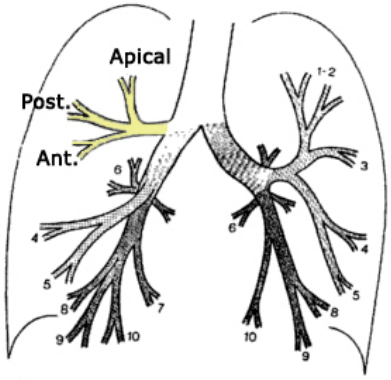
Lateral Chest Case 13
Chest Anatomy
Multi-lobar Collapse
Paediatric Chest Immobilisation Devices

Right Upper Lobe Collapse

Introduction

The plain film appearance of collapse of the upper lobes varies considerably between the right and left sides. The right side is the relatively easy diagnosis, being particularly characteristic in its appearance on the AP/PA projection image.

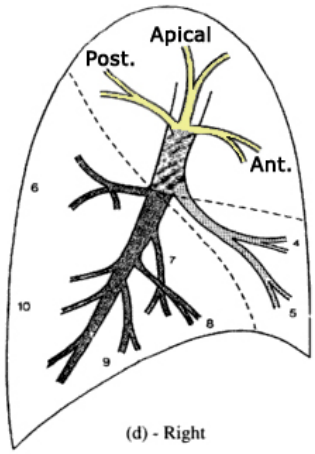
The Right Upper Lobe Anatomy



adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002

The RUL is comprised of three segments: apical, posterior, and anterior

Further information on lung anatomy here



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Important Characteristics of all Lobar Collapse

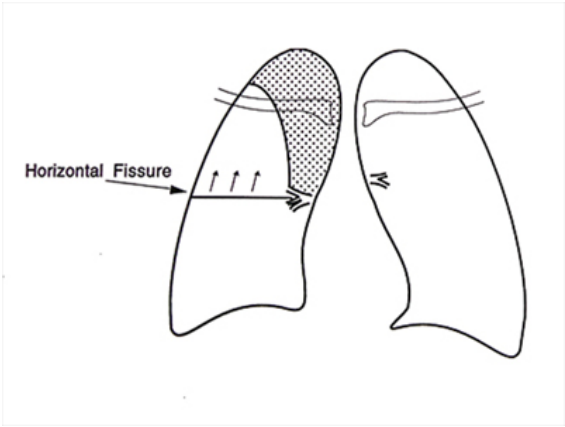
1. Collapse and consolation can occur independently or together
2. Collapse can be partial or complete
3. It is often not clear to what extent the appearance is due to collapse or consolidation or both. The degrees of each are often unclear.
4. If a lobe is only partially collapsed and there is no accompanying consolidation, there may be no increase in opacity
5. In cases of pure collapse, only when the collapse is virtually complete will there be a significant increase in density of the affected lung

Radiographic Technique

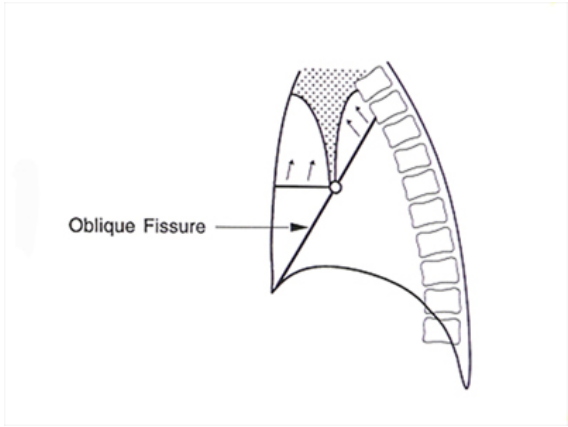
It is sometimes useful to perform an apical lordotic view to help demonstrate equivocal pathological appearances in the upper lobes. It is also advantageous to direct patients to cross their arms across their heads for the lateral view (as opposed to *hands on head and elbows forward*). The upper lobes are frequently partially obscured by upper arm soft tissues on the lateral view when the *hands on head, elbows forward* technique is used.

Plain Film Appearance

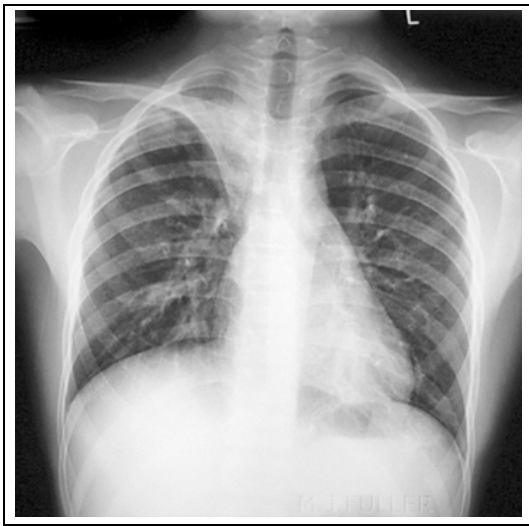
The Right Upper Lobe (RUL) collapses in a manner that is similar to closing a fan.



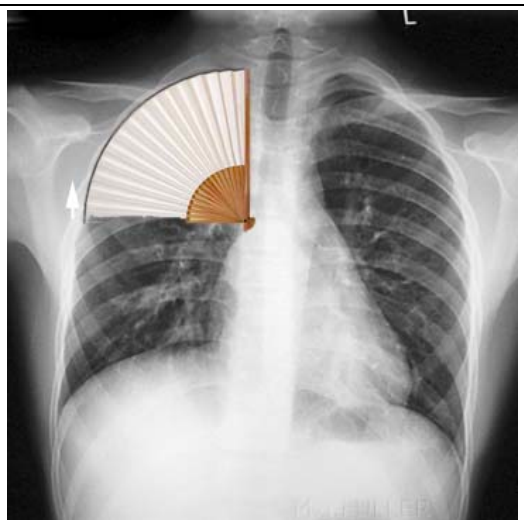
- The horizontal fissure is attached near the hilum. As the RUL collapses it tends to close like a fan attached at the hilum.
- The horizontal fissure often is bowed.
- In cases of extreme collapse, the lobe may be indistinguishable from the upper mediastinum
- •Horizontal fissure commonly bows as the RUL collapses
  •May see tracheal deviation and/or hilar elevation
  •Compensatory emphysema may be present in other lobes



A similar pattern is seen on the lateral chest image. The hilum is now in the centre of the image and the hilum collapses from both an anterior and posterior direction. The sperior half of the oblique fissure is displaced anteriorly.

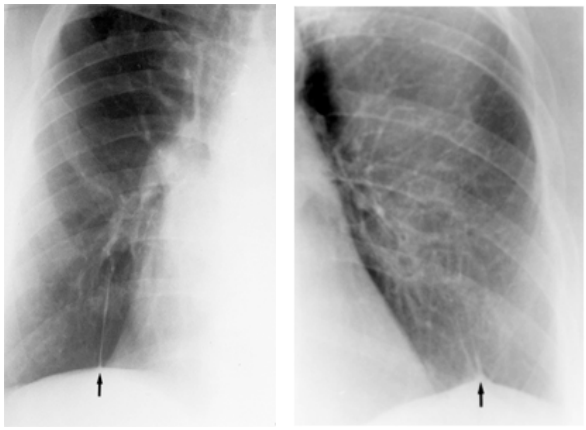


As the RUL collapses a "V" shaped opacity is seen in the right apical region.



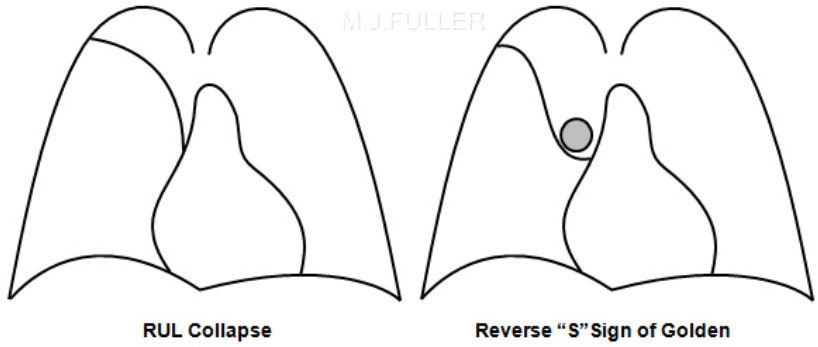
The RUL collapse results in a movement of the horizontal fissure that has been likened to closing a fan.

Notes

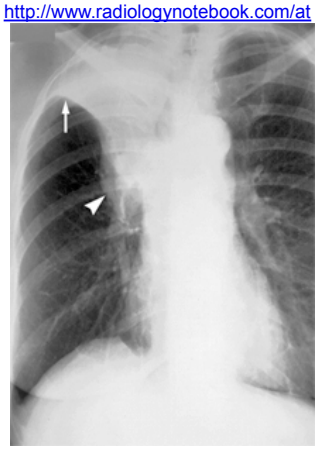


Eli Konen et al, Prevalence of the Juxtaphrenic Peak After Upper Lobectomy, AJR:177, October 2001

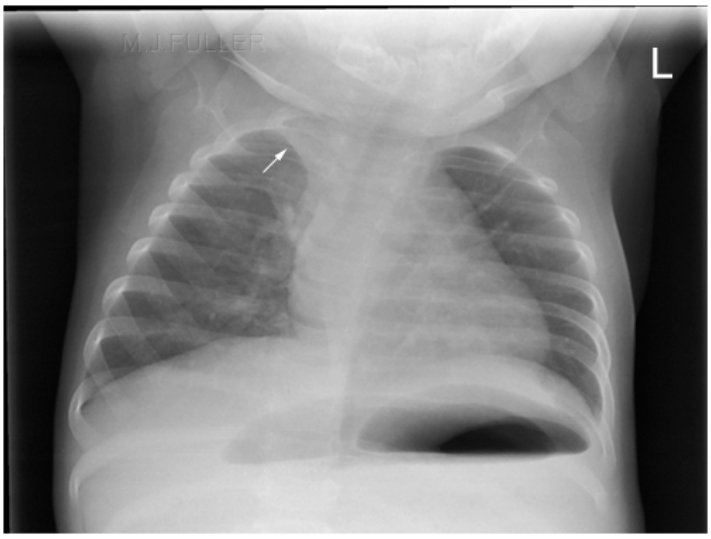
A peak-like shadow along the medial aspect of the right hemidiaphragm is evident in some cases and is referred to as a "juxta-phrenic peak." This finding is more common in left upper lobe collapse, however. The formation of the peak is thought to be related to traction on the basal pleura by the inferior pulmonary ligament. It has also been ascribed to upward retraction of the inferior accessory fissure or an intrapulmonary septum associated with the pulmonary ligament [9]. In severe cases the RUL becomes pancaked against the lung apex or upper mediastinum and can be mistaken for apical pleural thickening. Scott Williams, Aunt Minnie, April 3, 2002



S Sign of Golden - This sign refers to a reverse "S" shape that the minor fissure takes on in cases of RUL collapse resulting from a central obstructing mass. The superior portion of the "S" is from the displaced minor fissure, while the inferior portion results from the mass itself. The sign is commonly seen, but it is neither sensitive nor specific for lung cancer. http://www.radiologynotebook.com/at



electasis.html



With marked collapse of the RUL, the density of the lobe may blend with that of the right superior mediastinum

Felson, Benjamin (Chest Roentgenology, W.B. Saunders, 1973, p38)

for a more extreme example - http://bjr.birjournals.org/content/vol74/issue877/images/large/BJ72386.8.1.jpeg

... back to the Applied Radiography home page

Latest page update: made by AndyC , Feb 8 2010, 7:34 AM EST (about this update - complete history)

AndyC

Keyword tags: chest X-ray lobar collapse right upper lobe collapse RUL

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Right Middle Lobe Collapse
Notes on Chest Radiography
Multi-lobar Collapse
Paediatric Chest Immobilisation Devices

Right Lower Lobe Collapse

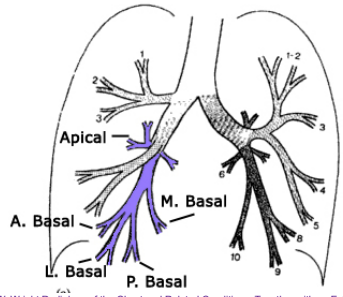
Introduction

Right lower lobe collapse is relatively uncommon. THis page considers all aspects of the plain film appearance of right lower lobe collapse.

Important Characteristics of all Lobar Collapse

1. Collapse and consolation can occur independently or together
2. Collapse can be partial or complete
3. It is often not clear to what extent the appearance is due to collapse or consolidation or both. The degrees of each are often unclear.
4. If a lobe is only partially collapsed and there is no accompanying consolidation, there may be no increase in opacity
5. In cases of pure collapse, only when the collapse is virtually complete will there be a significant increase in density of the affected lung

The Right Lower Lobe Anatomy

<table>
<tr>
<td> 

adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002</td>
<td>The right lower lobe is comprised of five pulmonary segments. It is a large lobe and will provide varying patterns of collapse depending on which segments are involved.</td>
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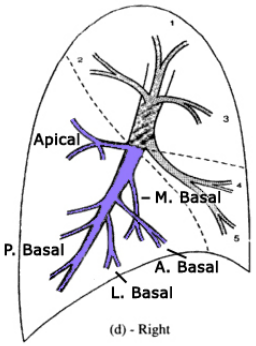
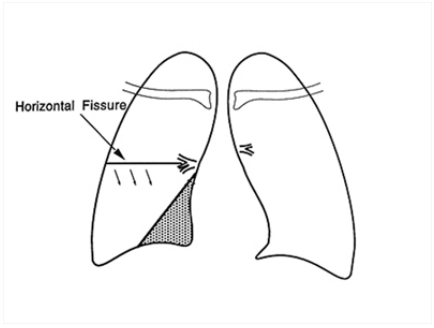
<tr>
<td> 

adapted from By Fred W. Wright Radiology of the Chest and Related Conditions: Together with an Extensive Illustrative Collection of Radiographs CRC Press, 2002</td>
<td>Note that collapse of the apical segment will not result in loss of the diaphragmatic outline.

Further information on lung anatomy here</td>
</tr>
</table>

Plain Film Appearance

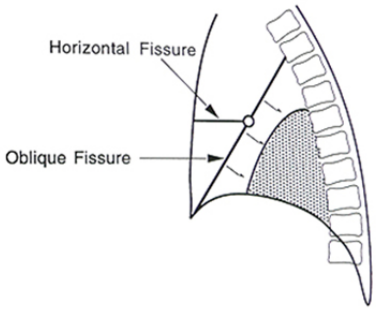
- The Right lower Lobe (RLL) collapses in a manner that is similar to closing a fan.
- May mimic a RML collapse if the superior segment of the RLL is affected in isolation
- may be loss of the visualisation of the right hemidiaphragm
- There should be no loss of visualisation of the right heart border
- There may be compensatory hyperexpansion of the RML resulting a clearly dilineated right heart border and right hemidiaphragm
- There may be evidence of reduced overall lung volume on the right
- the right hilum may be displaced inferiorly (but may be obscured by the collpased lung)
- The mediastinal vessels and fat can move to the right producing a triangle of opacity to the right of the trachea (**superior triangle sign**)
- The collapsed oblique fissure can become visible on the AP image mimicking the horizontal fissure



- The PA view will show an area of opacity at the base of the right lung adjacent to the right heart border

- The oblique fissure is displaced inferiorly (mimicking the horizontal fissure)
- There is increased density adjacent to the right heart border but not obliterating the right heart border
- There is loss of visualisation of the right hemidiaphragm (silhouette sign)
- The right hilum is displaced inferiorly

adapted from Lieberman's Classics Collection in Radiology

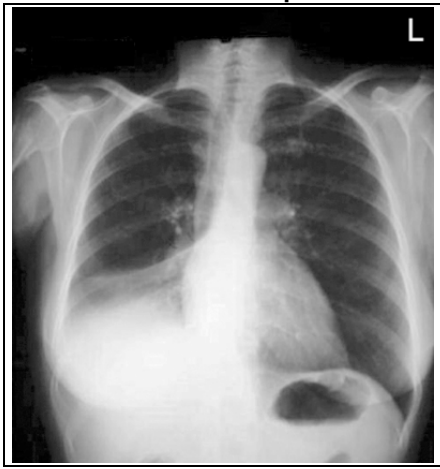


- The lateral view is usually definitive- there will be postero-inferior movement of the oblique fissure whilst maintaining the same slope
- Oblique fissue may be straight or concave anteriorly (opposite to the shape shown in the graphic!)

- The oblique fissure is displaced posteriorly and inferiorly
- There is loss of the normal darkening of the thoracic vertebral bodies inferiorly
- There is loss of visualisation of the right hemidiaphragm

adapted from Lieberman's Classics Collection in Radiology

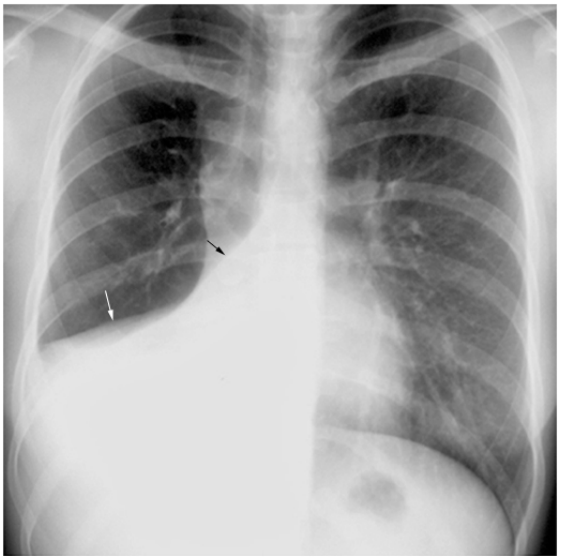
Horizontal Fissure or Oblique Fissure?



"occasionally, the upper part of the major septum [oblique fissure] may be displaced downward and medially to such a degree that the roentgen beam strikes it tangentially, producing a sharp superior border… this appearance closely simulates that of RML disease except that the heart border is not obliterated"

Felson, Benjamin (Chest Roentgenology, W.B. Saunders, 1973, p107)

Combined RML and RLL collapse



source: Paul Stark (MD)

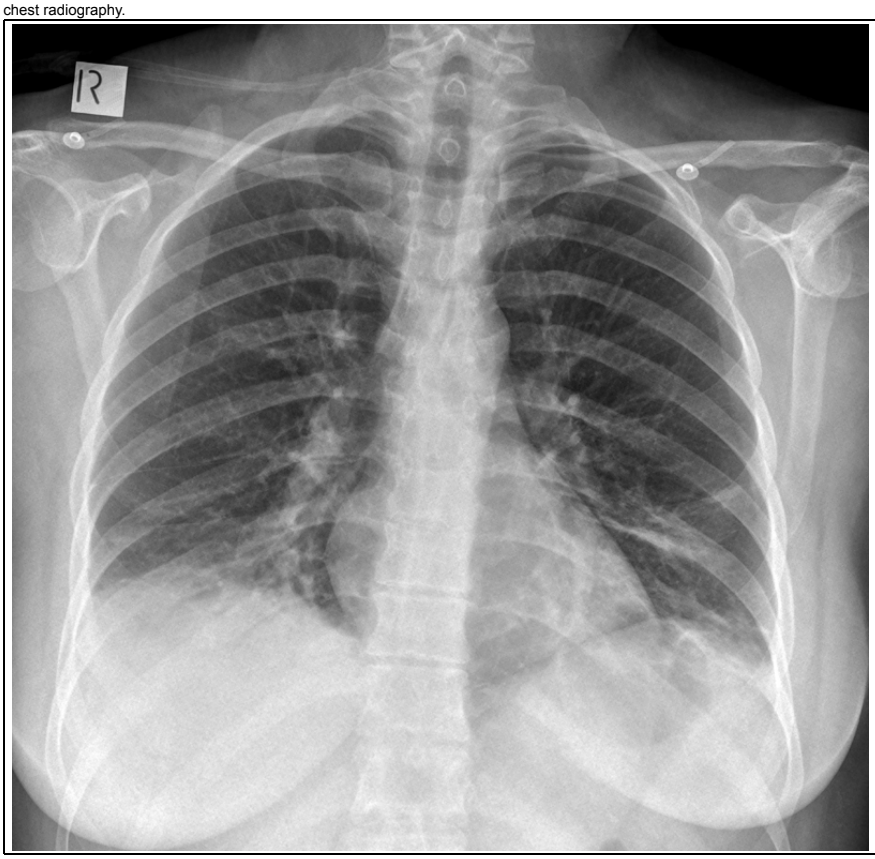
This uncommon combination can produce a confusing plain film appearance. The cause of the collapse often involves tumour compression of the bronchus intermedius. Loss of visualisation of the right hemidiaphragm and right heart border requires consideration of a combined RML and RLL collapse.

There is loss of visualisation of the right hemidiaphragm and right heart border suggestion RLL and RML disease respectively.

The oblique fissure is demonstrated in a collapsed position (black arrow) and the horizontal fissure as similarly seen in a collapsed position (white arrow)

Case 1

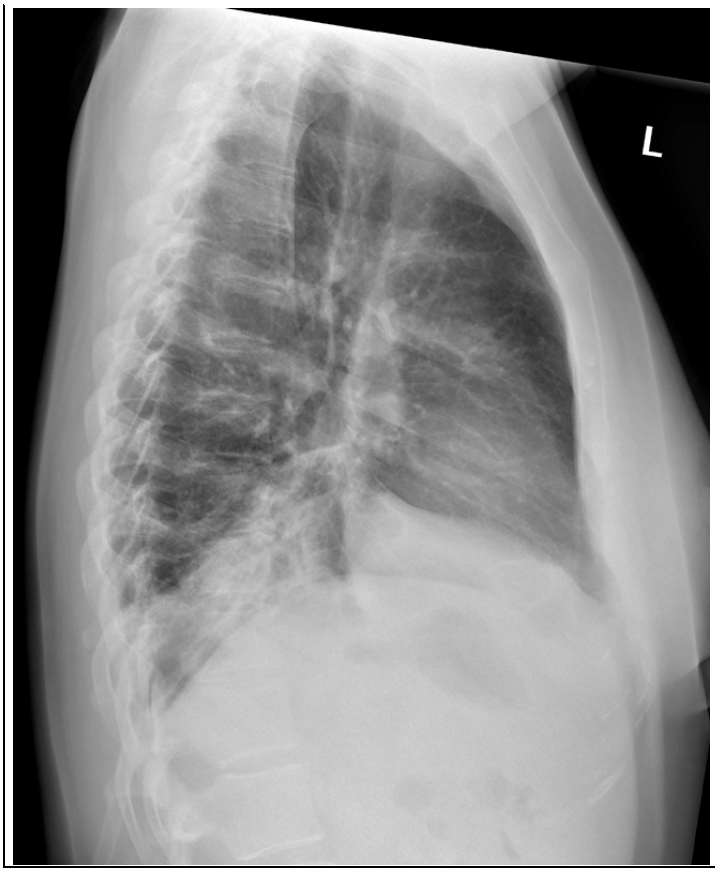
This 39 year old lady presented to the Emergency Department with shortness of breath. On auscultation she was noted to have decreased air entry on the right side. She was referred for chest radiography.



There is loss of clarity of the right hemidiaphragm. There is depression of the horizontal fissure with a faintly visible second fissure below the horizontal fissure.

There is a suggestion of increasd density of the right subdiahragmatic region compared to the corresponding subdiaphragmatic area on the left

Left linear subsegmental atelectasis noted on the left.



The horizontal fissure is faintly visible.

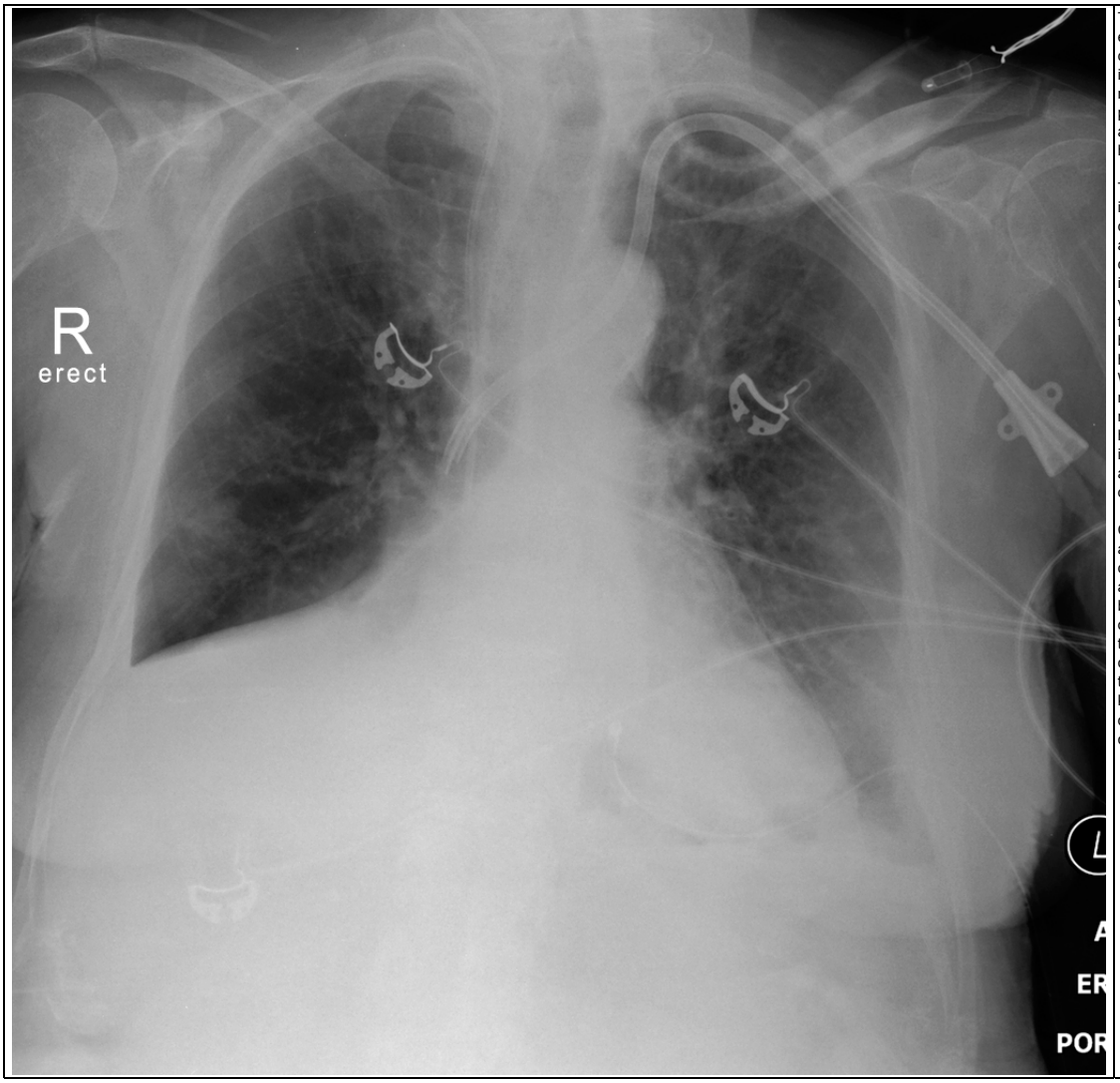
The oblique fissure has moved infero-posteriorly indicating RLL collapse. The fissure is "S" shaped which may explain the appearence of a second fissure below the horizontal fissure on the AP/PA view.

The posterior aspect of the right hemidiaphragm is obliterated (silhouette sign)

The RLL is not showing signs of complete collpase- the collapse segments appear to be the basal segments.

Diagnosis- Partial RLL collapse

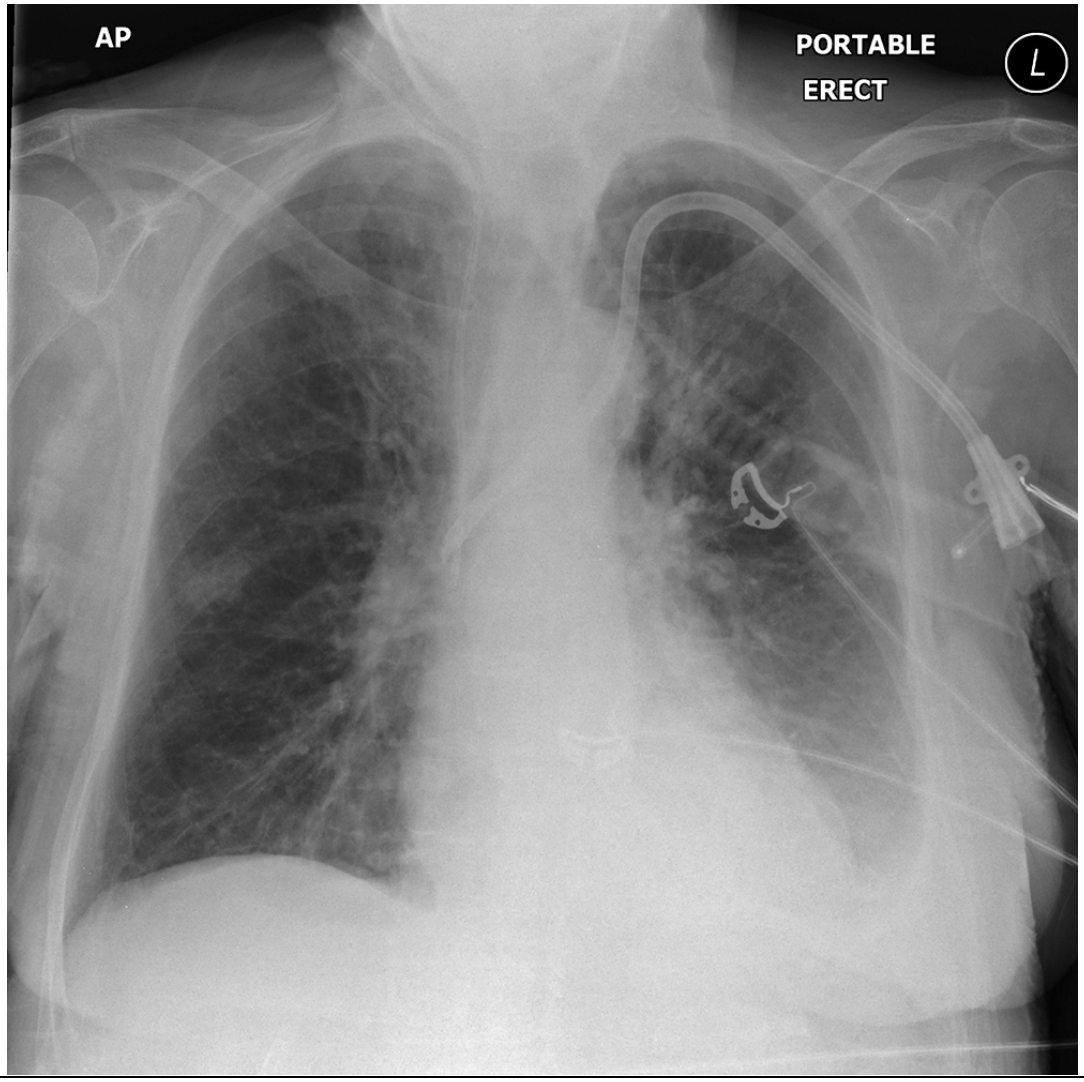
Case 2



This is an AP erect bedside chest X-ray image. There is right basal pathology. Is this a raised right hemidiaphragm?

This appearance is typical of combined RML and RLL collapse. There is loss of visualisation of the right heart border and right hemidiaphragm. What might be mistaken for the right hemidiaphragm is the superior aspect of the oblique fissure.

Combined RML and RLL collapse is associated with bronchial obstruction by tumour. This is consistent with the patients known history of disseminated cancer.



Previous chest X-ray image demonstrates normal right heart border and right hemidiaphragm.

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Latest page update: made by M.J.Fuller , Dec 29 2010, 10:09 PM EST (about this update - complete history)

Keyword tags: chest X-ray collapse right lower lobe

M.J.Fuller

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