

**Module 2**

11.	Clinical syndromes and symptoms of respiratory system affection (obstructive syndrome) .	2	5.12.16
12.	Clinical syndromes and symptoms of respiratory system affection (lungs consolidation syndrome).	2	12.12.16
13.	Clinical syndromes and symptoms of respiratory system affection (pulmonary insufficiency syndrome, dry and exudative pleuritis. )	2	19.12.16
14.	Clinical symptoms of blood system affection: anemia and erithrocytosis. Leukopenias and leukocytosis. Methods of clinical, laboratory and instrumental examination.	2	26.12.16
15.	Clinical syndroms and symptoms of gastrointestinal tract diseases ( syndromes of esophagus motility disorders and stomach diseases).	2	2.01.17
16.	Clinical syndroms and symptoms of gastrointestinal tract diseases (syndromes of large and small intestine motility disorders, syndromes of malgigestion and malabsorption).	2	9.01.17
17.	Clinical syndroms and symptoms of hepato-biliary system diseases (syndroms of gallbladder motility disorders, syndrome of jaundice).	2	16.01.17

# Lungs Consolidation Syndrome

## SIGNS AND SYMPTOMS OF RESPIRATORY SYSTEM DISEASES

LECTURE IN INTERNAL MEDICINE PROPAEDEUTICS

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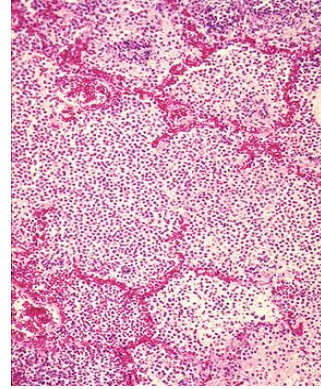


## Preamble:

the importance of the respiratory system

- Since our childhood we all are aware that food, water and oxygen are the basic necessities of life and we cannot survive without them
- An average person can live without food for 3-4 weeks
- We cannot survive without water for more than 3-5 days
- Oxygen is crucial to sustain life, and 3 minutes is the maximum time where a person can stay alive without breathing

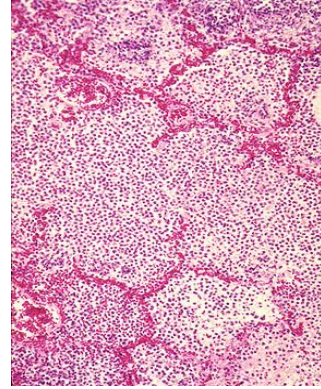
## Lung consolidation syndrome: definition 1



The  
photomicrograph  
shows many  
alveolar spaces  
filled with  
inflammatory  
infiltrate

- A lung (pulmonary) consolidation is a region of (normally compressible) organ tissue that has filled with liquid, a condition marked by induration (swelling or hardening of normally soft tissue) of a normally aerated lung

## Lung consolidation syndrome: definition 2

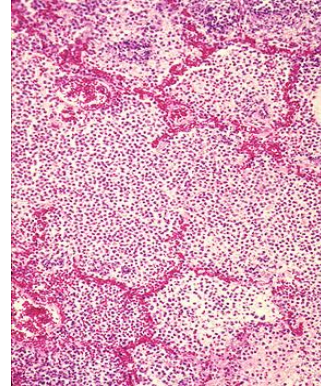


The  
photomicrograph  
shows many  
alveolar spaces  
filled with  
inflammatory  
infiltrate

- Consolidation occurs through accumulation of inflammatory cellular exudate in the alveoli and adjoining ducts and is defined as alveolar space that contains liquid instead of gas

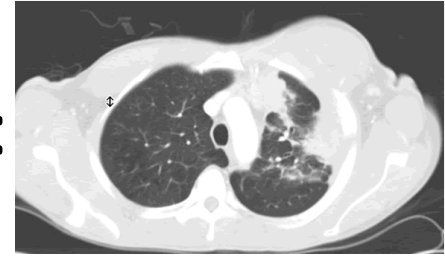
## Lung consolidation syndrome: definition 3

- The liquid can be pulmonary edema, inflammatory exudate, pus, inhaled water, or blood (from bronchial tree or hemorrhage from a pulmonary artery)



The  
photomicrograph  
shows many  
alveolar spaces  
filled with  
inflammatory  
infiltrate

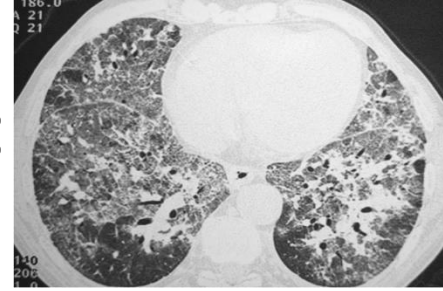
# Lung consolidation syndrome: diseases



The mediastinal  
lymphadenopathy and  
lung consolidation

- Pneumonia
- Infections (lung): actinomycosis, ascariasis, aspergillosis (invasive/infection or allergic), blastomycosis, cryptococcosis, hydatid cyst, syphilis
- Atelectasis (collapsed lung)
- Pulmonary edema (fluid in lungs)
- Tumors of the lung

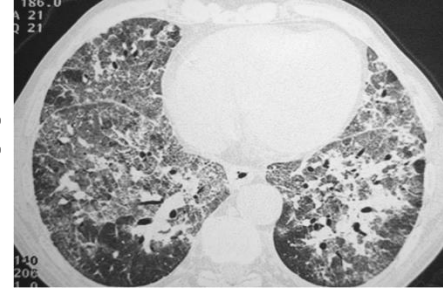
# Lung consolidation syndrome: symptoms 1



High-resolution CT scan at level of lower lung zones shows extensive "crazy-paving" pattern involving both lower lobes, lingula and middle lobe, in association with areas of air-space consolidation

- Dyspnea which is dependent on the extent of consolidation
- Abnormal breathing sounds
- Coughing
- Pallor acrocyanosis
- Percussion : dull note
- Palpation : tactile fremitus

# Lung consolidation syndrome: symptoms 2



High-resolution CT scan at level of lower lung zones shows extensive "crazy-paving" pattern involving both lower lobes, lingula and middle lobe, in association with areas of air-space consolidation

- Vocal resonance
- Bronchial breathing and egophony (it is said to occur when, during auscultation, a patient says the letter "E" and the examiner hears the letter "A")
- Pleural friction rub
- Unilateral reduction in chest expansion

# Lung consolidation syndrome: Examination



**Left lower lobe  
consolidation**

- On examination, decreased chest expansion may be noted on the affected side and dullness to percussion
- On auscultation, findings include bronchial breath sounds, inspiratory crackles or crepitations, increased vocal resonance and pleural rub

# Lung consolidation syndrome: Pathology 1



**Left lower lobe  
consolidation**

- Pneumonia with pus filling the alveoli is the most common cause of acute consolidation
- Other acute causes include blood from hemorrhage or contusions and transudative fluid from pulmonary edema seen in heart failure

# Lung consolidation syndrome: Pathology 2



**Right upper  
lobe  
consolidation**

- Chronic consolidation will be likely due to a malignant process
- Bronchoalveolar carcinoma, lymphoma and lung neoplasms with post-obstructive pneumonia result in malignant cells causing the consolidation seen on radiograph

# Lung consolidation syndrome: Pathology 3



**Right sided  
consolidation  
(multi-lobar)**

- Chronic consolidation will be likely due to a malignant process
- Bronchoalveolar carcinoma, lymphoma and lung neoplasms with post-obstructive pneumonia result in malignant cells causing the consolidation seen on radiograph

# Lung consolidation syndrome: Pathology 4



**Right upper  
lobe  
consolidation**

- Chronic post-infection diseases such as organising pneumonia or eosinophilic pneumonia as also causes, with alveolar proteinosis a rare cause resulting in alveoli filled with protein

# Lung consolidation syndrome: Radiographic features

- Consolidated areas are radio opaque on chest radiograph and chest CT compared to normally air filled lung tissue
- The distribution pattern of consolidation can aid in narrowing the potential differential diagnosis

# Lung consolidation syndrome: Lobar Consolidation

- Where increased density/opacity is seen in individual lung lobes
- Sharp delineation can be seen when consolidation reaches a fissure, since it does not cross
- Air bronchograms can also be seen due to bronchi becoming visible against the dense diseased tissue
- Volume loss is usually not seen

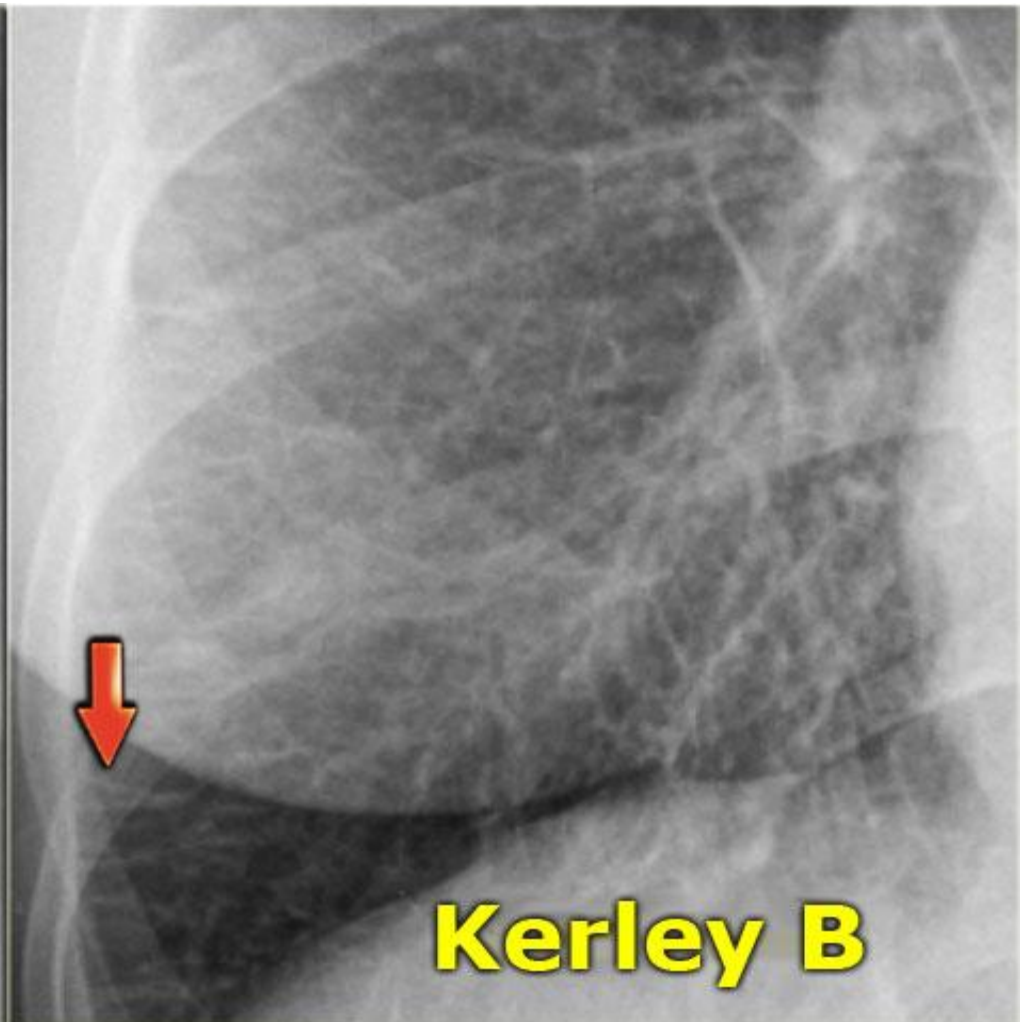
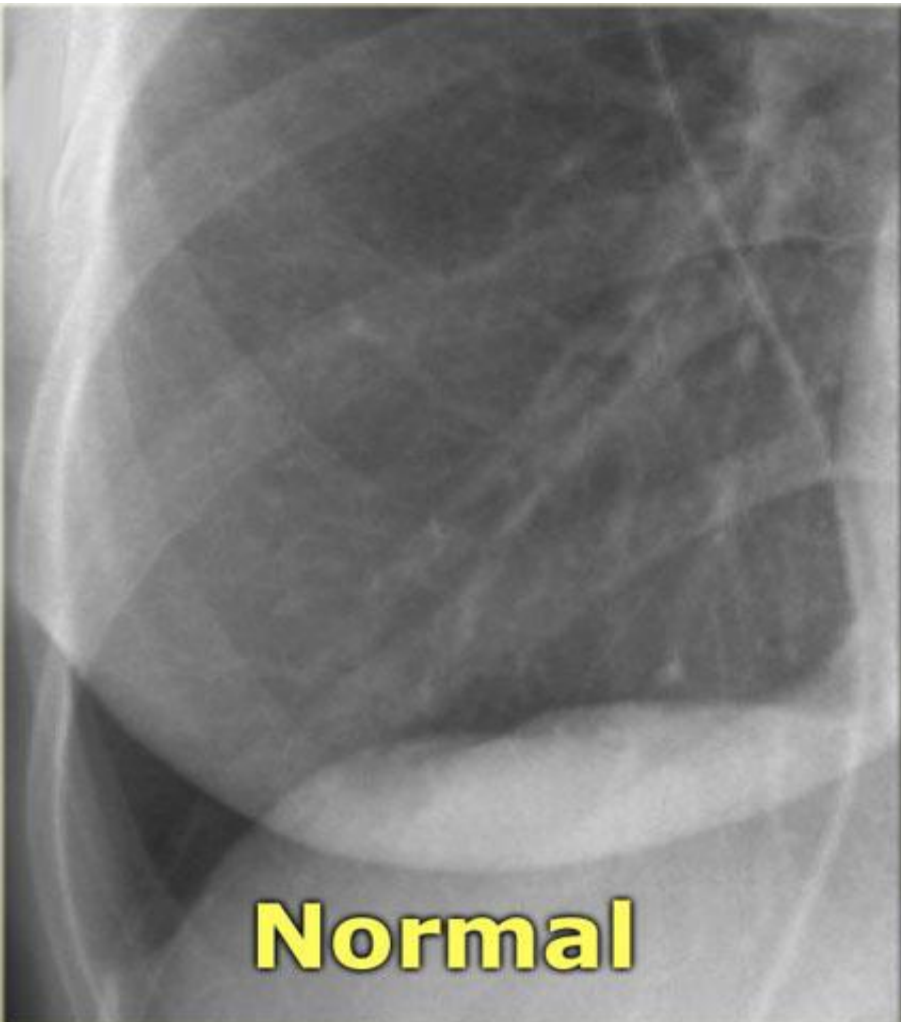
# Lung consolidation syndrome: Diffuse Consolidation

- Most commonly due to heart failure, resulting in other signs such increased cardiac size, Kerley B-lines, redistribution on pulmonary blood flow and pleural fluid
- Other findings can include multiple ill defined opacities progressing to diffuse spread seen in bronchopneumonia and "white out" of a lung due to progressive consolidation from bronchoalveolar carcinoma

# Lung consolidation syndrome: Kerley B-Lines

- These are short parallel lines at the lung periphery  
These lines represent interlobular septa, which are usually less than 1 cm in length and parallel to one another at right angles to the pleura
- They are located peripherally in contact with the pleura, but are generally absent along fissural surfaces

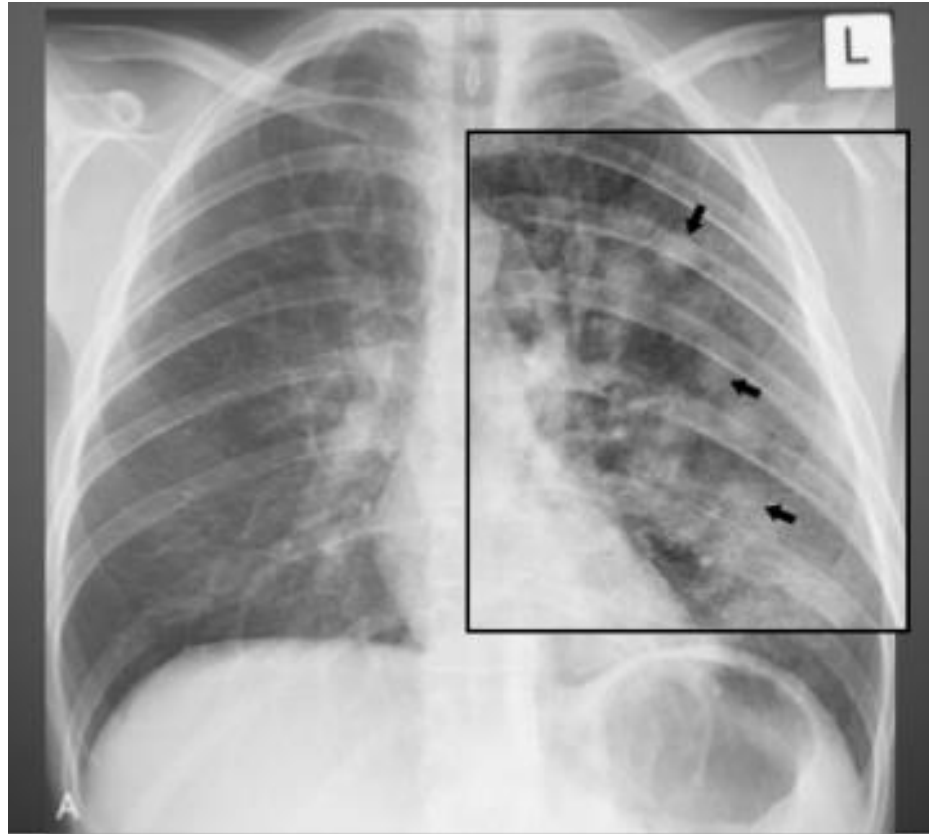
# Lung consolidation syndrome: Kerley B-Lines



# Lung consolidation syndrome: Multi-focal Consolidation

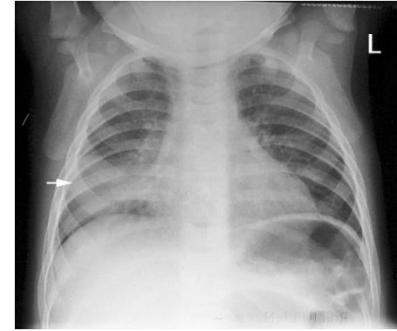
- Multiple areas of opacity seen throughout the lung most often is due to bronchopneumonia, starting from bronchi and spreading outwards
- Usually ill defined with peripheral distribution
- Neoplasms such as a primary malignancy or metastasis can also cause this picture

# Lung consolidation syndrome: Multi-focal Consolidation



**Bronchopneumonia**

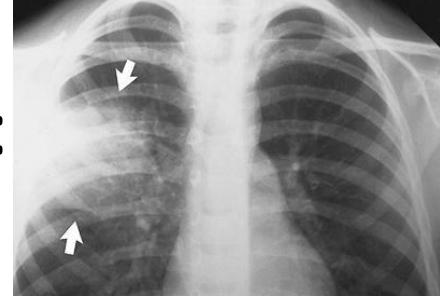
# Lung consolidation syndrome: X-ray patterns of consolidation



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

- Consolidation may be complete or incomplete
- The distribution of the consolidation can vary widely
- A consolidation could be described as “patchy”, “homogenous”, or “generalized”
- A consolidation may be described as focal or by the lobe or segment of lobe affected

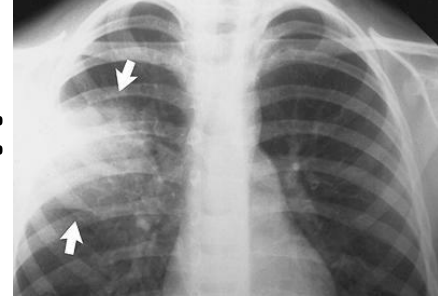
# Lung consolidation syndrome: X-ray features 1



The chest X-ray shows an area of lung inflammation indicating the presence of pneumonia

- Opacity of the affected area, lobule or lobe
- Loss of clarity of the heart border, diaphragm and or vertebral bodies (thoracic vertebrae)

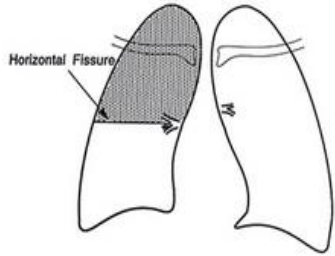
# Lung consolidation syndrome: X-ray features 2



The chest X-ray shows an area of lung inflammation indicating the presence of pneumonia

- Patchy consolidation may be seen with bronchopneumonia while confluent consolidation seen in lobar pneumonia
- Cavitation, bulging interlobular fissures and pleural effusion may also be evident

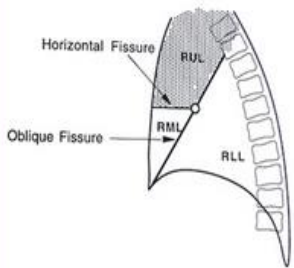
# Lung consolidation syndrome: Right Upper Lobe (RUL) consolidation



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

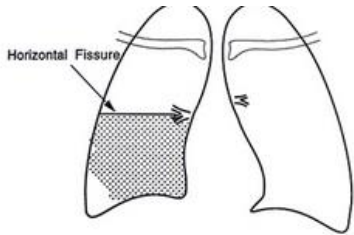


In the lateral view, there will be increased density in the RUL which may be sharply bordered by the horizontal and/or oblique fissure(s).



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

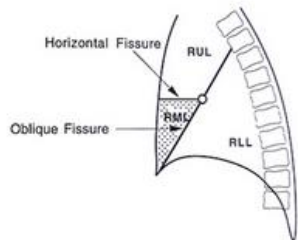
# Lung consolidation syndrome: Right Middle Lobe (RUL) consolidation



- 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

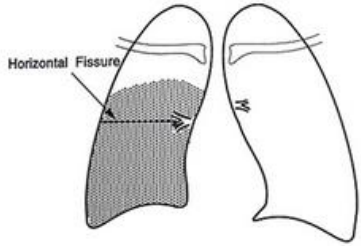


- RML consolidation is characteristically seen as a wedge opacity in the lateral view
- May be sharply bordered by the horizontal and oblique fissures
- (collapse of the lingula segment of the LUL has a similar appearance)



- 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

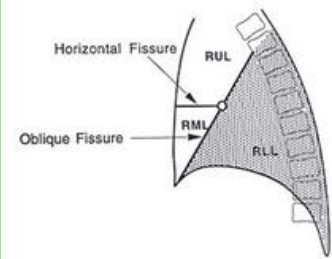
# Lung consolidation syndrome: Right Lower Lobe (RUL) consolidation



- 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

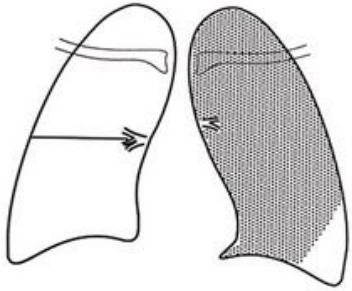


- Increased opacity within the RLL
- Commonly seen with loss of the right hemi-diaphragm



- Triangular opacity
- Loss of right hemi-diaphragm

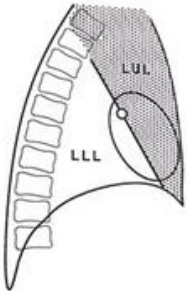
# Lung consolidation syndrome: Left Upper Lobe (RUL) consolidation



- 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

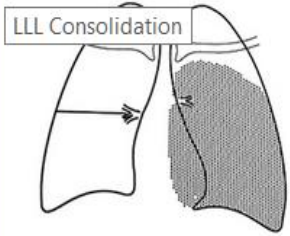


- Can be sharply bordered by the oblique fissure
- Does not involve the diaphragm

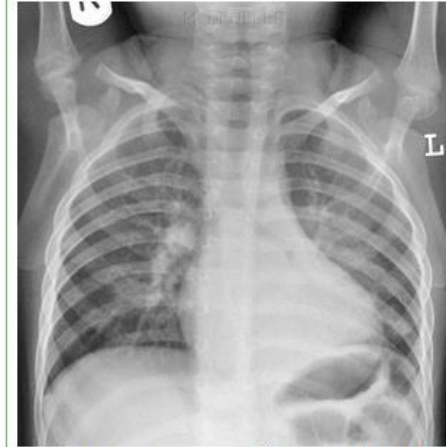


- Opacity seen anterior to the oblique fissure

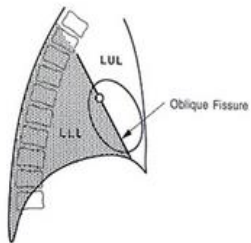
# Lung consolidation syndrome: Left Lower Lobe (RUL) consolidation



- 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

# Lung consolidation syndrome: lung ultrasound



- The consolidated lung is ‘hepatized’ (looks similar to liver)
- Extensive consolidation (of a whole lobe) allows the opposite pleural line to be seen (8-11cm deep) with mediastinum deeper and with the aorta or IVC still visible
- A fully consolidated lobe may be seen floating in a pleural effusion

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 1

- Microscopic polyangiitis (MPA) is defined as systemic necrotizing vasculitis with few or no immune deposits, affecting small vessels (capillaries, arterioles or venules)
- Although MPA can involve any organ, renal and pulmonary involvement predominate
- Pulmonary involvement can present from fleeting focal infiltrates to massive lung hemorrhage and hemoptysis secondary to alveolar capillaritis

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 2

- This is a case of a 39-year-old male who was admitted to hospital due to fever of unknown origin
- He was an ex-smoker (stopped 3 years ago) and his medical history is unremarkable
- Ten days back he was examined by his doctor due to fever, fatigue and dry cough
- He was diagnosed as having pneumonia

## Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 3

- The patient had normal breath sounds with normal blood gases and his temperature was 38 °C
- Laboratory studies revealed white cell count: 13,9 (N:79, L:11.5, M:8.5, E:0.6) hemoglobin 13.7 g/dl, the erythrocyte sedimentation rate 72 mm/h
- Renal, liver function and urinalysis were normal
- An arterial blood gas measurement while the patient was breathing room air demonstrated a  $PaO_2$  of 88 mmHg, a  $PaCO_2$  41 mmHg and pH=7.39

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 4



Chest radiograph revealed a consolidation in the right  
upper lobe

## Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 5

- The patient was admitted in hospital and began treatment with moxifloxacin 400 mg once daily
- Sputum and blood cultures were obtained and serology tests were conducted to rule out bacterial or viral infection
- A new radiograph showed an increase of the consolidation
- Due to nonresolving of the shadowing on the X-ray, the treatment was switched to ticarcillin/potassium plus teicoplanine

Lung consolidation syndrome:  
pulmonary consolidation with fever is not always  
pneumonia 6

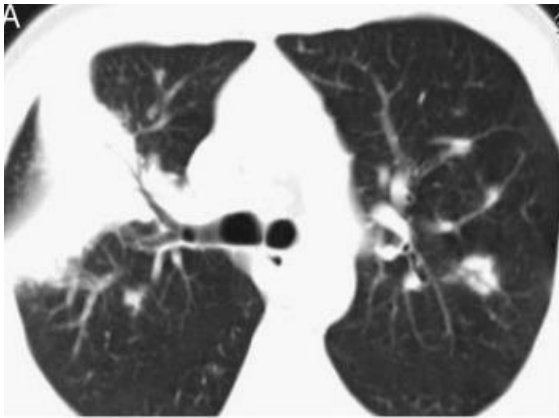


Repeat chest radiograph a few days later shows  
worsening of consolidation

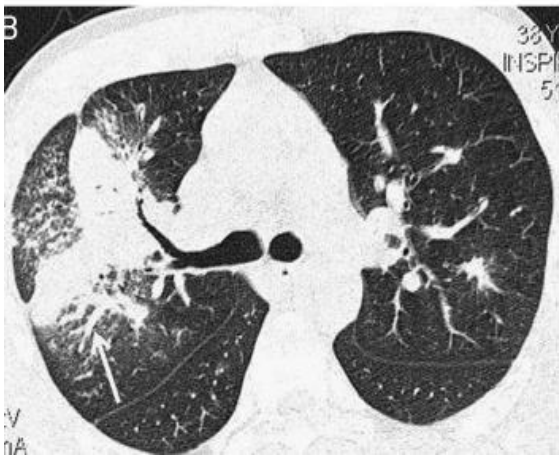
# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 7

- Chest spiral computed tomography showed a few enlarged lymph nodes in the paratracheal and carinal regions, up to 1.5 cm in the short axis
- Apart from the consolidation in the right upper lobe, CT revealed multiple nodular lesions, some with a central air-bronchogram, scattered in all lobes, more prevalent in the upper and middle lung fields
- Thickened bronchovascular bundles were seen, some connected to nodules

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 8

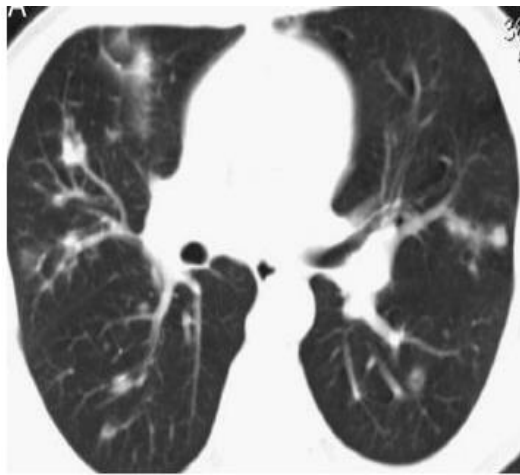


- (A) CT obtained at presentation shows air-space consolidation in the right upper lobe and a nodule with air-bronchogram in the left upper lobe



- (B) HRCT reveals development of extensive areas of ground-glass attenuation as well as thickening of bronchovascular bundles (arrow)

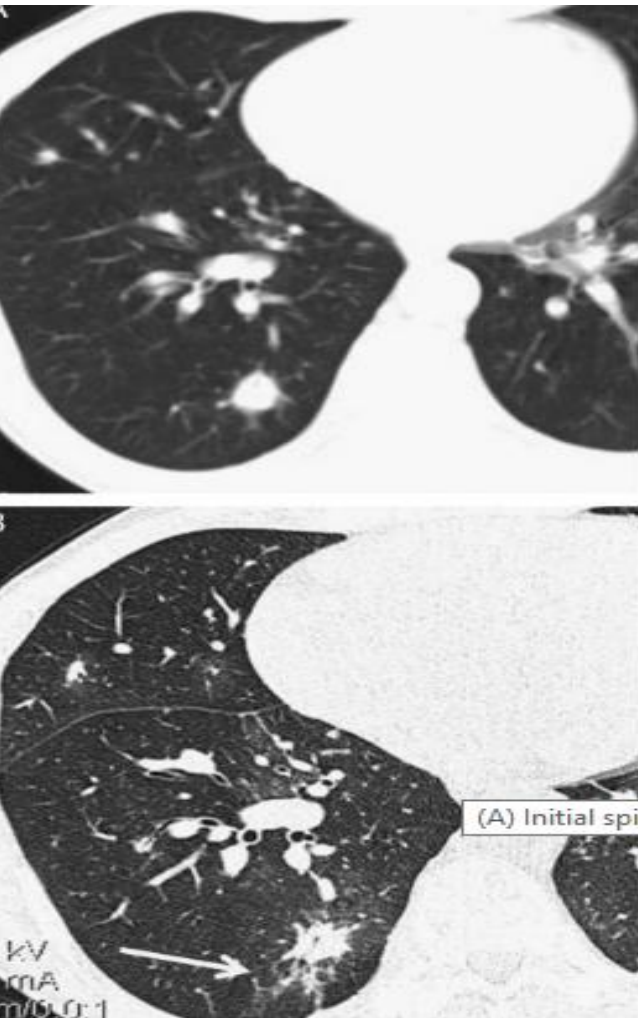
# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 9



- (A) CT: multiple nodules in both lungs connected to thickened bronchovascular bundles
- (B) HRCT: resolution of some nodular opacities in the right lung and patchy ground-glass opacities in both lung fields; newly developed ground-glass areas surround nodules in the left lung, a CT sign strongly indicative of hemorrhagic infiltration (arrows)



# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 10



- (A) Initial spiral CT at the level of basal segments of the lower lobes shows a rather smooth nodule in the right lower lobe
- (B) Follow-up HRCT shows a halo of ground-glass surrounding the nodule and neighboring peripheral bronchovascular bundle thickening (arrow)

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 11

- Taking into account the febrile patient and nonresolving “pneumonia”, the differential diagnosis was broadened widespread infections, tuberculosis, whereas thickened bronchovascular bundles connected with nodules and lymphadenopathy indicated Wegener granulomatosis and lymphoma

# Lung consolidation syndrome: pulmonary consolidation with fever is not always pneumonia 12

- Perinuclear anti-neutrophil cytoplasmic antibodies were positive and renal biopsy revealed focal pauci-immune necrotic glomerulonephritis
- The diagnosis of microscopic polyangiitis was established
- The patient began the treatment with methylprednisolone and
- Remission was achieved