

Pathology teamwork

Lecture (5): Pneumonia

Color Index :-

- **VERY IMPORTANT**
- Extra explanation
- **Examples**
- **Diseases names: Underlined**
- **Definitions**

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Objectives :

- Understand that pneumonia is an inflammatory condition of the lung characterised by consolidation (solidification) of the pulmonary tissue
- Be aware of the pathogenesis of pneumonia and its classifications which principally include: bronchopneumonia, lobar pneumonia, and atypical pneumonia
- To be able to appreciate the aetiology and pathogenesis of lung abscess

DR. RIKABI NOTES (INTRODUCTION)

- **Pneumonia** is the infection or inflammation of the lung parenchyma which may extend to the pleura.
- Most are **bacterial**
- Pneumonia is classified according to 3 methods:
 - 1- Pathology and morphology (anatomically)
 - Lobar pneumonia
 - Interstitial pneumonia (atypical)
 - Bronchopneumonia
 - 2- Based on etiology
 - Pneumococcal pneumonia (from Strept. Pneumonia)
 - Klebsiella
 - Staphylococcal (from Staph. Aureus)
 - Streptococcal viridans
 - 3- Epidemiology (this is important because organisms vary based on epidemiology)
 - CAP contagious spread of an organism within a particular community (e.g. from nursery)
 - HAP (nosocomial) from hospital usually from gram - bacilli except for MRSA (Methicillin resistant Staphylococcus Aureus)

INTRODUCTION

Pulmonary Infections / Pneumonia

- Pneumonia /pulmonary infection can be very broadly defined as any infection in the lung
- **Pneumonia can be acute or chronic**
- Respiratory tract infections are more frequent than infections of any other organ.
*Why??
 - The epithelium of the lung is exposed to liters of contaminated air
 - Nasopharyngeal flora are aspirated during sleep
 - Underlying lung diseases render the lung parenchyma vulnerable to virulent organism

Predisposing factors/ Risks

- ✓ **Loss or suppression of the cough reflex:** as a result of coma, anaesthesia, neuromuscular disorders, drugs, or chest pain.
- ✓ **Injury to the mucociliary apparatus:** by either impairment of ciliary function or destruction of ciliated epithelium e.g. cigarette smoke, inhalation of hot or corrosive gases, viral diseases, chronic diseases or genetic disturbances
- ✓ **Decreased function of alveolar macrophages:** by alcohol, tobacco smoke, anoxia, or oxygen intoxication
- ✓ **Pulmonary congestion and edema**
- ✓ **Retention and accumulation of secretions:** e.g. cystic fibrosis and bronchial obstruction
- ✓ **Immunologic deficiencies,** treatment with immunosuppressive agents, leukopenia
- ✓ **Chronic diseases**

Transmission

Portal of entry for most pneumonias is by:

- Inhalation of air droplets
- Aspiration of infected secretions or objects
- Hematogenous spread from one organ to other organs can occur.

Anatomic classification of pneumonia

Classification of pneumonia can be made according to causative agent or gross anatomic distribution of the disease.

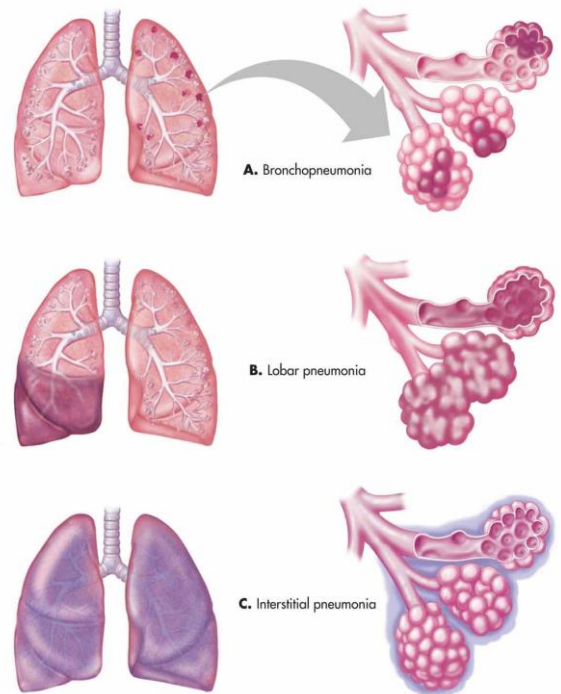
1- Alveolar

- **Bronchopneumonia:**
 - (Streptococcus pneumoniae, Haemophilus influenza, Staphylococcus aureus)
 - Represent an extension from pre-existing bronchitis or bronchiolitis.
 - Extremely common tends to occur in two extremes of life.
- **Lobar pneumonia:**
 - (Streptococcus pneumoniae)
 - Acute bacterial infection of a large portion of a lobe or entire lobe.
 - Classic lobar pneumonia is now infrequent.

Note: Overlap of the two patterns often occur

2. Interstitial:

Influenza virus (children),
Mycoplasma pneumoniae



The clinical types of pneumonia

Table 12–6 The Pneumonia Syndromes and Implicated Pathogens

1)	Community-Acquired Acute Pneumonia <i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Moraxella catarrhalis</i> <i>Staphylococcus aureus</i> <i>Legionella pneumophila</i> Enterobacteriaceae (<i>Klebsiella pneumoniae</i>) and <i>Pseudomonas</i> spp.
2)	Community-Acquired Atypical Pneumonia <i>Mycoplasma pneumoniae</i> Chlamydia spp.— <i>Chlamydia pneumoniae</i> , <i>Chlamydia psittaci</i> , <i>Chlamydia trachomatis</i> <i>Coxiella burnetii</i> (Q fever) Viruses: respiratory syncytial virus, human metapneumovirus, parainfluenza virus (children); influenza A and B (adults); adenovirus (military recruits)
3)	Nosocomial Pneumonia Gram-negative rods belonging to Enterobacteriaceae (<i>Klebsiella</i> spp., <i>Serratia marcescens</i> , <i>Escherichia coli</i>) and <i>Pseudomonas</i> spp. <i>S. aureus</i> (usually methicillin-resistant)
4)	Aspiration Pneumonia Anaerobic oral flora (<i>Bacteroides</i> , <i>Prevotella</i> , <i>Fusobacterium</i> , <i>Peptostreptococcus</i>), admixed with aerobic bacteria (<i>S. pneumoniae</i> , <i>S. aureus</i> , <i>H. influenzae</i> , and <i>Pseudomonas aeruginosa</i>)
5)	Chronic Pneumonia <i>Nocardia</i> <i>Actinomyces</i> Granulomatous: <i>Mycobacterium tuberculosis</i> and atypical mycobacteria, <i>Histoplasma capsulatum</i> , <i>Coccidioides immitis</i> , <i>Blastomyces dermatitidis</i>
6)	Necrotizing Pneumonia and Lung Abscess Anaerobic bacteria (extremely common), with or without mixed aerobic infection <i>S. aureus</i> , <i>K. pneumoniae</i> , <i>Streptococcus pyogenes</i> , and type 3 pneumococcus (uncommon)
7)	Pneumonia in the Immunocompromised Host Cytomegalovirus <i>Pneumocystis jiroveci</i> <i>Mycobacterium avium</i> complex (MAC) Invasive aspergillosis Invasive candidiasis “Usual” bacterial, viral, and fungal organisms (listed above)

1) COMMUNITY-ACQUIRED ACUTE PNEUMONIA

- Usually Bacterial
- Can follow URT infection
- It can be **lobar** or **bronchopneumonia**

Clinical features:

- Sudden onset of:
 - High fever,
 - Chills,
 - Pleuritic chest pain and
 - Productive cough, may be with hemoptysis
- Reduced air entry and dullness by percussion

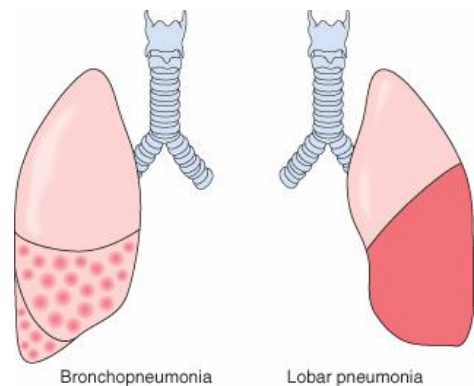
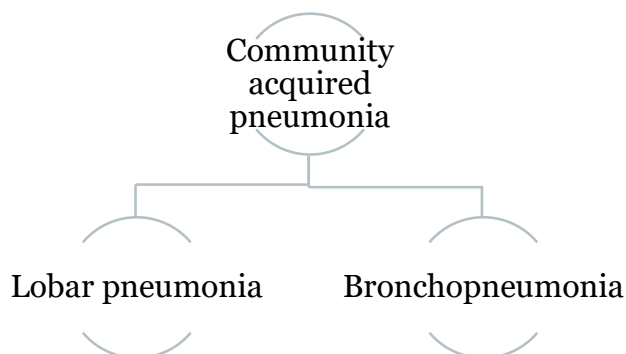
Cause:

- **The most common cause** of Community-Acquired Acute Pneumonia is **Streptococcus pneumoniae**
- **Other common causes:** Haemophilus influenzae, Moraxella catarrhalis, Staphylococcus aureus, Legionella pneumophila, Klebsiella pneumoniae and Pseudomonas aeruginosa spp.
- **In intravenous drug abuser:** Staphylococcus aureus
- It is more common in:
 - Underlying chronic disease e.g. DM, COPD, and congestive heart failure
 - Congenital or acquired immune deficiency
 - Decreased or absent splenic function

Dr.Rikabi Notes:

Organisms causing pneumonia CAP:

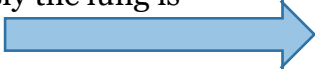
- Streptococcal pneumonia, follows **measles and influenza**
- Staph Aureus follows **viral infection common cold or influenza**
- Haemophilus influenza common in people with **COPD**. It exacerbates bronchitis (this is a medical emergency)
- **Klebsiella, Staph Aureus, Streptococci, are the three organisms capable of forming abscesses and it can be seen in debilitated people**
- Legionella pneumonia: Usually **lives in water tanks and water coolers**

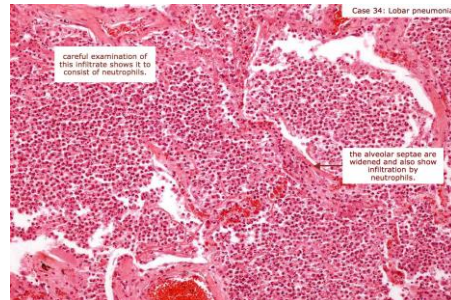
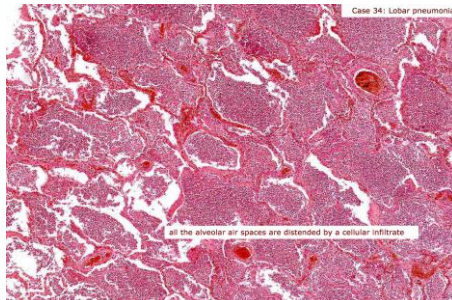
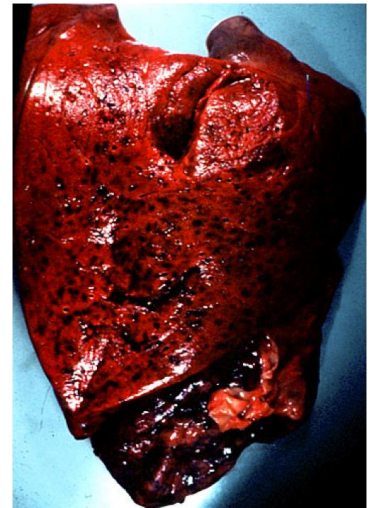


Lobar Pneumonia

- It is widespread involvement of a large area and even an entire lobe of lung (widespread fibrinosuppurative consolidation).
- 90-95% are caused by pneumococci (*Streptococcus pneumoniae*) (type 1,3,7 & 2)
- Rare agents: *K. pneumoniae* staphylococci streptococci *H. influenzae* - *Pseudomonas* and *Proteus*
- There are 4 stages:



- I. **Stage I: Congestion:** lung is heavy, boggy and red. The intra-alveolar space is filled with fluid, few scattered neutrophils and numerous bacteria.
- II. **Stage II: Red hepatization (solidification):** alveolar spaces are filled with neutrophils, red cells (congestion) and fibrin. Grossly the lung is firm/solid red and liver-like. 
- III. **Stage III: Gray hepatization:** here the red cells are reduced but neutrophils and fibrin (fibrinopurulent/suppurative exudate) are still present. Grossly the lung is still firm/solid and liver-like but grey.
- IV. **Stage IV: Resolution:** exudates within the alveoli are being enzymatically digested, resorbed, ingested by macrophages or coughed up.



Dr.Rikabi Notes:

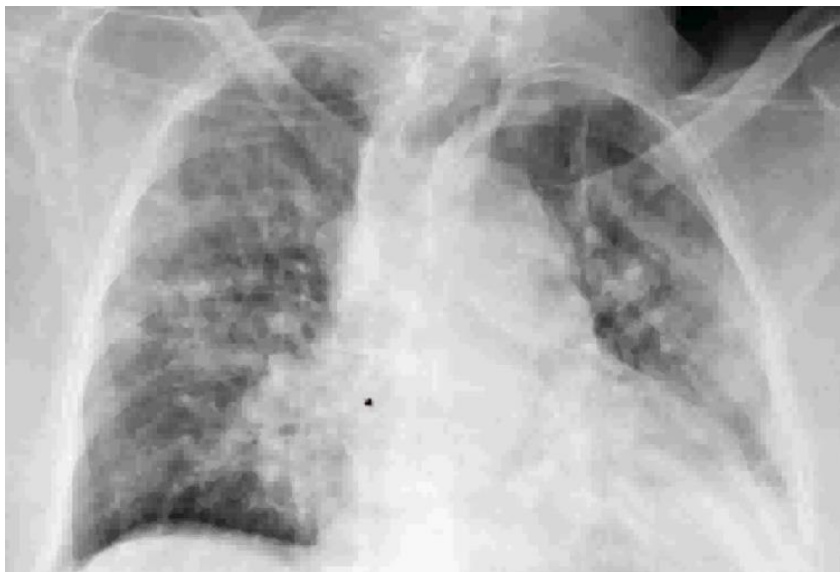
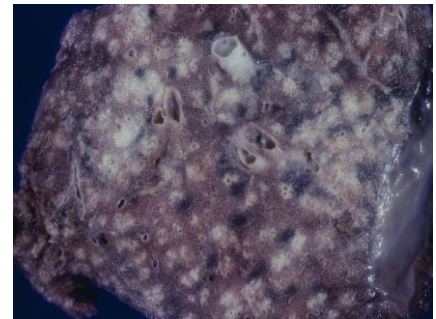
- **Lobar pneumonia:** (affects pleura) leading to pleural effusion (exudate with neutrophils, lots of protein and high specific gravity) these all indicate inflammation
- **CXR:**
 - X-ray shows bacterial (lobar) pneumonia consolidation associated with pleuritis it is easy to diagnose due to exudate which is apparent on X-ray.
 - Lobar pneumonia affects 1 or 2 lobes.
- **Stages of lobar pneumonia:**
 - **Congestion:** exudate to alveoli due to increased vascular permeability
 - **Red hepatization:** large number of neutrophils filling alveoli (it is called hepatization because usually the lung is spongy but here it becomes solid like a liver)
 - **Grey hepatization:** Replacement of neutrophils with macrophages & lysis of RBCs
 - **Resolution:** exudate goes away due to successful treatment
- Early prescription of antibiotics prevents going through all of these stages

Dr.Rikabi Notes:

- **Bronchopneumonia:** Bronchial (patchy) inflammation in bronchiole bronchus and surrounding alveoli more common.
 - usually occurs after infection of children with fever (because of influenza viruses)
 - Terminal event for many diseases
- **CT scan of bronchopneumonia:**
 - Shows areas of consolidation next to normal areas
 - Abscess: cavity with fluid level (low density) it could remain full of pus or drain into bronchus or go to pleura causing pleurisy

Bronchopneumonia

- Are focal/patchy areas of consolidated acute suppurative inflammation in one or more lobes.
- Most common agents are:
 - **Streptococcus pneumoniae**,
 - Haemophilus Influenza, in COPD
 - Pseudomonas Aeruginosa in CF
 - coliform bacteria.
 - staphylococci
- Usually it involves lower lobes (basal) bilaterally because there is a tendency of the secretions to gravitate into the lower lobes.
- Well developed lesions are 3 to 4 cm dry grey red ill defined nodules.
- **Microscopy:** **neutrophil rich exudate** filling the bronchi, bronchioles and adjacent alveolar spaces.



On CXR: multiple small opacities (consolidation)

Clinical features

- Abrupt onset of
 - High fever
 - Shaking chills
 - **Cough productive** of mucopurulent sputum occasional patients may have hemoptysis
- Reduced air entry and dullness by percussion.
- When fibrinosuppurative pleuritis is present, it is accompanied by pleuritic pain and pleural friction rub
- Radiology:
 - In **lobar pneumonia** there is a radio opaque (consolidation) well circumscribed lobe
 - In **bronchopneumonia** there are multiple small opacities usually basal and bilateral.

Complications

IMPORTANT

- Tissue destruction and necrosis (**abscess**).
- Spread of infection to the pleura leading to **empyema** (pus in pleural cavity).
- Organization of the exudate which converts the lung into **solid tissue**.
- Bacteremic dissemination to heart valves (infective endocarditis), pericardium, brain (meningitis), kidneys, spleen or joints (arthritis)

Dr.Rikabi Notes:

• How it usually presents (lobar pneumonia):

- Usually patients are **old, debilitated, and have many diseases** (e.g. Ischemic heart disease, hyperuricemia, diabetes etc.) (“he has so many problems half of the text book of medicine he has it, رايح ”جاي عالمستشفى
- Usually there is a change in the nature of symptoms, **suddenly cough sputum changes color(mucopurulent sputum)**. They usually develop **spiking fever, chill, malaise, chest pain** (in the lateral chest wall) due to the **large pleural effusion**
- **Sputum might include blood (hemoptysis) and tastes rusty** due to lysis of RBCs (“يחס بطعم حديد ”في فمه
- Patient could have **septicemia**
- **PMN high, leukocytosis** with 65% neutrophils. Concurrent with a **shift to the left (increase in primitive cells due to high demand)**
- **ESR very high** due to high number of white blood cells
- **High CRP**

• Gross view:

- **Abscess in lung**, usually due to bronchopneumonia usually in people with gastric content aspiration
- Abscess is a cavity full of pus (bacteria PMN and fibrin)
- Empyema: Pleura with pus covering them

2-COMMUNITY ACQUIRED ATYPICAL PNEUMONIA

• Primary atypical pneumonia/interstitial pneumonitis

- Characterized by patchy inflammation in the lungs confined to the alveolar septae and pulmonary interstitium and therefore it is called interstitial pneumonitis.
- It is also called **atypical pneumonia** because it not the typical pneumonia in which the inflammation is primarily in the alveolar spaces.
- caused by many organisms
 - the most common is *Mycoplasma pneumoniae*
 - *Others include:*
 - **Viruses** e.g. respiratory syncytial virus, influenza virus (children), influenza A and B (adults); adenovirus and SARS virus .
 - **Chlamydia** spp. (*C. pneumoniae* etc.) and *Coxiella burnetii* (Q fever). Chlamydia is transmitted by inhalation of dried excreta of infected birds and causes ornithosis/psittacosis.
 - Predisposing factors: malnutrition, alcoholism and any underlying debilitating disease.

Mycoplasma pneumoniae

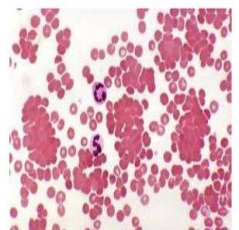
- To confirm Mycoplasma pneumoniae, we use **cold agglutinin test**.
- Serological PCR detection as well.

cold agglutinin test explanation

- We take a human plasma, then we freeze it down to -4°C.
- After freezing it, we add a (sheep) blood to it.
- If the test positive, blood will clout.
- It will clout because the human plasma contain antibody IgM to fight M.Plasma. incase of positive result.

Cold Agglutination test

- Positive in Mycoplasma (Primary Atypical) Pneumonia
- The patients sera agglutinated human O group erythrocytes at 4 o c the agglutination being reversible at 37 0 c



2-COMMUNITY ACQUIRED ATYPICAL PNEUMONIA

Clinical course

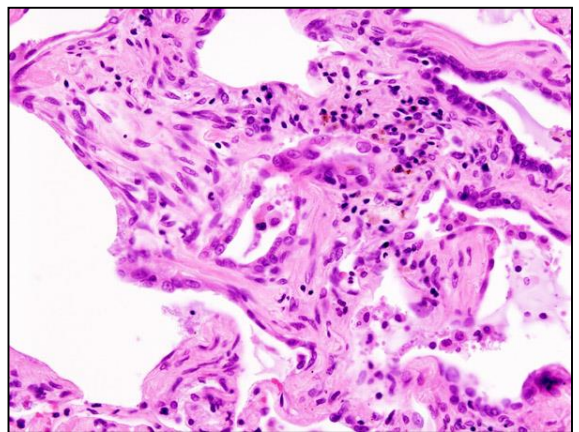
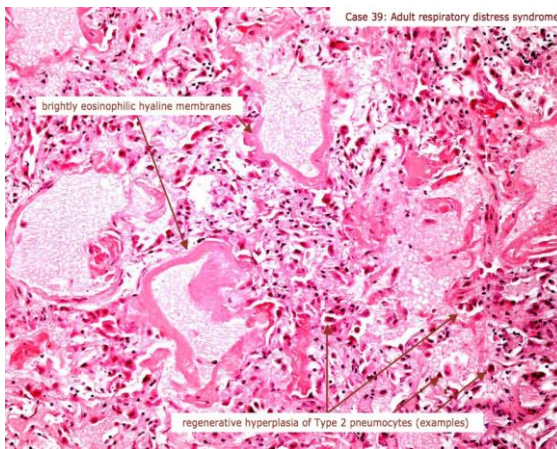
- Extremely variable course. Patient usually present with flulike symptoms which may progress to life-threatening situations.
- Identification of the organism is difficult.
- Prognosis in uncomplicated pt. is good

Gross morphology

- Pneumonic involvement may be patchy, or involve whole lobes bilaterally or unilaterally.
- Affected areas are red-blue congested.

Micro morphology

- Predominantly there is inflammation in the interstitium/alveolar wall.
- Alveolar septa are widened and edematous with mononuclear inflammatory infiltrate (and neutrophils in acute cases only)
- Sever cases: Intra-alveolar proteinaceous material with pink hyaline membrane lining the alveolar walls (diffuse alveolar damage)



3-NOSOCOMIAL PNEUMONIA

- Hospital acquired Pneumonia. =nosocomial pneumonia.
- Acquire terminal pneumonias while hospitalized (nosocomial infection)

Predisposing factor: sever underlying conditions e.g. immunosuppression, prolonged antibiotic therapy, intravascular catheter and pt. with mechanical ventilator

Cause: **Gram-negative** organisms like Klebsiella, Pseudomonas aeruginosa and E. coli.

4-ASPIRATION PNEUMONIA

- Occur in debilitated patients, comatose, alcoholic, or those who aspirated gastric contents
 - Chemical injury due gastric acid and bacterial infection (anaerobic bacteria admixed with aerobic bacteria, e.g. Bacteroides, Fusobacterium and Peptococcus). Occur during repeated vomiting.
- A necrotizing pneumonia with fulminant clinical course, common complication (abscess) and frequent cause of death.

5-CHRONIC PNEUMONIA

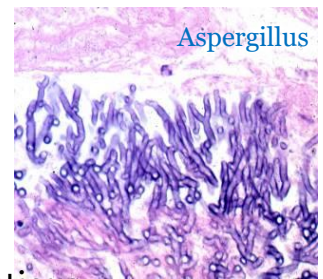
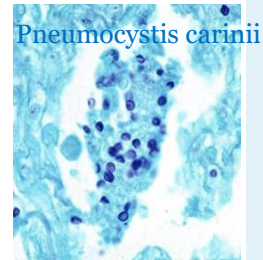
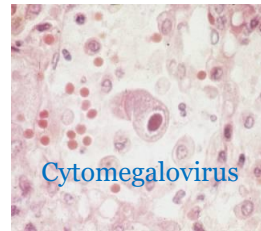
- is most often a localized lesion in an immunocompetent person, with or without regional lymph node involvement.
- There is typically granulomatous inflammation,
 - Which may be due to bacteria (e.g., M. tuberculosis) or
 - fungi (Histoplasma capsulatum, Coccidioides immitis, Blastomyces)
- In the immunocompromised, there is usually systemic dissemination of the causative organism, accompanied by widespread disease.
- Tuberculosis is the most important entity within the spectrum of chronic pneumonias.

6-OPPORTUNISTIC PNEUMONIA

- Infections that affect immunosuppressed patients (AIDS, cancer patients and transplant recipients)

Causative organisms:

- Cytomegalovirus
- Pneumocystis jiroveci (carinii)
- Mycobacterium avium-intracellulare
- Invasive aspergillosis
- Invasive candidiasis
- "Usual" bacterial, viral, and fungal organisms



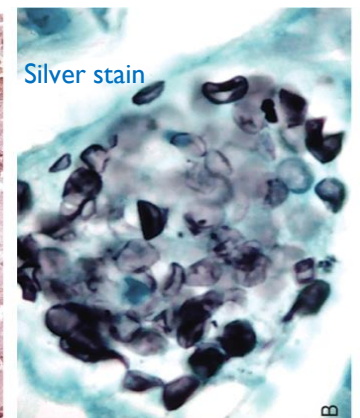
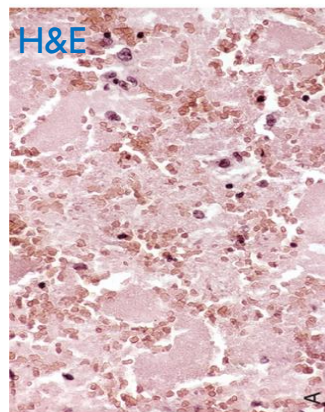
Pneumocystis Pneumonia

- **P. jiroveci** (formerly P. carinii) is an opportunistic infectious agent (a fungus)
- Seen in immunocompromised individuals especially AIDS.
- Pneumocystis infection is confined to the lung, produces an interstitial pneumonitis.
- Effective methods of diagnosis are:
 - identify the organism in bronchoalveolar lavage (BAL) fluids or in a transbronchial biopsy specimen.
 - immunofluorescence antibody kits and PCR-based assays.

Microscopically

- characteristic intra-alveolar foamy, pink-staining exudate on H&E stains
- organism is trapped in the foamy material and can be seen on silver stain as oval cup shaped structures

Pneumocystis pneumonia:
Under the microscope you will see cyst (cup oval cell shape)



LUNG ABSCESS

Is localized suppurative necrotic process within the pulmonary parenchyma.

Features: tissue necrosis and marked acute inflammation.

Organisms:

- Staphylococci
- Streptococci
- Gram-negative organisms
- Anaerobes

Pathogenesis:

- Can follow aspiration
- As a complication of bronchopneumonia
- Septic emboli
- Tumors
- Direct infection

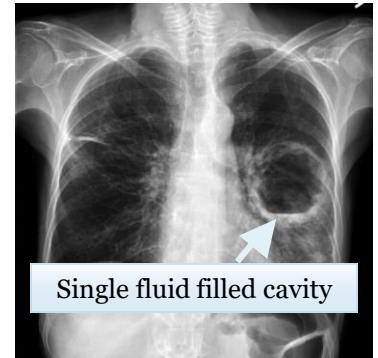
Clinical features:

- Prominent cough producing copious amount of foul smelling and bad-tasting purulent sputum
- Change in position evoke paroxysm of cough
- Fever malaise and clubbing of fingers
- Radiology shows fluid filled cavity

Complications:

- Bronchopleural fistula and pleural involvement resulting in empyema
- Massive hemoptysis, spontaneous rupture into uninvolved lung segments
- Non-resolution of abscess cavity
- Bacteremia could result in brain abscess and meningitis

Prognosis: with antibiotic therapy, 75% of abscess resolve



Single fluid filled cavity



Abscess is filled with necrotic suppurative debris

- **1- Interstitial Pneumonia is also known as?**
 - a) Lobar Pneumonia
 - b) Atypical Pneumonia
 - c) Community acquired Pneumonia

- **2- A 83 year old woman came to you with High fever and a rusty cough and pleuritic chest pain. Sputum cytology showed increase number of macrophages and decreased neutrophils. Which Pathological stage is the patient in?**
 - a) Red hepatization
 - b) Congestion
 - c) Gray hepatization
 - d) Resolution

- **3- A patient diagnosed with lobar Pneumonia. Which of the following is not true ?**
 - a) Acute inflammatory exudate in the Bronchi
 - b) rusty cough
 - c) X-ray shows Consolidated lobe
 - d) Increased polymorphic cell count

- **4-Which of the following is found in the resolution stage in lobar Pneumonia?**
 - a) Eosinophils
 - b) Plasma cell
 - c) Macrophages
 - d) Neutrophils

- **5- A Doctor diagnosed a patient with HIV and Pneumonia. What is the most likely type of Pneumonia the patient has?**
 - a) Bronchopneumonia
 - b) lobar Pneumonia
 - c) Mycoplasma Pneumonia
 - d) Pneumocystis carinii pneumonia

- **6- In the previous Question the Doctor ordered a bronchial lavage. What will it most likely show?**
 - a) Bubble gum transudate
 - b) Soap bubble exudate
 - c) Triple bubble Exudate
 - d) Double bubble transudate

- **7- A 58 man presents with fever, malaise, headaches, and muscle pain (myalgia). A chest x-ray reveals bilateral infiltrates. You draw a tube of blood from the patient (the tube contains anticoagulant) and place the tube in a cup of ice. After the blood has cooled, you notice that the red cells have agglutinated (not clotted). This agglutination goes away after you warm up the tube of blood. This patient's illness is most likely due to infection with ?**
 - a) Influenza A virus
 - b) Mycoplasma pneumonia
 - c) Streptococcus pneumoniae
 - d) Pneumocystis pneumoniae
 - e) Mycobacterium tuberculosis

- **8- A 58 man admit to hospital had fever and developed productive cough with green sputum.... Patchy infiltration. What is the most likely diagnosis?**
 - a) Lobar pneumonia
 - b) Bronchopneumonia
 - c) Mycoplasmic pneumonia
 - d) Viral pneumonia

- **9- which of the following can cause interstitial pneumonia ?**
 - a) Streptococcus pneumonia
 - b) Streptococcus pyogenes
 - c) Mycoplasma pneumonia

- **10-Which of the following is caused by a species of chlamydia:**
 - a) Ornithosis
 - b) Nonspecific urethritis
 - c) Pigeonbreeder lungs
 - d) A & B
- **11- The most common causative agent of interstitial pneumonia in children is:**
 - a) Viruses
 - b) Bacteria
 - c) Fungi
- **12-Which of the following does NOT cause community acquired acute pneumonia ?**
 - a) Streptococcus pneumoniae
 - b) TB
 - c) Staphylococcus aureus
 - d) Legionella pneumophila
- **13-Which of these organisms causes Q fever?**
 - a) Staphylococcus aureus
 - b) Legionella pneumophila
 - c) pneumocystis carinii
 - d) Coxiella burnetti
- **14-Of the following pathogens, which of those are the most common cause of pneumonia in HIV patients ?**
 - a) Staphylococcus aureus
 - b) Pneumocystis jiroveci
 - c) Klebsiella
 - d) K. pneumoniae
- **15- A 30 year old patient was previously diagnosed with bronchiectasis. However, he came to the clinic complaining of suddenly worsening symptom. What could be the causative organism ?**
 - a) Staphylococcus aureus
 - b) Haemophilus influenza
 - c) Legionella pneumophila
 - d) Pneumocystis carinii
- **16- Which of these organisms is not hospital acquired and gram negative ?**
 - a) Klebsiella
 - b) Pseudomonas aeruginosa
 - c) Escherichia coli
 - d) Streptococcus pneumoniae

SAQ

- **1- What is Pneumonia?**

- An inflammation of lung parenchyma associated with consolidation
- in parts of the lung.

- **2- Classify pneumonia:**

- **Community acquired pneumonia.**
- **Hospital acquired pneumonia (Nosocomial pneumonia)**

- **3- What kind of pneumonia infiltrates to the adjacent alveoli and has Patchy Distribution ?**

- Bronchopneumonia

- **4- What is the most cause of lobar pneumonia ?**

- **Streptococcus pneumoniae**
-

- **5- Stages of lobar pneumonia are?**

- **Congestion**
- **Red hepatization**
- **Grey hepatization**
- **Resolution**

- **6-What will happen in Red hepatization stage of lobar pneumonia ?**

- A lot of fibrin, bacteria, exudative fluid and neutrophils (acute inflammatory cells) within the alveoli.

- **7- what do we mean by when we say shift to the left and why do we have it in in lobar Pneumonia?**

- Immature WBC which are produced by bone marrow and released to the peripheral blood because of the increase demand of them.

- **8- The bacteria cause lung abscess are ?**

- **Klebsiella, Staphylococcus aureus ,streptococci pyrogen**

CASE:

- **A) A 64 year old man presented to the ER with a temperature of 41 C ,dyspnea and a rusty cough and pleuritic chest pain. Histological investigations showed high neutrophils count and shift to the left. A Sputum cytology showed fibrin and neutrophils.**
 - 1) What is the most likely diagnosis?
 - Lobar Pneumonia
 - 2) Which Pathological stage is the patient in?
 - Red hepatization
 - 3)what is the cause of pleuritic chest pain?
 - empyema
 - 4)What will you find in the x-ray?
 - Increased density because of the consolidation
 - 6) what is most likely organism causing this disease ?
 - Streptococcus pneumoniae
- **B) A 58 man admit to hospital for inguinal hernia under general anesthesia. who is a chronic smoker in the 5 postoperative day he had fever and developed productive cough with green sputum.... Patchy infiltration and abscess.**
 - 1)What is the most likely diagnosis?
 - Bronchopneumonia
 - 2) what is most likely organism ?
 - Staphylococcus aureus
 - 3)give two other organism that can cause abscess?
 - Klebsiella pneumonia, Streptococcus pyogenes
- **C) a 23 year old woman with a history of kidney transplant and she had been on corticosteroids as immunosuppression for 6 months came to the hospital with pneumonia after you do BAL you you find soup bubble exudate**
 - 3) What is the most likely diagnosis?
 - Interstitial (Atypical) pneumonia. (Pneumocystis pneumonia)
 - 2)what stain should you use to see the organism ?
 - Silver Stain
 - 3)what will you see after you do the stain ?
 - cyst and coma shaped cells (Pneumocystis pneumonia)
 - 4)what treatment will give the patient ?
 - Erythromycin and tetracycline

Females:

بشينة آن ماجد -leader

-فاطمة باشرف

-رفف الشمري

-رنا الفرم

-هديل عورتاني

-منيرة المسعد

-الجوهرة الشنيفي

-رزان الزهراني

-رولان مشعل

-نوف العتيبي

-ابتسام المطيري

-غرام جليدان

-بلقيس الراحي

-نورة القاضي

-آلاء الصويغ

-ريم القحطاني

Males:

محمد باحافق -leader

عبدالجبار اليماني

أحمد الراشد

عبدالله بالعبيد

عبدالله السرجاني

أحمد الربيعي

أنس السيف

داود إسما عيل

فهد الفايز

محمد بن معيوف

فهد النجالي

سعد الفوزان

سيف المشاري

تميم الوهبي

خالد العقيبي

محمد الصويغ

محمد الأصقعه

نواف السبيعي

عبدالعزیز المحنا

عبدالله المعيدر

فايز الدر سوني

رشيد البلاغ

عبدالإله الحسين



Kindly contact us if you have any questions/comments and suggestions:

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- * TWITTER: [@pathology437](https://twitter.com/pathology437)

GOOD LUCK! 😊

* references:

- Robbins Basic Pathology
- doctor's slides