Pathology of Pneumonia

Dr. Atif Ali Bashir
Assistant Professor of Pathology
College of Medicine
Majma’ah University

Introduction:
5000 sq meters of area....!
(olympic track)
Filters >10,000 L of air / day...!
Normal lungs are sterile.
Delicate, thin resp. mem – gas exch.
Filter, humidify, sterilize, highly sensitive.

**Normal Lung**

**Normal Lung**

**Etiology:**
Decreased resistance - General/immune
Virulent infection - Lobar pneumonia
Defective Clearing mechanism
Cough/gag Reflex – Coma, paralysis, sick.
Mucosal Injury – smoking, toxin aspiration
Low Alveolar defense - Immunodeficiency
Pulmonary edema – Cardiac failure, embol.
Obstructions – foreign body, tumors

Patterns of Lung disorders:

**Airway**
- Bronchitis, Bronchiectasis,
- Bronchiolitis.
- Tumors / Cancer

**Parenchyma**
- Pneumonia.
- Lung abscess, TB
- Hyaline membrane dis (HMD & ARDS)
Pneumoconiosis
Tumors / Cancer

**Pleura:**
- Pleural effusion (TB)
- Tumors / Cancer

Pathogenesis of Pulmonary Infections

Step 1: Entry

Aspiration (ie Pneumococcus)

Inhalation (ie Mtb and viral pathogens)

Inoculation (contaminated equipment)
Colonization (in patients with COPD)
Hematogenous spread (patients with sepsis)
Direct spread (adjacent abscess)

Pathogenesis:

Pneumonia Types:

Etiologic Types:

Infective
  Viral
  Bacterial
  Fungal
Tuberculosis
Non Infective
Toxins
chemical
Aspiration

Morphologic types:
Lobar
Broncho
Interstitial

Duration:
Acute
Chronic

Clinical:
Primary / secondary. Typical / Atypical
Community a / hospital a

Lobar Pneumonia:
whole lobe, exudation - consolidation
95% - Strep pneum.(Klebsiella in aged, DM, alcoholics)
High fever, rusty sputum, Pleuritic chest pain.
Four stages: (*also in bronchopneumonia)
Congestion – 1d – vasodilatation congestion.

**Red Hepatization**

2d Exudation + RBC

**Gray Hepatization** 4d

neutro & Macrophages.

**Resolution** – 8d

few macrophages, normal.
Pathogenesis of Pneumonia

Lobar Pneumonia:
Lobar Pneumonia – Gray hep...
Lobar Pneumonia:
Lobar Pneumonia:
Congestion
Lobar Pneumonia: Red hepat.
Lobar Pneumonia: Grey hepat.
Broncho-pneumonia (patchy)
Extremes of age. (infancy and old age)
Staph, Strep, Pneumo & H. influenza
Patchy consolidation – not limited to lobes. Suppurative inflammation Usually bilateral Lower lobes common Broncho-pneumonia Broncho-pneumonia Bronchopneumonia: Bronchopneumonia - CT Bronchopneumonia
Broncho – Pneumonia
- Lobar
Extremes of age.
Secondary.
Both genders.
Staph, Strep, H.infl.
Patchy consolidation
Around Small airway
Not limited by
anatomic boundaries.
Usually bilateral.
Middle age – 20-50
Primary in a healthy males common. 
95% pneumococ (Klebs.) 
Entire lobe consolidation 
Diffuse 
Limited by anatomic boundaries. 
Usually unilateral 
Broncho – Pneumonia 
- Lobar
Interstitial / atypical Pneumonia
Primary atypical pneumonia in the immunocompetant host (Mycoplasma or Chlamydia)
Interstitial pneumonitis

- immunocompromised host: Pneumocystic carinii; CMV
- Immunocompetant host: Influenza A

Gross features:
Lungs are heavy but not firmly consolidated

Microscopic features:
Septal mononuclear infiltrate
Alveolar air spaces either ‘empty’ or filled with proteinaceous fluid with few or no inflammatory cells
Interstitial Pneumonia: Chronic Pneumonia
Chronic, lymphoid infiltrate,
No classic stages.
Lung destruction – cavity, abscess etc.
Organisms
Mycobacterium tuberculosis
Histoplasma capsulatum
Aspergillosis
Actinomyces

Comm – **Pneumonia**
- Nosoc
In healthy adults
Gram positive.
Streptococcus pneumoniae (90%)
Strep. Pyogenes,
Staph, H. influenzae
and Klebsiella in elderly or with COPD. In *sick patients. gram-negative bacilli Pseudomonas aeruginosa, Escherichia coli, Enterobacter, Proteus, and Klebsiella.
Pathogenesis of Clinical features:
* Alveolar inflammation.
Tachypnoea, Dyspnoea, Resp Acidosis → Solid/airless lungs – decreased oxygenation.
Dull percussion -
Consolidation –
Exudation
Rusty sputum - RBC & Inflammatory cells.
Fever – Inflammatory mediators.
Complications of Pneumonia
**Abscesses**
Localized suppurative
necrosis, Right side often in aspiration. Staphylococcus; Klebsiella; Pseudomonas
**Pleuritis / Pleural effusion.**
Inflammation of the pleura (Streptococcus pneumoniae)
Blood rich exudate (esp. rickettsial diseases)

**Empyema**
Pus in the pleural space.

**Septicemia**
Abscess formation

**Lung Abscess:**
Abscess formation

**Lung Abscess:**
Lung Fungal Abscess: Candida