PATHOLOGY OF PRIMARY & POST PRIMARY TUBERCULOSIS

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Pathogenesis of Tuberculosis

Types of tuberculosis

I) Primary tuberculosis [TB infection]
   The first MTB Invasion in the body →
   Primary Tuberculosis / Primary Pulmonary Tuberculosis

II) Post primary tuberculosis [Disease]
   Invasion of MTB in already infected body[Pr TB] →
   Post Pr TB / Post Primary Pulmonary Tuberculosis

Why: Because of immune status of the body; response in uninfected body & already infected body is entirely different
Primary pulmonary tuberculosis

MTB → alveous /bronchioli → polymorphs & macrophages
reach the site → ↑ in no PMN, macrophages & AFB → pneumonic lesion

• **Primary complex**
  1- Ghon’s focus
  2- Tub. Lymphangitis
  3- Hilar lymph-adenopathy
Initial tuberculous infection. Small bronchopneumonic infiltrate in r. upper lobe (first infection may be anywhere in lungs with greatly enlarged hilar and tracheobronchial lymph nodes).

X-ray film showing ill-defined shadow of initial infective focus in lateral upper zone of r. upper lobe with enlarged lymph nodes in hilar and azygos vein areas in a 6-year-old child.

In time, pulmonary focus often heals to a fibrosed, calcified “Ghon lesion” and lymph nodes regress and calcify as shown here.

Calcified “Ghon lesion” in lateral portion of r. lower lobe.

Section of a very inspissated, dried-out focus with fibrous capsule.
Spread of the MTB infection beyond Pr. Complex

- Hilar lymphadenopathy $\rightarrow$ spill over to lymph $\rightarrow$ blood $\rightarrow$ hematogenous spread $\rightarrow$ all organs of body e.g.
  - Liver
  - meninges
  - bones, joints
  - spleen
  - Kidney etc.
Development of CMI / Hypersensitivity

• With in 2-10 week immune system get ready & recruits specific CMI [T lymphocytes]
• CMI → start combating on progressive lesions all over the body
• This specific immunity takes over; further growth of M.T.B. get hindered and healing process starts every where
• Healing period 3-5 years
• Healing (95% cases):-
  - Resolution
  - Fibrosis
  - Calcification
Non Healing of the Pr. Disease

• **Primary Progressive disease (5%)**: 
  growth of MTB continues unabated → disease

• **Forms of Primary Progressive Disease:**
  a) Symptomatic Primary Complex  
b) Infiltrative / pneumonic / cavitary  
c) Miliary tuberculosis  
d) Pleurisy (pleural effusion)  
e) Bone & joint tuberculosis  
f) Skin tuberculosis
Innumerable miliary tubercles scattered throughout both lungs and on pleural surface.

Multiple solitary and conglomerate tubercles composed mostly of epithelioid cells with an occasional giant cell of the Langhans type and surrounded by numerous lymphoid cells.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration</th>
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<tbody>
<tr>
<td>1) Primary Complex formation</td>
<td>2-10 wks</td>
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<tr>
<td>2) Stage of hematogenous spread</td>
<td>6 m</td>
</tr>
<tr>
<td>3) Stage of pleurisy/pl eff.</td>
<td>6-12 m</td>
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<tr>
<td>4) Bone/joint tuberculosis</td>
<td>1-5 yrs</td>
</tr>
<tr>
<td>5) Skin lesion / genito-urinary</td>
<td>5-15 yrs</td>
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<tr>
<td>6) Healing Pr Complex</td>
<td>3-5 yrs</td>
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Post Primary Tuberculosis

**DEFINITION**
Development of tuberculous disease in a healed case of primary tuberculosis [infection / disease]

**MECHANISM**

I) **Reactivation of endogenous Lesion (common)**
   * Aging
   * ↓immunity
   * Immuno suppressive drugs

II) **Re-infection / Exogenous (Less common)**
Pathogenesis of Post Primary

CMI is specific

• Granuloma formation
• Caseation necrosis
• Liquefaction
• Cavity formation → enlargement of cavity
• Fibrosis
• Calcification
Characters of Post Pr. Tuberculosis

- **Types of pulmonary lesions:**
  - Nodular (granulomatous)
  - Fibro-caseous
  - Fibro-cavitary
  - Pneumonic
  - Miliary
  - Calcification

- **Bronchogenic spread**

- Pleural involvement is rare
- Lymph node involvement is less
- Miliary TB less common
Signs & Symptoms: (C F)

(A) General constitutional features
(B) As a result of pathological changes in the anatomy of the affected organs
(C) Associated extra pulmonary manifestations
Sputum Culture

**Concentration and decontamination**
Equal amounts of 4% NaOH plus 0.5% N-acetyl-L-cysteine added to sputum, shaken for 1 minute and incubated at room temperature for 15 to 20 minutes. This kills most contaminant and also kills some *M. tuberculosis*.

**Specimen centrifuged** for 15 minutes and supernatant discarded.

Sediment diluted with 0.5 ml water or albumin, neutralized with phosphate buffer (pH 6.8), then spread over slants or slants of medium.

*M. tuberculosis* colonies on Löwenstein-Jensen media. Orange pigmentation appears only after exposure to light.

*M. avium* colonies on Löwenstein-Jensen medium.

**Drug susceptibility testing** (for selected patients)

Direct: Medium in each of 3 quadrants contains a different drug. INH is control. Diluted sediment is spread evenly over all 3 or 4 plates required, as each drug is tested in 2 or 3 concentrations. INH 0.2 and 1.0; EMB 0.5, 10.0, and 15.0; RFP 0.2, 0.5, and 1.0; and SM 2.0 and 10.0 mg are most frequently tested.

Indirect: Organisms are first cultured and then measured aliquots of culture are spread over quadrants containing different drugs in varying concentrations as well as control.

INH = isoniazid, EMB = ethambutol, RFP = rifampin, SM = streptomycin.
Thank You