Slide 1

Chest Radiology Interpretation:
Findings of Tuberculosis

Slide 2

Case #1

Slide 3

Reading the TB CXR

- Be systematic!
- Start centrally and work outwards
- Normal or abnormal
- Describe the finding(s)
- Consider the significance of the finding(s)
Heart

- <55% thoracic diameter
- Technique important
- Larger in:
  - AP film
  - Poor inspiration
  - Rotation
  - Children
- True enlargement
  - Chamber enlargement
  - Pericardial effusion
  - Mass

Artifactual cardiomegaly

Slide 18
Q1. Pathology in this patient is most likely to show?

- A. Caseating granulomas
- B. Non-caseating granulomas
- C. Atypical cells with high nuclear/cytoplasmic ratio
- D. Fibrosis
Q2. Where is this lesion located?

- A. Lung
- B. Mediastinum
- C. Pleura
- D. Chest wall
Q3. What is the primary abnormality?

A. Mediastinal widening
B. Diffuse lung opacities
C. Pleural effusion
D. Normal
Inspiration: (≥10 posterior ribs)

Slide 44

Slide 45
Slide 55

Q4. What is the most likely diagnosis?

A. Tuberculosis
B. Aspergillosis
C. Malignancy
D. Mycoplasma

Slide 56

Categories of lung opacities

1. Nodule(s) or mass(es)
2. Alveolar, airspace, consolidation
3. Interstitial (diffuse lines or nodules)
4. Airways (circular or tubular)

Slide 57

Nodule ≤ 3cm, Mass > 3 cm
Slide 58

Consolidation

- Confluent opacity
- Fluffy around the periphery
- Air bronchograms

Slide 59

ARDS

Slide 60

Interstitial disease

- Normal
- Nodular
- Reticular
Questions

- Could this be TB? (the answer is always)
- Is TB the most likely diagnosis?
- If so, what form of TB does the radiology suggest?
- Is active disease likely or unlikely?
- Is TB an unlikely diagnosis?
- What are possible alternative diseases to produce the radiographic pattern?

Key points

- You must know the classic TB patterns
- TB patterns overlap with each other
- TB patterns overlap with other diseases
- If there is an abnormality, it could be due to TB
- But, if it doesn’t fit into a typical TB pattern, it is unlikely to be TB
- It’s all about likelihood!
- Clinical-radiographic correlation
Case #3

Reactivaton TB - radiology

- Location
  - Apical/posterior segments upper lobes
  - Superior segment lower lobes
  - Isolated anterior disease very unusual

- Presence of cavities
- Pleural disease
- Volume loss/scarring early in disease
- Diff dx: fungal, bacterial infections

Chest Radiology Interpretation: Findings of Tuberculosis (Part 2)
Is this likely TB?

Q5. What lobe is involved?
   - A. Right upper lobe
   - B. Azygous lobe
   - C. Right middle lobe
   - D. Right lower lobe

Lobar anatomy

Left Lung
Slide 85

RLL pneumonia

- Obscured Diaphragm
- Clear Heart Border

Slide 86

? Which lobe is involved

Slide 87

Lobar anatomy

- RUL
- RML
- RLL
- Right Lung
Slide 94

Lateral View of the Chest

Diaphragm

Slide 95

Lateral View of the Chest

Diaphragm

Slide 96

Normal LLL Pneumonia
Q6. What is the primary abnormality?

- 1. Consolidation
- 2. Emphysema
- 3. Airway enlargement
- 4. Fibrosis
Prior reactivation tuberculosis

- Upper lobe scarring
  - Volume loss
  - Retraction of hila superiorly
  - Band-like (linear) opacities
  - Architectural distortion
- Asymmetric > symmetric
- Bronchiectasis
- Cystic changes
- Diff dx: fungal, sarcoid, pneumoconioses
Warning signs

- Consolidation outside areas of fibrosis
- Consolidation with cavitation
- Lower lobe abnormalities
- Non-calcified nodules (ill-defined)
- Change from prior CXR

Reactivation TB

Case #5
Q7. What is the likelihood of malignancy?

- A. <5%
- B. 5-10%
- C. 10-20%
- D. >20%

Solitary nodule/mass - the top 5:
- Granuloma
- Hamartoma
- Solitary metastasis
- Bronchogenic carcinoma
- Lots of others

So you see a nodule on CXR…

1. Look for old films
2. Is diffuse calcification present?
3. Get a CT scan
When to get a CT scan?

- Questionable CXR findings
- Further characterization of CXR findings
- Concern for cancer

Role of CT scan for nodules

1. Attempt to prove they are definitively benign
   - Benign pattern of calcification (diffuse, central, ring-like, popcorn)
   - Fat
   - ≥2 years of stability
Features of benign nodules include:

<table>
<thead>
<tr>
<th>Benign patterns of calcification</th>
<th>Presence of fat</th>
<th>Long term stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse</td>
<td>Presence of fat</td>
<td>Initial CT</td>
</tr>
<tr>
<td>Central</td>
<td>Hamartoma</td>
<td>24 month follow-up</td>
</tr>
<tr>
<td>Popcorn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Slide 116**

*Hamartoma*

---

**Slide 117**

*Irregular calcification: adenocarcinoma*
Role of CT scan for nodules

1. Attempt to prove they are definitively benign
   - Benign pattern of calcification (diffuse, central, ring-like, popcorn)
   - Fat
   - ≥2 years of stability

2. Determine likelihood of nodule being benign or malignant
   - Low likelihood -> CT follow-up
   - High likelihood -> immediate action (e.g. biopsy)

Suspicous features of nodules include:

- Large size
- Spiculated borders
- Growth

The size threshold above which malignancy is likely demonstrates geographic variability, depending upon the prevalence of endemic granulomatous infection.

Size and likelihood of cancer

- 0% 1% 15% 81%

Swensen. Radiology 2005; 235: 259
**Follow-up recommendations**

<table>
<thead>
<tr>
<th>Nodule size</th>
<th>Low-risk patient</th>
<th>High-risk patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤4 mm</td>
<td>No follow-up</td>
<td>12 months</td>
</tr>
<tr>
<td>&gt;4-6 mm</td>
<td>12 months</td>
<td>6-12 months</td>
</tr>
<tr>
<td>6-8 mm</td>
<td>6-12 months</td>
<td>6-12 months</td>
</tr>
<tr>
<td>8-18 mm</td>
<td>18-24 months</td>
<td>24 months</td>
</tr>
<tr>
<td>&gt;18 mm</td>
<td>24 months</td>
<td>24 months</td>
</tr>
</tbody>
</table>


---

**Old tuberculosis**

---

**Bronchogenic carcinoma**
Prior tuberculosis

- Mid to lower lung predominance
- Can be anywhere
- Nodule: Ghon focus
- Nodule + lymph node: Ranke complex
- Calcification indicative of inactivity

Case #7

Q8. What is the most likely diagnosis?

A. Tuberculosis
B. Bacteria
C. Adenovirus
D. Mycoplasma
Primary tuberculosis

- Difficult radiologic diagnosis
- Mimics other diseases
- Findings
  - Nonspecific consolidation
  - Nodule
  - Lymphadenopathy
- Cavitation unusual
- LAD more common than with 2° TB (particularly kids + HIV)
Q9. What is the LEAST likely diagnosis?

- A. Tuberculosis
- B. Hypersensitivity pneumonitis
- C. Fungal infection
- D. Sarcoidosis

Miliary pattern CXR

- Miliary tuberculosis
- Fungal infection (histo, cocci, blasto)
- Metastases
- Sarcoidosis
Slide 139

Metastases

Slide 140

Case #10

Slide 141

Pleural + pericardial disease

- Primary or secondary
- May be only manifestation in 1° TB
- Empyema more common in secondary
- Adults >> kids
Slide 145

Q10. What is the primary abnormality?

- A. Lymphadenopathy
- B. Pericardial effusion
- C. Lytic bony lesion
- D. Normal

Slide 146

Case #11

Slide 147

- Lymphoma
- Leukemia
- Germ cell tumor
- Bacterial mediastinitis
- Fungal infection
- Tuberculosis
Lymphadenopathy with TB
- Kids >> adults
- Primary >> secondary
- Asymmetric (right > left)
- Most common locations
  - Hilar
  - Right paratracheal
  - Necrosis very common

Slide 149

TB lymphadenitis

Slide 150

Case #12
Slide 151

heart <65% thoracic diameter

thymus

Slide 152

Conclusions

- Be systematic when reading CXR
- Typical TB patterns
- Mimics of TB
- Get a CT scan when appropriate

Slide 153