Radiological aspects of thoracic TB

Etienne Leroy Terquem – Pierre L’Her
SPI / ISP
Soutien Pneumologique International / International Support for Pulmonology
Thoracic TB, main radiological aspects and differential diagnosis

- Common **pulmonary** TB in adult
- Intra thoracic **extra-pulmonary** TB

TB sequelae

TB and AIDS: AIDS modifies the clinical and radiological course of TB. Differential diagnosis are many. It is important to know them, in order to choose the adapted treatment

TB aspects in children
Common adult pulmonary TB

Basic radiological images:

- Nodule
- Infiltrate
- Cavity
- TB pneumonia

These images can follow in time:

nodule → macronodule → excavated nodule → cavern
- These elements are very often associated in the same patient

- The association of several images of different ages and different aspects is very indicative for TB

- Round picture with a diameter > 4 cm, non-excavated, is very rarely TB
Tuberculous Caverns

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Quiz - Caverns (pre test)
Male 67 y old, diabetic, fever, cough, expectoration. 
*Negative AFB.* Unimproved by amoxicillin x 8 days

Do you prescribe a TB treatment TB?

Answer

Yes

No
M 70 y old, fever, asthenia, sweat and weight loss
No respiratory symptoms. Biological inflammatory syndrome
AFB negative not yet available

Select the most likely answer:
A. Normal CXR
B. TB cavern. So I think AFB and X-pert will be positive
C. TB nodule in right lung
Man 57y old, non productive cough. Air-fluid picture left basal. What is your diagnosis?

A. TB cavern
B. Hiatal hernia
C. Lung abcess
D. Excavated cancer
Man 47y old, hemoptysis, poor general condition

AFB negative

What is your diagnosis?

A. TB pneumonia with cavitation
B. Bacterial infection on TB sequelae
C. Aspergilloma
D. Superinfection by NTM
Man 23 y old, long stay in Australia, Thailand, fever 40°, Weight loss, worsening condition, cough & sputum. AFB neg

Do you prescribe a TB treatment TB?
Answer
Yes
No
**Most frequent etiologies of cavitary images**

<table>
<thead>
<tr>
<th>Only cavity with thin wall</th>
<th>Only cavity with thick wall</th>
<th>Multiple cavities with thin wall</th>
<th>Multiple cavities with thick wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>- <strong>Tuberculosis</strong></td>
<td>bronchiectasis</td>
<td>- <strong>Tuberculosis</strong></td>
</tr>
<tr>
<td>Emphysema bulla</td>
<td>- <strong>Bacterial abcess</strong></td>
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</tr>
<tr>
<td>Hydatidosis</td>
<td>- <strong>Bronchial cancer</strong></td>
<td>- <strong>Bronchial cancer</strong></td>
<td>- <strong>Bronchial cancer</strong></td>
</tr>
<tr>
<td>Fungal infection</td>
<td>- Fungal infection (aspergillus)</td>
<td>- Pneumatocele</td>
<td>- Metastasis</td>
</tr>
<tr>
<td>Bronchogenic cyst</td>
<td>- Amibiasis</td>
<td>- Hydatidosis</td>
<td>- Septic embolism</td>
</tr>
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<td>Pneumatocele</td>
<td></td>
<td>- Septic embolism (sequela)</td>
<td>- Pneumatocectasis</td>
</tr>
<tr>
<td>Hiatal hernia</td>
<td></td>
<td>- Metastasis</td>
<td>- Fungal infection</td>
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</table>

From Felson
Cavitary images
Remember main etiologies

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<th>multiple cavities,</th>
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<td>(Aspergilloma)</td>
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Tuberculous cavern

This is an image of clarity surrounded by a wall

- Round or oval shape
- Variable size
- With a wall more or less thick, more or less regular
- Usually located in the upper lobes, or in the apical segment of the lower lobes
- Most often without fluid level
- Sometimes a draining bronchus is visible

IMPORTANT +++
- AFB++ in the direct examination of sputum

The TB cavity is, most often, associated with nodules, alveolar lesions or others caverns
Notice, close to the cavern the infiltrate and the nodules:

This frequent association is highly suggestive of TB:

F 25 y, t°, cough > 3 weeks AFB + in sputum
RUL TB cavern + LUL pneumonia + RLL pneumonia
Different aspects of TB cavities

Thin wall, round aspect

Excavated pneumonia

Thick wall
Differential diagnosis

- **Pulmonary abscess**
  - Smooth inner wall
  - Air-fluid level

- **Cavited Cancer**
  - Round opacity
  - Regular external wall
  - Thick irregular tortuous inner wall

- **Thin wall**
  - TB caverns

- **Thick wall**
TB cavern: usually heal with minimal sequelae

AFB + TB treatment
2RHZE / 4RH

Film after treatment

26.08.07

12.02.08
Male, 25 y old, cough, fever and weight loss, hemoptysis, AFB++ in sputum

TB cavern: usually heal with minimal sequelae
Rarely, cavity is sterilized but persists: risk of Aspergilloma
M 20 y old cough, hemoptysis weight loss 8 kg

Right side:
- nodules
- caverns
- infiltrates

Left:
- 2 caverns with Draining bronchus

AFB +++ in sputum
TB cavern with draining bronchus + left lower lobe pneumonia (Silhouette sign)
Man 70 year old cough, asthenia, Fever, and weight loss

AFB ++

Where is the cavern?
Right side: infiltrate

Left side: excavated nodule
F 35 y old, fever, asthenia, sweat and weight loss
No respiratory symptoms
Biological inflammatory syndrome

AFB negative in sputum
You don’t have a scanner. If you suspect an apex lesion compare right and left and ask for a CXR back on the film (AP view).

AFB negative in sputum

AFB ++ in bronchial aspiration (endoscopy)

Small cavity in retro clavicular area
Systematised pneumonia of the RUL with 2 cavities inside
Notice the draining bronchus of the upper cavity (red arrow)
Most probable diagnosis is active TB
Young woman, 24 years old. Cough and fever. Notion of TB in her brother 4 years ago. AFB positif in sputum.
• Tuberculous cavities are generally easily diagnosed by the bacteriological examination of the sputum because the caverns are very rich in bacilli (AFB+++).

• But be careful in cases of bad quality sputum (saliva) or a too weak patient unable to produce sputum coming from bronchi.

• A hidden or poorly adapted TB treatment is likely to involve a false negative.
• In return, tuberculosis is very rare in cases of a round, non-excavated picture if the diameter is bigger than 4 cms.

• Above this diameter, (and even well before), the tuberculous nodule becomes excavated because of the central necrosis.
This is **not** a TB.
The most likely diagnosis is a bronchial cancer (notice the destruction of the posterior arch of the 3rd rib)
This is **not** tuberculosis. The most likely diagnosis is a bronchial cancer (no excavation)
But a cavity is not always tuberculous ...
M 52 y old, heavy smoker, asthenia and weight loss, t° 38°C, cough, purulent sputum and hemoptysis

Pulmonary abcess? Excavated cancer? TB cavity?
The excavated lesion associated with posterior infiltrate is very indicative of TB.

But this TDM is useless for the diagnosis which has been established by the sputum examination.
M 60 y old, heavy smoker, poor general condition, t° 38°C, cough, hemoptoic sputums

Pulmonary abscess? Excavated cancer? TB cavity?

AFB negative
Bronchial fibroscopy: tumour of the right superior bronchus
Scanner: excavated tumour and mediastinal extension

Excavated cancer
Excavated cancer
Man, 75 years old, heavy smoker, AEG and cough, pain in right shoulder. AFB negative after examination of sputum. TB? Cancer?
EXCAVATED CANCER

(spontaneous evolution 1 year later)
Man, 55 years old past history of alcohol and tobacco. Worsening condition with repeated hemoptysis. AFB negative in sputum and bronchial aspiration. Different diagnosis could be considered: - TB cavity, but AFB are negative in sputum and in bronchial aspiration, which is rather unusual in case of big cavities like this one.

- Bronchial abscess, but external limit are sharp, and no infectious context and no purulent sputum. Nevertheless not impossible but no improvement with antibiotic.

- **Bronchial cancer**: It was the good diagnosis (epidermoïd type). This patient has been deferred to thoracic surgery unit: lobectomy.
Scan view of the previous case
Excavated malignant tumor

- Central necrosis of a bronchial cancer
- Sometimes associated with mediastinal tumoral adenopathies
- Clean external limit, intern irregular limit
- Never a draining bronchus
- Frequent Smoker
- **BK consistently negative in sputum.**
M 50 y old, alcoholism and smoking worsening condition, t° 40°C, cough, purulent sputum

Pulmonary abscess? Excavated cancer? TB cavity?
AFB negative in sputum

Bronchial fibroscopy: pus in the right basal pyramid
Scanner: image of an abcess with smooth walls
Favourable evolution with antibiotherapy

Pulmonary abcess
Note the same dimension in the level of liquid in the front-view image and the lateral-view image: the abscess is intra-pulmonary and develops like a sphere.
Pleural or pulmonary opacity?

Pleural: the level of liquid is not the same in the front and lateral views.

Pleural: the level of liquid is not the same in the front and lateral views.
Fever, purulent sputum, rapid onset (1 week) AFB negative in sputum. Smoker

Pulmonary abscess? TB? Cancer?
Evolution after antibiotic therapy
Amoxicillin + Clavulanic acid

Bacterial abscess, non TB
Background of alcohol and tobacco, Poor oral health status. Fever, Purulent and fetid sputum - negative AFB

Multiple bacterial abscesses
Favorable evolution with antibiotics in 2 weeks
*Staphylococcus aureus* pneumopathy (diabetic context)
The pulmonary abcess

- This is a dense homogenous oval-shaped opacity before excavation.
- The excavation may be accompanied by abundant purulent sputum production.
- After excavation there is an air-fluid level, with regular internal wall, external wall less regular with blurred contour. The fluid level has the same dimension on front and lateral view (different from hydropneumothorax or pyo-pneumothorax).
- The sputum is purulent, and **AFB is negative**.

- Most frequent bacteria:
  
  S. aureus, anaerobic bacteria, gram negative bacteria (*Klebsiella, E. coli, ...*)
M 20 y. from French Guyana t° 40°
WBC count :15000/ mm³ 80 % neutrophils
Persistent fever antibiotic resistant

Normal hepatic ultrasound
Amoebic serology positive
Metronidazole => apyrexia in 2 days

Amoebic lung abcess
Cavitation at D 6
Cambodian farmer 35 y old, t° 39 °
Basi-right chest pain for 7 days
Failure of antibiotic treatment with amoxicillin
CXR 4 days later: this is an amoebic lung abscess

NB: ultrasound show an hepatic amebiasis associated
Poor general condition
Hemoptysis
Poor general condition
Hemoptysis

Moon crescent aspect

ASPERGILLOMA

AFB negative
F 32 y from Gabon
Right upper lobe TB
at the age of 14 years
Aspergilloma in a sterilized TB cavity
Hemoptysis
In a former TB patient
Hemoptysis in a former TB patient

Moon crescent clarity

Declive opacity
Bell « gretol » aspect

Aspergilloma in a healed TB cavity
M 60 y old, hemoptysis. Treated 10 years earlier for TB AFB negative in sputum and bronchial aspiration.

What do you think?
Detection of *Aspergillus* in bronchial aspiration

TB sequelae with bronchiectasis
Thoracic scanner in decubitus and procubitus position:

Aspergilloma is mobile in the cavity, declive, topped by an air crescent.
Cough, abundant purulent expectoration each morning
Frequent surinfections - Chronic respiratory failure
Digital hippocratism - AFB negative on several exams

Bilateral bronchiectasis
Digital Hippocratism
Frequently associated with severe bronchiectasis
Unilateral bronchiectasis, developed on TB sequella
Bronchiectasis (or dilatations of the bronchi) are a frequent pathology.

The etiologies are varied: congenital malformations, sequelae from early childhood infections (measles++, wooping cough, tuberculosis+++).

Not to be confused with TB cavities.
What is your diagnosis?

Large hiatal hernia

Air-fluid picture left basal

What is your diagnosis?
Bulky hiatal hernia
Man, 48 years old, Cambodian farmer productive cough thoracic paint for 30 days. No improvement with antibiotic (amoxi than ceftriaxone). Sputum negative for AFB.
Excavated left pneumonia It could be:

- Tuberculous pneumonia (but AFB neg)
- Staphylococcic pneumonia
- Gram neg or anaerobic pneumonia
- Melioidosis (infection due to *Burkholderia pseudomallei*)
- *In specific area (southeast Asia)*

Melioidosis!
Melioidosis

- Not so rare in south east Asia (particularly in Laos and Thaïland)
- Predisposing factors: diabetes, alcohol excess, chronic lung diseases, steroid therapy…
- Others possible localisations: skin, spleen, liver, kidney, parotid, brain
- Different possible presentation CXR: Infiltrate, pneumonia, cavited pneumonia, ards.
Melioidosis
Melioidosis
Melioidosis: difficult treatment

- Initial intensive therapy: ceftazidime (50mg per kg) + cotrimoxazole 8/40 per kg every 12 hours): minimum 14 days
- Maintenance cotrim idem +/- doxycyclin 100 mg twice a day 3 months minimum
F 16 y old
History = 0
Repeated hemoptysis

Normal clinical examination - inflammatory Sd = 0
Blood count: 7500 WC 1750 eosino - AFB negative
BAL: AFB neg
Capped egg 100μ

Paragonimus

Case from Dr Thierry François Tenon Hospital Paris
Paragonimiasis frequent in Laos

Pseudo TB excavated lesions but often in the lung bases
Paragonimiasis frequent in Laos

Pseudo TB excavated lesions but often in the lung bases. Pleurisy are common, sometimes bilateral.
Caverns - In summary

- An excavated image first evokes TB
- AFB is positive.
- **If AFB is negative mention other diagnoses:**
  - Bronchial cancer in smokers
  - Lung abscess
- Other diagnoses are less common: Aspergilloma, Amebic abscess (right base), Fungal infections, nocardia ...
- Don’t ignore bronchiectasis, a frequent and underestimated pathology
- Remember specific pathologies in specific areas (ex: Meïloidosis or paragonimosis in Lao and south east asia)
- **Traps:**
  - Asymptomatic air-fluid retro-cardiac image may correspond to a hiatal hernia
  - Anti-TB treatment, undisclosed to physician may negate sputum in 2 or 3 weeks
Quiz - Caverns (post test)
Male 67 y old, diabetic, fever, cough, expectoration. Negative AFB. Unimproved by amoxicillin x 8 days.

Do you prescribe a TB treatment TB?

Circle your choice

Yes

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sputum analysis not yet available

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