



# Diagnosis of TB Disease: Radiology

*Megan Devine, MD*

*June 11, 2025*

TB Intensive • June 10 – 12, 2025 • Dallas, Texas



# Megan Devine, MD

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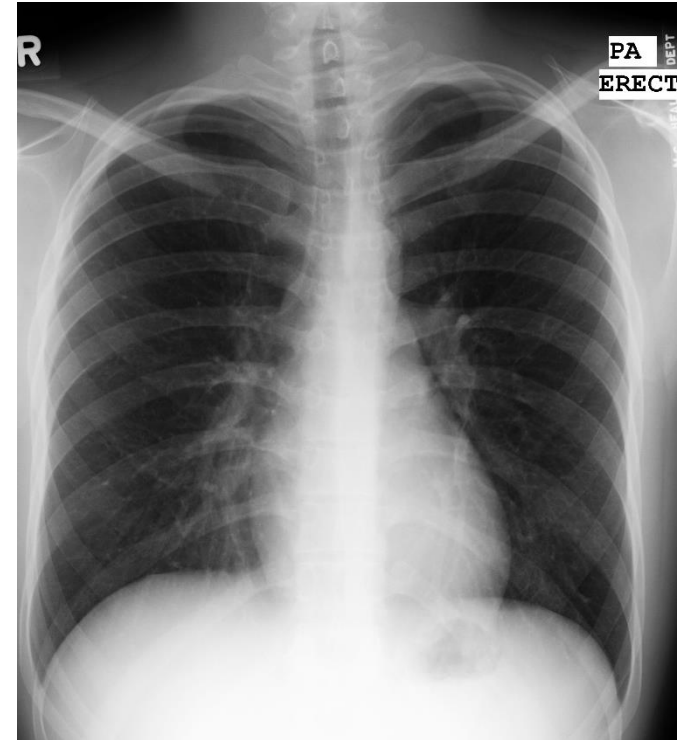
- No conflict of interests
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# Diagnosis of TB Disease: Radiology

Megan Devine, MD  
Pulmonary Medicine

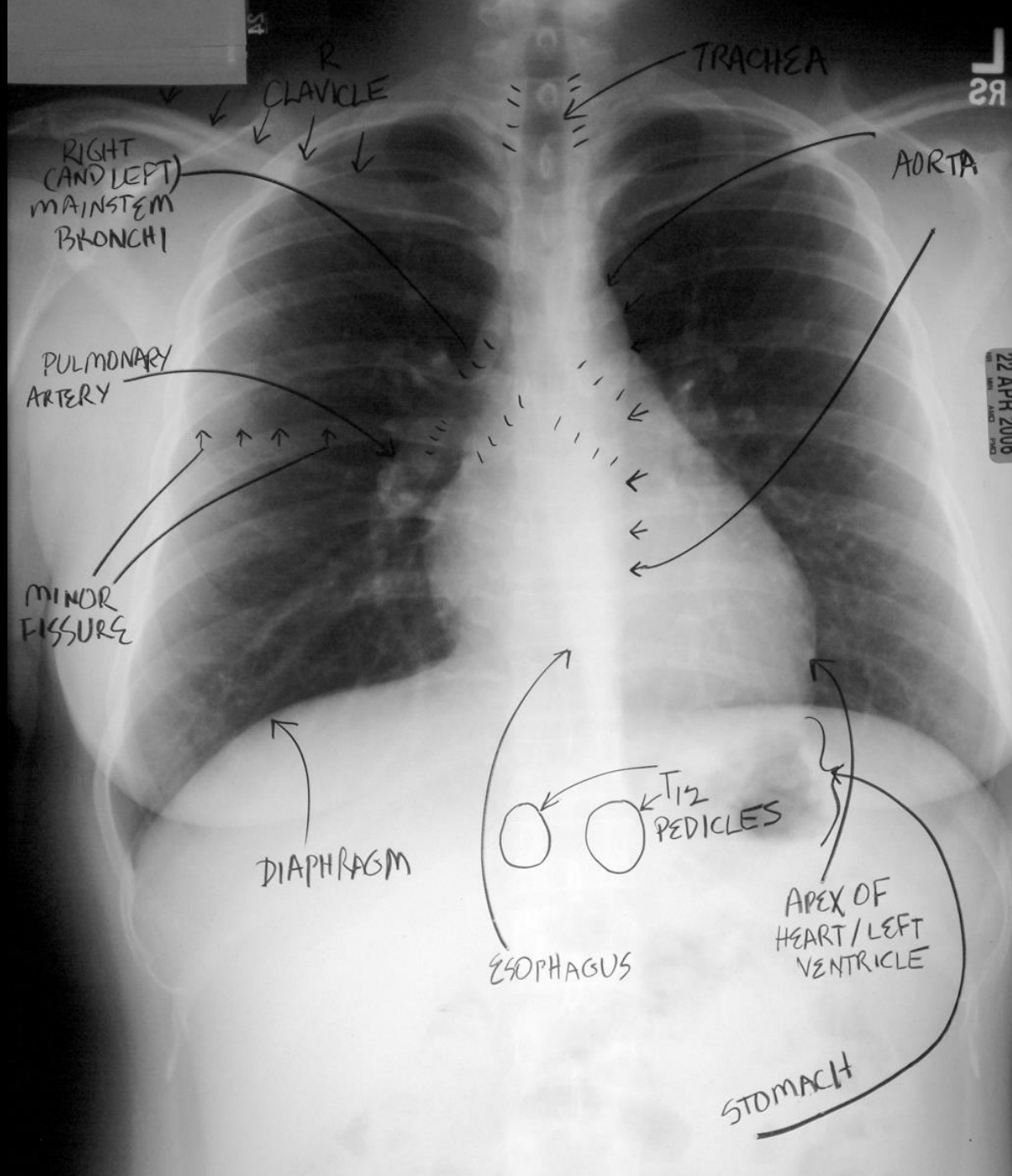
Associate Professor of Medicine  
UT Health Science Center Tyler



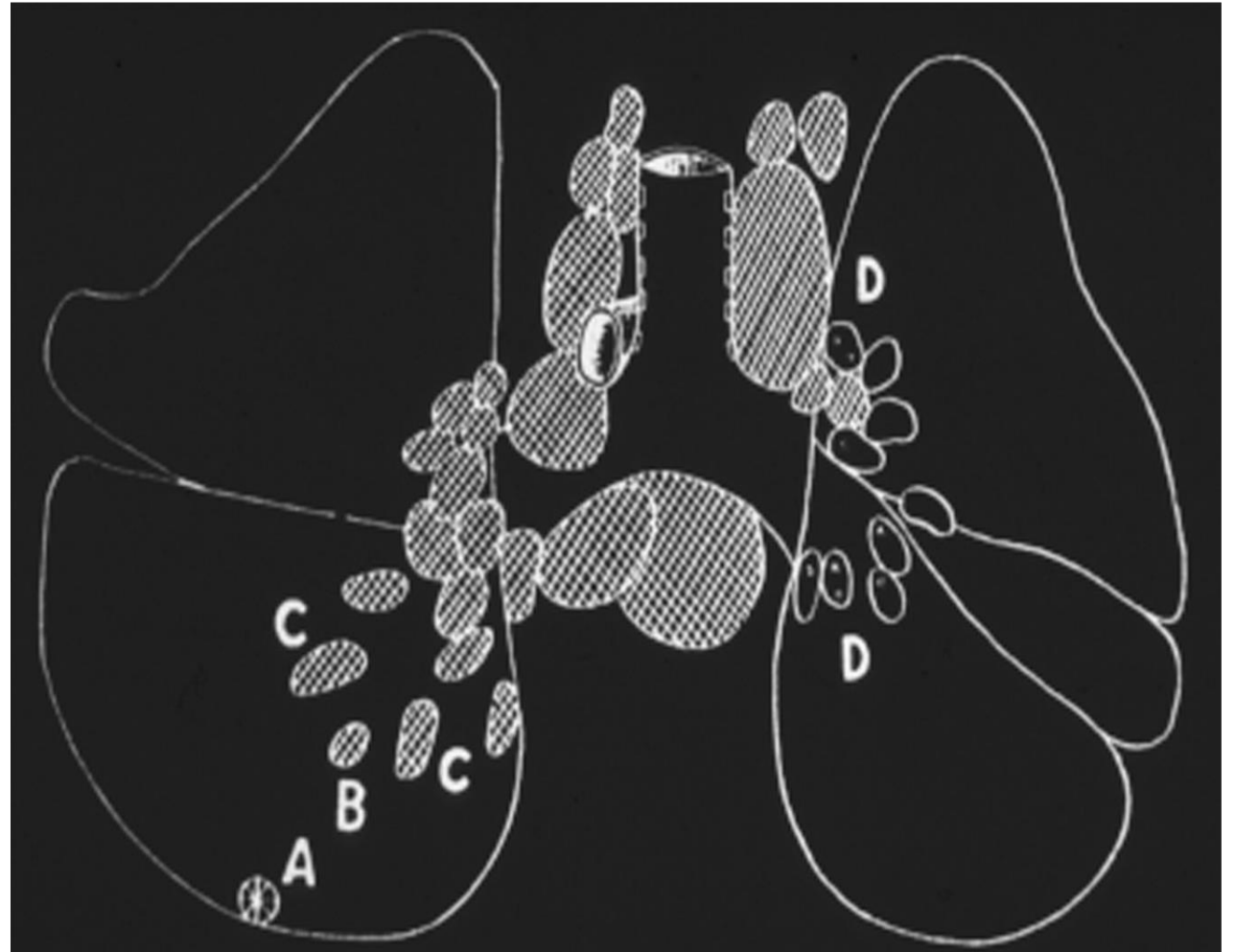
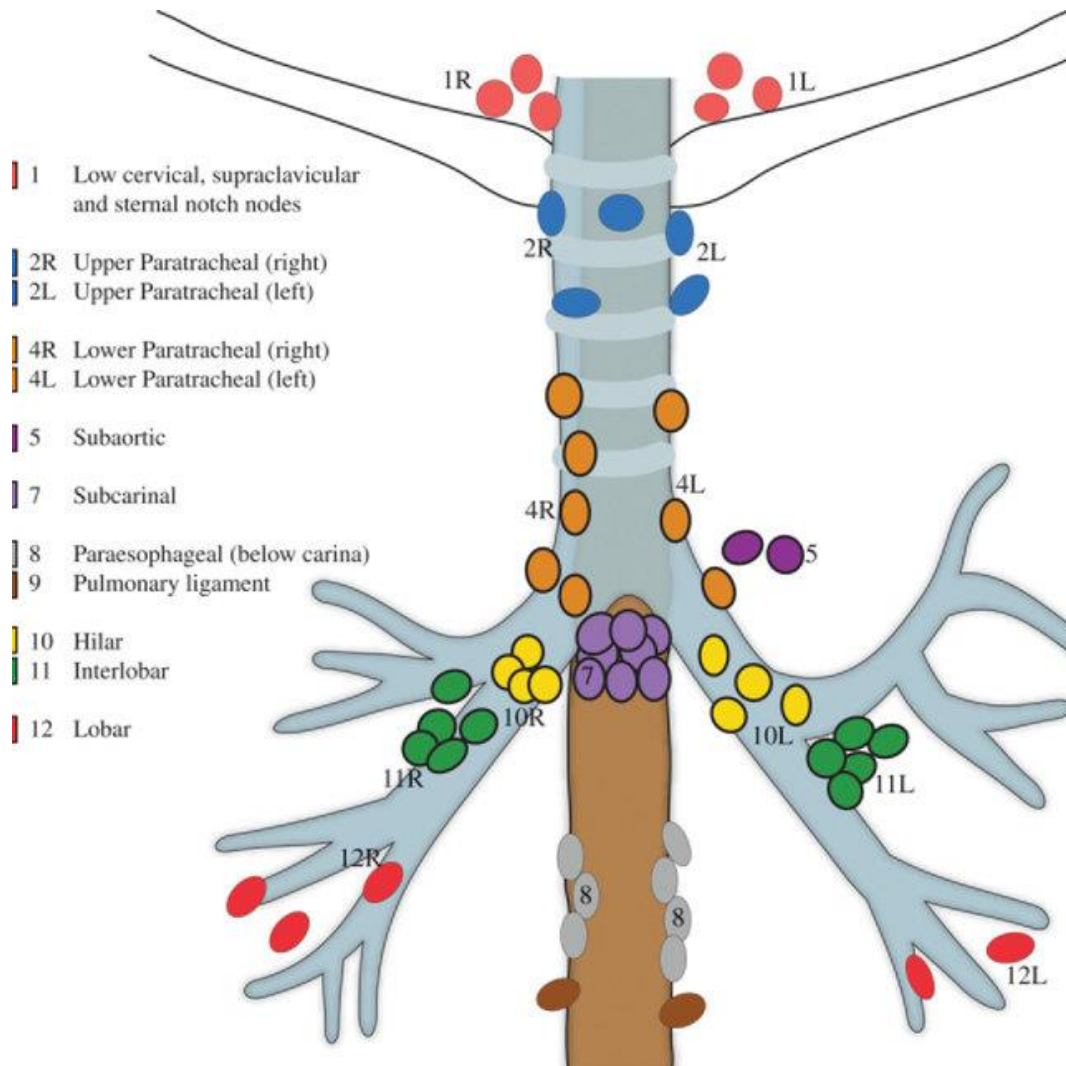
# Chest Radiology in TB

- X-Rays penetrate air, absorbed by fluids/solids
  - Dark = Air
  - Dense White = Calcium (Bone Density)
  - White = Water Density (Everything else)
    - Water
    - Blood
    - Fat
    - Tissue
    - Pus
- Chest radiographs are just shadows
- Interpretation of a chest radiograph is pattern recognition that requires clinical correlation for diagnosis



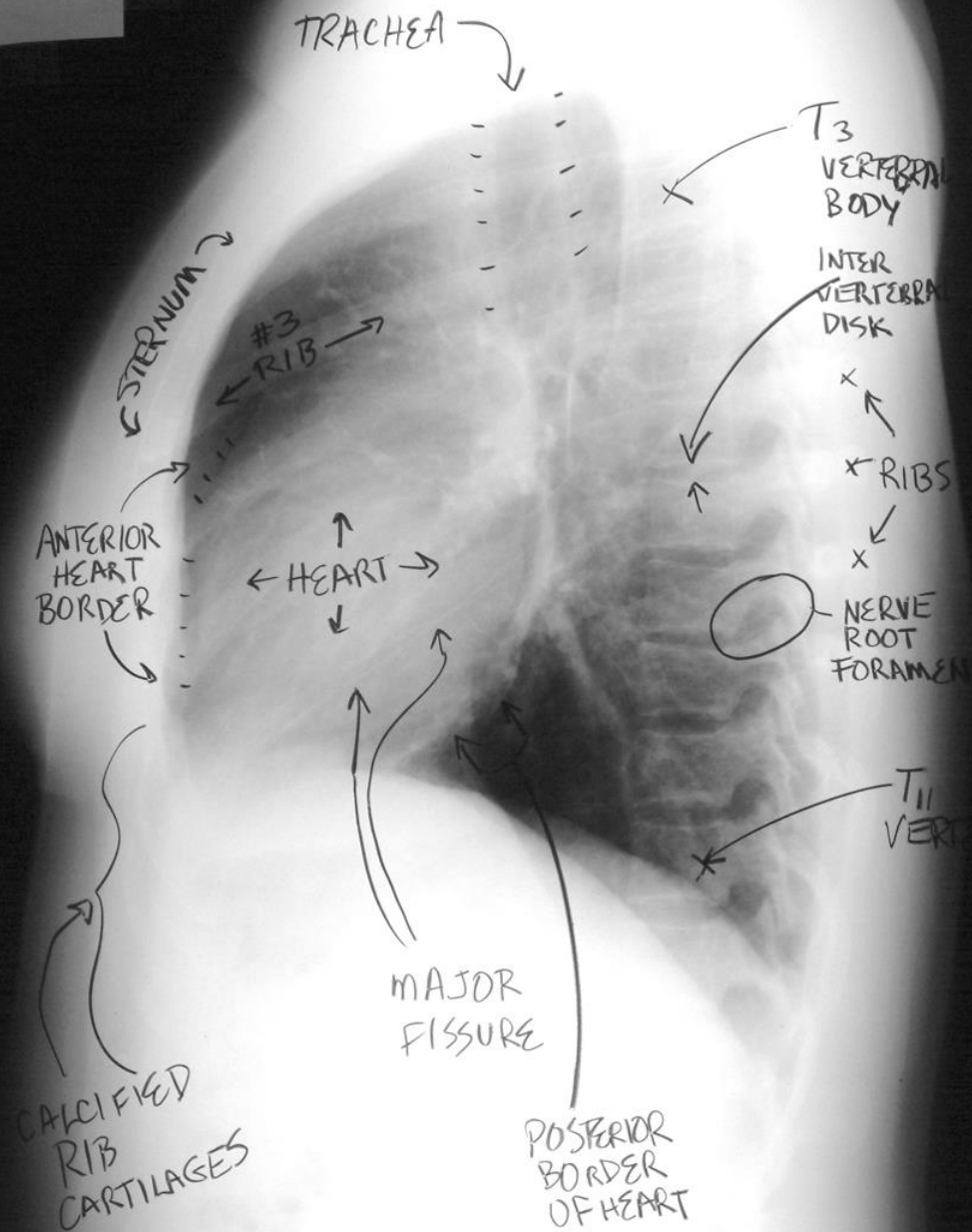


# Thoracic Lymph Nodes





22 APR 2006



# Normal CXR Child





# Role of CT in the Diagnosis of TB

- CT is not the primary radiologic diagnostic test for TB (CT is overused in the US)
- Usually don't need CT for cavitory consolidation
- If TB is a possible diagnosis, sputum for AFB should be obtained prior to CT
- In most instances, CT should be reserved for patients in whom the diagnosis is unclear



# Role of CT in the Diagnosis of TB

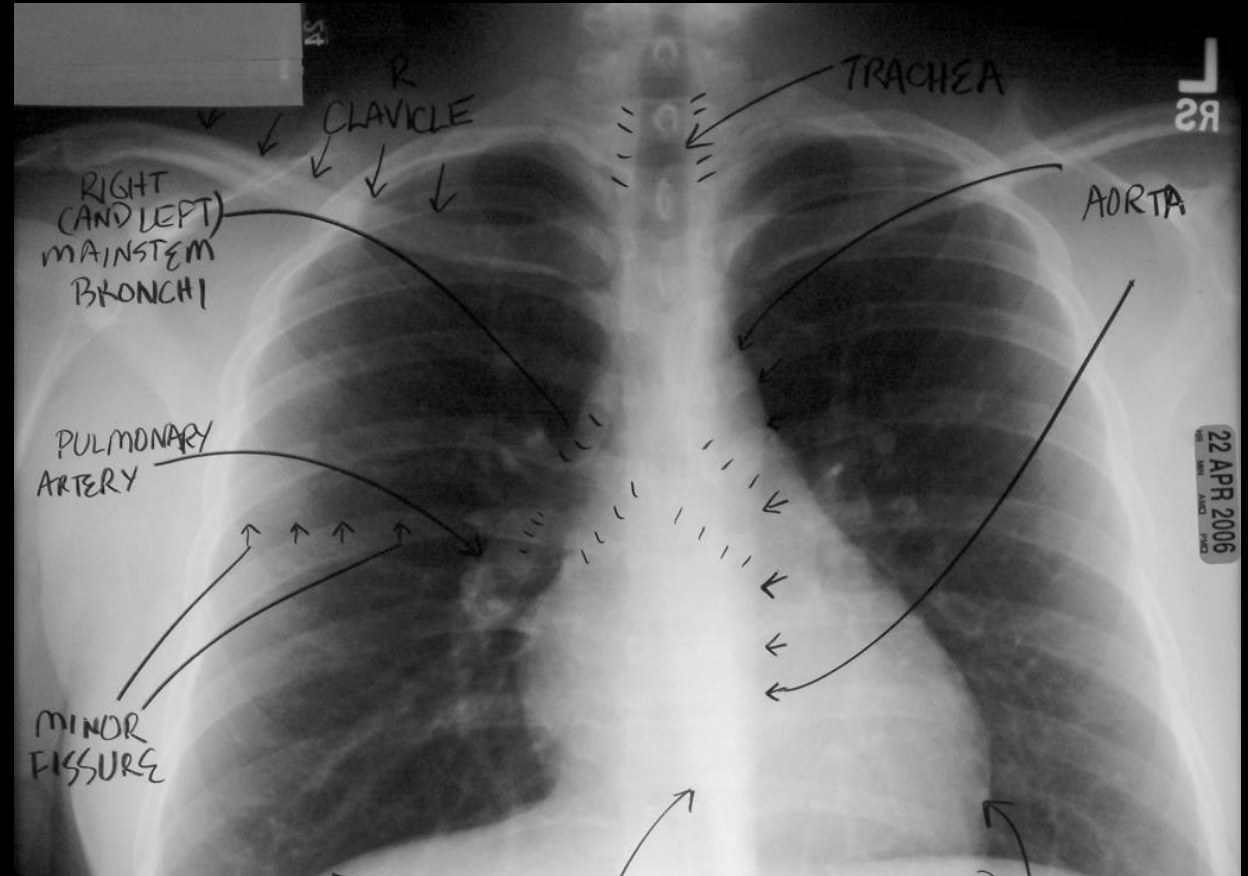
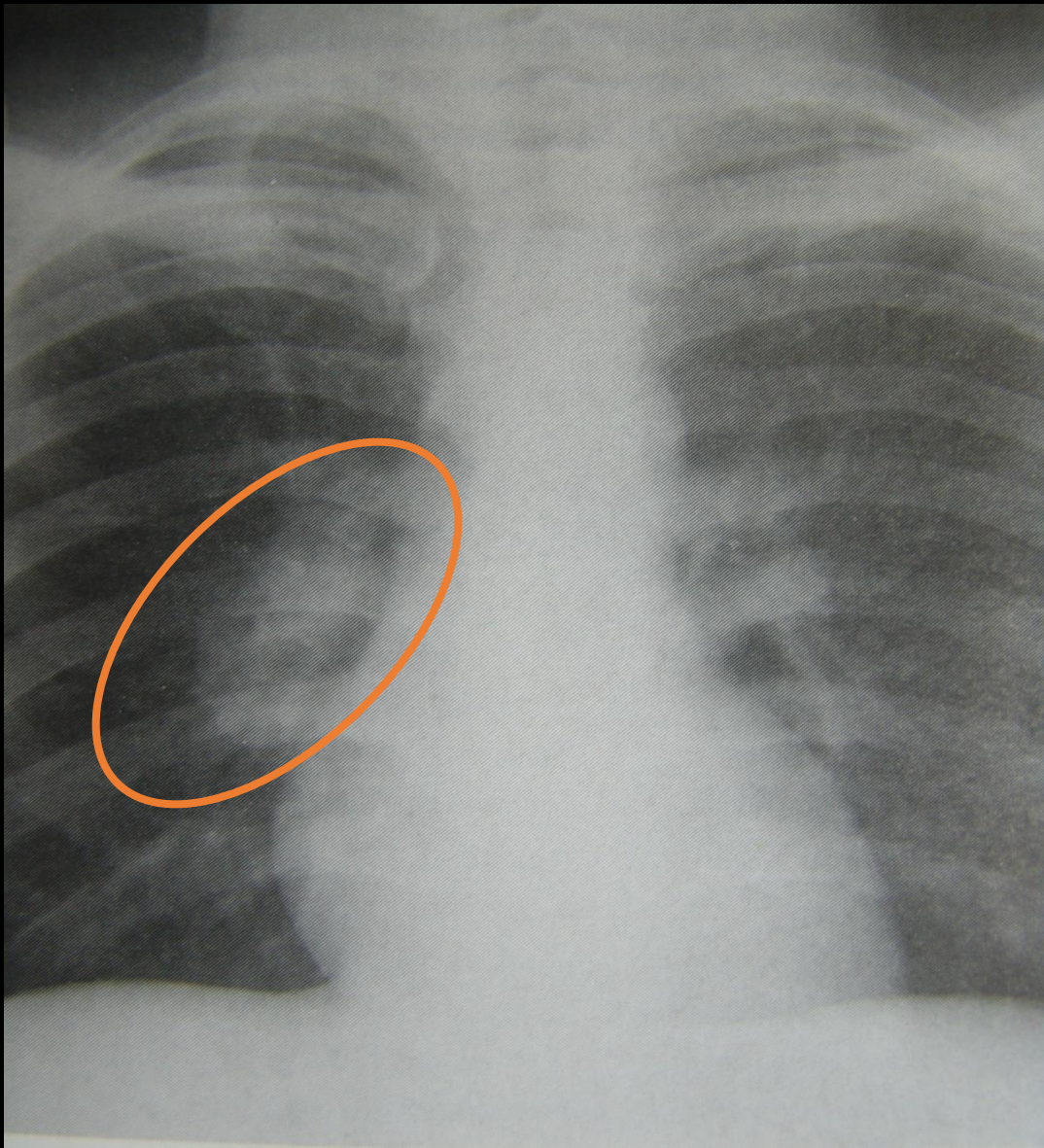
- Reveals occult lung disease in patients with pleural effusion, pericarditis, etc.
- Reveals intra-thoracic lymphadenopathy (children, HIV co-infected)
- Can suggest miliary disease
- Can suggest alternative diagnoses (lung cancer)

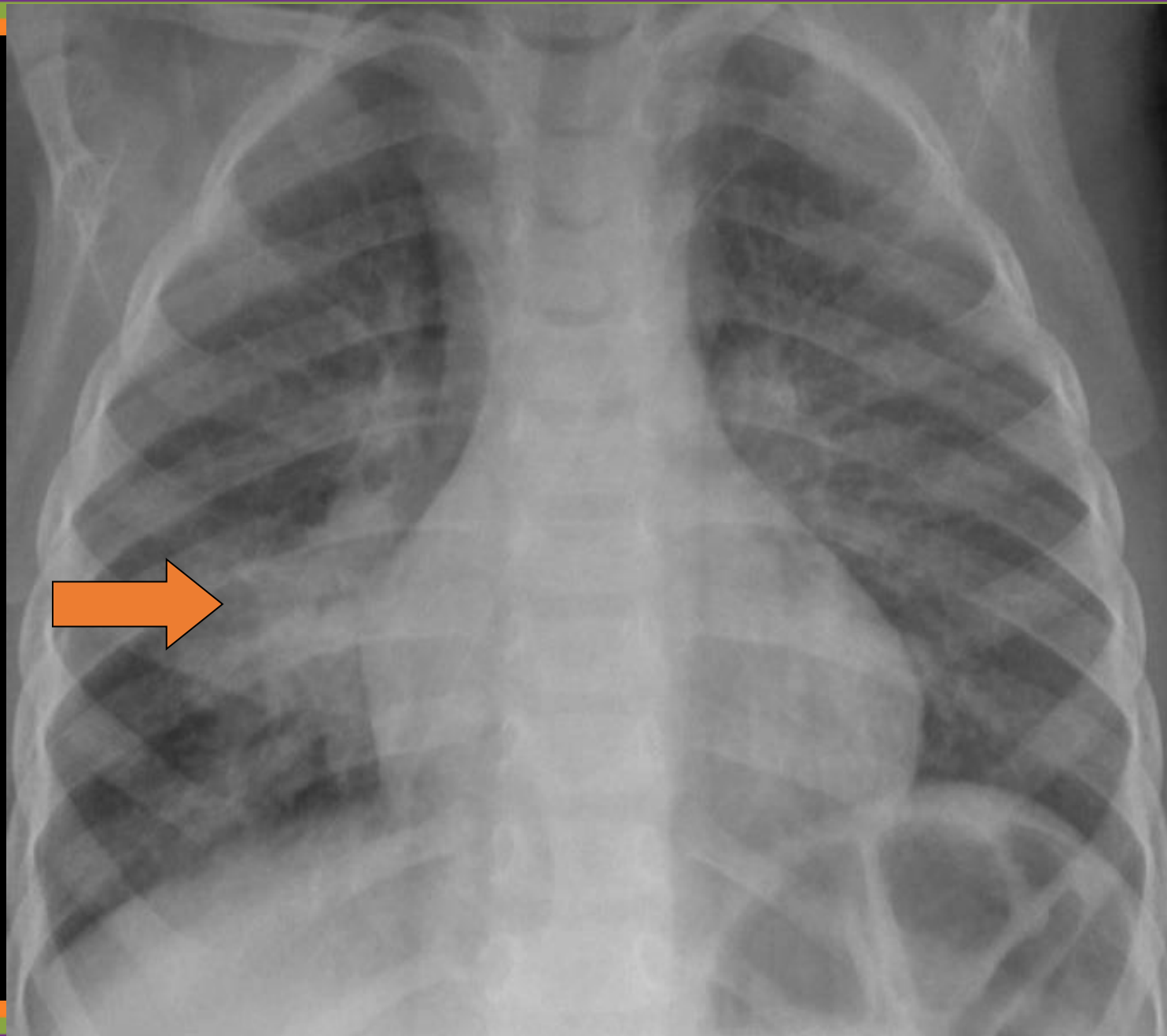


# Primary Tuberculosis

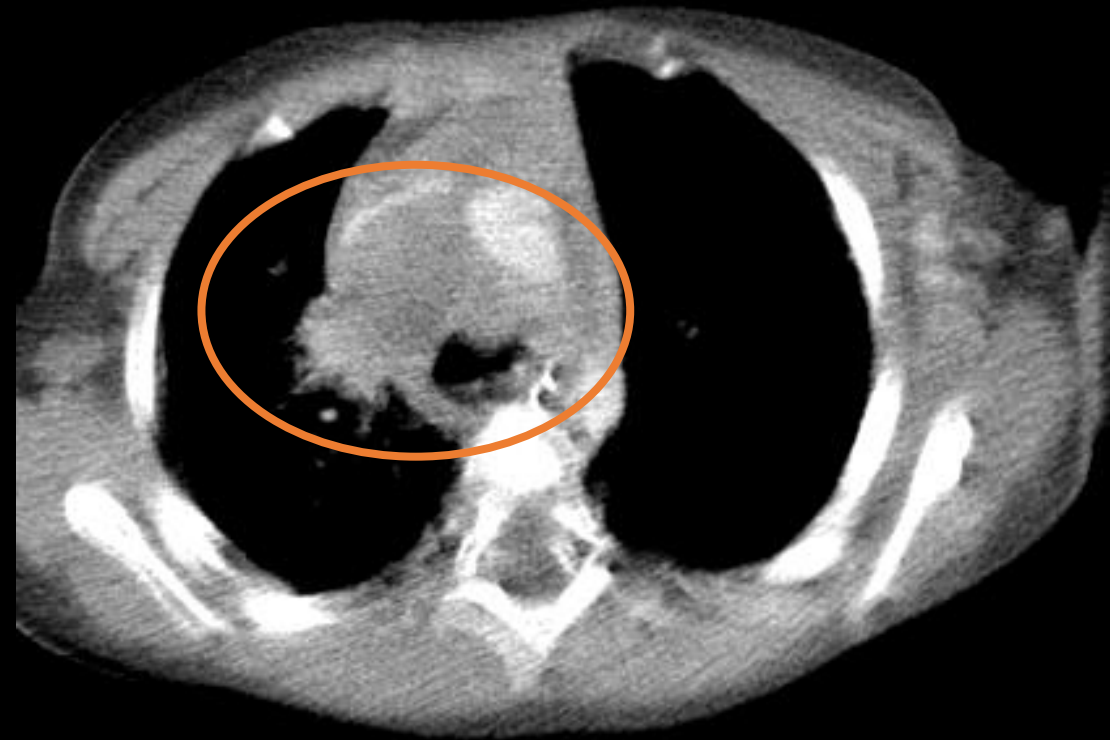
- Most commonly in children and immune compromised patients
- Opacities are seen the in middle and lower lungs
- Commonly unilateral, bilateral 15%
- Lymph node enlargement often occurs, and may cause bronchial compression
- Hilar or paratracheal lymphadenopathy with or without infiltrates is characteristic.





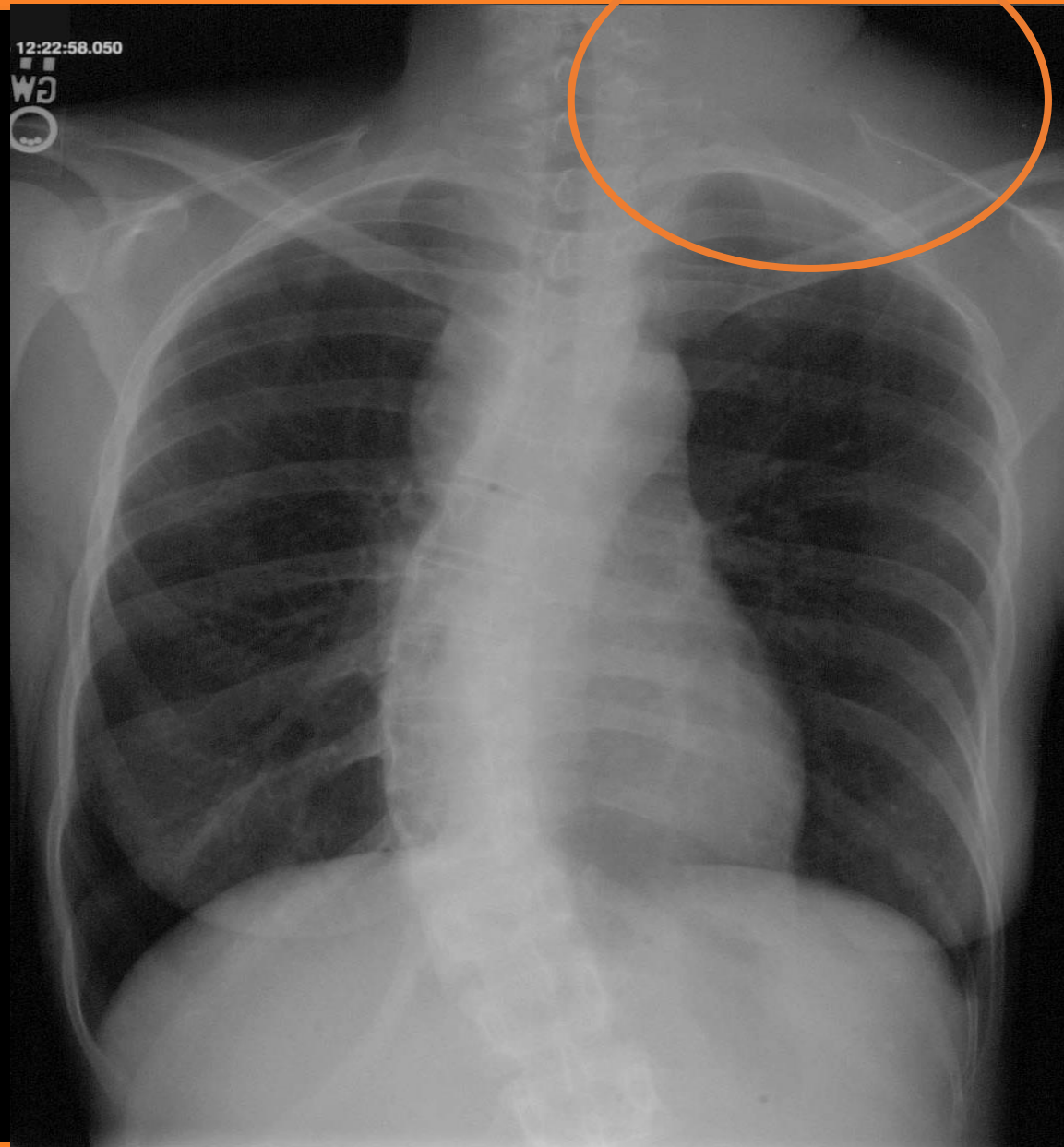


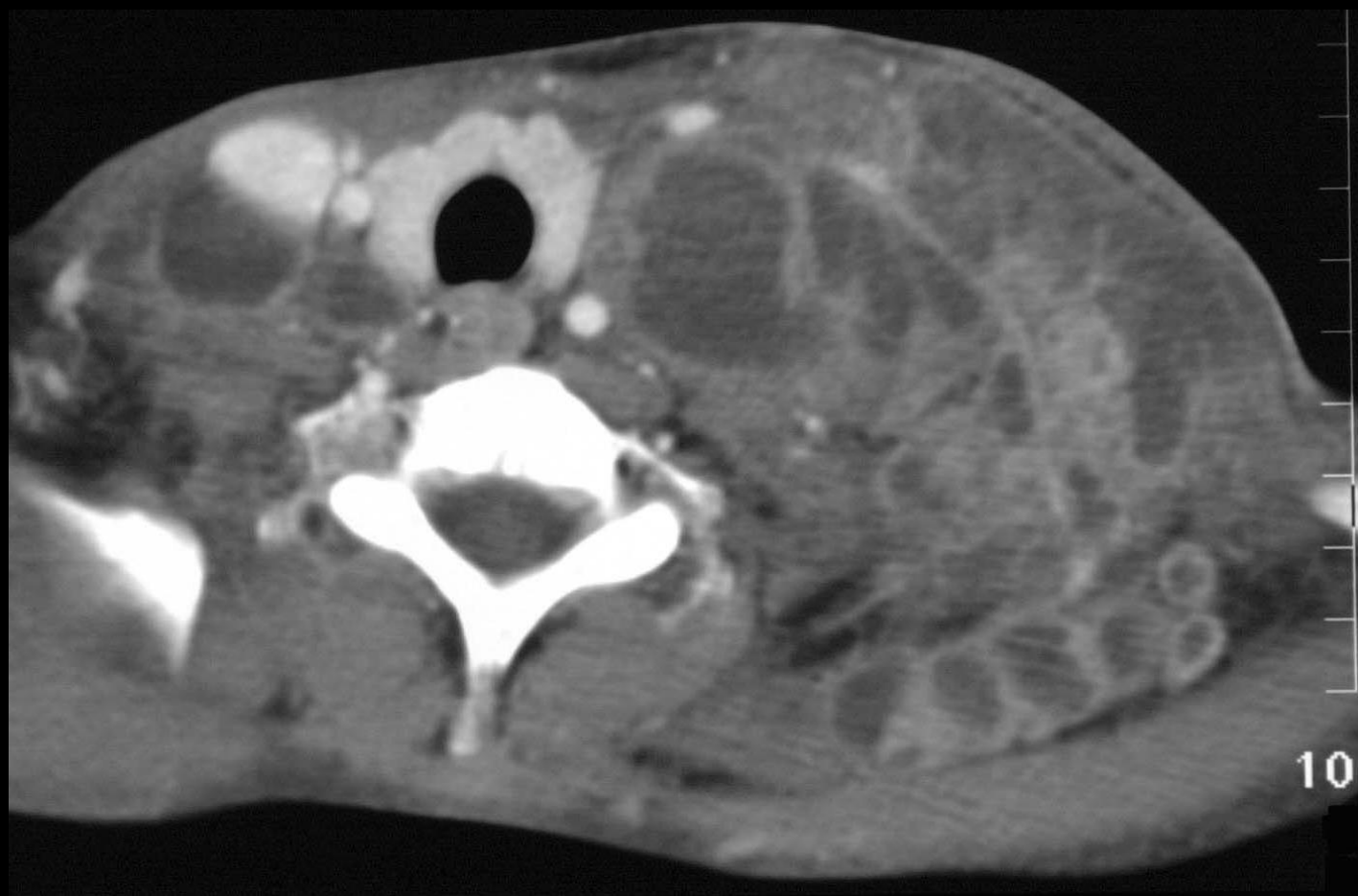


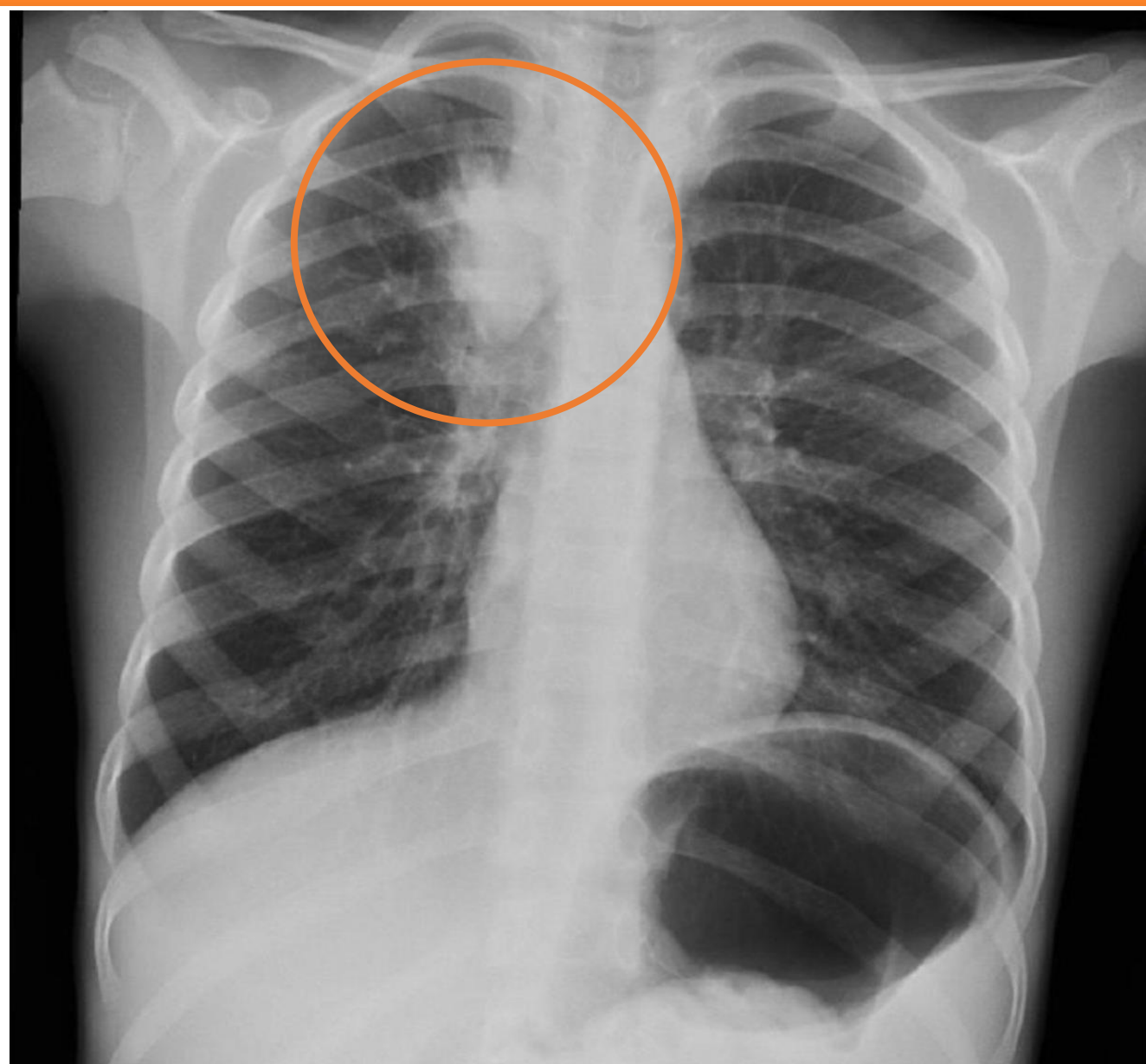
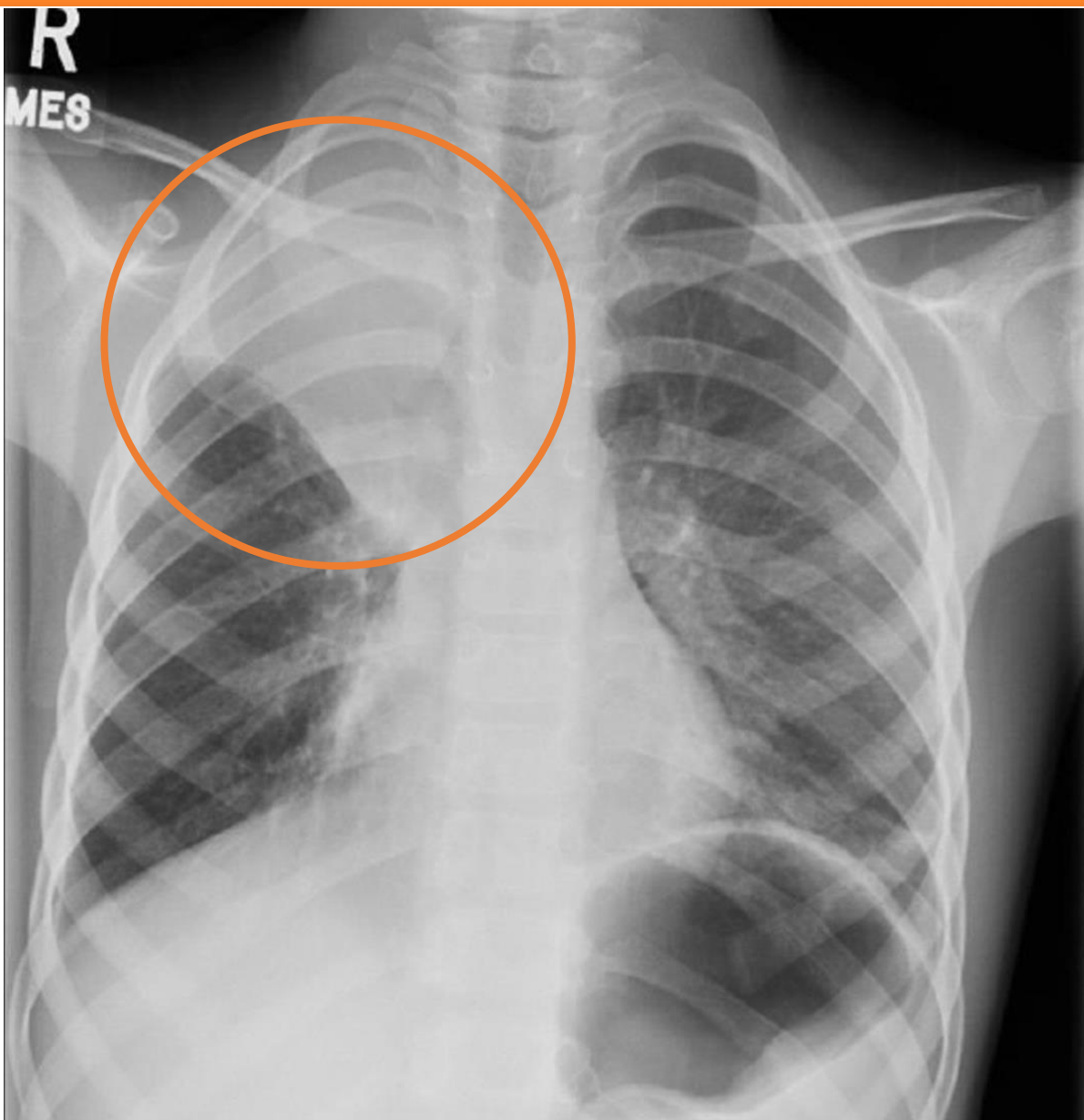


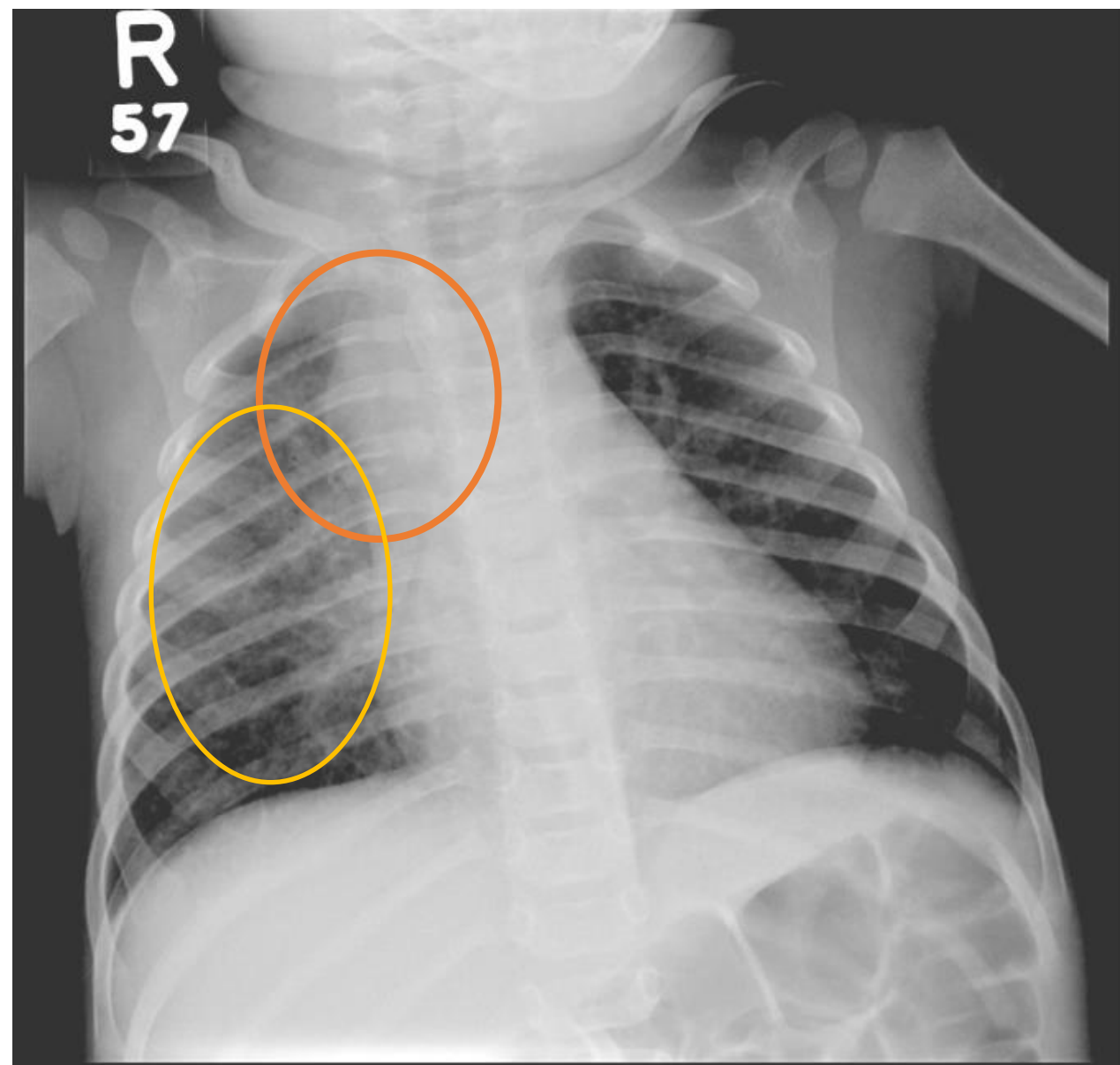


Where is the  
Adenopathy?



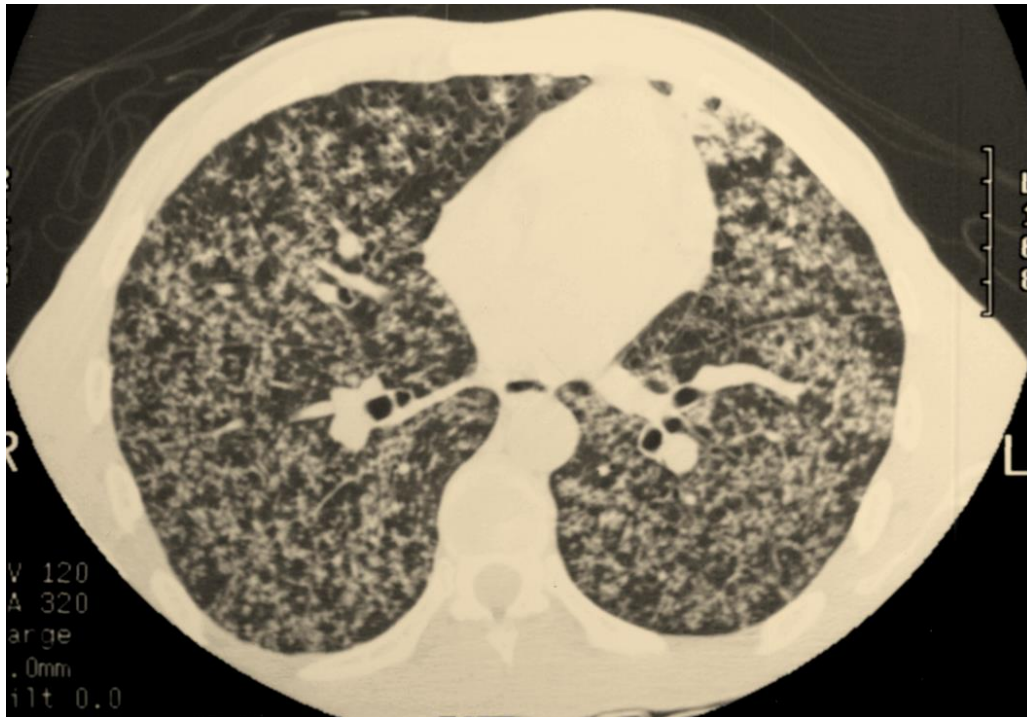


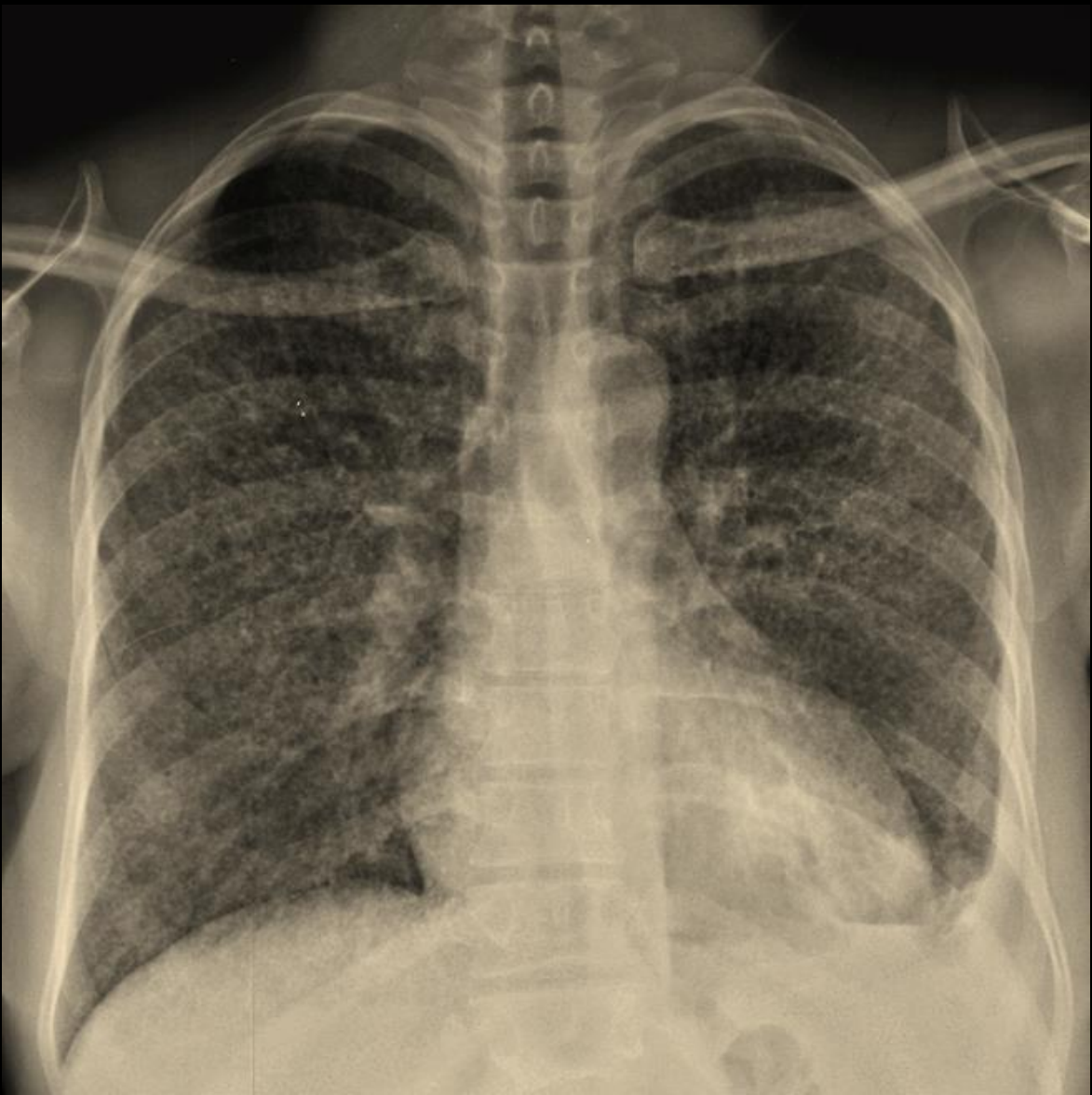






# Miliary Tuberculosis







# Post Primary, Reactivation Tuberculosis

- Characterized by upper lobe predilection, cavitation and absence of lymphadenopathy.
- Cavitation is the hallmark; can also see parenchymal disease (consolidation), hematogenous dissemination (miliary), bronchogenic spread (tree-in-bud) and pleural disease.
- Fibrosis and calcification are seen after healing.

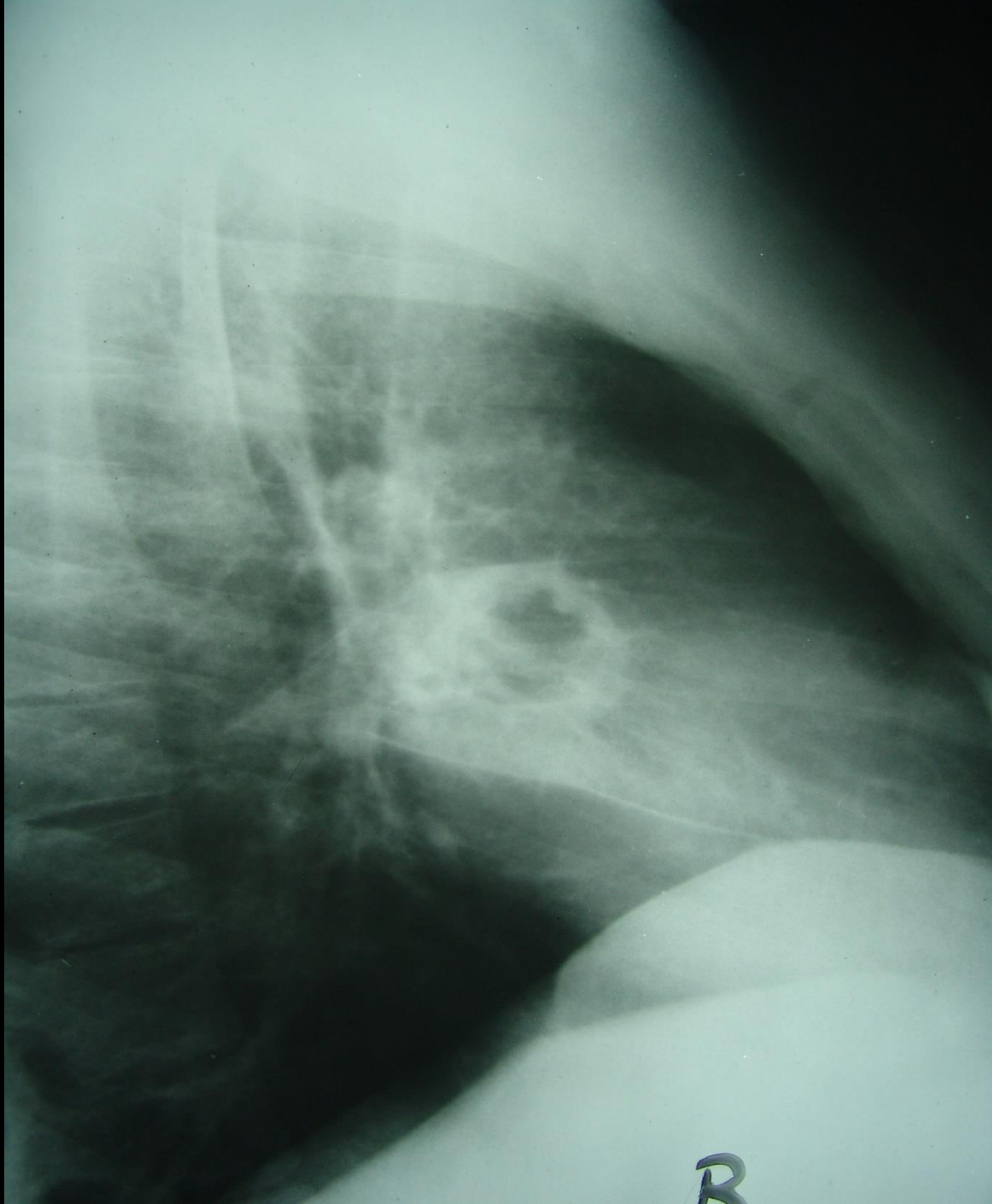


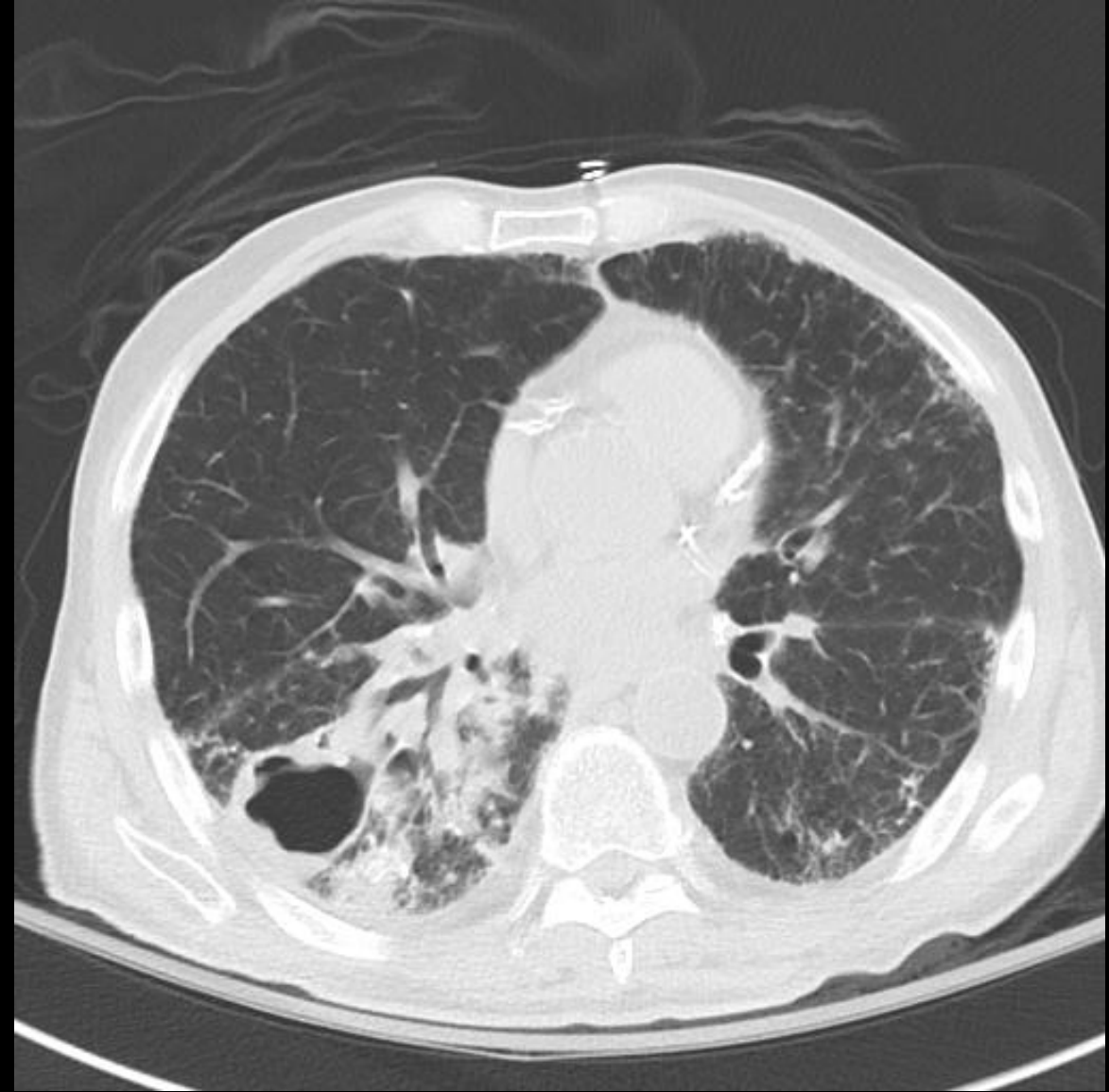
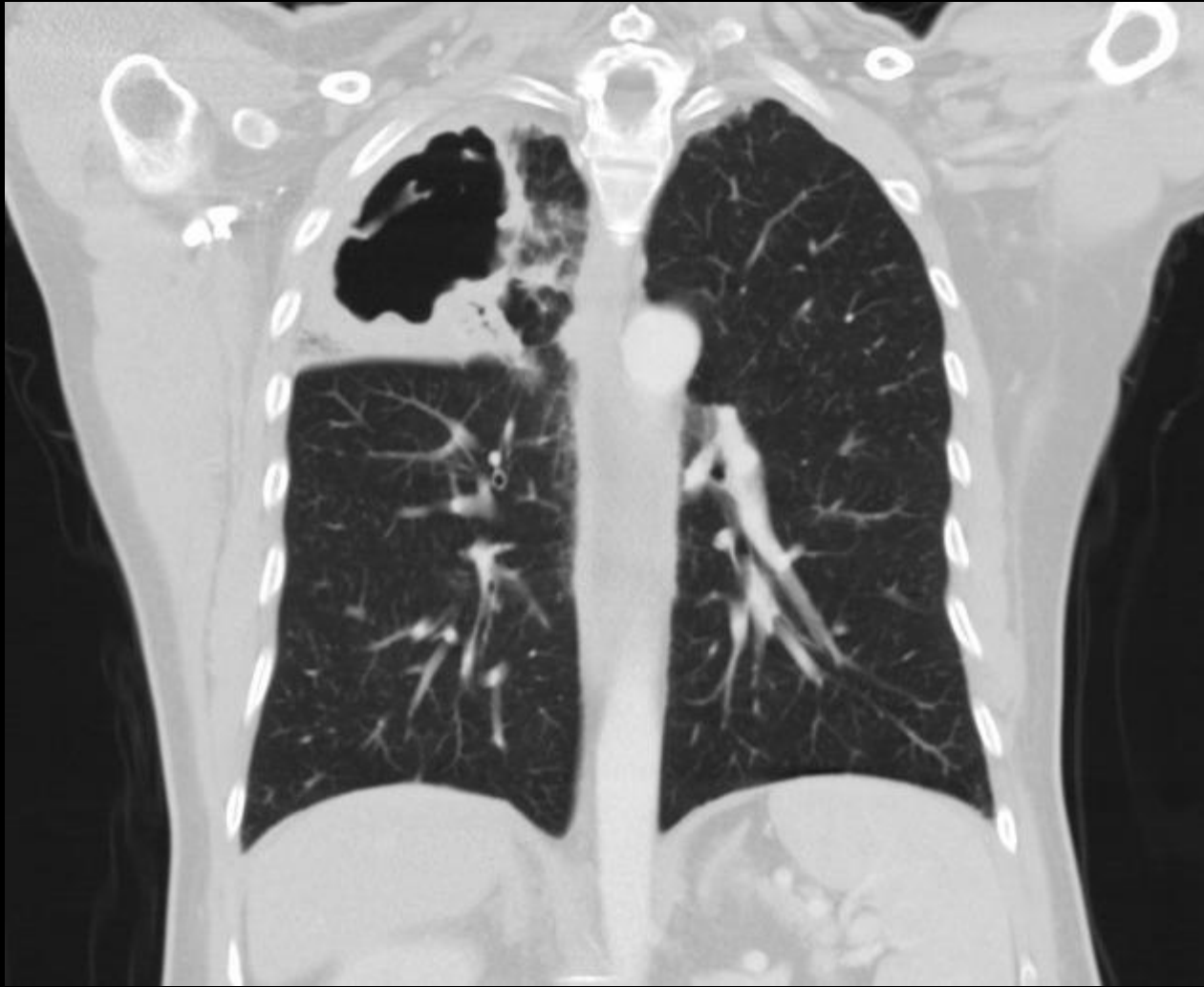
# Tuberculous Cavities

- Usually have thick, irregular walls
- With treatment, walls thin and cavity shrinks and usually collapses



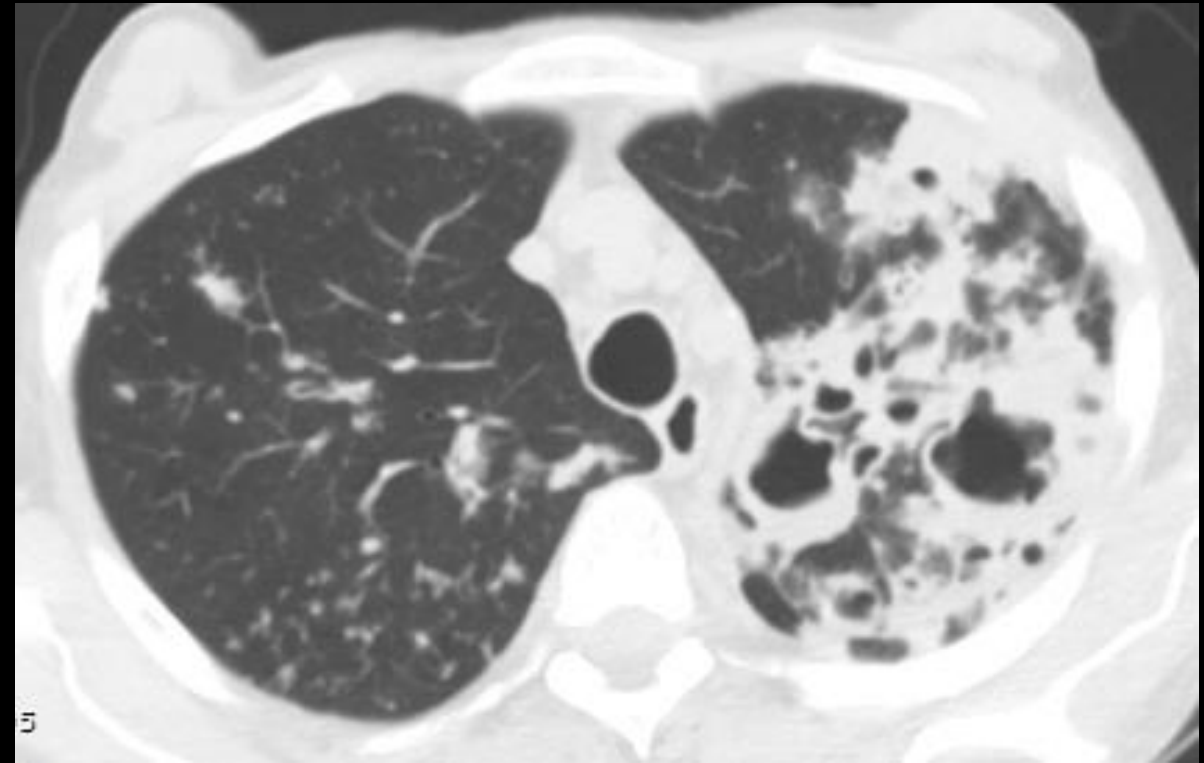
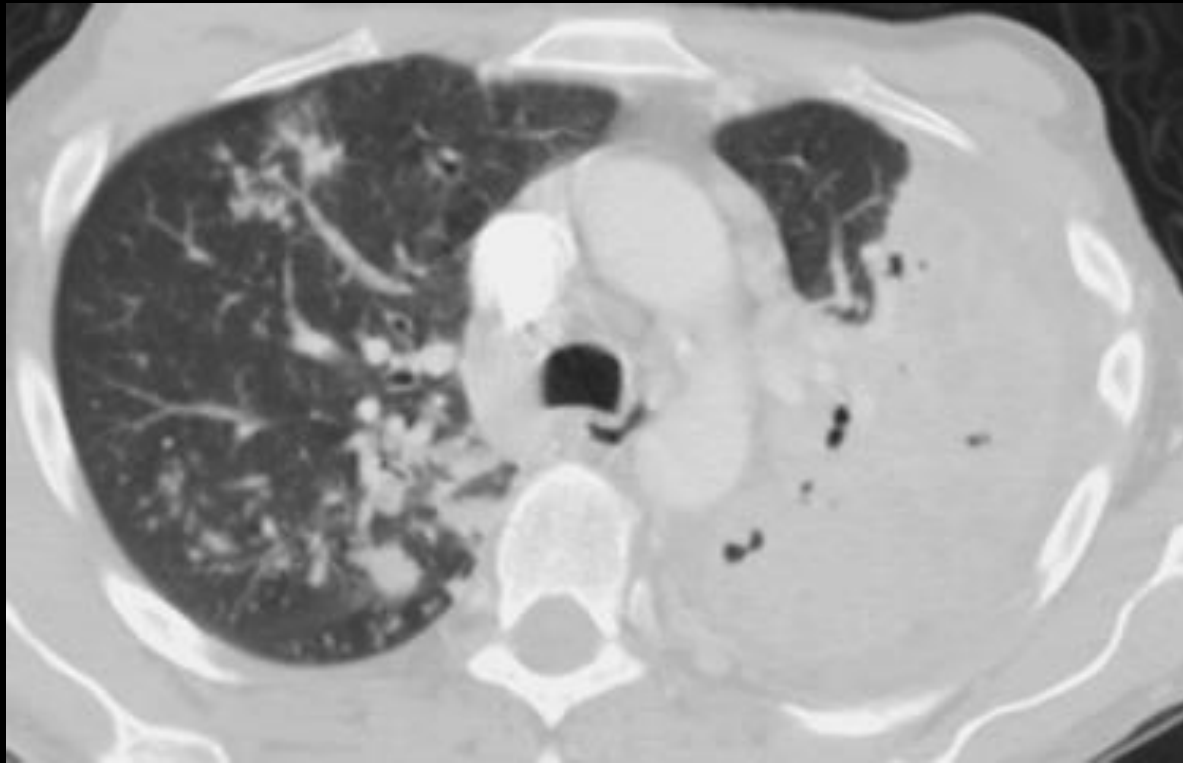








# Cavitary Consolidation

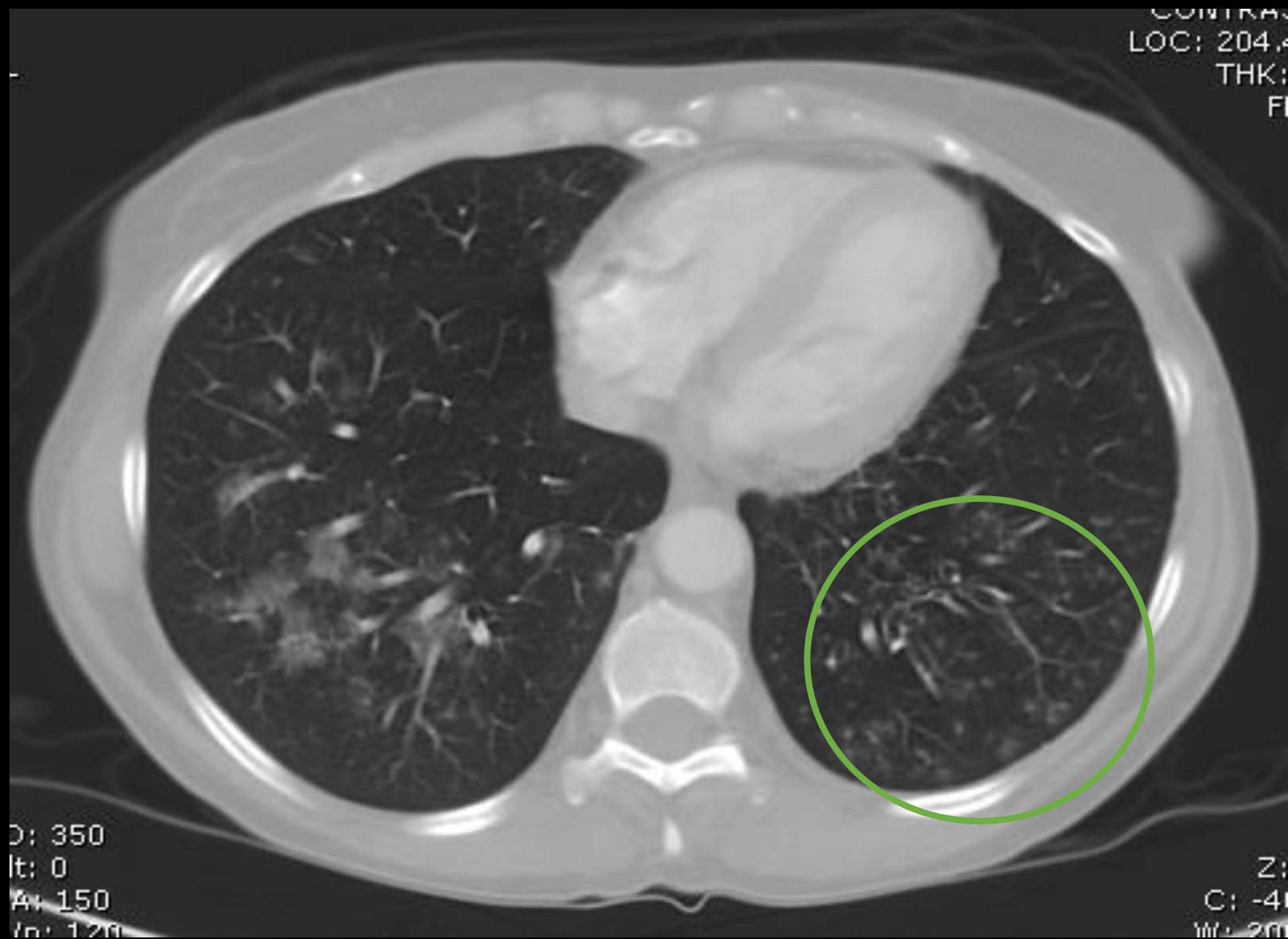






# Tree in Bud.....





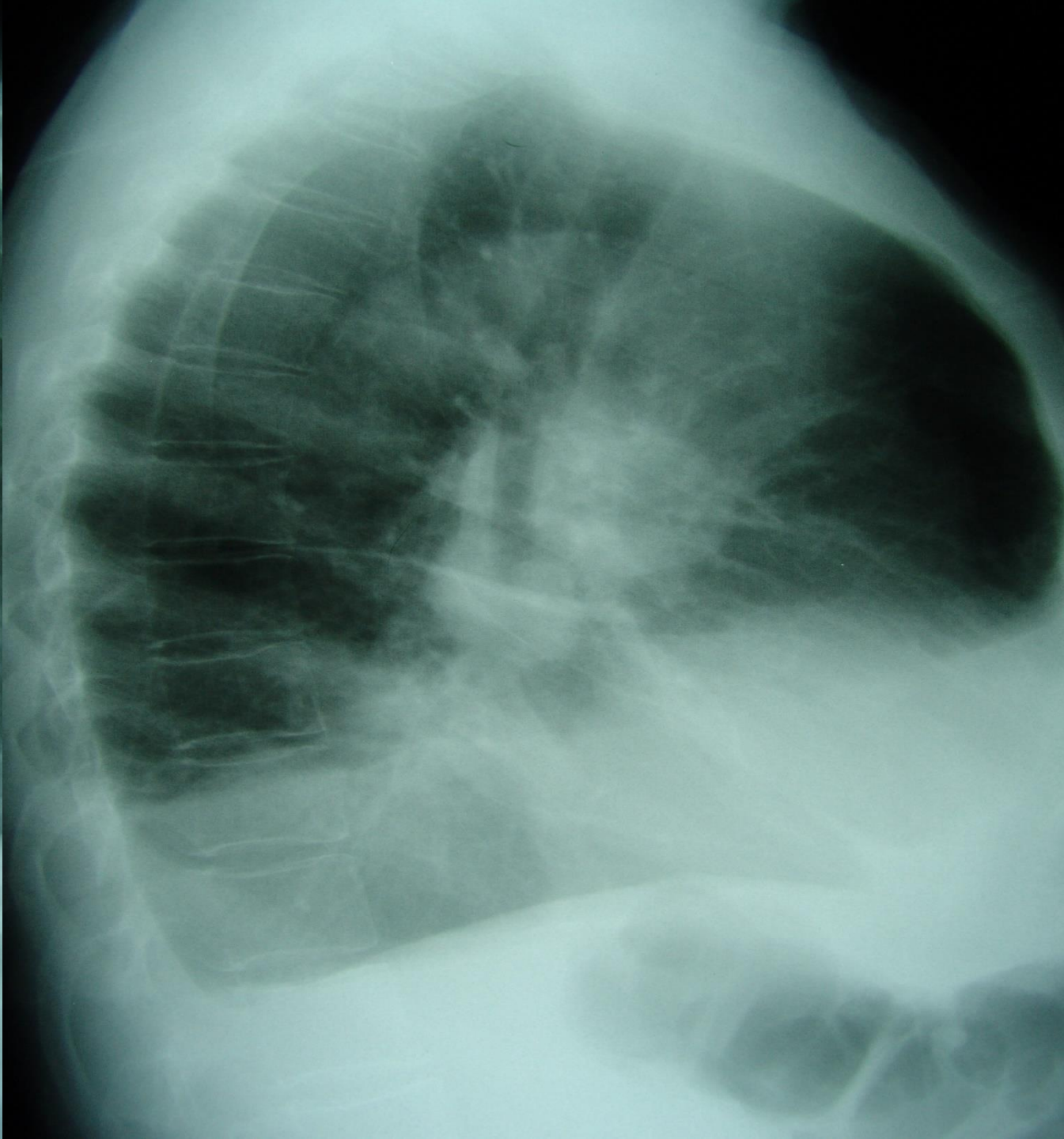
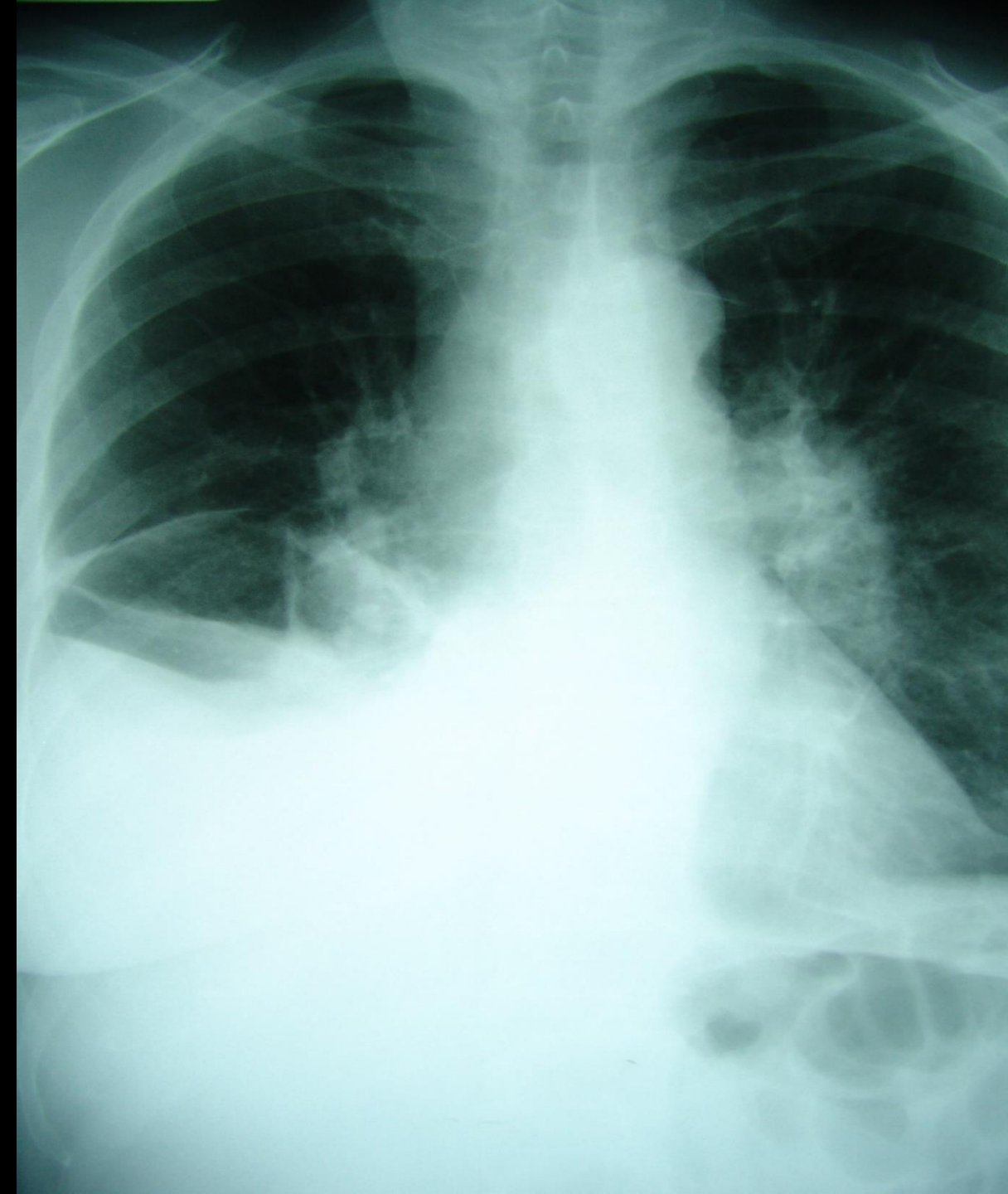


# Pleural Effusions

- Primary TB (25%)
- Hypersensitivity reaction to TB proteins
- Organisms uncommonly isolated from fluid
- May not be associated with obvious parenchymal disease on CXR

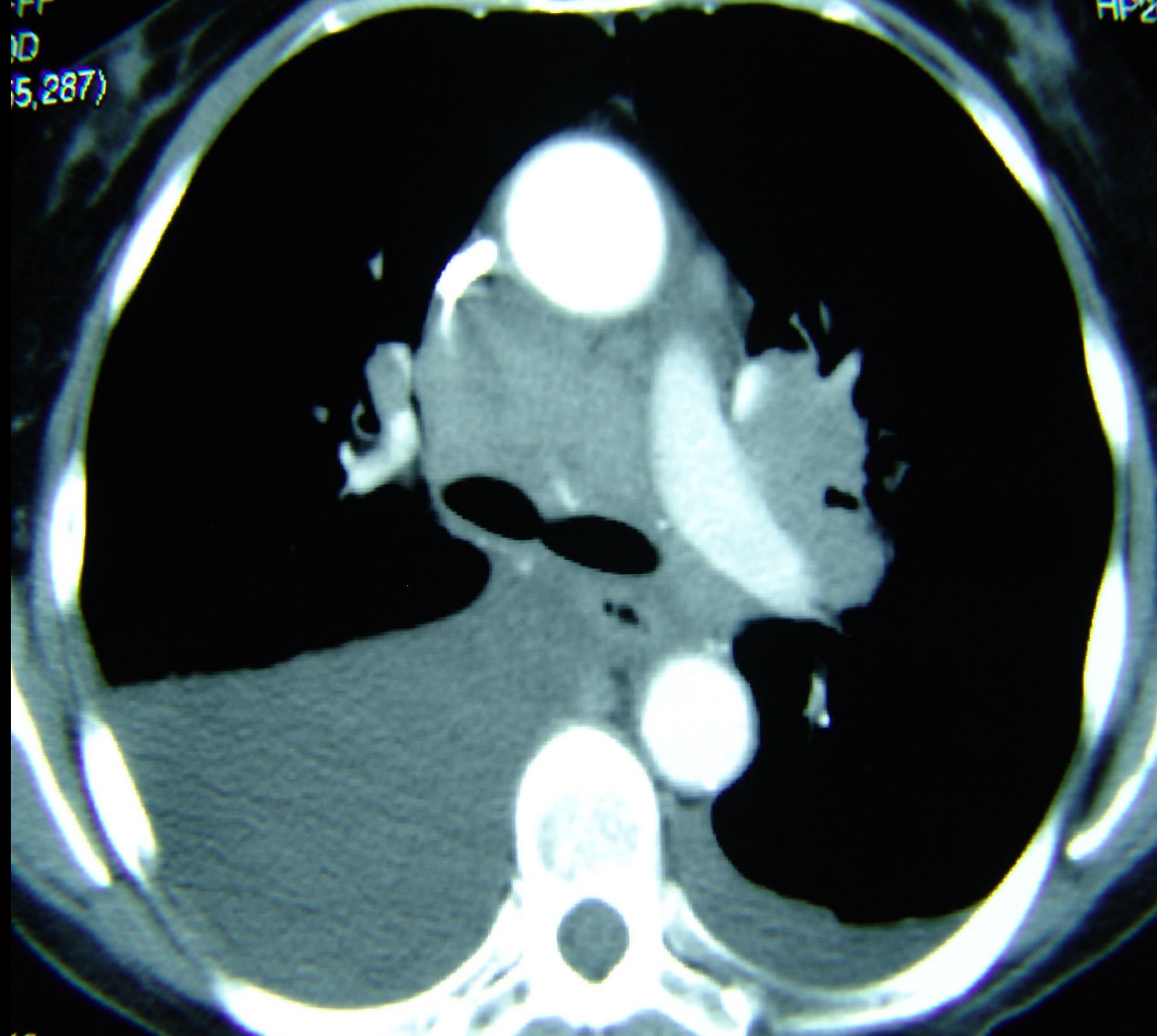


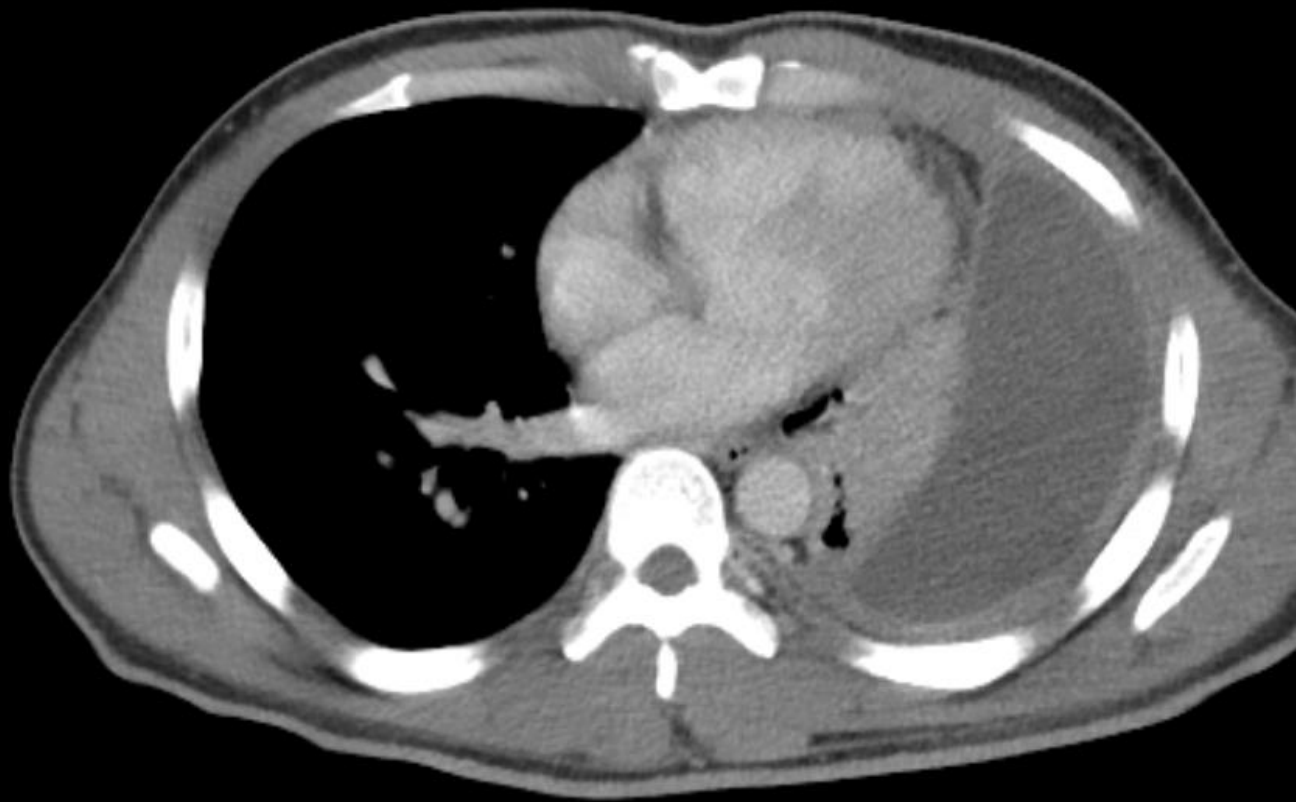






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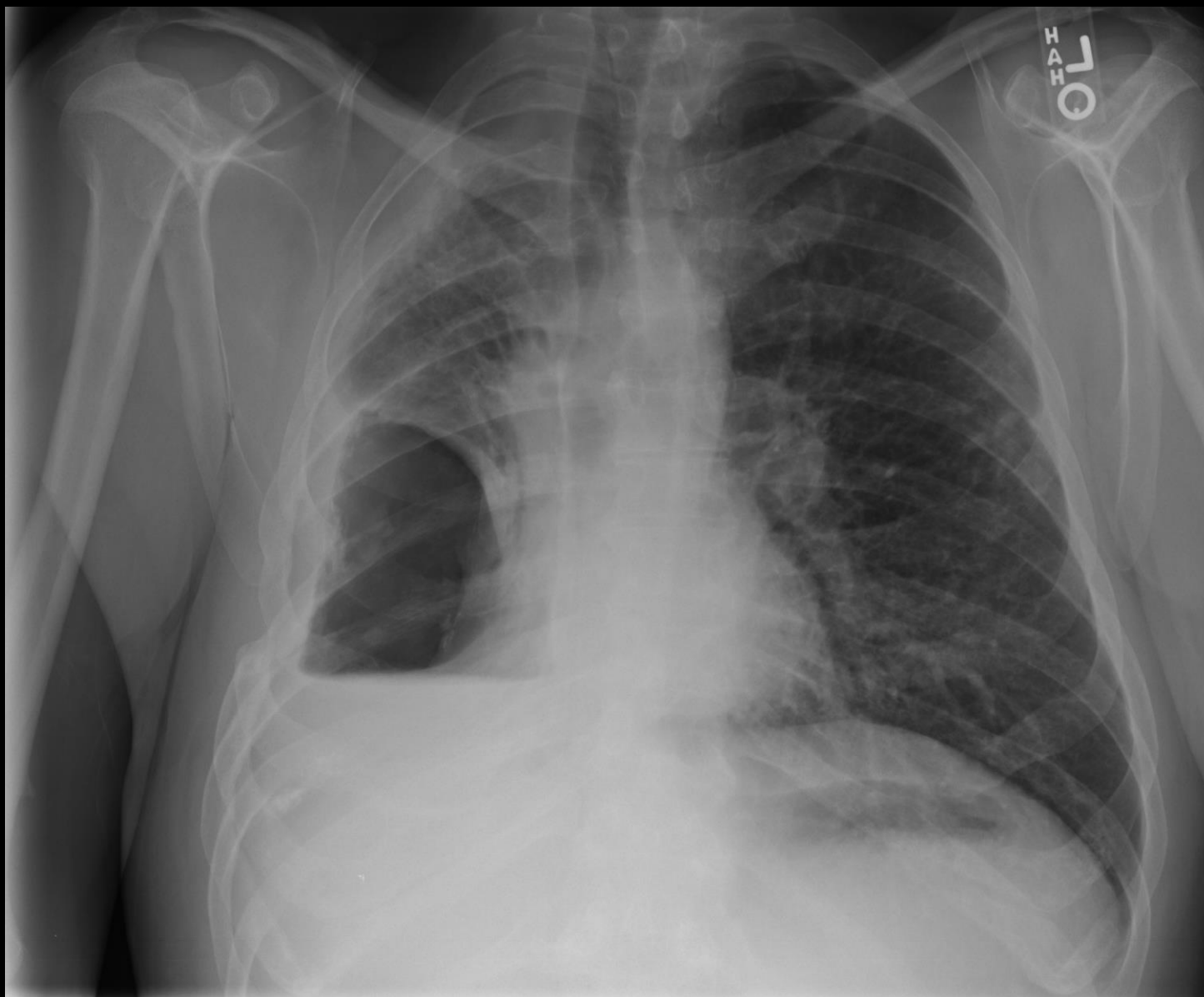


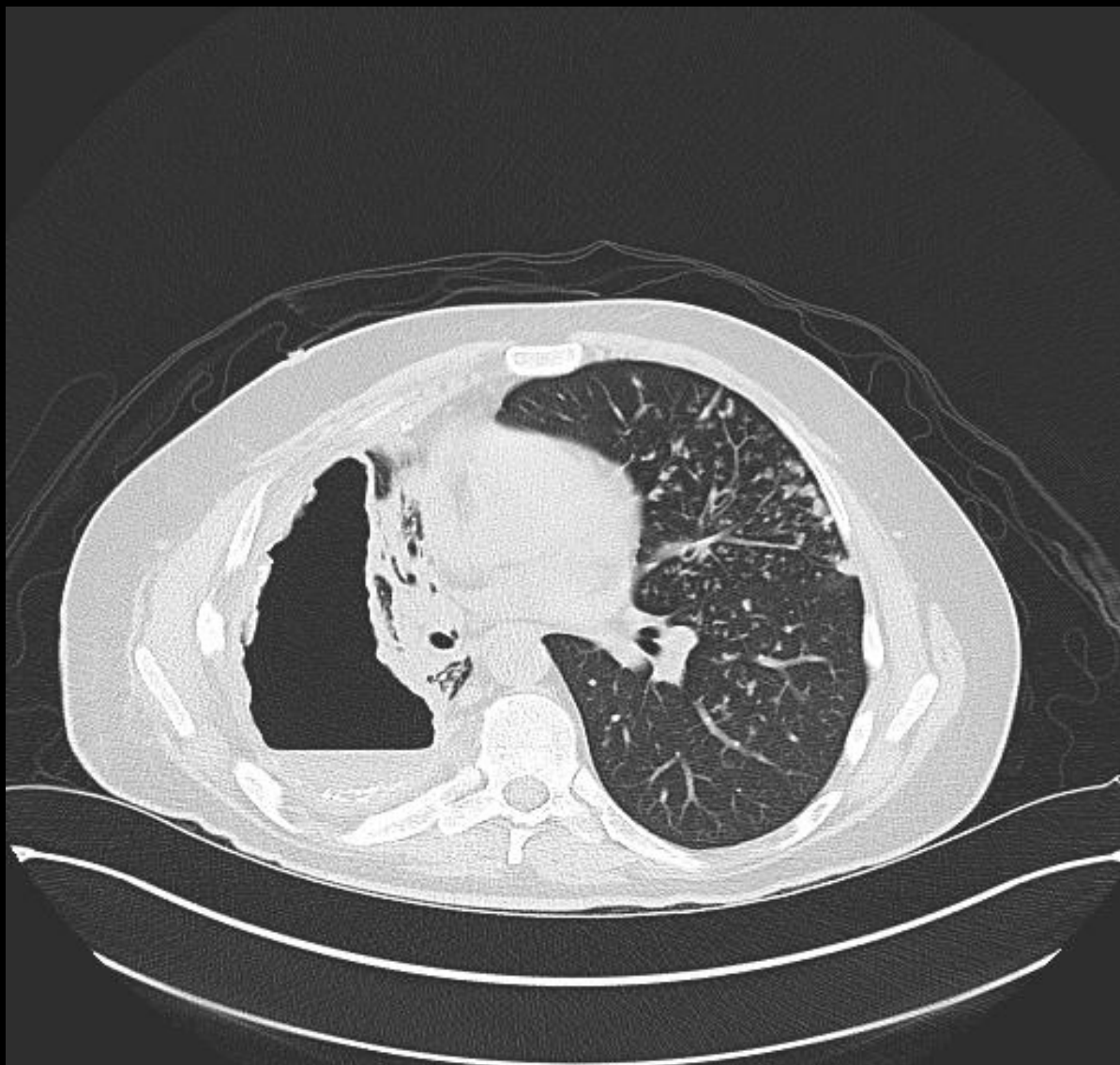


# Pleural Effusions

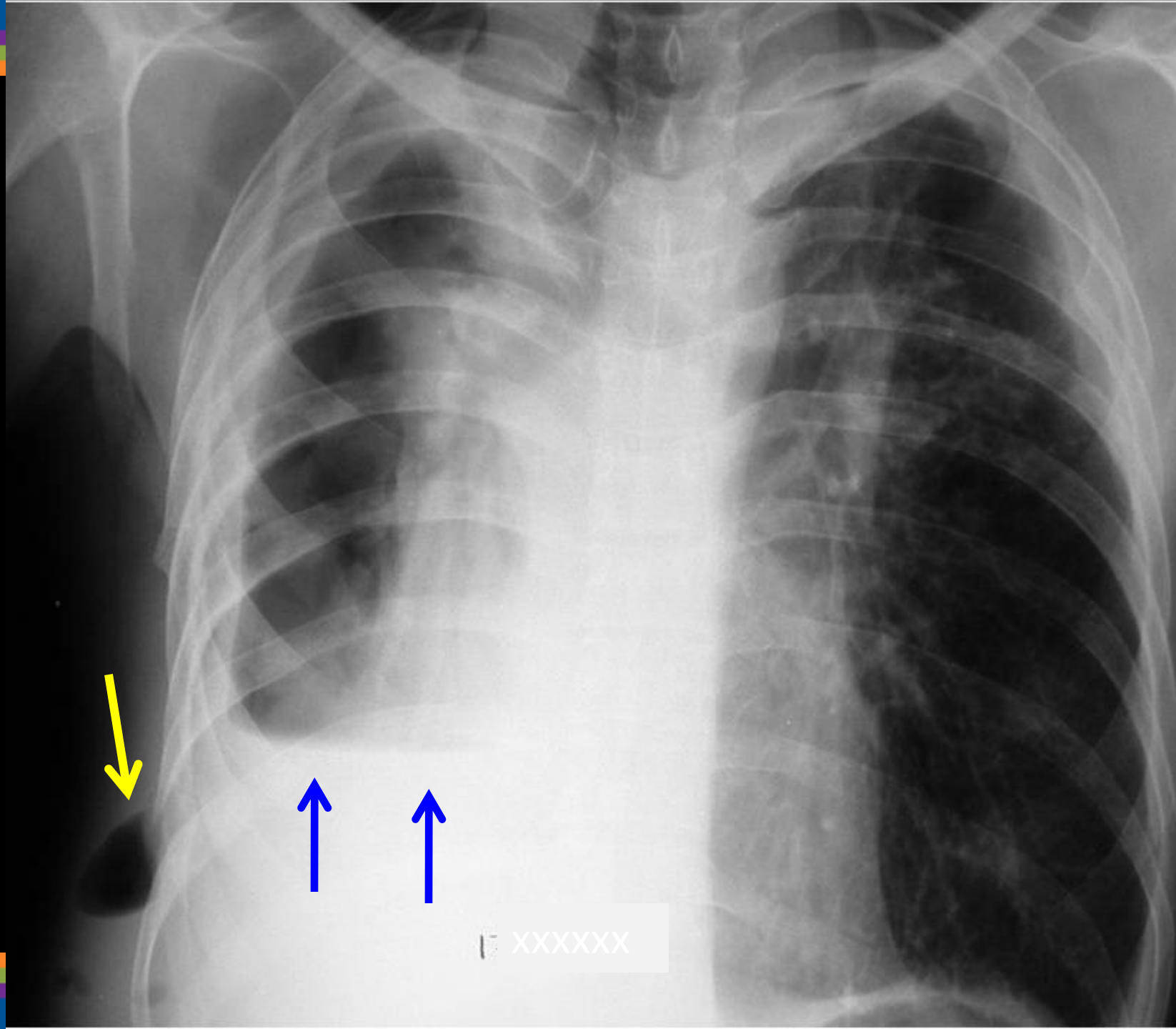
- Post primary TB (20%)
- Caused by rupture of a tuberculous cavity into the pleural space, causing empyema
- May cause bronchopleural fistula with air fluid levels
- Often results in irreversible pleural thickening and calcification









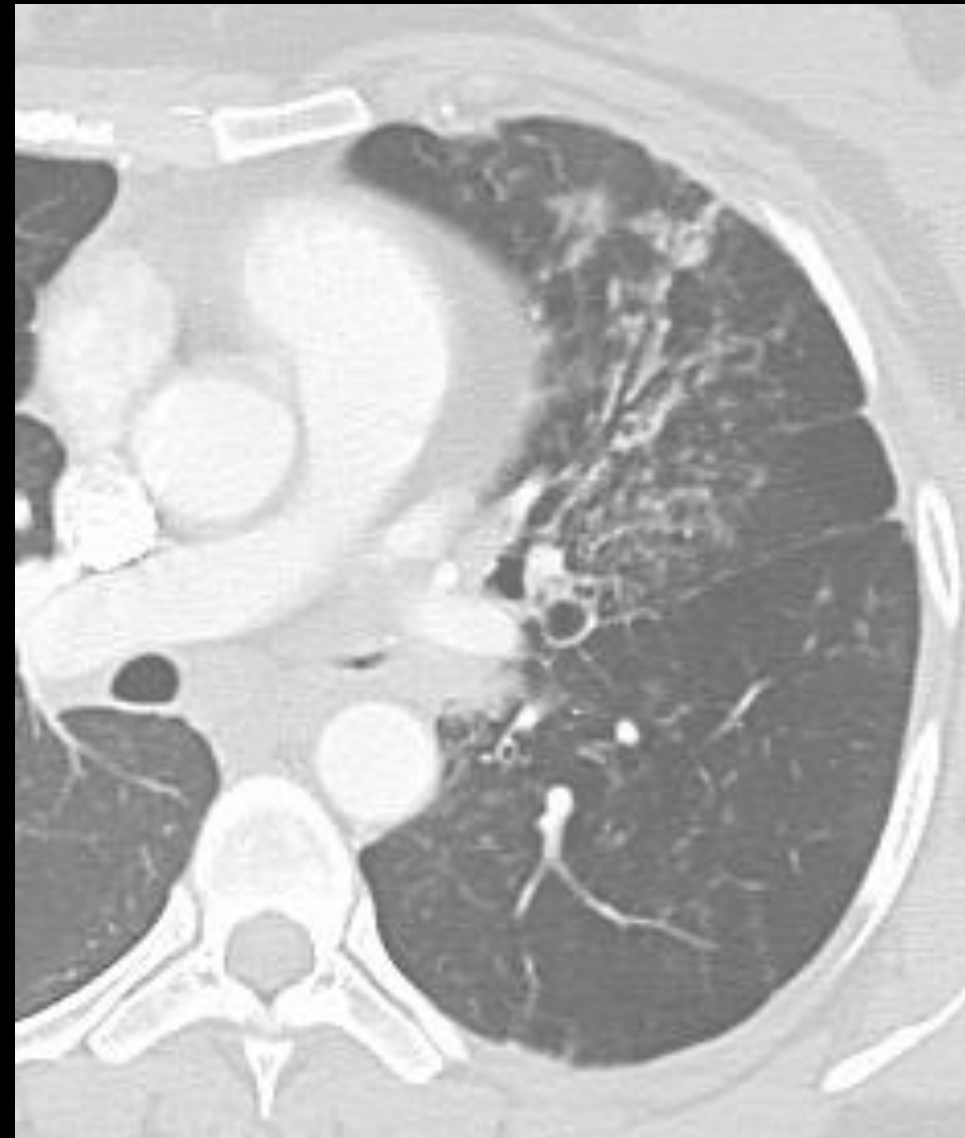


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# Tracheobronchial TB

- TB is the most common cause of inflammatory stricture of a bronchus
- 10% - 20% of TB patients
- Circumferential wall thickening
- Luminal narrowing
- Long segment involvement
- Left > Right





# Tuberculosis and Immunocompromised Persons

- Higher prevalence of extra-pulmonary involvement
- 38% of immunocompromised patients with TB have pulmonary involvement only, but up to 30% have only extrapulmonary involvement
- May have a normal chest radiograph due to limited immune response

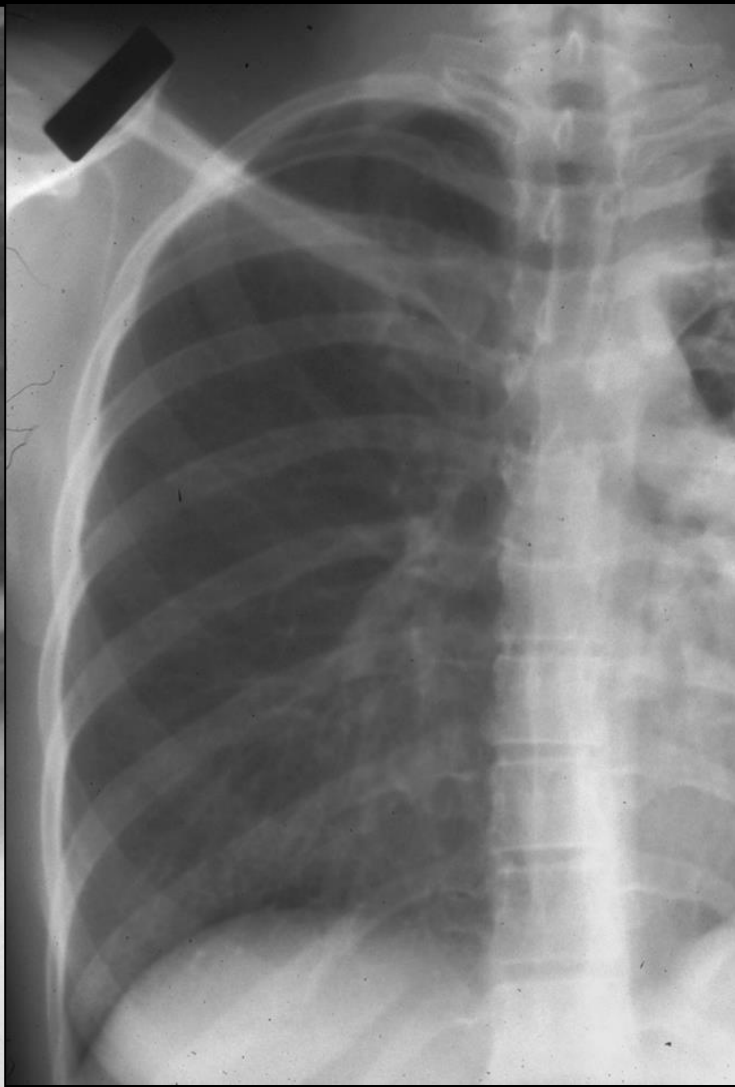
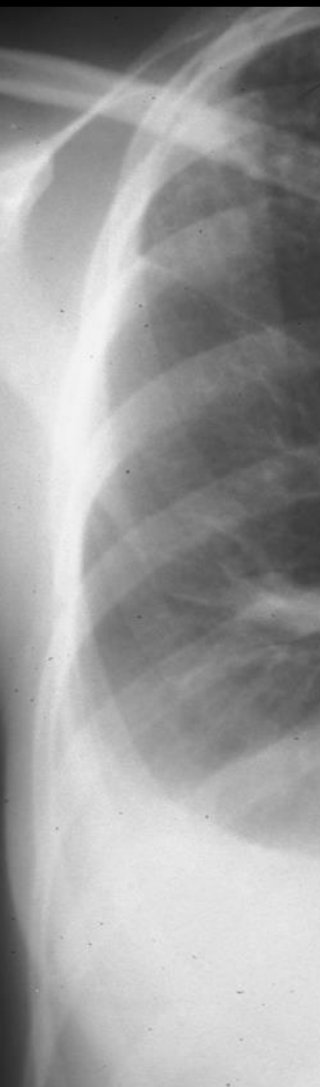


## Tuberculosis and HIV ....

Any combination of the previously mentioned patterns!



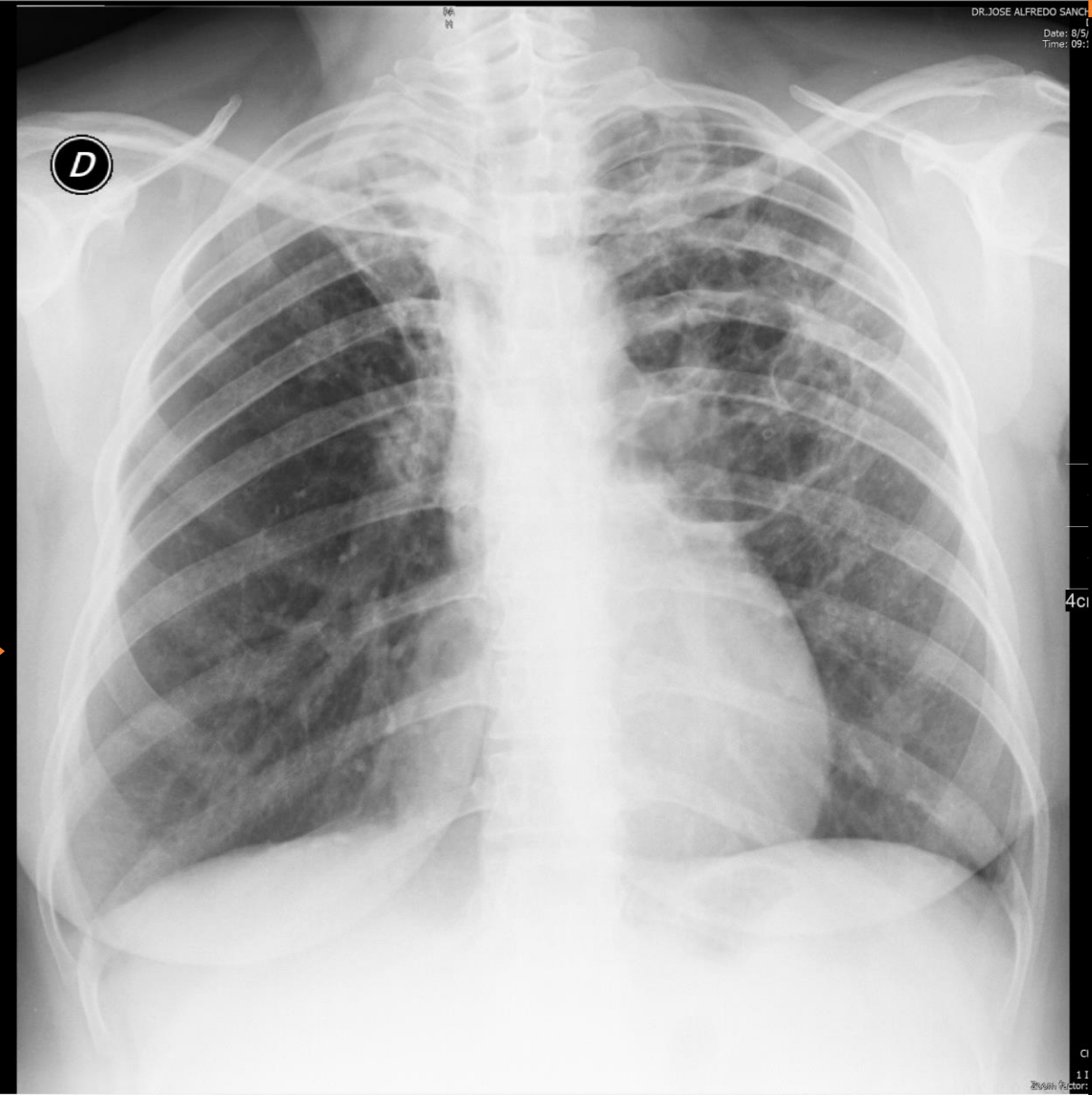
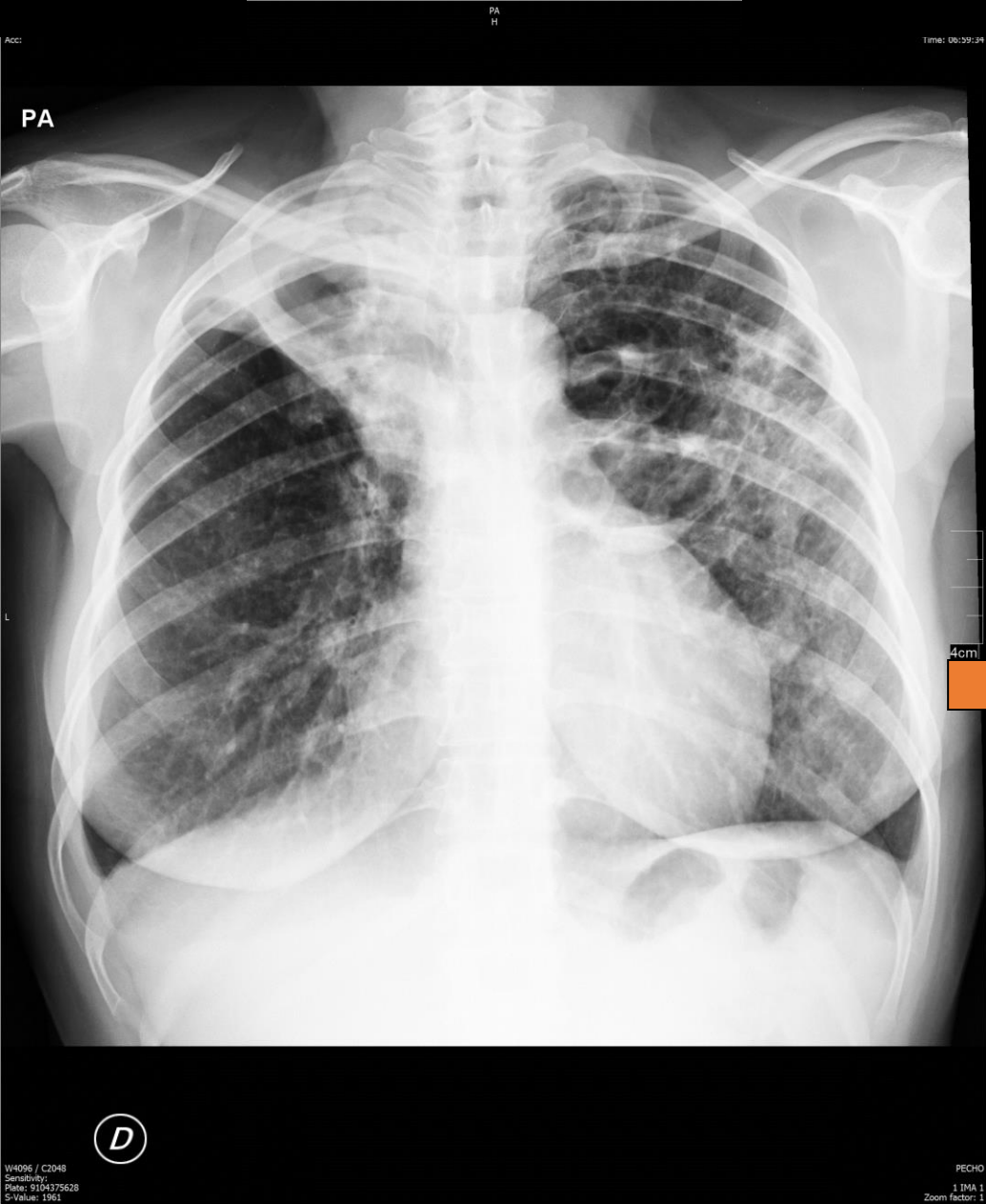




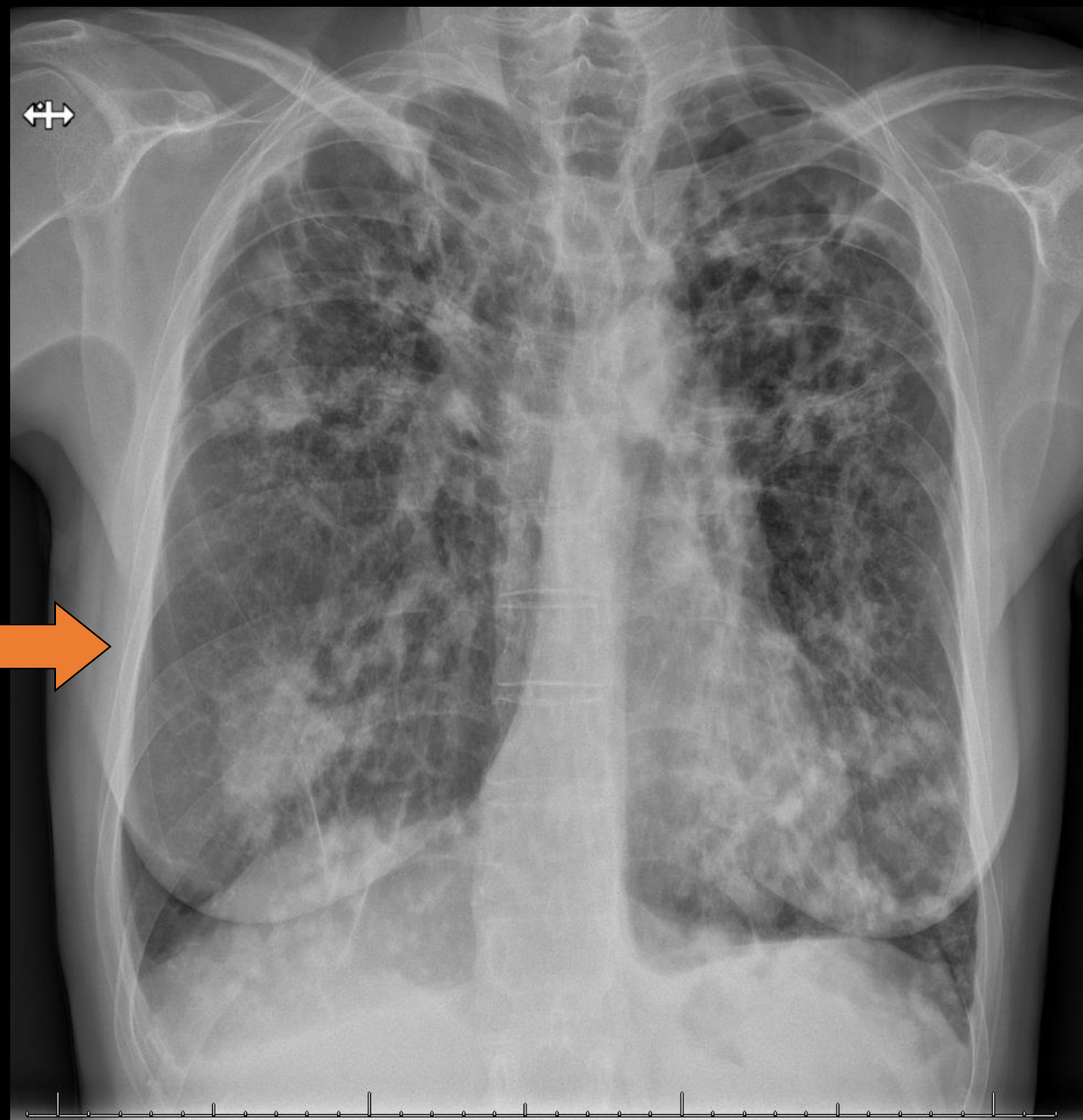
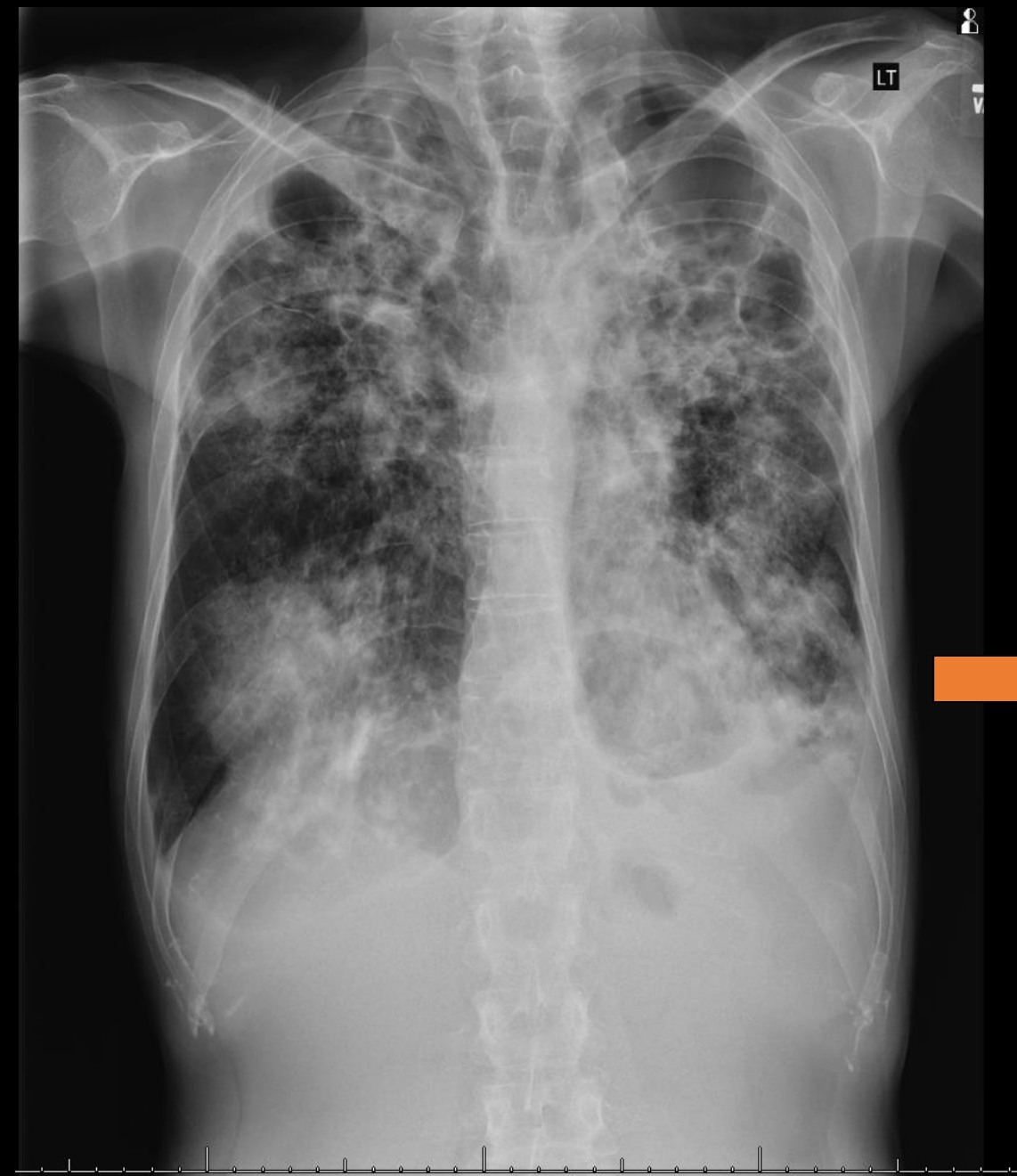
# Complications of Pulmonary Tuberculosis

- Bronchiectasis
- Broncholithiasis
- Extensive pulmonary destruction
- Non-tuberculous mycobacterial disease
- Chronic pulmonary aspergillosis
- Venous thromboembolism

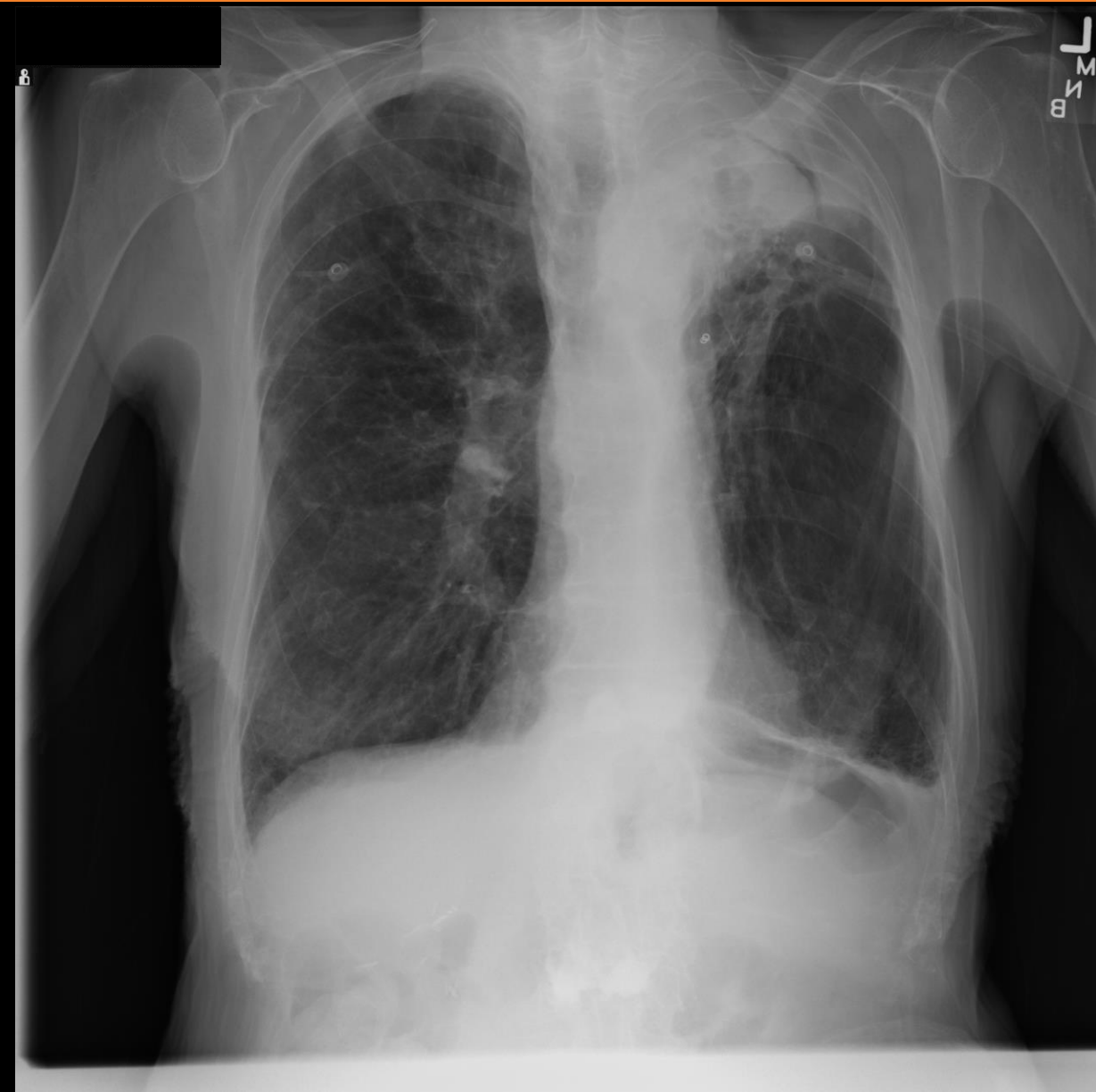












# Extra-pulmonary Tuberculosis can affect ANY ORGAN

- Cardiac: pericarditis, pericardial effusion, myocarditis
- CNS: meningitis, tuberculomas, tuberculous abscesses, cerebritis, and miliary TB
- Head and neck: lymphadenitis (scrofula), less common sinonasal, thyroid, skull base
- Musculoskeletal: spinal column, pelvis, hip, and knee (spondylitis, osteomyelitis, arthritis)
- Abdominal: lymphadenopathy, peritonitis, ileocecal region, hepatosplenic, adrenal glands
- Genitourinary: renal, ureters, bladder, genital (fallopian tubes in women and seminal vesicles or prostate gland in men)



## A Word About MRI...

- Uses non-ionizing radiofrequency radiation inside a strong magnetic field to detect the location and chemical environment of protons.
- Achieves greater tissue contrast than CT imaging.
- Particularly helpful in neurologic, bone and soft-tissue imaging.
- Limitations



# Tuberculous Meningitis

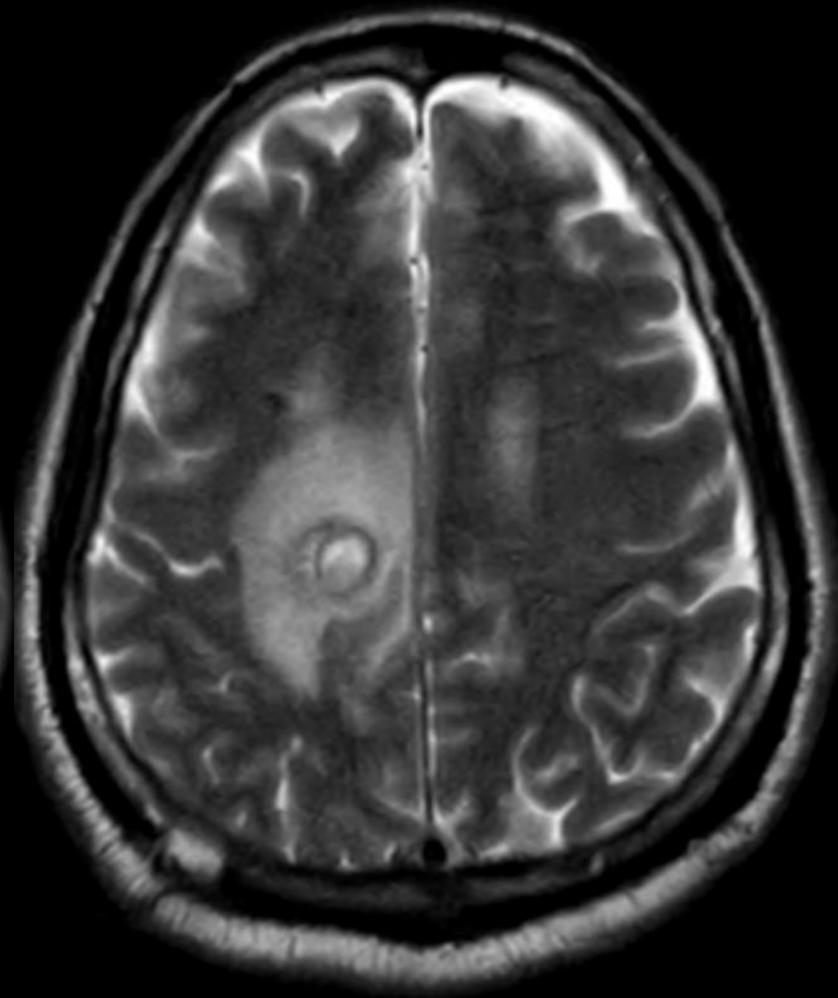
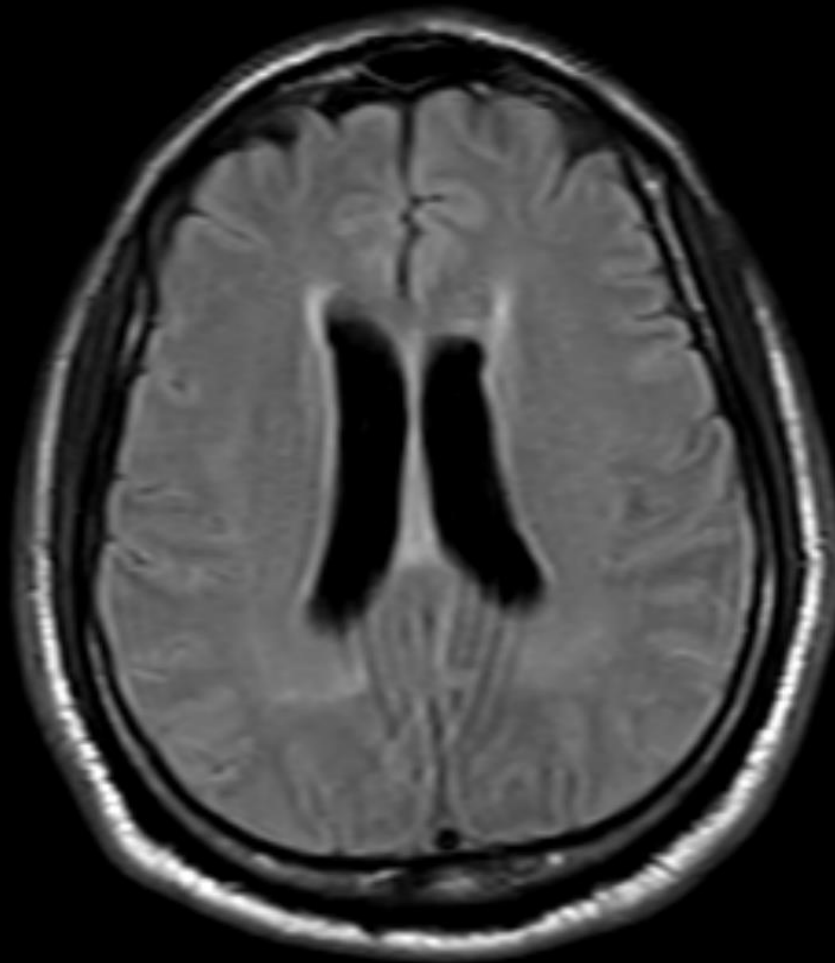
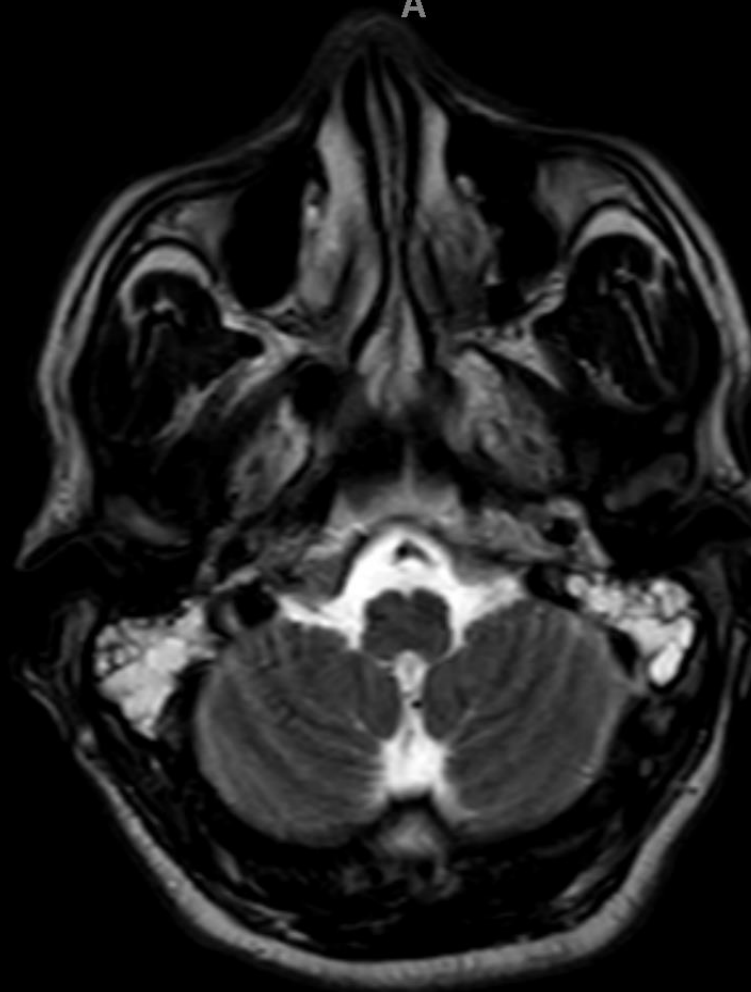
- Hematogenous dissemination
- TB meningitis thought to occur via rupture of a subependymal tubercle into the subarachnoid space
- Basal meninges most commonly involved
- Secondarily results in cortical and lacunar brain infarction and spinal cord infarction





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# Bone Involvement

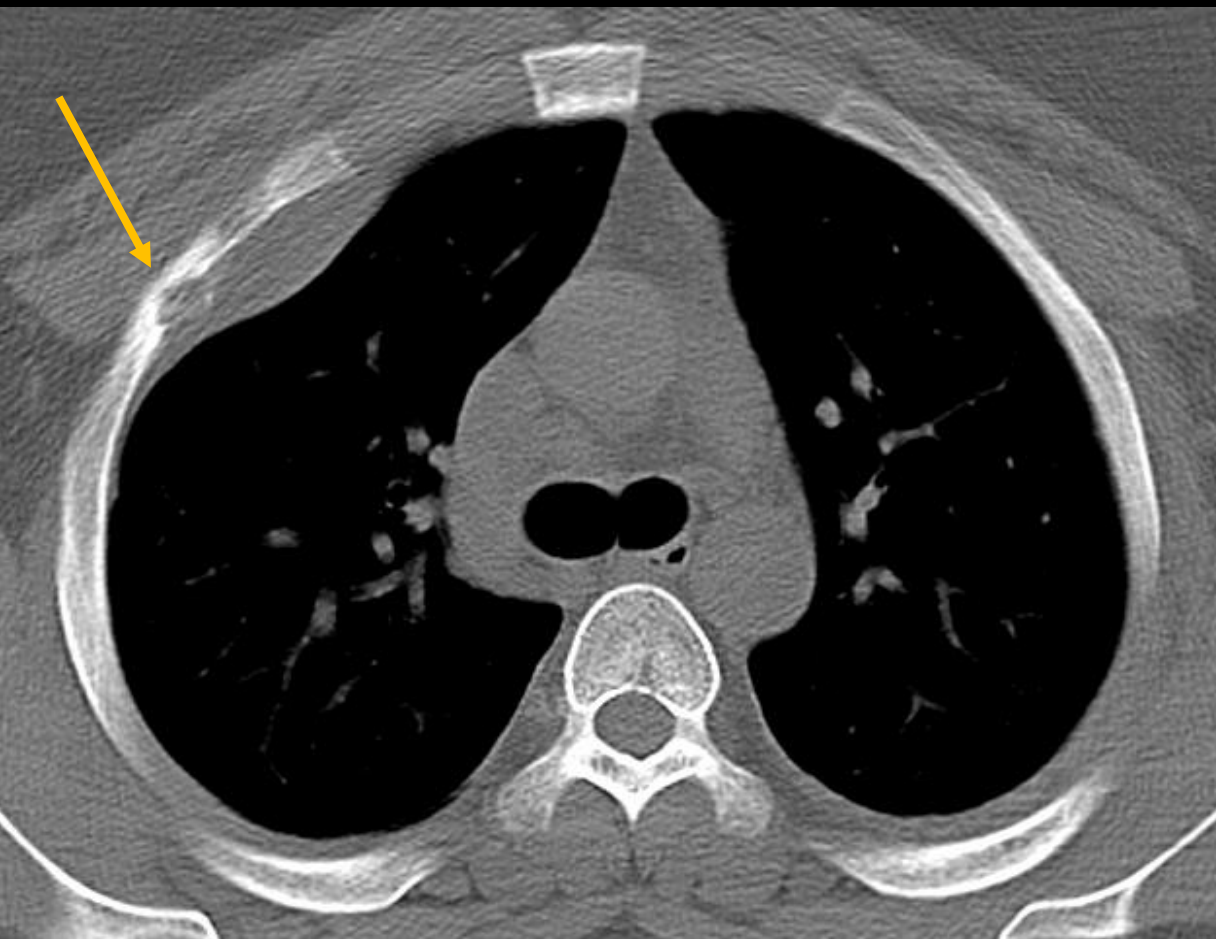
- Potts disease – Tuberculous spondylitis
  - Destructive lesions in the spine primarily centered in vertebral discs and secondarily involving vertebral end plates, resulting in kyphosis.
  - May result in paravertebral abscess.
  - Extends under anterior longitudinal ligament, involving multiple vertebra.
- Can involve other joints – hip, knee, tarsal joints



# Extrapulmonary Tuberculosis

## Pott's Disease





Courtesy: Dr. Santiago Rest



# Urinary Tract Involvement

- Hematogenous spread to the kidney
- Tuberculomas form in renal parenchyma
- Hematuria, “sterile” pyuria
- 75% unilateral
- Auto-nephrectomy – shrunken, calcified, scarred, and nonfunctional
- Ureteral involvement develops from direct spread, resulting in stricture and obstruction

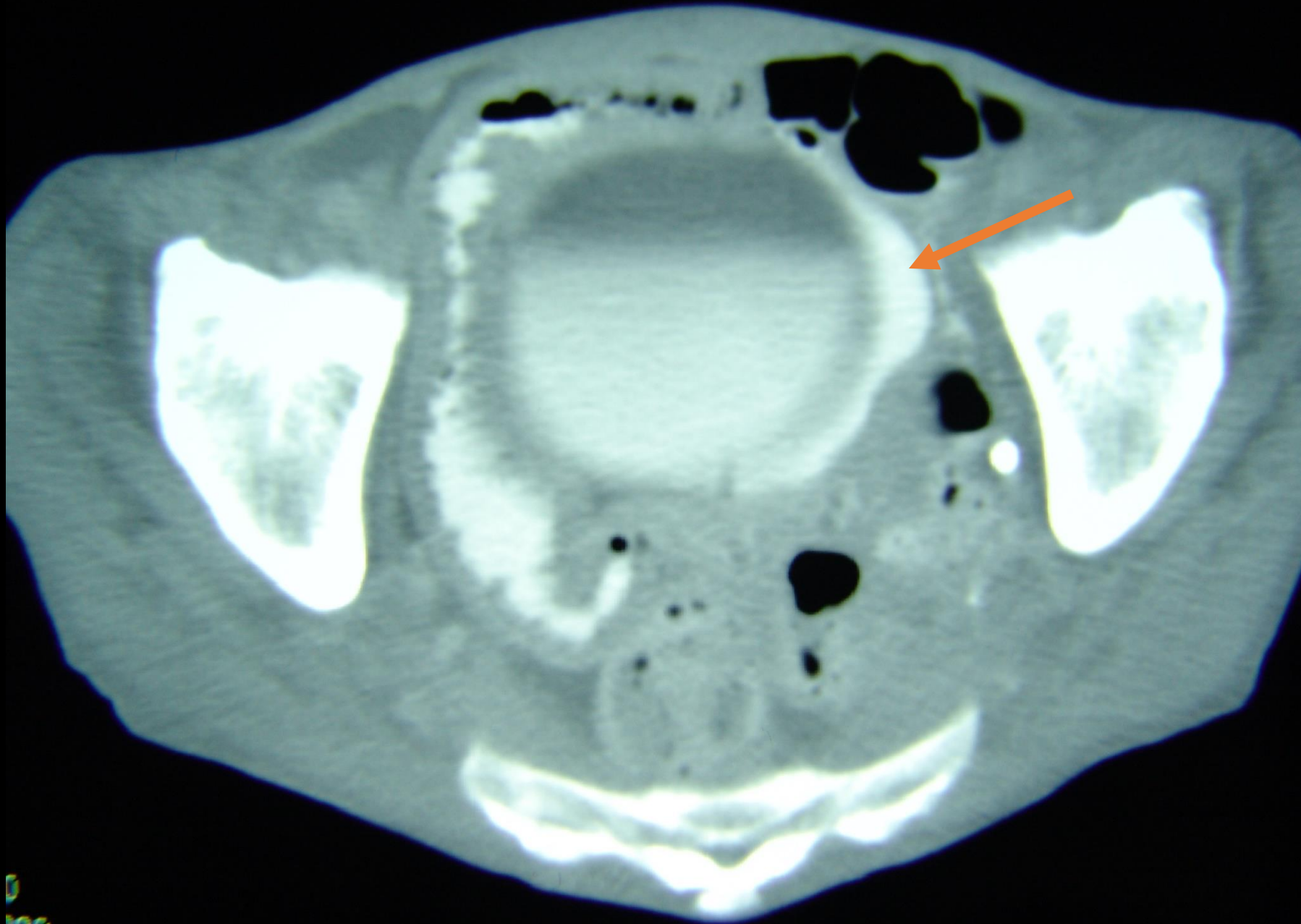




# Bladder Involvement

- Direct spread
- Interstitial cystitis with thickened bladder wall
- Ulceration





# Genital Tuberculosis

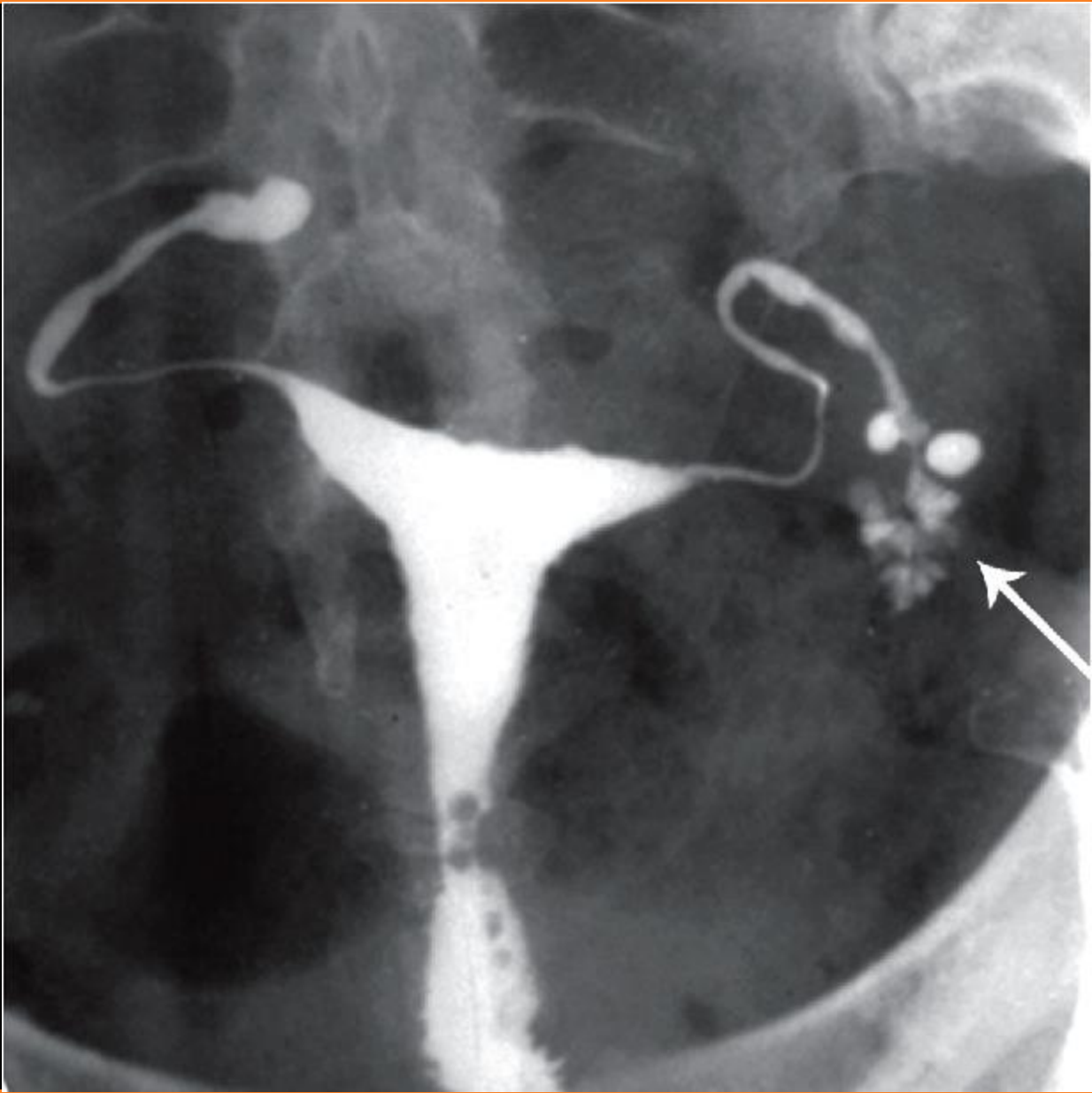
- An important and underrecognized cause of infertility.
- 90% from hematogenous spread but can also spread from local extension.

ORGAN	FREQUENCY
Fallopian tubes	90-100%
Endometrium	50-60%
Ovaries	20-30%
Cervix	5-15%
Vulva and Vagina	1%

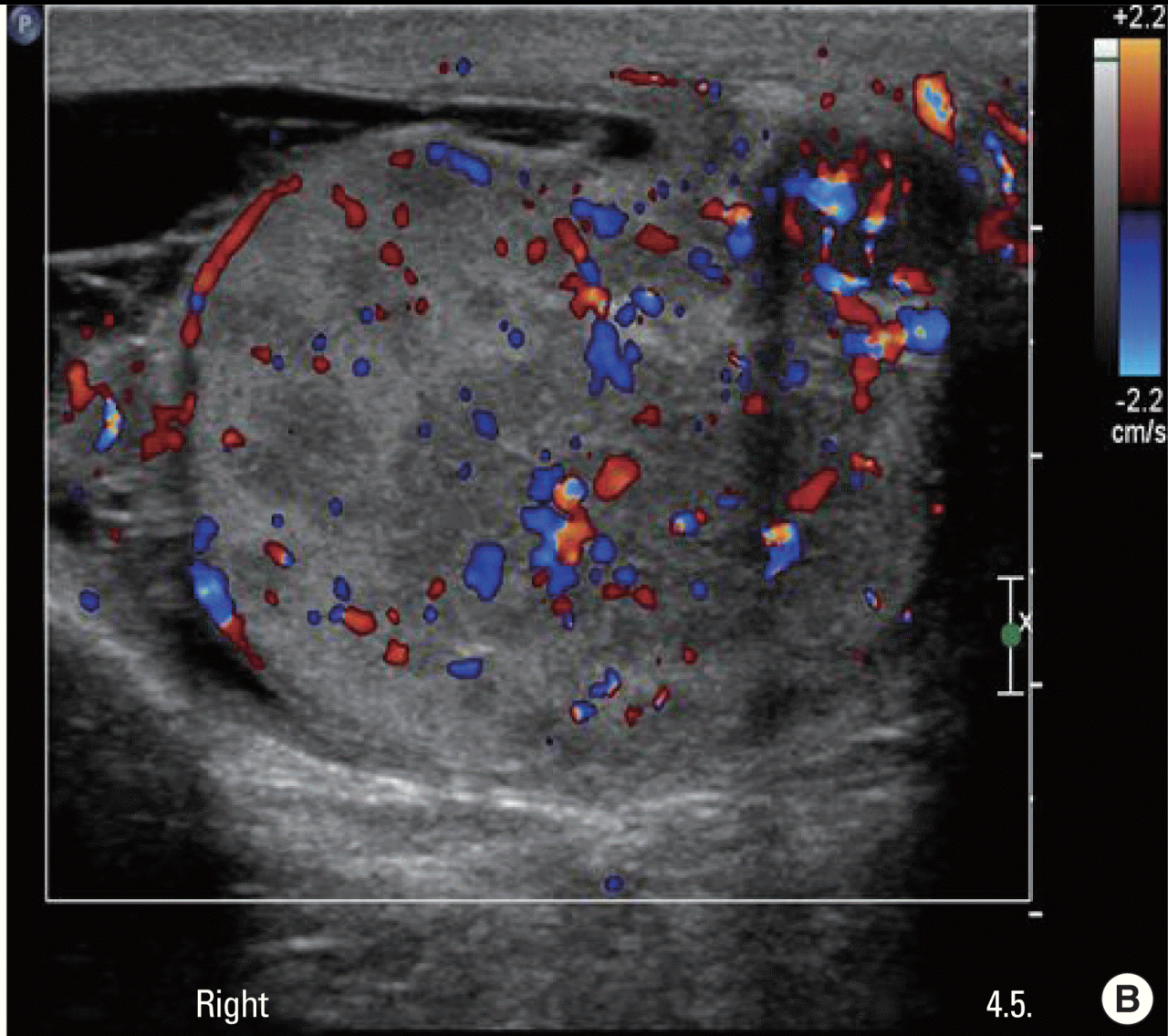
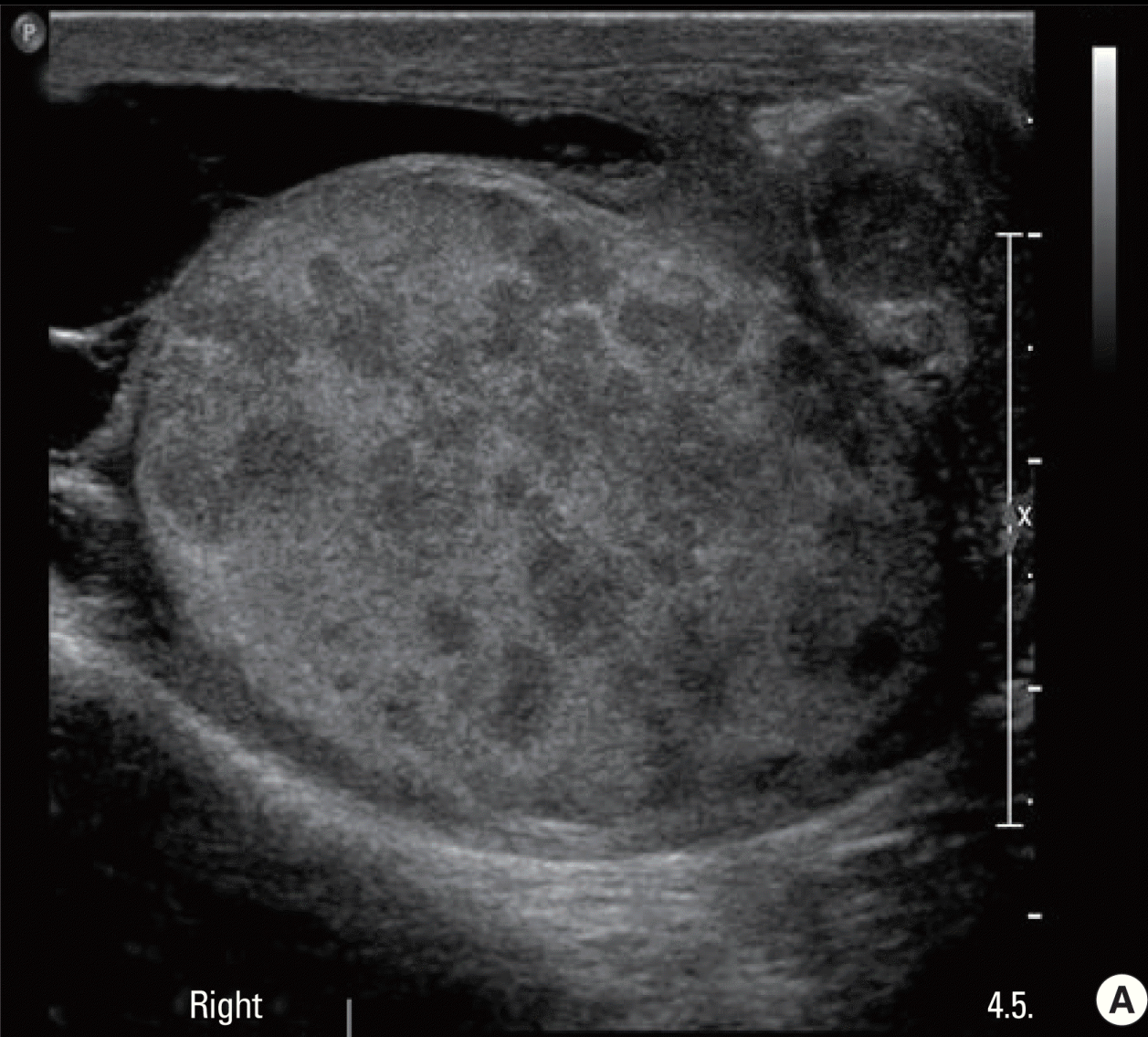
Schaefer G: Female genital tuberculosis. Clin Obstet Gynecol 19:23, 1976)









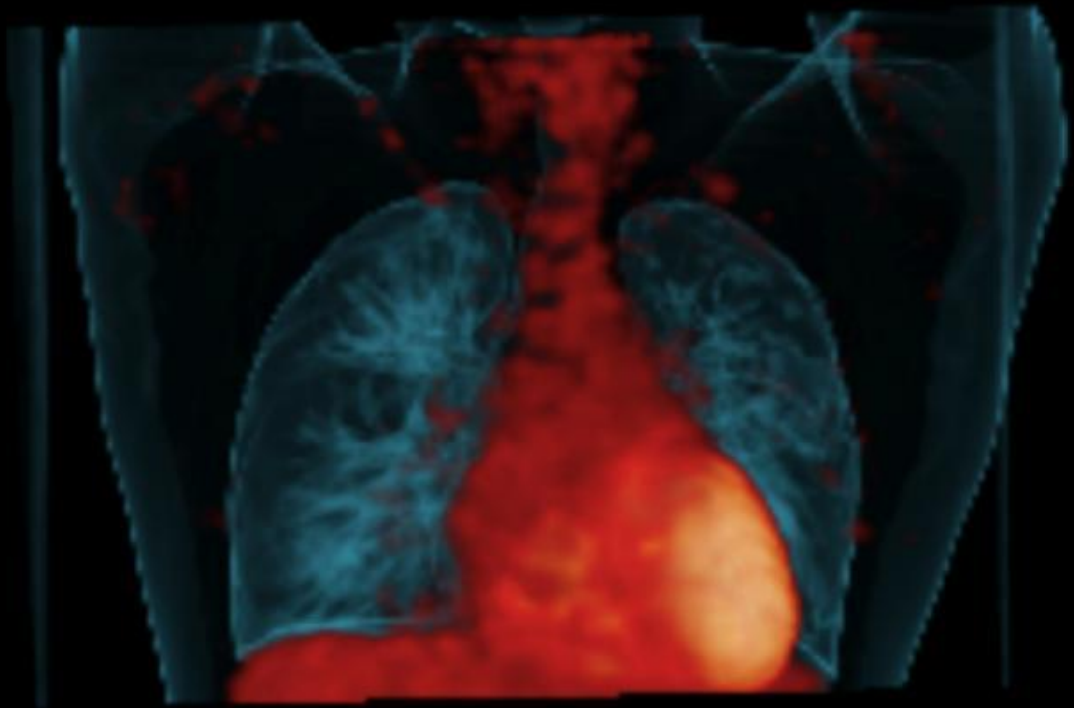
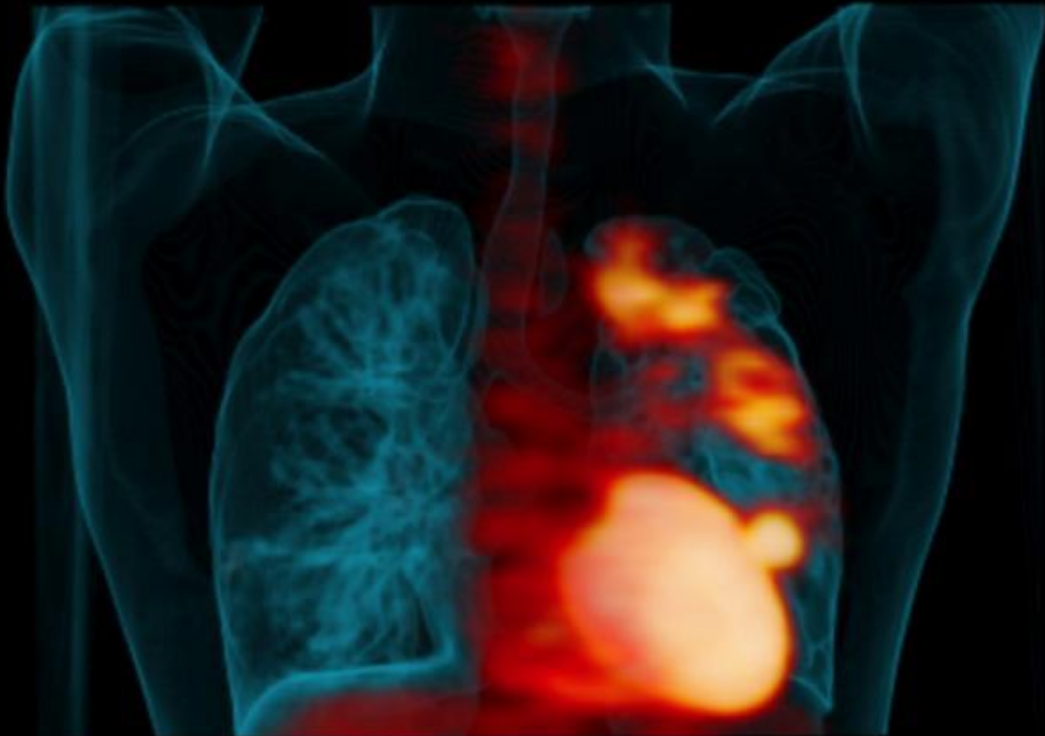
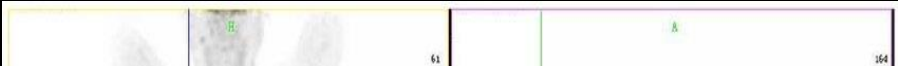




## A Word About PET\_CT...

- It happens.
- It may be useful in determining if activity is present in old lesions or after treatment.
- Who will pay for it?





Questions ?

