# Cases-discussion

By

# بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لا عِلْمَ لَنَا إِلا
مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ
الْحَكِيمُ

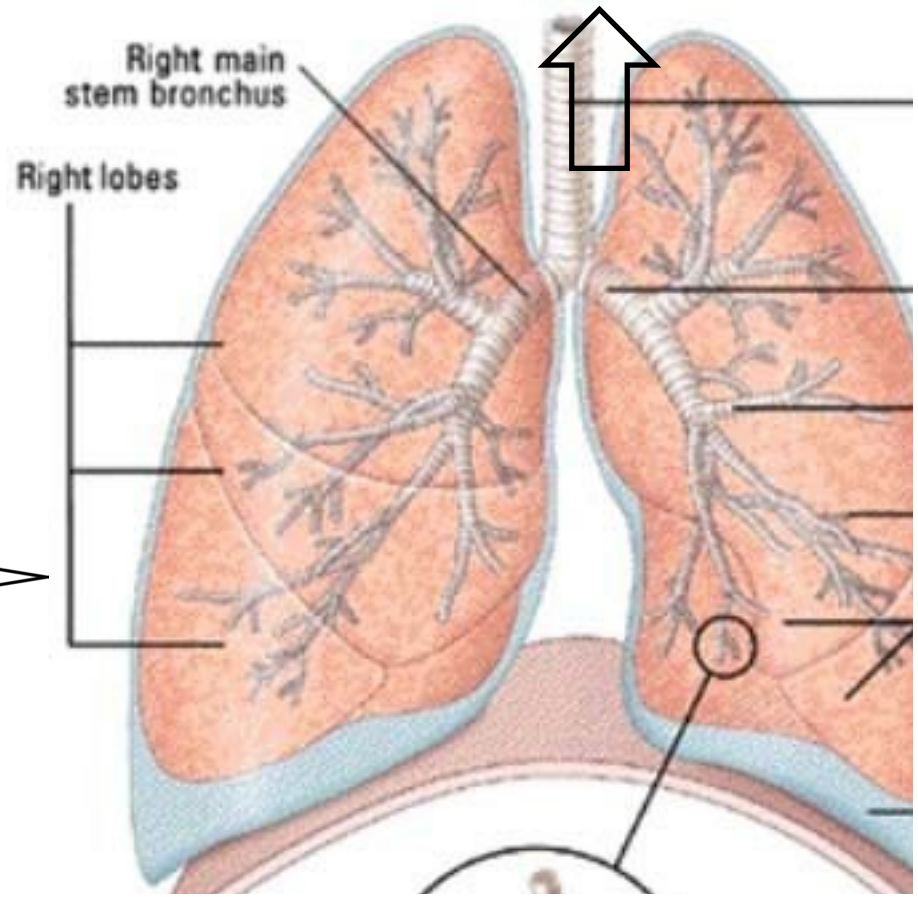
[البقرة: 32]

# Case study 1

**Airway diseases**
**Bronchitis**
**bronchiectasis**
**B Asthma**
**COPD**
**Bronchiolitis**

- **Lung parenchyma**
- **Alveolar►**
- **Interstitial**

**Pleura**
**Pleural effusion**
**Pleurisy**
**Pneumotorax**
**Pleural tumours**



# History

A 60 years old farmer developed a fever and rigors. Over the next 6 hrs he developed dry cough and complains of right sided chest pain. He felt progressively more unwell and is brought to emergency department.

He had been well previously with no significant medical history. There is no relevant family history. His farm is a small dairy farm that he manages with his wife and 18- year- old son.

# Examination

General examination:

- Patient lies on the right side, conscious, alert,
- Flushed face.
- He has a temperature of 39 C
- Pulse rate of 104 b/min
- Blood pressure of 120/85.
- The respiratory rate is 30 breath/min.

**Local Examination:**

**Inspection:** Diminished movement of the right part.

**Palpation:** Lack of expansion of the affected area

Increased vocal fremitus.

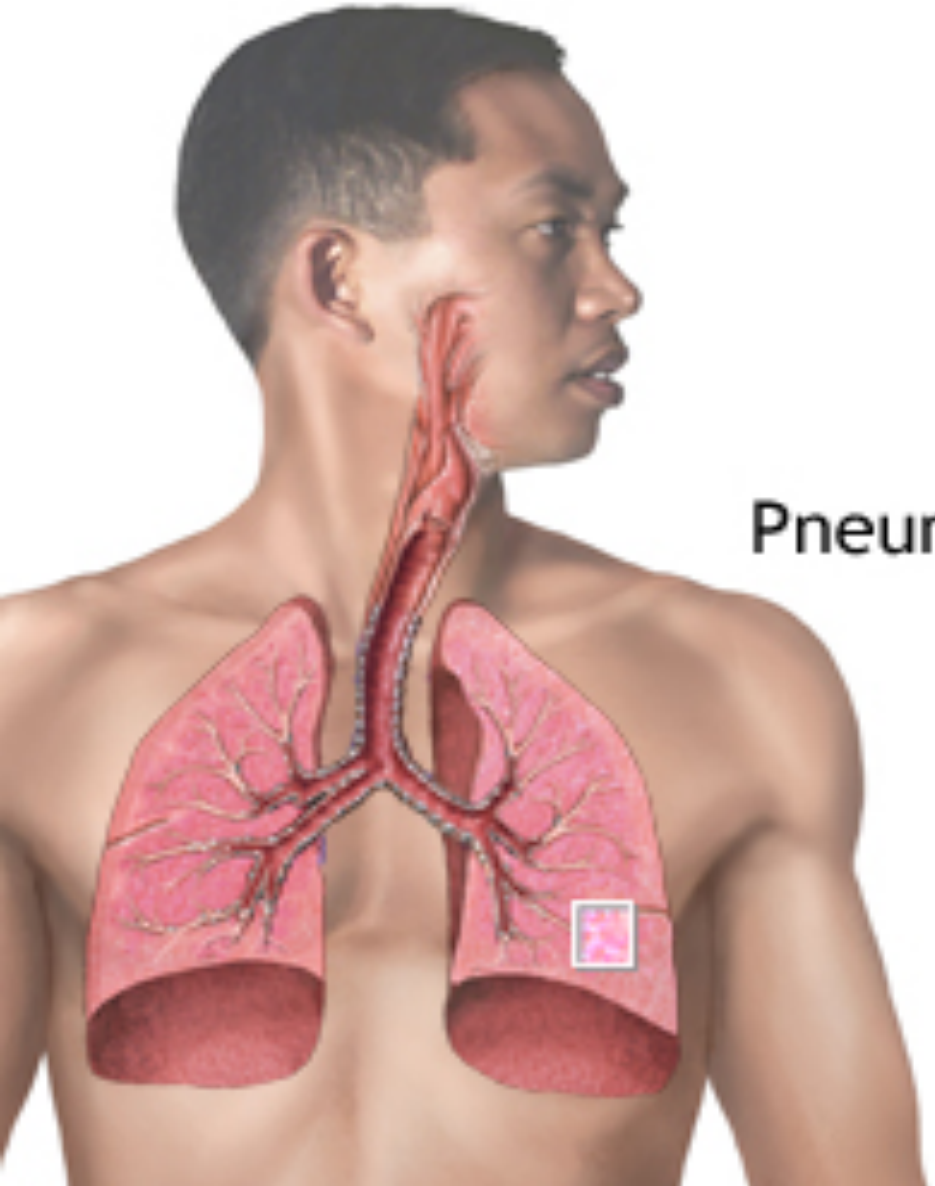
**Percussion:** Dullness over the right lower part

**Auscultation:** Bronchial breathing over the affected area

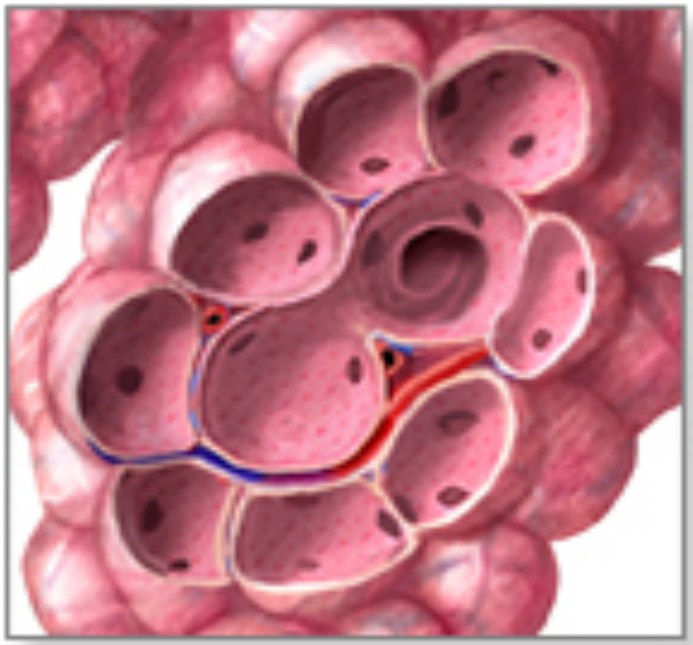
Fine Crepitations,

Vocal resonance is exaggerated

Whispering pectoriloquy is often heard.

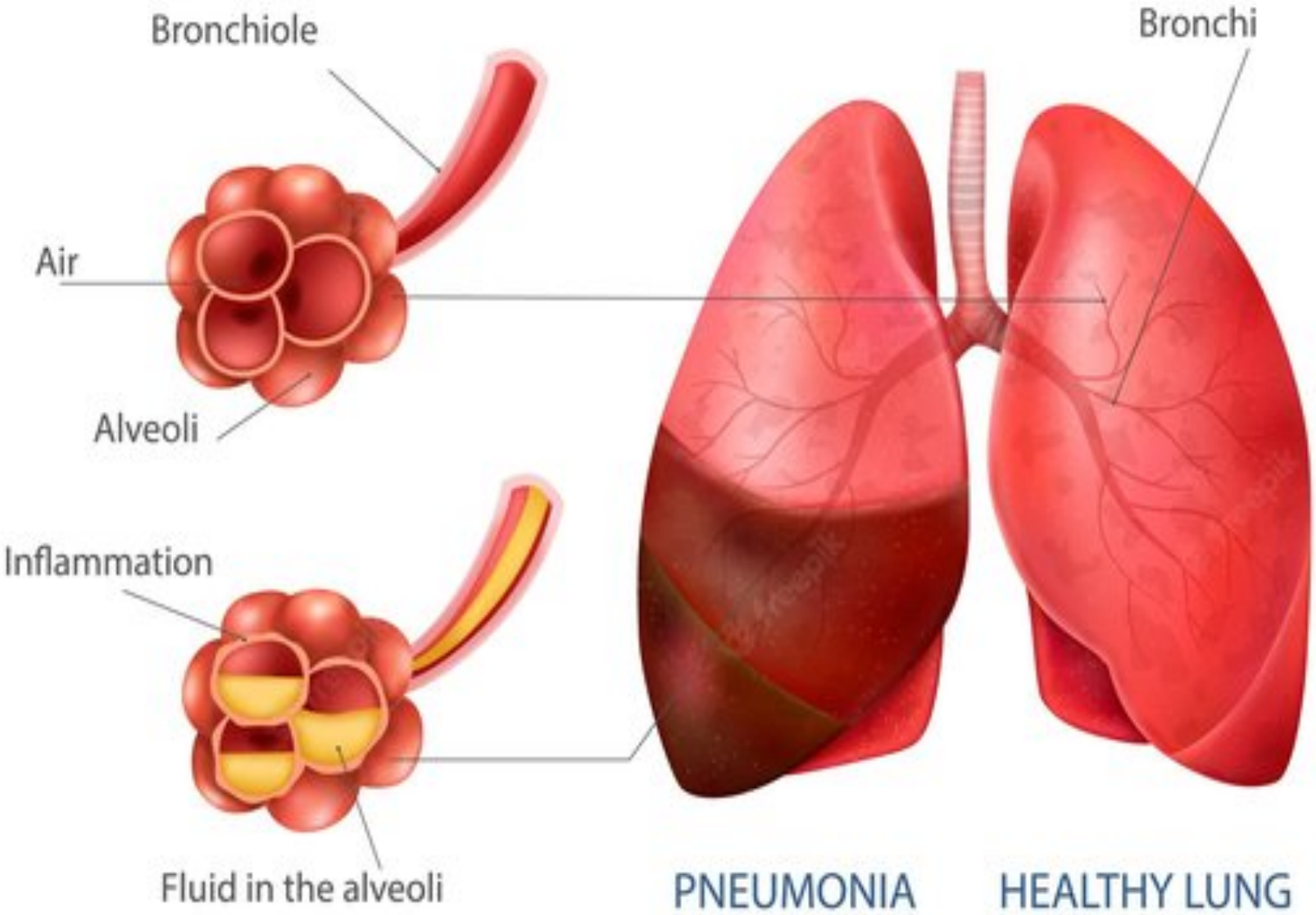


Normal alveoli



Pneumonia

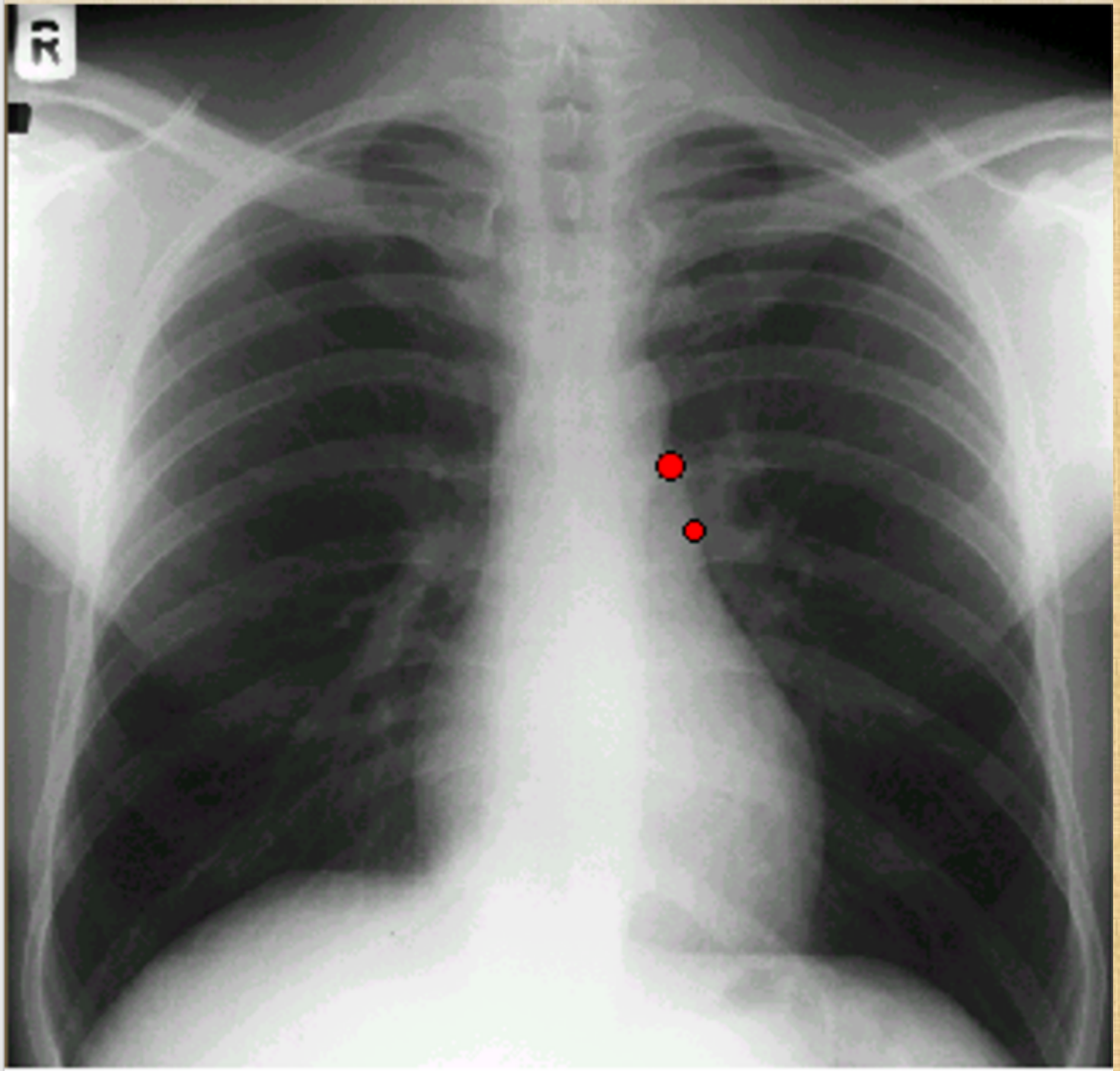
# PNEUMONIA


Bronchiole
Air
Alveoli
Inflammation
Fluid in the alveoli
Bronchi
PNEUMONIA
HEALTHY LUNG

# Questions

- What is the likely diagnosis ?
- What is the most likely investigation ?

# CXR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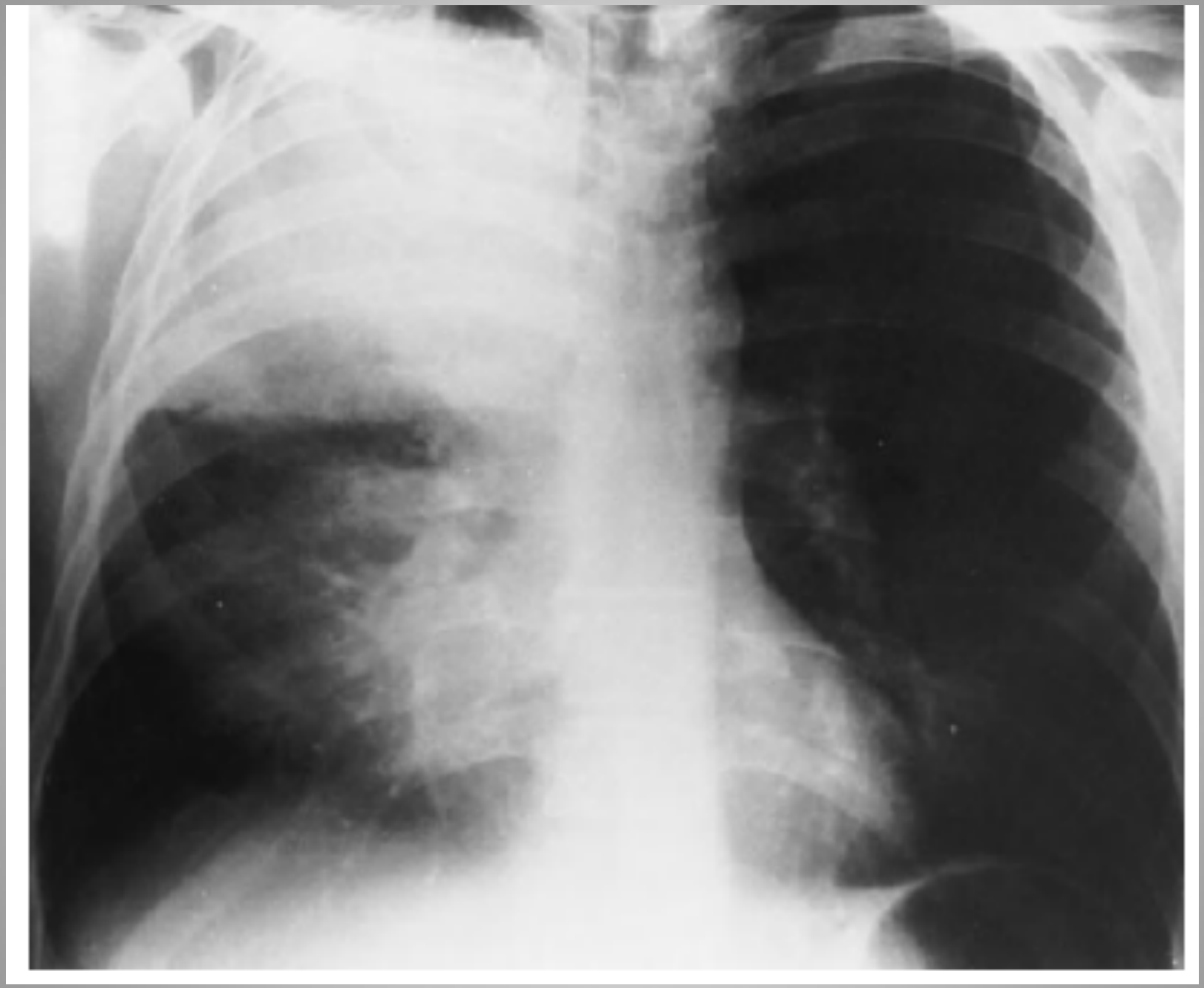
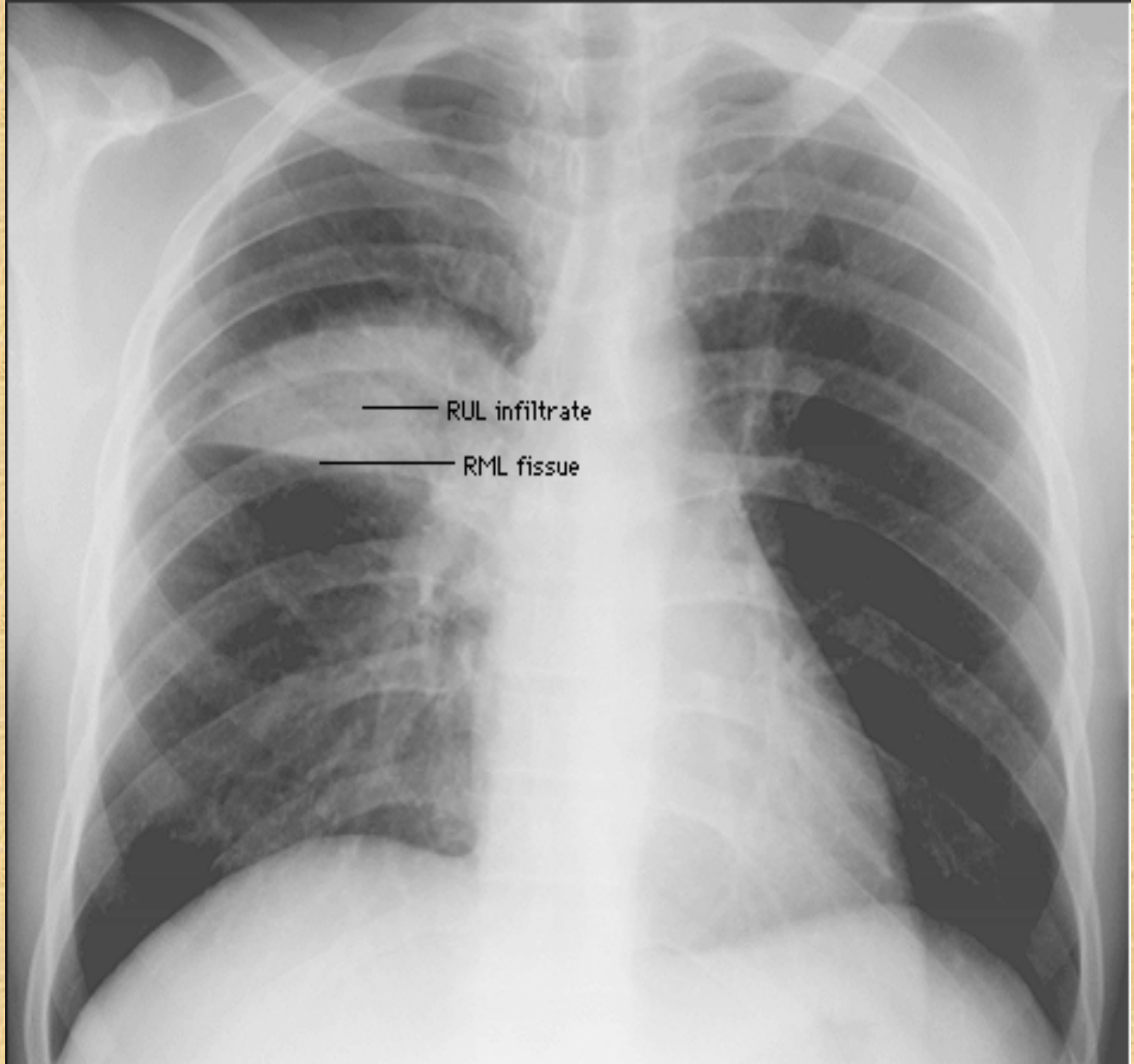
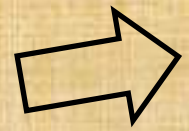
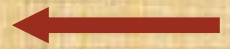



RUL infiltrate
RML fissue



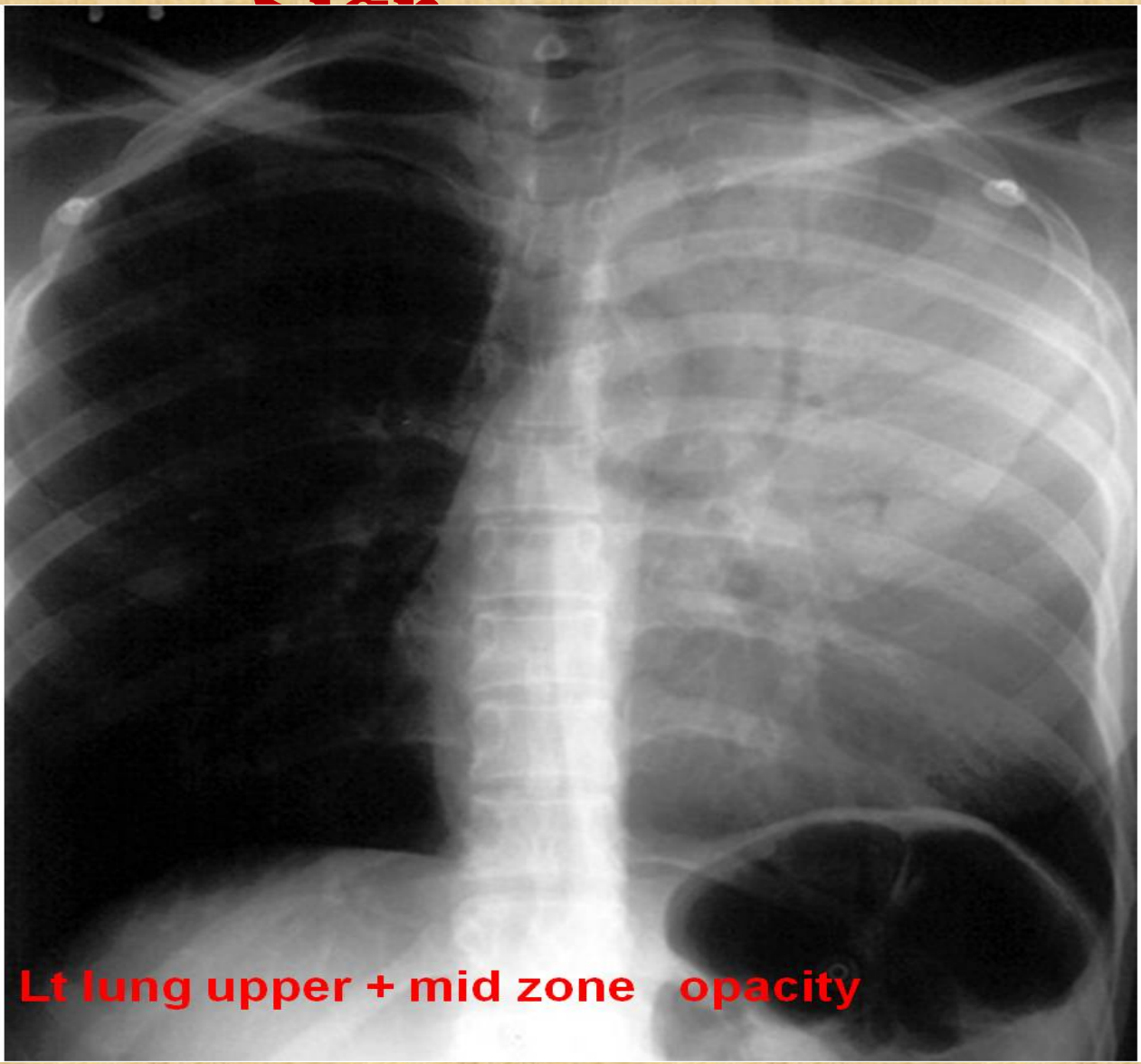


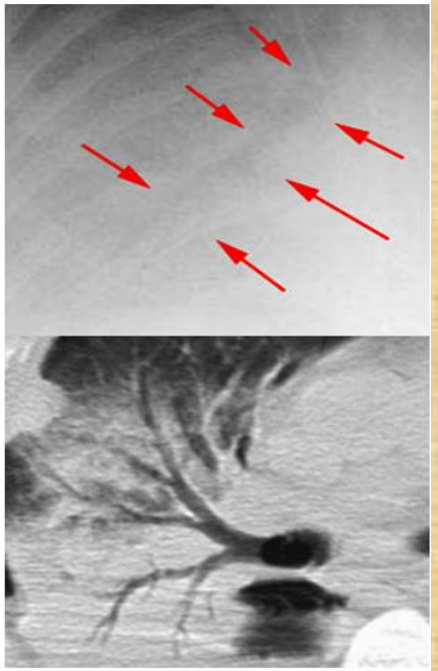
Consolidated Pneumonia

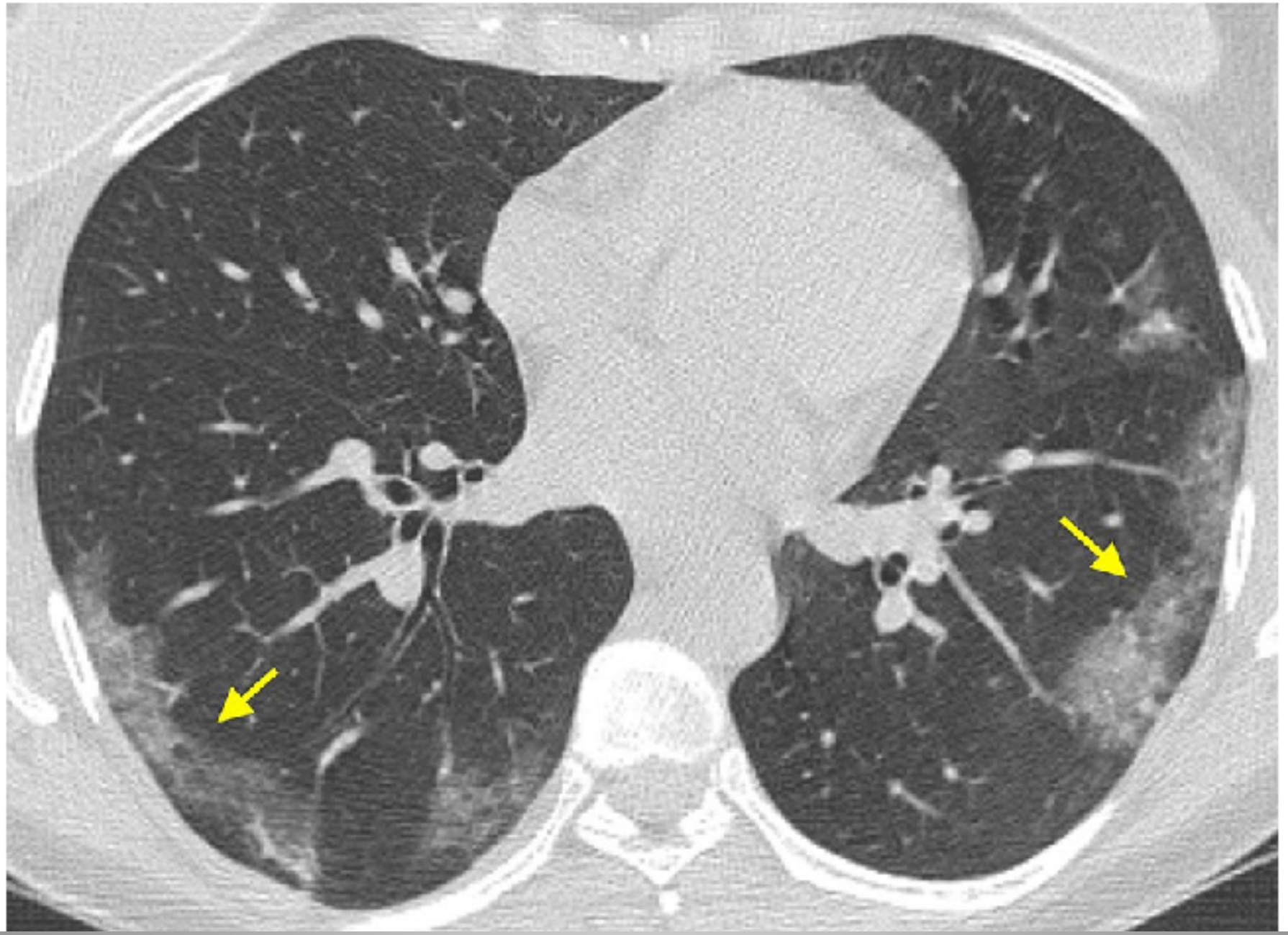
Massive Atelectasis

Massive Pleural Effusion

# Air-Bronchogram Sign





# What next investigations diagnosis

# Laboratory Tests for CAP

- CBC
- CRP and ESR
- BUN and Creatinine
- Liver enzymes
- Serum electrolytes

- ABG
- Gram stain of sputum
- Culture of sputum
- Blood cultures
- Septic work up

# CBC

| CBC | results | normal |
|---|---|---|
| WBC | 19.9 | 4.5-11.5 |
| RBC | 5.1 | 4.2-5.4 |
| Hb | 15.8 | 11.5-15.5 |
| Hct | 48.5% | 38-47% |
| MCV | 98.2 | 80-96 |
| MCHC | 31.6% | 32-36% |

| WBC Differential | results | normal |
|---|---|---|
| Neutrophils | 76% | 40-75% |
| Lymphocytes | 12% | 20-45% |
| Monocytes | 5% | 0-6% |
| Eosinophils | 4% | 0-6% |
| Basophils | 2% | 0-1% |
| Bands | 1% | 0-6% |

| Electrolytes | | |
|---|---|---|
| Na+ | 137 | 137-147 |
| K+ | 4.8 | 3.5-4.8 |
| Cl- | 87 | 98-105 |
| Total CO2 | 41 | 23-33 |

# Questions

- **What would be the appropriate initial treatment?**

# CURB-65 AND CRB-65 SEVERITY SCORES FOR COMMUNITY-ACQUIRED PNEUMONIA

| Clinical factor | Points |
|---|---|
| Confusion | 1 |
| Blood urea nitrogen > 19 mg per dL | 1 |
| Respiratory rate ≥ 30 breaths per minute | 1 |
| Systolic blood pressure < 90 mm Hg<br>or<br>Diastolic blood pressure ≤ 60 mm Hg | 1 |
| Age ≥ 65 years | 1 |
| **Total points:** | |

| CURB-65 score | Deaths/total (%)* | Recommendation† |
|---|---|---|
| 0 | 7/1,223 (0.6) | Low risk; consider home treatment |
| 1 | 31/1,142 (2.7) | |
| 2 | 69/1,019 (6.8) | Short inpatient hospitalization or closely supervised outpatient treatment |
| 3 | 79/563 (14.0) | Severe pneumonia; hospitalize and consider admitting to intensive care |
| 4 or 5 | 44/158 (27.8) | |

# Group I: Outpatients but no Comorbidities

## Organisms

- Streptococcus pneumoniae
- Hemophilus influenza
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Legionella spp
- Respiratory viruses

## Therapy

**Macrolide:**

- Azithromycin500mg once or
- Clarithromycin 500mg bid

**" Strong Recom."**

**or**

- Amoxicillin or
- amoxicillin + clavulanic acid
- Doxycycline

**" Weak Recom."**

# Group ll: Outpatient, with Comorbidities

**ORGANISMS**

- Strept. pneumoniae (including DRSP)
- Hemophilus influenza
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Legionella spp.,
- Enteric gram-negatives
- Aspiration( anaerobes)
- Respiratory viruses

## Therapy

**β –Lactam ;**

- Amoxicillin,
- Cefpodoxime,
- Cefuroxime
- Amoxicillin /clavulanate
- Ampicillin-sulbactam
- Ceftriaxone

\+ **Macrolide**

**Or**

**Lung Fluroquinolones** as Monotherapy

- Levofloxacin 750 mg OD
- Moxifloxacin 400 mg OD
- Gemifloxacin 320 mg OD

# Differential diagnosis

- His occupation raises the possibility of conditions such as extrinsic allergic allveolitis (farmer¬s lung) and the symptoms of fever, rigors and dry cough would fit this diagnosis.

# Diagnosis

- **This is a community- acquired pneumonia with no known underlying illness.**

- **The commonest cause is streptococcus pneumoniae (50%) which would fit well with the acute onset with fever and rigors.**


THANK
YOU
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# Case study 2


CASE HISTORY

- **A 13-year-old male presents to the emergency department with acute onset of breathlessness. He has had recurrent, episodic attacks of wheezing, cough, dyspnea, itchy red eyes, nasal discharge, and occasional chest tightness for past 2 years.**

- **Initially, his symptoms were relieved by short-acting β-agonist, albuterol. However, the frequency and the severity of the symptoms have increased for the past 1 month with the patient waking up with these symptoms. He has a history of eczema. His family history is significant for asthma in his mother**

- **Physical examination** reveals respiratory rate of 22c/min and diffuse wheezing all over the lung fields.

# What i your diagnosis

**What is the most probable diagnosis ?**

**a. Bronchial asthma**
**b. COPD**
**c. Bronchiectasis**
**d. Extrinsic allergic alveolitis**

# Conditions Mimicking Asthma

- COPD
- GERD
- Pulmonary embolism
- Bronchiectasis
- Cardiac disease
- Bronchiolitis
- ILD
- Cystic Fibrosis
- Psychogenic

- Foreign body
- Endobronchial tumors
- Extra bronchial obstruction

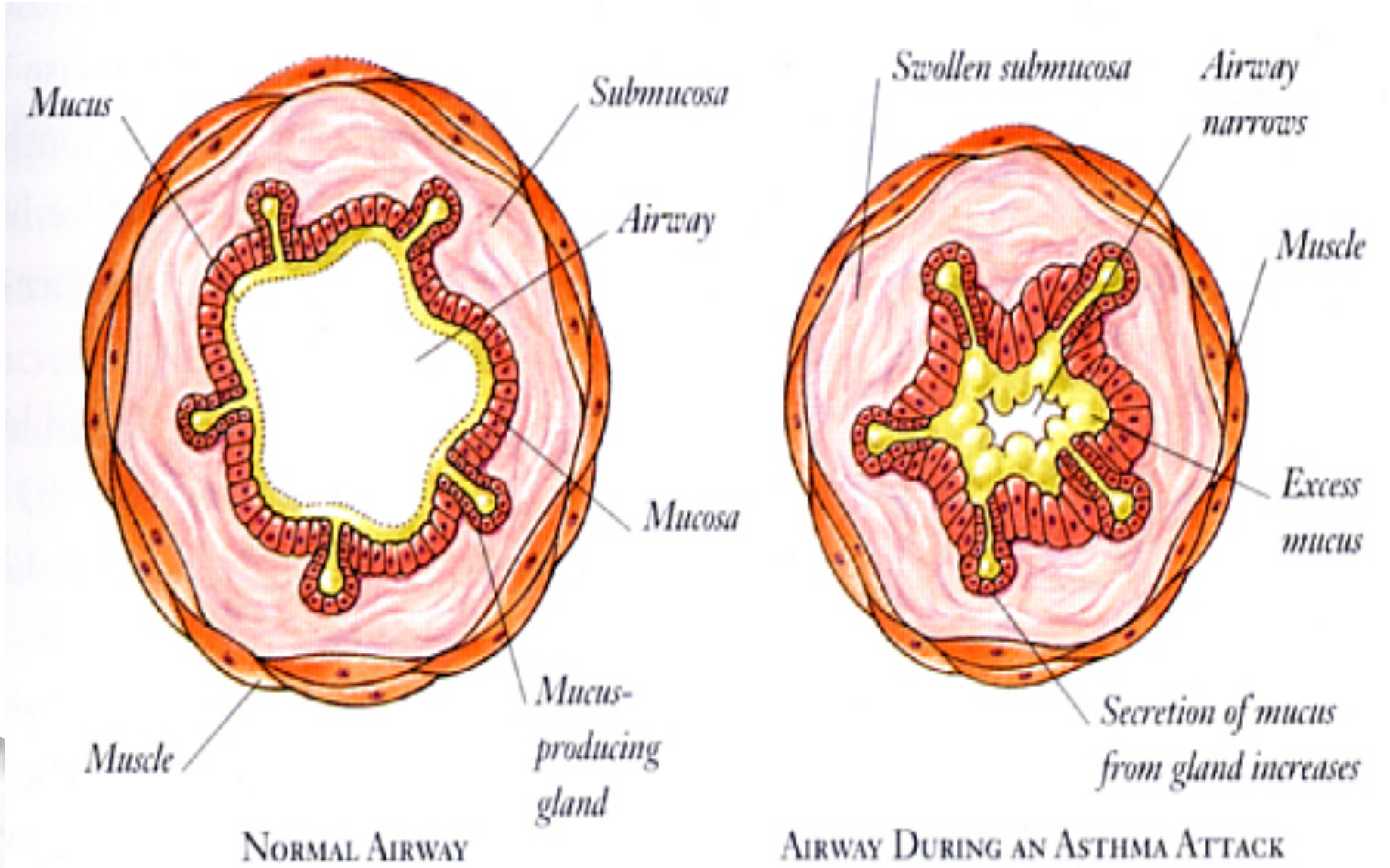
## Clinical Differences Between Asthma and COPD

| Clinical features | Asthma | COPD |
|---|---|---|
| Age of onset | Usually early childhood, but may have onset at any age | Usually > 40 years old |
| Smoking history | May be non-, ex- or current smoker | Usually > 10 pack-years |
| Atopy | Often | Infrequent |
| Family history | Asthma or other atopic disorders commonly present | Not a usual feature |
| Clinical symptoms | Intermittent and variable | Persistent and gradually progressive worsening |
| Cough | Nocturnal cough or on exertion | Morning cough with sputum |
| Sputum production | Infrequent | Often |
| Reversibility of airflow obstruction | Characteristic of asthma | Airflow limitation may improve but never normalises |
| Exacerbations | Common at all levels of severity except in mild disease | Increase in frequency with increasing severity of disease |

**All of the following are the main cause of airway obstruction in asthma except:**

**a. Bronchospasm**
**B. Mucus Hypersecretion**
**C. Inflammation Of Bronchial Wall**
**D. Extra bronchial compression**

# Asthma: Pathological changes



# What are Factors Influencing the Development and Expression of Asthma

## Host factors:

- Genetic
- Obesity
- Sex

# Environmental factors

- **Allergens**
  - Indoor: Domestic mites, furred animals (dogs, cats, mice), cockroach allergen, fungi, molds, yeasts
  - Outdoor: Pollens, fungi, molds, yeasts
- **Infections** (predominantly viral)
- **Occupational sensitizers**

# Contributing Factors

- **Respiratory infections; The most common cause of acute exacerbation of asthma. Respiratory viruses are the major factors.**
- **Physical activity**

- **Psychological factors**
- **Medication**

**Which is the diagnostic test you will order next for this asthmatic patient?**

**(a) ABGs**
**(b) PFTs (PEFR or FEV1)**
**(c) Pulse oximetry**
**(d) CXR**

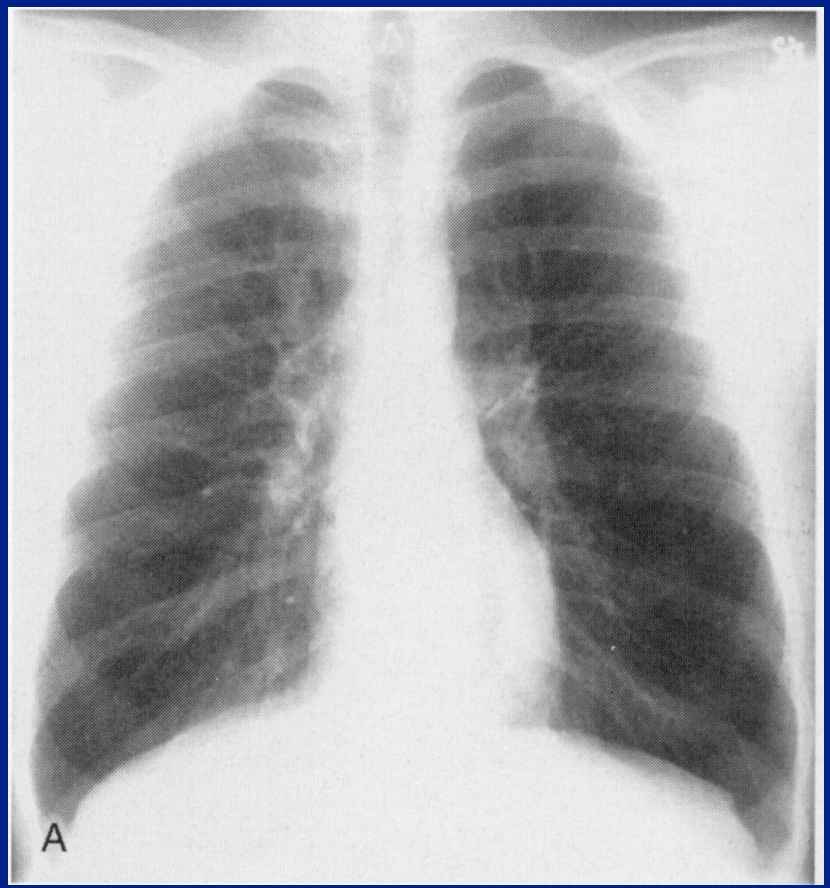
# CXR

Most patients with asthma have **normal x-rays.**

Signs of **Hyperinflation** (Diaphragm is down to the 8th rib anteriorly, MCL-ribbon-shaped heart…) as in ASA

**Diagnosis of Complications:**

- Pneumonia
- Pneumothorax



**Which is the diagnostic test you will order to confirm diagnosis of asthmatic patient?**

**(a) ABGs**
**(b) PFTs (PEFR or FEV1)**
**(c) Pulse oximetry**
**(d) CXR**

**Obstructive airway defect is characterized on PFT by which one of the following**

**a. Reduced FEV1/FVC ratio**
**b. Decreased total lung capacity**
**c. Reduced residual volume**
**d. Decrease in diffusing capacity**

# Diagnostic testing

**Diagnosis of asthma can be confirmed by demonstrating the presence of reversible airway obstruction using PFT ; *Spirometry* or *Peak flow meter*.**

# Reversibility and variability of Airflow Obstruction

- **Confirm presence of airflow obstruction**
  - **FEV1/FVC is reduced + Reduced FEV1**
  - **FEV1/ FVC ratio is normally > 0.75 in healthy adults, and > 0.90 in children**

**Confirm presence of Bronchodilator reversibility**

- **Increase in FEV1 > 12%of predicted or >200mL after bronchodilator**

- **If initial testing is negative: Repeat when patient is symptomatic, or after withholding bronchodilators**

**Pulmonary function test (PFT)** shows

FEV1/FVC ⇛0.65.

FEV ⇛ 60% of predictive and

Post-bronchodilator FEV1⇛ 74% of predictive.

**Which is the other diagnostic test you will order to this asthmatic patient?**

**(a) ABGs**
**(b) PFTs (PEFR or FEV1)**
**(c) Pulse oximetry**
**(d) CXR**

# Blood Gas Measurements

- Best indicators of overall lung function are arterial blood gases
  - pH, $PaO_2$, $PaCO_2$

- Oxygen saturation ($O_2$ sat)
  - Detect the percent of oxyhaemoglobin
  - Normal $O_2$ sat 95 – 99 %

**Which one of the following is the first-line therapy in the management of an acute asthma attack**

**a. Steroids**
**b. β2-agonists**
**c. Theophylline**
**d. Antibiotics**
**e. Magnesium sulfate**

# Management of Acute exacerbation of Bronchial Asthma

**Oxygen Therapy:**

- **By nasal Cannula or mask to achieve SpO2 > 90%**
- **Controlled O2 therapy in patients with elevated CO2**

**Bronchodilators:**

- **Nebulized B2 agonists Combined with nebulised Ipratropium bromide**
- **Given continuously for one hour, then every 60 min, after that regularly every 4-6 hours,**
- **Reduced according to response.**

**Corticosteroids:**

- **Hydrocortisone 100 mg every 6-8 hours to be reduced to Dexamethazone or oral preparation**
- **Later ,then inhaled preparations started.**

**Antibiotics : when signs of bacterial infection**

**Aminophylline:**

**Intravenous infusion every 8 hours to be transformed into oral long acting preparation after improvement of acute attack.**

**Intravenous magnesium**

**All of the following are accurate indicators of a life threating asthma except:**

**(a) The presence of wheezing**
**(b) The use of accessory muscles**
**(c) The presence of diaphoresis and cyanosis**
**(d) The presence of a pulsus paradoxus > 12mmHg**

# Acute severe asthma

1. Anxiety, and SOB ; can not complete one sentence.
2. Use of accessory muscles of respiration
3. Tachycardia ≥ 110 beat/min
4. Tachypnea ≥ 25 breath/min
5. Pulsus paradoxus
6. Bilateral generalized inspiratory and expiratory rhonchi
7. PEF ≤ 50%

# Life-threatening asthma

1. Confusion
2. Cyanosis,
3. Bradycardia,
4. Hypotension
5. Silent chest,
6. Pao2<60 ,paco2 ≥ 50
7. PEF < 33%

**The cornerstone drug of choice for the control of asthmatic patient is:**

**(a) Inhaled Corticosteroids**
**(b) Atropine**
**(c) Inhaled beta-adrenergic agents**
**(d) Subcutaneous beta-adrenergic agents**

# Pharmacological Treatments

- The goal of asthma treatment is to achieve and maintain clinical control.

- Medications to treat asthma can be classified as controllers or relievers.

# I- Controllers

- These are medications taken daily on a long-term basis to keep asthma under clinical control chiefly through their anti-inflammatory effects.

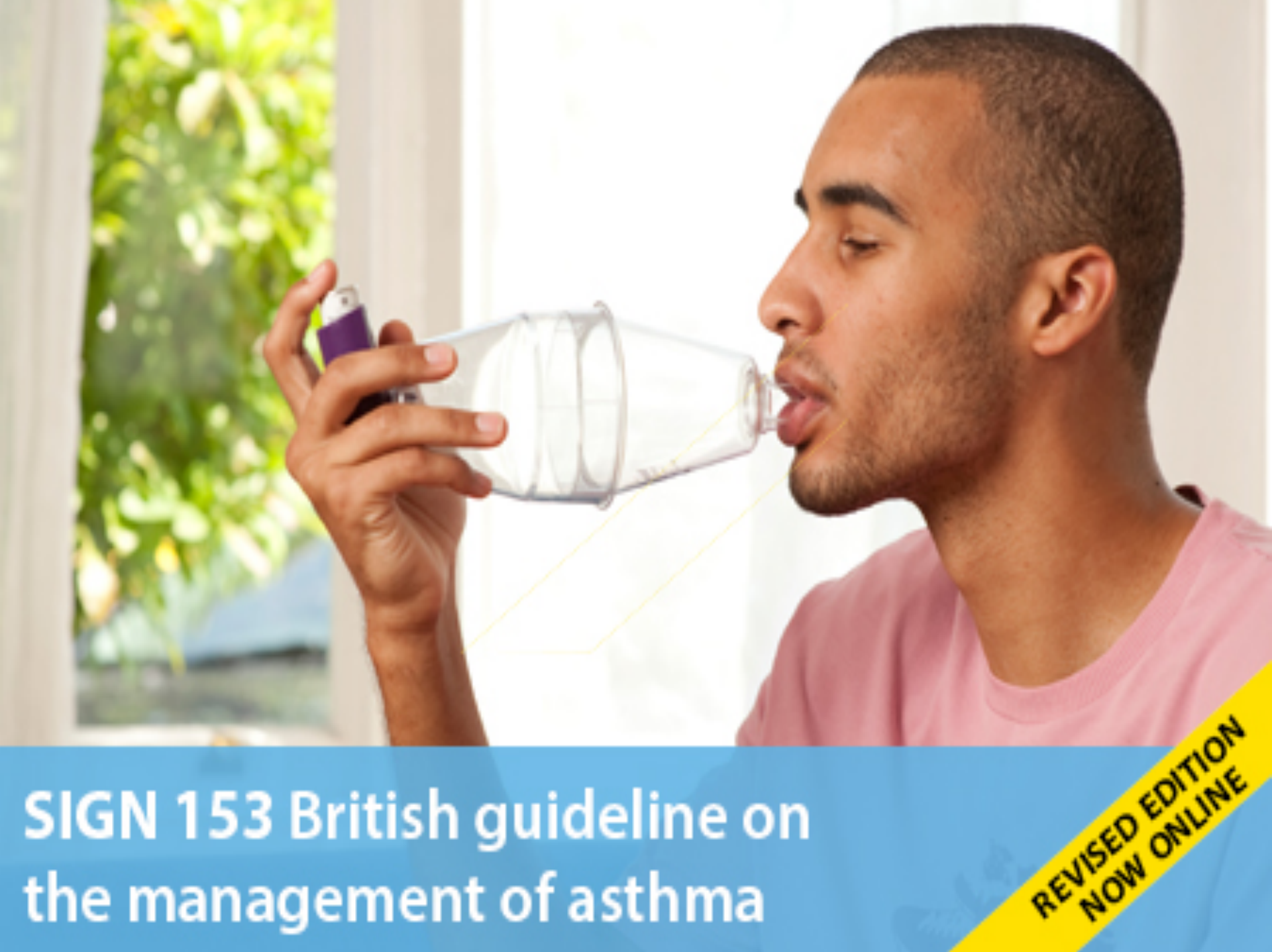
- Controller medications include:
  - Inhaled and systemic glucocorticosteroids,
  - Leukotriens modifiers,
  - Long-acting inhaled B2-agonists, LABA
  - Sustained-release theophylline,
  - Immunomodulators: 1.Omalizumab
    2.Allergen-specific

# 2-Relievers:

- These are medications used as-needed that act quickly to reverse bronchoconstriction and relieve its symptoms.

- Relievers medications include:
  - Short-acting inhaled B2- agonists, SABA
  - Inhaled anticholinergic,
  - Short-acting theophylline,
  - Short-acting oral B2-agonists.

# A Lot Going On Beneath The Surface



# SIGN 153 British guideline on the management of asthma

REVISED EDITION NOW ONLINE


100/50


Seretide 500
500


Flixotide
Flixotide
Diskus
500

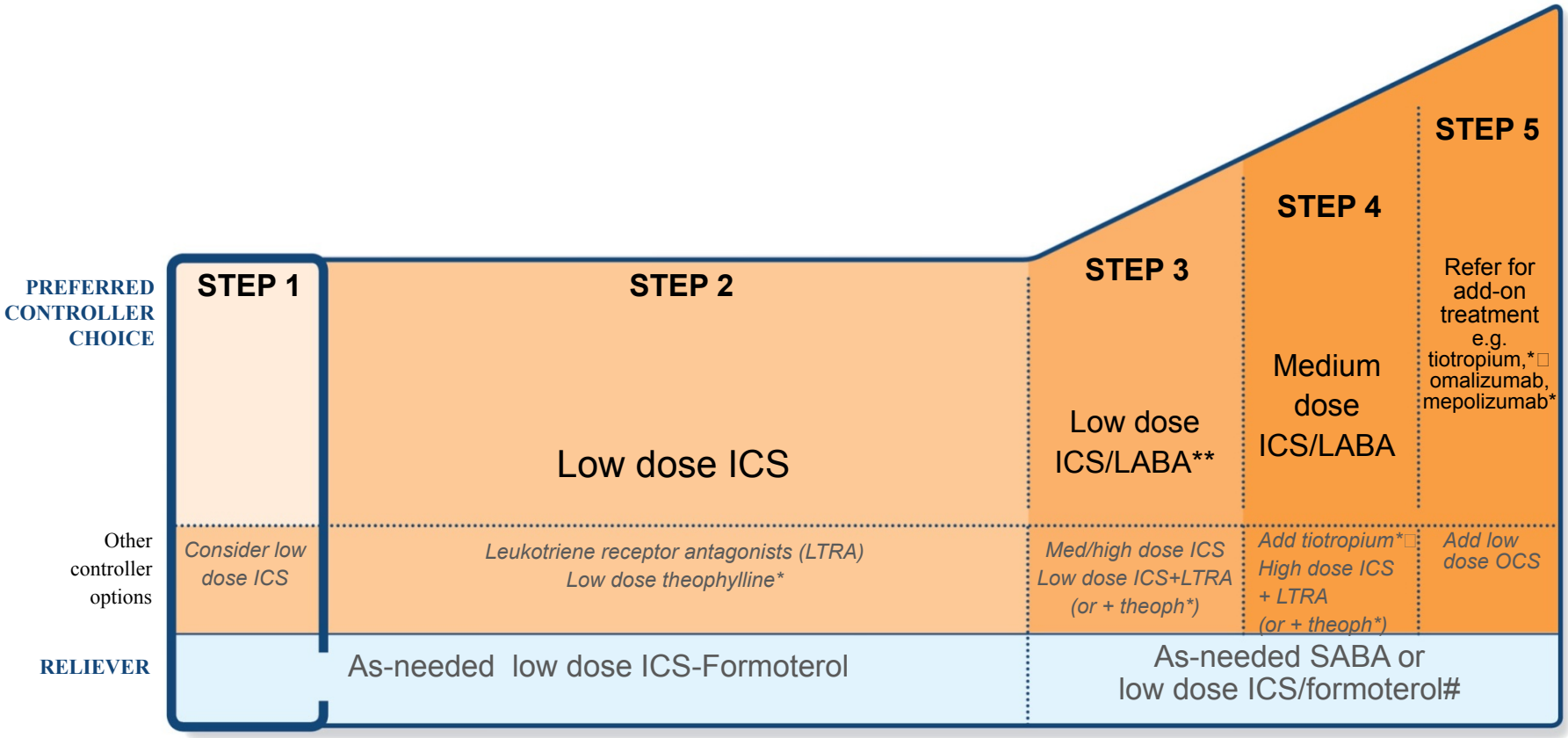

Symbicort
budesonide/
formoterol
120
doses
Turbuhaler
160/4.5µg/dose
Inhalation powder
0260928236
160
4.5
AstraZeneca
Symbicort
160

# Global Initiative for Asthma (GINA)

## What's new in GINA 2018?

GINA Global Strategy for Asthma Management and Prevention

# Step 1 – As-needed low dose ICS-Formoterol




*Not for children <12 years

**For children 6-11 years, the preferred Step 3 treatment is medium dose ICS

#For patients prescribed BDP/formoterol or BUD/ formoterol maintenance and reliever therapy

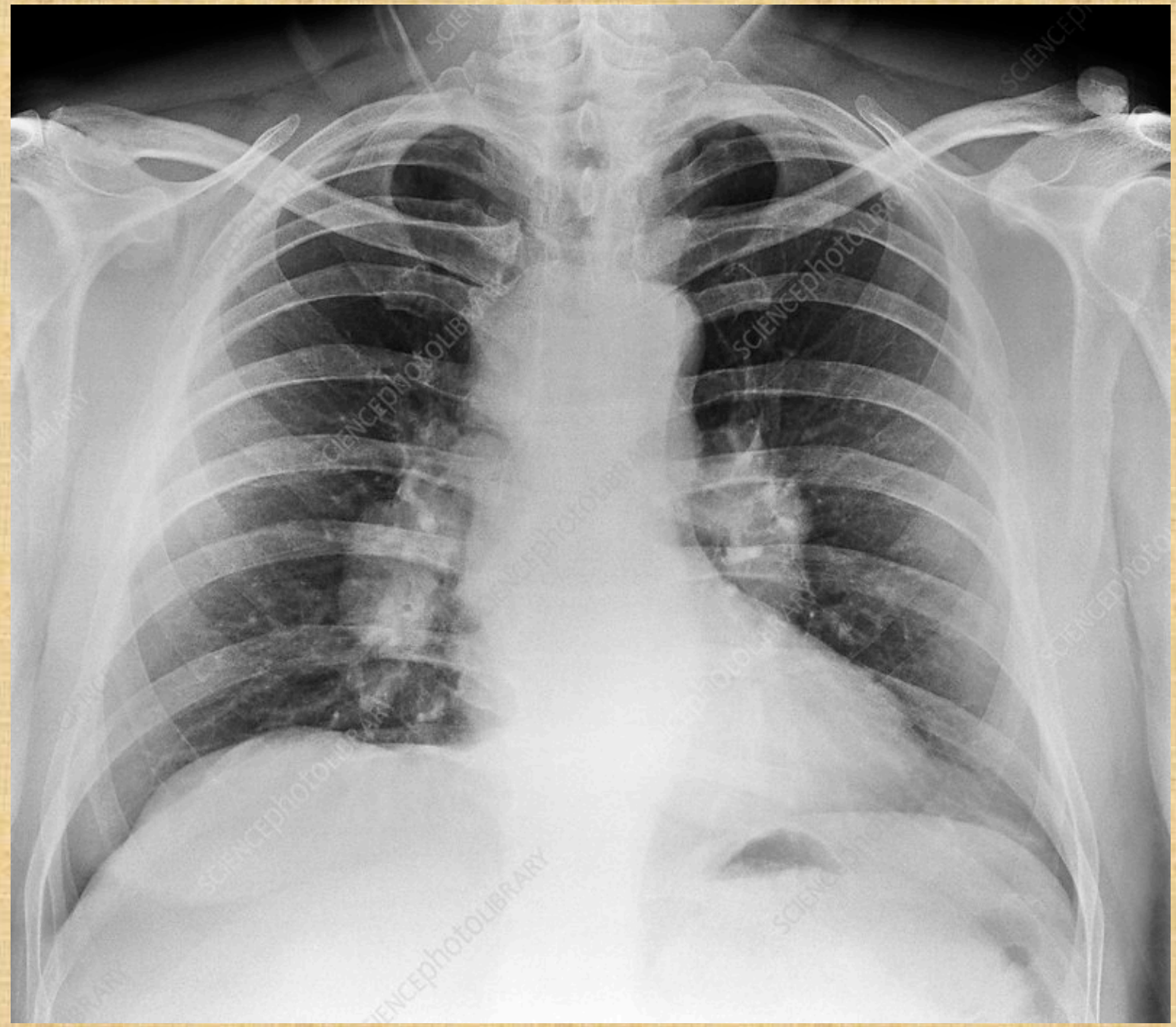
 Tiotropium by mist inhaler is an add-on treatment for patients ≥12 years with a history of exacerbations

# case scenario 3

- **A 36-year-old female presented with 4 months of cough, fatigue, diffuse chest pain with dyspnea on exertion.**

- **Physical examination:**
  - **Mild weight loss**
  - **Pain and swelling in joints, such as the ankles**
  - **Diffuse bibasilar fine crackles**

- **Chest radiograph done.**



***Chest radiograph shows airspace consolidation confined mainly to the peripheral lung (photographic negative shadow of pulmonary edema).***

# What about your diagnosis

**What is the differential diagnosis ?**

- **The differential included:**
  - **Pulmonary sarcoidosis.**
  - **Lymphoma,**
  - **Tuberculosis,**
  - **Fungal infections, and**

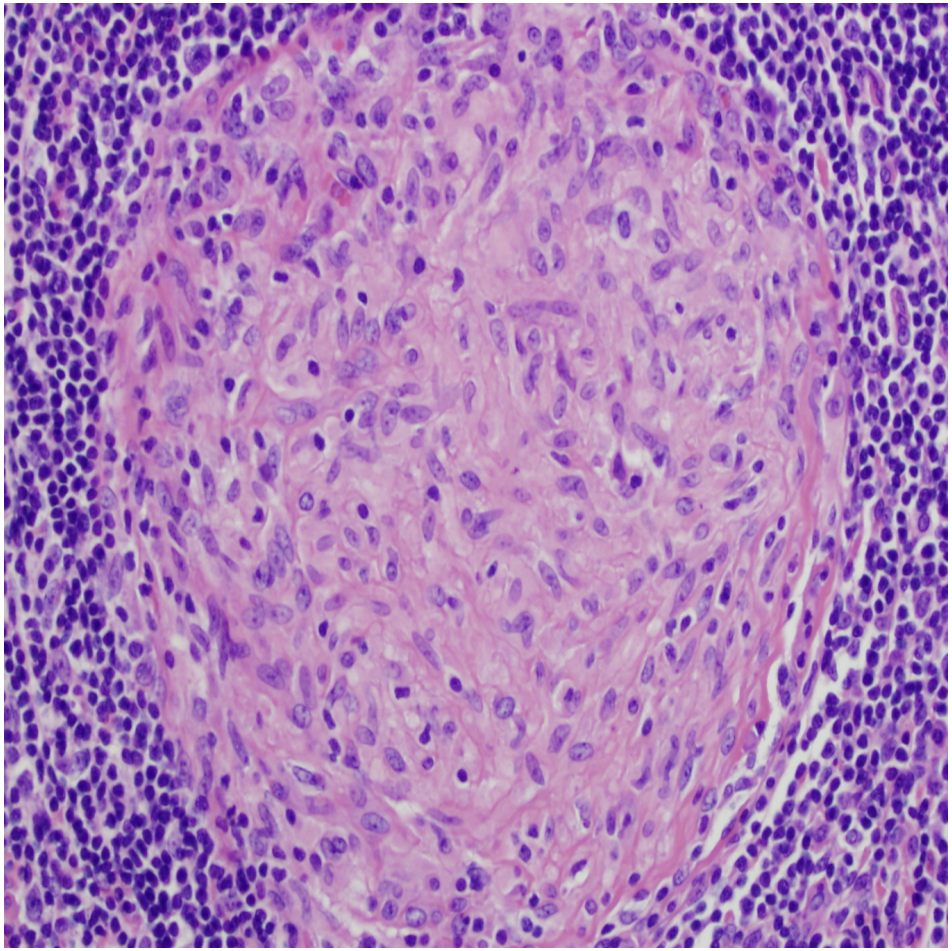
# What next step for diagnosis

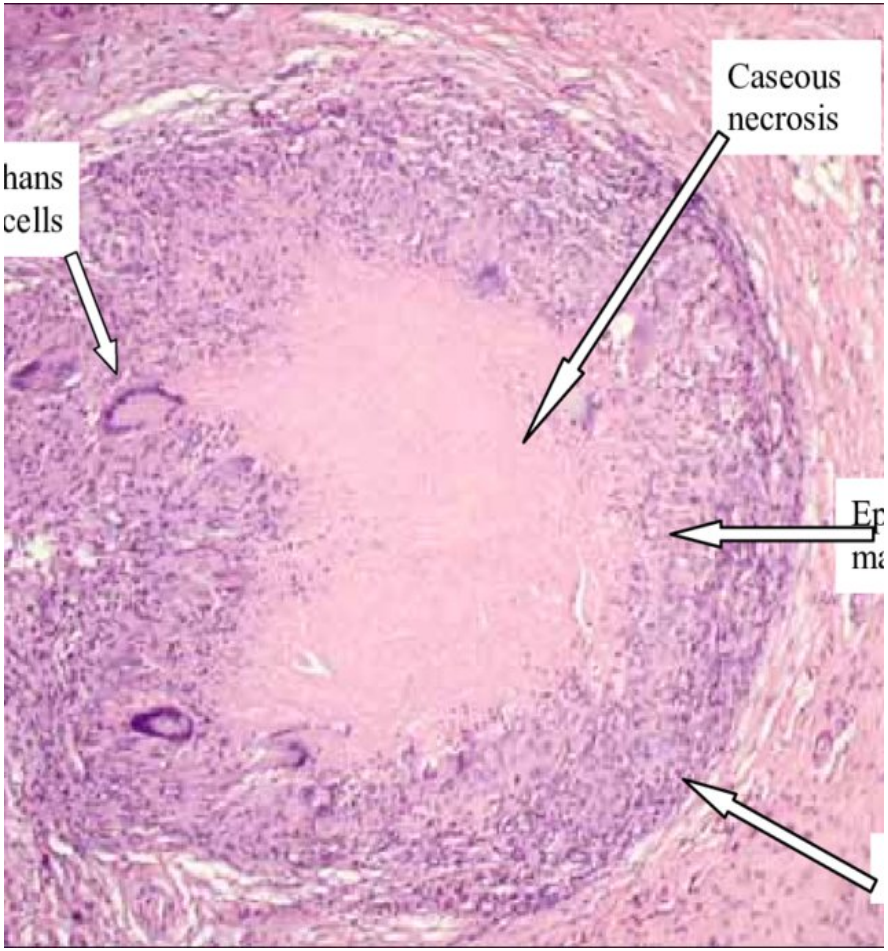
**Blood tests ?**

**Computerized tomography** (CT) scan

**Lung (pulmonary) function tests**

- **Bronchoscopy with transbronchial biopsies was done.**
- **Histopathology revealed ?**
- **Other diagnostic procedures ?**




Caseous
necrosis
hans
cells

# Chest X-ray

**Four stages:**

1. **Bilateral hilar lymphadenopathy**
2. **Bilateral hilar lymphadenopathy and reticulonodular infiltrates**
3. **Bilateral pulmonary infiltrates**
4. **Fibrocystic Sarcoidosis typically with fibrosis and cystic changes.**

# Treatment:

## Corticosteroids.

- These powerful anti-inflammatory drugs are usually the first line treatment for Sarcoidosis.
- In some cases, corticosteroids can be applied directly to an affected area — via a cream to a skin lesion or drops to the eyes.

## Medications that suppress the immune system.

- Medications such as methotrexate) and azathioprine, Hydroxychloroquine (Plaquenil) may be helpful for skin lesions and elevated blood-calcium levels.

# Treatment:

- **Tumor necrosis factor-alpha (TNF-alpha) inhibitors**
- **Oxygen therapy**
- **Lung transplantation**

# Case Scenario 4

# History

- A 63-year-old male , taxi driver presented to the emergency department with complaint of frank hemoptysis for the past 3 days. He states he complaining of cough and expectoration of yellowish sputum and shortness of breath with loss of weight for the last 2 months. He also complains of waking up in the middle of the night “drenched in sweat” for the past few weeks.

# History

- His chart indicates that he was in the emergency department last week with similar symptoms and was diagnosed with community-acquired pneumonia and discharged with azithromycin. He is smoker 20 cigarettes/day for 40 years . He is diabetic on insulin .

# Examination

## Vitals:

- Temperature :38.0ºC
- Heart Rate: 110 beats per minute.
- Respiratory Rate: 20 breaths per minute.
- Blood Pressure: 130/75.
- Oxygen Saturation: 95% on room air.

# Examination

## Local Examination

- **Inspection: Diminished movement of the left side.**
- **Palpation : Diminished expansion of the left side.**
- **Percussion: impaired note of the left supra mammary region.**
- **Auscultation: Diminished vesicular breath sound with Crepitations on left supra mammary region.**

# What is your diagnosis

# Diagnosis

**The Most probable diagnosis is ?**

A. Bronchiectasis

B. COPD

C. Pneumonia

D. Tuberculosis

E. Lung cancer

# What is your differential diagnosis

# Differential Diagnosis

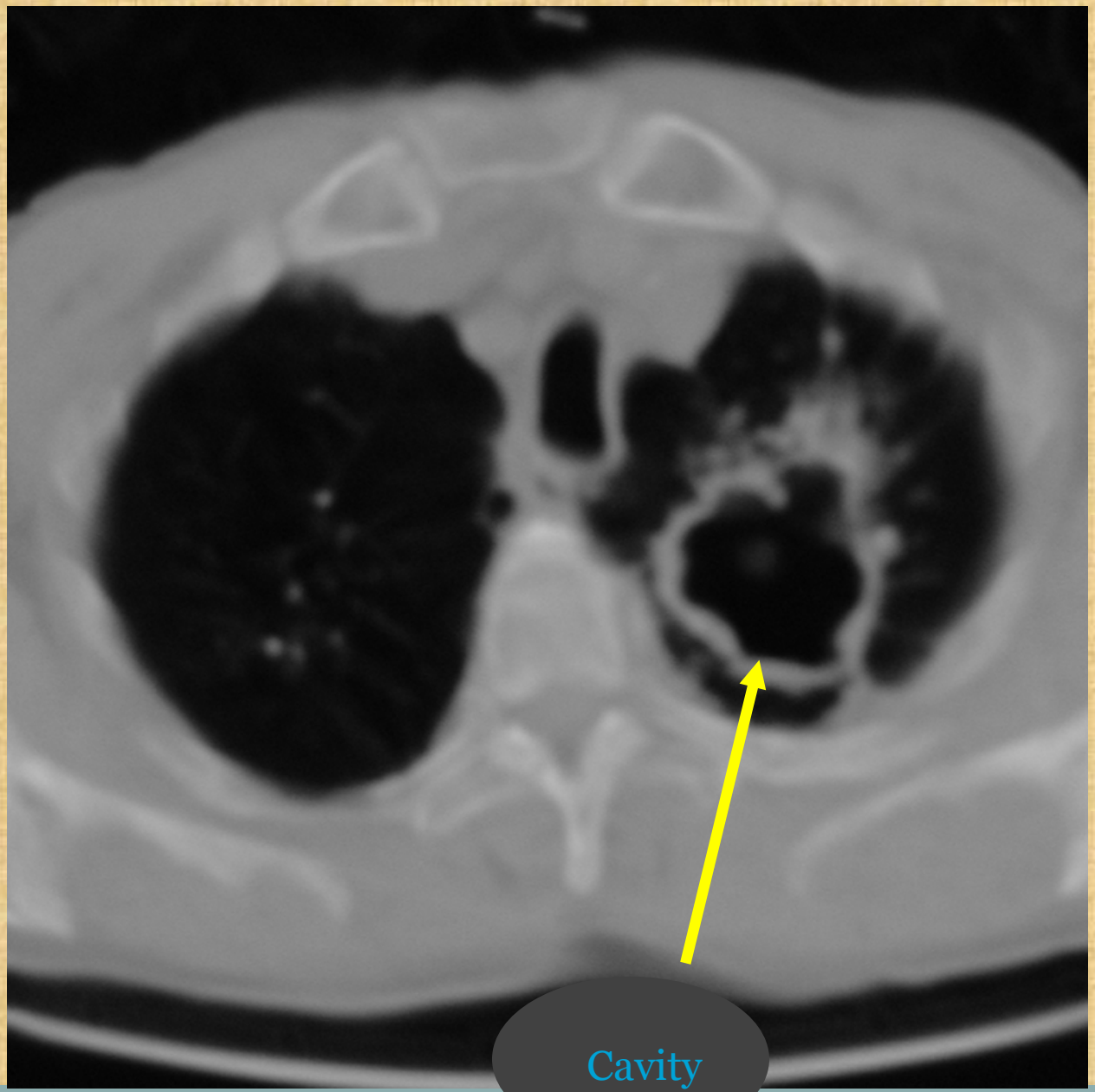
**DD**

- Bronchiectasis
- COPD
- Pneumonia
- Fungal infection
- Lung cancer
- Pulmonary embolism
- ILD
- Pleural effusion

# What is the first investigation?

# Investigations

- **Chest x-ray revealed left sided apical cavitary lesion surrounded by Heterogenous opacities .**


Cavity

# What are further investigation?

# Investigations

## Labs

- WBC: 9.4 x 109/L
- Hb: 11.4 g/dL
- Platelets: 149 109/L
- Creatinine: 1.8

# After lab result and CXR, What is your diagnosis

# Diagnosis

**The Most probable diagnosis is ?**

A. Bronchiectasis

B. Lung abscess

C. Pneumonia

D. Tuberculosis

E. Lung cancer

F. Fungal infection

# What are further investigation ?

# Further Investigation

**What are further investigation ?**

A. Tuberculin test

B. Sputum acid-fast bacilli

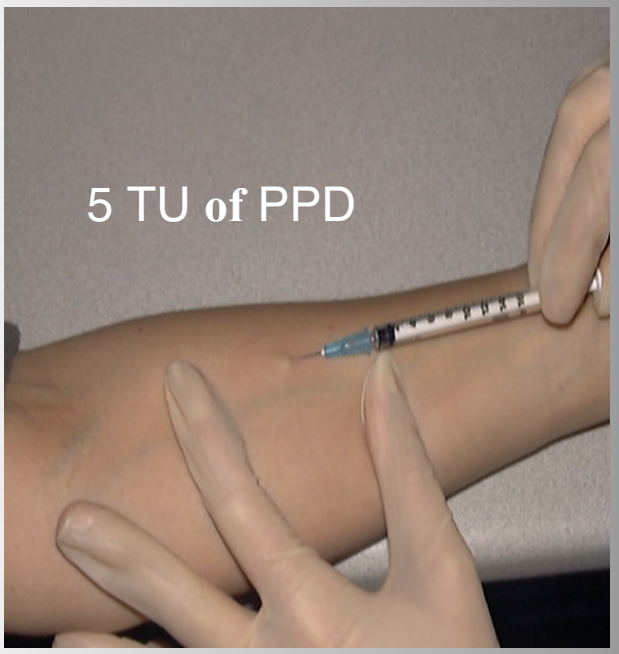
C. Sputum C/S

D. ESR

# Further Investigation

- A Tuberculin skin test was done and was found to be positive with an induration of 25mm.
- Sputum analysis for AFB smear was positive.

# Tuberculin Testing "Mantoux Test"




**48 - 72 hours**

**Mantoux tuberculin skin test**

# Reading the TST

- Measure reaction in 48 to 72 hours
- Measure induration, not erythema
- Record reaction in millimeters, not "negative" or "positive"
- Ensure trained health care professional measures and interprets the TST

- **Tuberculin skin testing is the most common method used to screen for latent M tuberculosis.**

- **Positive tuberculin skin test indicates tuberculous infection , with or without disease**

**Positive ⇛ Infection and Immunity**

# Positive Tuberculin Test

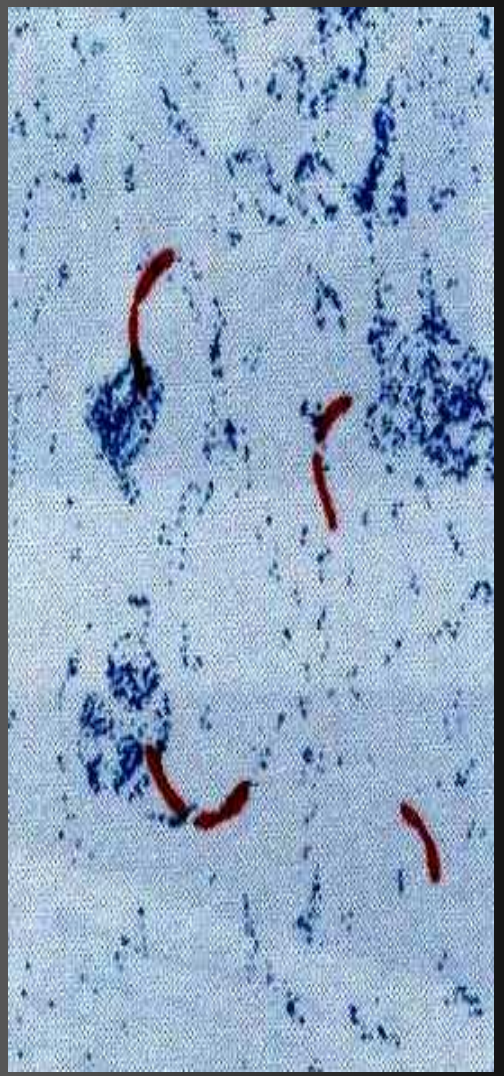
| Size of induration | Considered positive in : |
| --- | --- |
| **≥ 5 mm for** | 1. Close contacts of active pulmonary.<br>2. HIV-immunocompromised persons<br>3. Persons with fibrotic chest x-ray findings consistent with old TB.<br>4. Organ transplant recipients or other immunosuppressed persons (including persons receiving long-term, high dose oral or parenteral corticosteroid therapy (>15 mg prednisone, or equivalent, daily for 1 month or longer). |

| Size of induration | Considered positive in : |
| --- | --- |
| **≥ 10 mm for** | 1. Persons with certain medical conditions e.g.,<br>o Silicosis,<br>o Chronic renal failure,<br>o Diabetes mellitus,<br>o Some cancers, leukaemia, and lymphoma<br>o Gastrectomy/jeujunoileal bypass<br>2. Health care and laboratory workers.<br>3. Persons who have immigrated within the past 5 years from areas with high prevalence<br>4. Persons with prolonged stay (>1month) in areas with high TB e.g. prisons<br>5. Injection drug users.<br>6. Persons over age 70 and children < 4 years of age. |

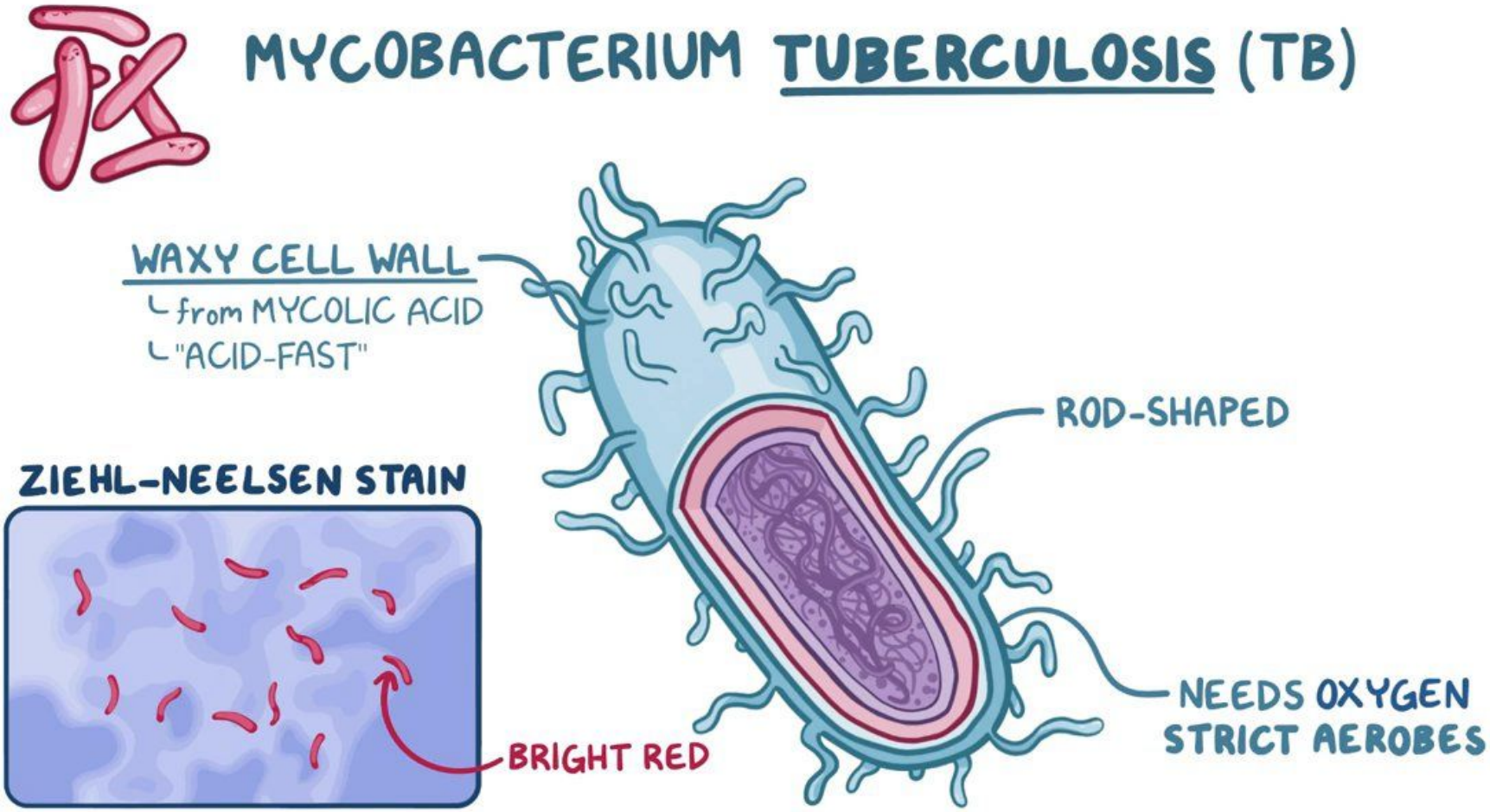
# Aetiology

- Bacillus is aerobic thin, somewhat curved, from 1 - 5 microns in length, with a complex cell wall (lipid core) responsible for its characteristic coloration (acid -fast).

- Susceptible to sunlight, heat and dryness.



# Mycobacteria unique cell wall structure



- **What are the groups at higher risk for developing TB disease?**

# High risk groups for tuberculosis

## High risk groups for tuberculosis

- **Silicosis,**
- **Impaired immunity as in:**
  - Diabetes
  - HIV (human immune deficiency virus) infection,
  - Corticosteroids ,
  - Immunosuppressive drugs .

- **Health care providers**
- **Contact**
- **Prisoners**
- **Goza consumers**

- **What are the most significant issues that may suggest active TB disease in this patient?**

# Activity assessment of tuberculosis

## Assessment of activity :

**Clinically:**

**Symptoms: Cough, Haemoptysis ,fatigue, night sweating, weight loss.**

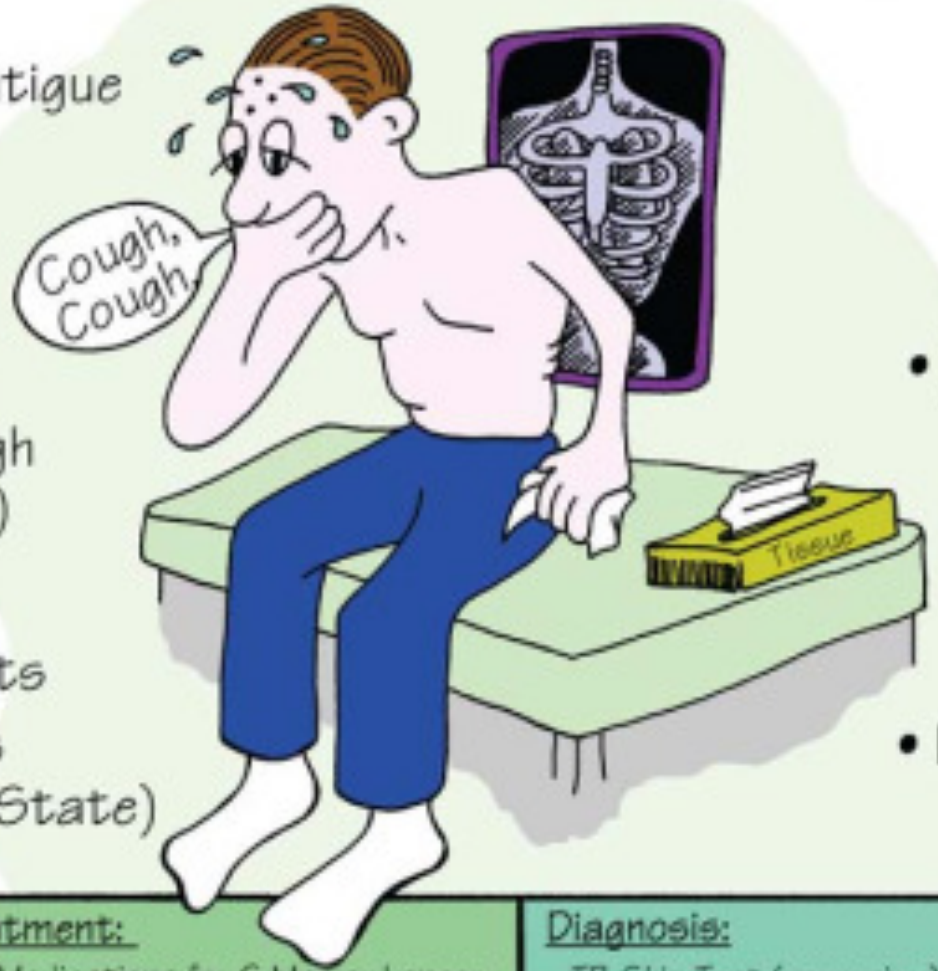
**Signs: Crepitations.**

**Bacteriology: +ve sputum ZN smear .**

**Radiology: Cavitary lesions, Soft shadows.**

# TUBERCULOSIS (TB)

- Progressive Fatigue
- Malaise
- Anorexia
- Wt. Loss




- Chronic Cough (Productive)
- Night Sweats
- Hemoptysis (Advanced State)

- Pleuritic Chest Pain
- Low Grade Fever

**Treatment:**

TB Medications for 6 Mos or Longer
Decreased Activity
Keep Isolation Until Negative Sputum
Frequently Outpatient Treatment

**Diagnosis:**

TB Skin Test (screening)
Chest X-Ray
Sputum Studies
(3 specimens collected on different days)

- **4.What are the major differences between latent TB and active TB disease ?**

# LTBI vs. TB Disease (1)

| Person with LTBI | Person with TB Disease (in the lungs) |
|---|---|
| • Has a small number of TB bacteria in his or her body that are alive, but under control | • Has a large number of **active** TB bacteria in his or her body |
| • Cannot spread TB bacteria to others | • May spread TB bacteria to others |
| • Does not feel sick, but may become sick if the bacteria become active in his or her body | • May feel sick and may have symptoms such as cough, fever, or weight loss |
| • TST or IGRA results usually positive | • TST or IGRA results usually positive |
| • Chest x-ray usually normal | • Chest x-ray usually abnormal |

# LTBI vs. TB Disease (2)

| Person with LTBI | Person with TB Disease (in the lungs) |
|---|---|
| • Sputum smears and cultures negative | • Sputum smears and cultures may be positive |
| • Should consider treatment for LTBI to prevent TB disease | • Needs treatment for TB disease |
| • Does not require respiratory isolation | • May require respiratory isolation |
| • Not a case of TB | • A case of TB |

**5.What is the standard medications and duration of treatment for this patient?**

# Treatment of tuberculosis

## 6 months regimen :

- **Initiation phase:**
- **Rifampicin +** } **for 2 months.**
- **INH +**
- **Pyrazinamide +**
- **Ethambutol.** } **for 4 months.**
- **Continuation phase :**
- **Rifampicin +**


THANK
YOU

| Spirometry | (BTPS) | PRED | PRE-RX BEST | PRE-RX %PRED | POST-RX BEST | POST-RX %PRED | % Chg |
|---|---|---|---|---|---|---|---|
| FVC | Liters | 3.69 | (2.34) | (63) | (2.26) | (61) | -3 |
| FEV1 | Liters | 2.34 | 1.45 | 62 | 1.49 | 64 | 3 |
| FEV1/FVC | % | 67 | 62 | | 66 | | |
| FEF25-75% | L/sec | 2.03 | 0.64 | 32 | 0.81 | 40 | 27 |
| PEF | L/sec | 7.24 | 5.55 | 77 | 5.30 | 73 | -4 |

| Lung Volumes (BTPS) | | | | | | | |
|---|---|---|---|---|---|---|---|
| TLC | Liters | 5.70 | | | 4.85 | 85 | |
| RV | Liters | 2.54 | | | 2.59 | 102 | |
| RV/TLC | % | 44 | | | 53 | | |
| FRC PL | Liters | 3.45 | | | 2.81 | 82 | |
| VC | Liters | 3.69 | | | (2.27) | (61) | |

| Diffusion | | | | | | | |
|---|---|---|---|---|---|---|---|
| DLCO | mL/mmHg/min | 20.9 | | | 16.3 | 78 | |
| DL Adj | mL/mmHg/min | 20.9 | | | 17.5 | 83 | |
| DLCO/VA | mL/mHg/min/L | 3.33 | | | 4.10 | 123 | |
| DL/VA Adj | mL/mHg/min/L | | | | 4.39 | | |
| VA | Liters | | | | 3.98 | | |

# Interpreting PFTs

- **Look at the Flow-Volume loop**

– Determine acceptability of the test, and look for upper airway obstruction pattern.

- **Look at FEV1/FVC Ratio .**

– <70% = obstructive lung disease

Then FEV1

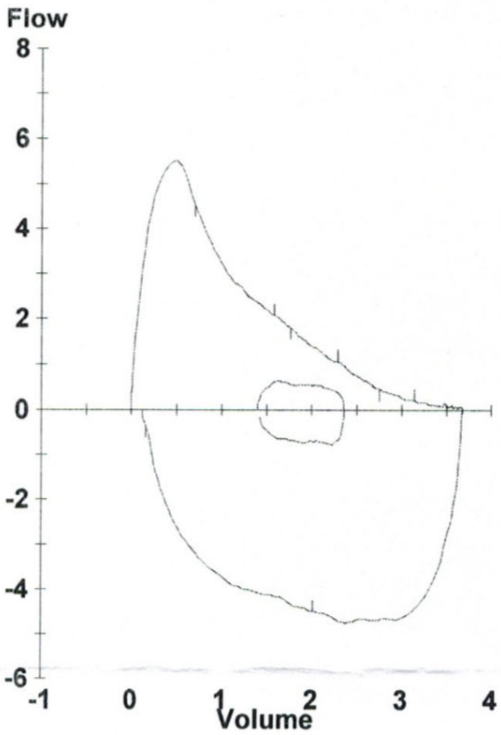
– Grade severity of obstruction
– Check for reversibility

– Normal = restrictive lung disease or normal PFT

Then FVC

– If FVC is low = Restrictive lung disease
– If Normal = Normal pulmonary function

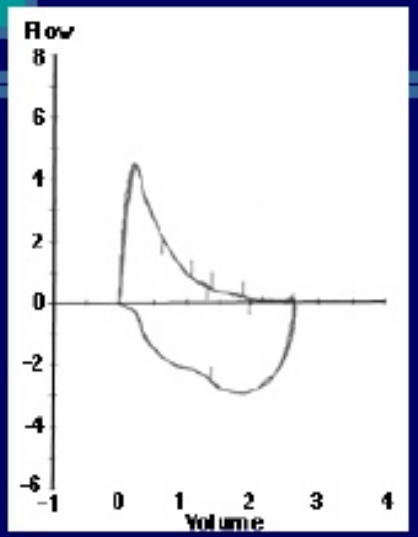
| | | Ref | (Normal Range) | Pre | % Ref | Post | % Ref | %Chg |
|---|---|---|---|---|---|---|---|---|
| **Spirometry** | | | | | | | | |
| FVC | Liters | 3.76 | (2.9 - 4.6) | 3.69 | 98 | | | |
| FEV1 | Liters | 2.93 | (2.3 - 3.5) | 2.33 | 80 | | | |
| FEV1/FVC | % | 78 | (68.4 - 87.1) | 63 | | | | |
| FEF25-75% | L/sec | 2.92 | (1.6 - 4.2) | 1.25 | 43 | | | |
| FEF50% | L/sec | 3.63 | (3.2 - 4.1) | 1.73 | 48 | | | |
| FEF75% | L/sec | 1.23 | (0.6 - 1.8) | 0.44 | 36 | | | |
| PEF | L/sec | 7.10 | (5.3 - 8.9) | 5.51 | 78 | | | |
| FIF50% | L/sec | 5.28 | (3.4 - 7.1) | 4.45 | 84 | | | |
| FEF/FIF50 | | 0.67 | (0.2 - 1.1) | 0.39 | 58 | | | |
| **Lung Volumes** | | | | | | | | |
| TLC | Liters | 5.62 | (4.7 - 6.6) | 6.02 | 107 | | | |
| VC | Liters | 3.77 | (3.0 - 4.5) | 3.69 | 98 | | | |
| IC | Liters | 2.38 | (1.9 - 2.8) | 2.30 | 97 | | | |
| FRC PL | Liters | 2.98 | (2.2 - 3.8) | 3.63 | 122 | | | |
| ERV | Liters | 1.19 | (1.0 - 1.4) | 1.29 | 109 | | | |
| RV | Liters | 1.78 | (1.2 - 2.4) | 2.34 | 131 | | | |
| RV/TLC | % | 36 | (24.1 - 48.7) | 39 | | | | |

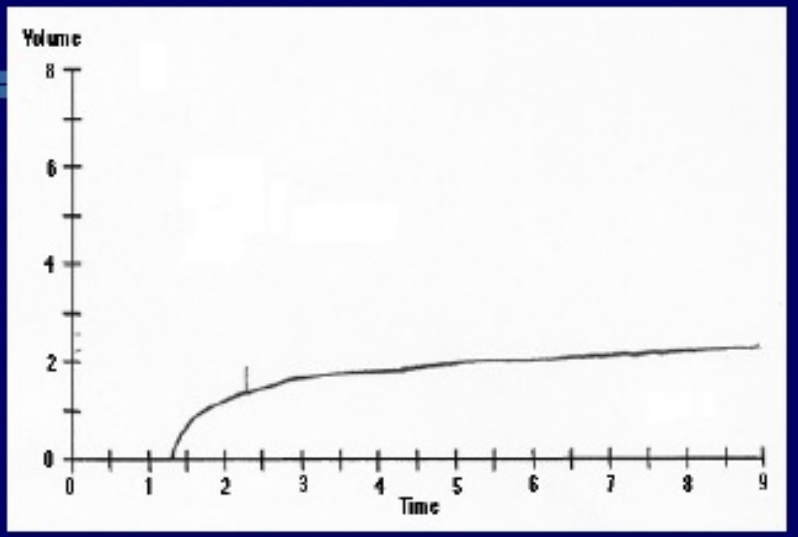


## *PULMONARY FUNCTION ANALYSIS*

| *Spirometry* | | Ref | Pre Meas | Pre % Ref | Post Meas | Post % Ref | Post % Chg |
|---|---|---|---|---|---|---|---|
| **FVC** | **Liters** | **3.81** | **3.45** | **90** | **3.78** | **99** | **10** |
| **FEV1** | **Liters** | **3.27** | **2.34** | **72** | **2.90** | **89** | **24** |
| **FEV1/FVC** | **%** | **86** | **68** | **79** | **77** | **89** | **13** |
| FEF25-75% | L/sec | 3.83 | 1.44 | 38 | 2.40 | 63 | 67 |
| FEF50% | L/sec | 4.11 | 1.93 | 47 | 3.33 | 81 | 73 |
| FEF75% | L/sec | 1.91 | 0.57 | 30 | 0.98 | 51 | 73 |
| PEF | L/sec | 6.55 | 6.08 | 93 | 7.57 | 116 | 25 |
| PIF | L/sec | | 3.63 | | 4.53 | | 25 |

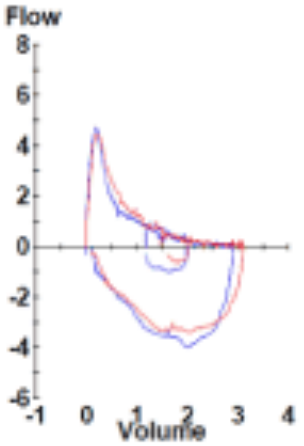
# Example 1

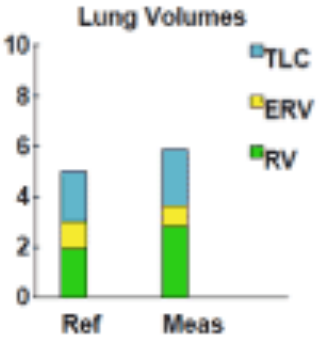



| Variable | means | predicted | %pred |
|---|---|---|---|
| FVC | 2.62 | 2.82 | 93 |
| FEV1 | 1.45 | 1.98 | 73 |
| FEV1/FVC | 55 | 70 | |
| FEF25-75% | 0.43 | 2.20 | 20 |
| PEF | 4.50 | 5.48 | 82 |

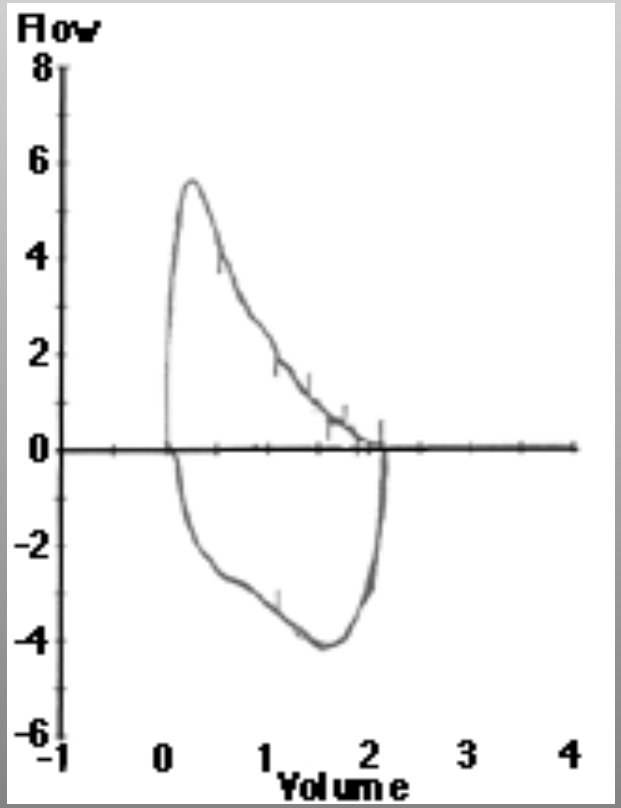
| | | Ref | Pre | % Ref | Post | % Ref | %Chg |
|---|---|---|---|---|---|---|---|
| **Spirometry** | | | | | | | |
| FVC | Liters | 3.23 | 2.91 | 90 | 3.12 | 96 | 7 |
| FEV1 | Liters | 2.47 | 1.31 | 53 | 1.42 | 57 | 8 |
| FEV1/FVC | % | 77 | 45 | | 45 | | |
| FEF25-75% | L/sec | 2.16 | 0.37 | 17 | 0.39 | 18 | 4 |
| PEF | L/sec | 6.08 | 4.71 | 77 | 4.71 | 78 | 0 |
| FET100% | Sec | | 15.05 | | 15.14 | | 1 |
| **Lung Volumes** | | | | | | | |
| TLC | Liters | 4.97 | 5.84 | 117 | | | |
| VC | Liters | 3.23 | 3.04 | 94 | | | |
| FRC PL | Liters | 3.04 | 3.61 | 119 | | | |
| ERV | Liters | 1.01 | 0.79 | 78 | | | |
| RV | Liters | 1.94 | 2.79 | 144 | | | |
| RV/TLC | % | 39 | 48 | | | | |
| **Diffusing Capacity** | | | | | | | |
| DLCO | mL/mmHg/min | 17.6 | 9.2 | 52 | | | |
| DL Adj | mL/mmHg/min | 17.6 | 9.2 | 52 | | | |
| DLCO/VA | mL/mHg/min/L | 3.74 | 1.91 | 51 | | | |
| DL/VA Adj | mL/mHg/min/L | | 1.91 | | | | |
| VA | Liters | 4.97 | 4.84 | 97 | | | |
| IVC | Liters | | 2.91 | | | | |



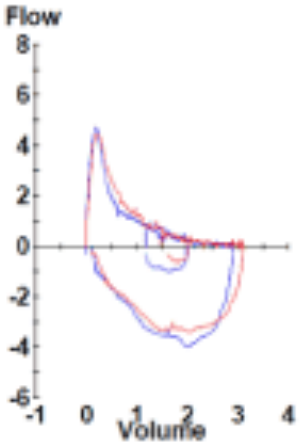



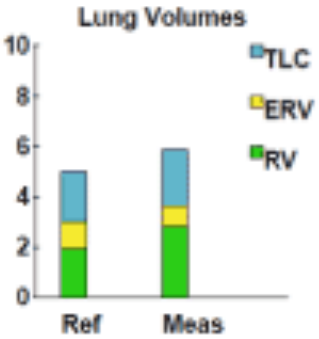
# A 66 year old female complains of cough after dust exposure

| %Pred | Ref | Meas | |
|---|---|---|---|
| 85 | 2.58 | 2.2 | FVC |
| 97 | 1.85 | 1.79 | FEV1 |
| | 72 | 81 | FEV1/FVC |
| 82 | 2.23 | 1.82 | FEF 25-75 |
| 109 | 5.2 | 5.67 | PEF |



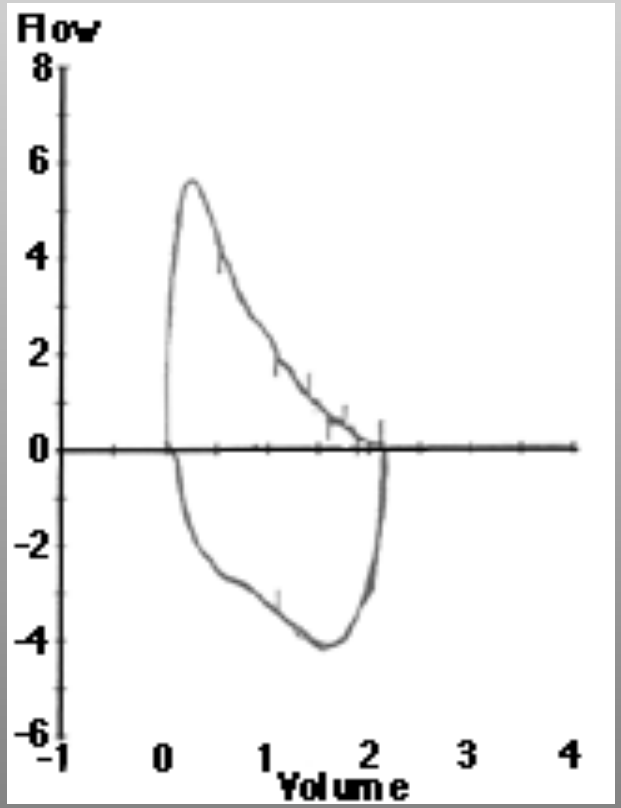
| | | Ref | Pre | % Ref | Post | % Ref | %Chg |
|---|---|---|---|---|---|---|---|
| **Spirometry** | | | | | | | |
| FVC | Liters | 3.23 | 2.91 | 90 | 3.12 | 96 | 7 |
| FEV1 | Liters | 2.47 | 1.31 | 53 | 1.42 | 57 | 8 |
| FEV1/FVC | % | 77 | 45 | | 45 | | |
| FEF25-75% | L/sec | 2.16 | 0.37 | 17 | 0.39 | 18 | 4 |
| PEF | L/sec | 6.08 | 4.71 | 77 | 4.71 | 78 | 0 |
| FET100% | Sec | | 15.05 | | 15.14 | | 1 |
| **Lung Volumes** | | | | | | | |
| TLC | Liters | 4.97 | 5.84 | 117 | | | |
| VC | Liters | 3.23 | 3.04 | 94 | | | |
| FRC PL | Liters | 3.04 | 3.61 | 119 | | | |
| ERV | Liters | 1.01 | 0.79 | 78 | | | |
| RV | Liters | 1.94 | 2.79 | 144 | | | |
| RV/TLC | % | 39 | 48 | | | | |
| **Diffusing Capacity** | | | | | | | |
| DLCO | mL/mmHg/min | 17.6 | 9.2 | 52 | | | |
| DL Adj | mL/mmHg/min | 17.6 | 9.2 | 52 | | | |
| DLCO/VA | mL/mHg/min/L | 3.74 | 1.91 | 51 | | | |
| DL/VA Adj | mL/mHg/min/L | | 1.91 | | | | |
| VA | Liters | 4.97 | 4.84 | 97 | | | |
| IVC | Liters | | 2.91 | | | | |



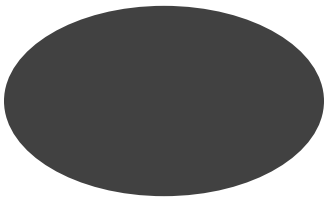
# A 66 year old female complains of cough after dust exposure

| %Pred | Ref | Meas | |
|---|---|---|---|
| 85 | 2.58 | 2.2 | FVC |
| 97 | 1.85 | 1.79 | FEV1 |
| | 72 | 81 | FEV1/FVC |
| 82 | 2.23 | 1.82 | FEF 25-75 |
| 109 | 5.2 | 5.67 | PEF |



- A patient with poorly controlled IDDM missed his insulin for 3 days.

pH 7.1 HCO3 8 mEq/l PaCO2 20 mmhg Na 140 mEq/l CL 106 mEq/l and urinary ketones +++



# Step4: For a metabolic disturbance, is the respiratory system compensating OK?

**Metabolic acidosis**

Expected PCO2 =(1.5 X HCO3-) + 8 ±2

Winter's Equation

**Metabolic alkalosis**

Expected PCO2 = 40 + (0.6 X ΔHCO3-) ±2

Quick rule of thumb : $PCO_2$ = last 2 digits of pH

**For any metabolic disorder**

# Step4: For a metabolic acidosis, Anion gap?

**Anion Gap = $Na^+$ - ($Cl^-$ + $HCO3^-$)**

**Normal anion gap is < 12.**

## Metabolic Acidoses

**Increased Anion Gap**
- Ketoacidosis
- Lactic acidosis
- Kidney failure
- Poisonings:
  - Methanol
  - Ethylene glycol
- Aspirin overdose

**Normal Anion Gap**
- Diarrhea
- Renal tubular acidosis

- Following sleeping pills ingestion, patient presented in drowsy state with sluggish respiration with respiratory rate 4/min.

pH 7.1 $HCO_3$ 28 mEq/L $PaCO_2$ 80 mmhg $PaO_2$ 42 mmhg

# Step 3: For Primary Respiratory disturbance, is it acute or chronic? then Acute or chronic Compansation

## PaCO2 and pH

Acute condition.

for each 1mm Hg PaCO2 ⇛ pH changes 0.008 .

Chronic condition.

for each 1mm Hg PaCO2 ⇛ pH changes 0.003

**pH changes = Δ pH × 1000 / ΔPaCO2**

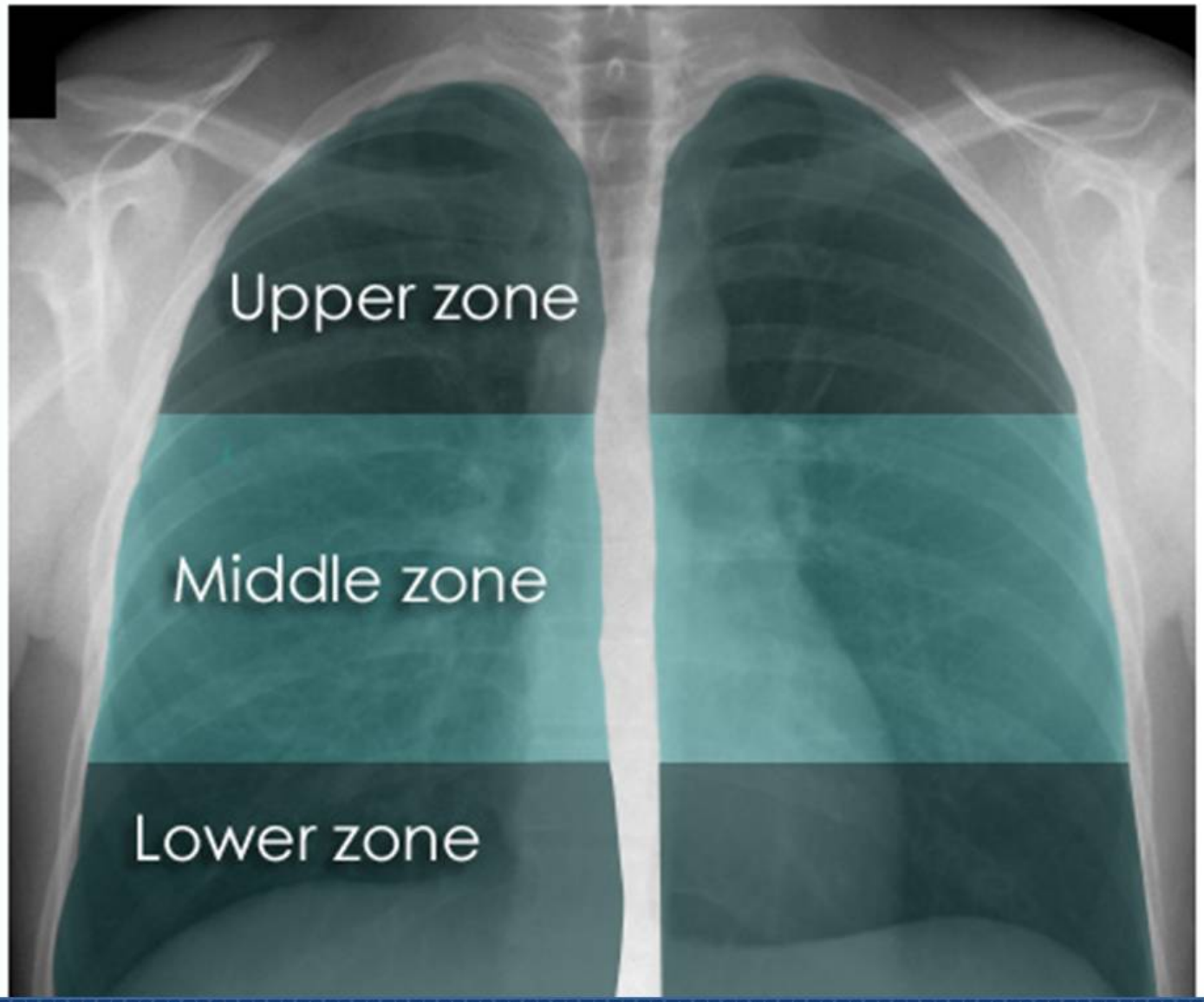
- **PH 7.2**
- **PaCO2 35 mmHg**
- **HCO3 10 mEq\L**

- **PaO2 90 mmHg**
- **SpO2 93 %**

- **Na+ 130mEq\L**
- **Cl- 110mEq\L**

# How to comment???????

- Plain x-Ray P-A view
- Site of the lesion
- Description
- Diagnosis or DD




Each of these zones occupies approximately one third of the height of the lungs.

RU
L

RML

RLL

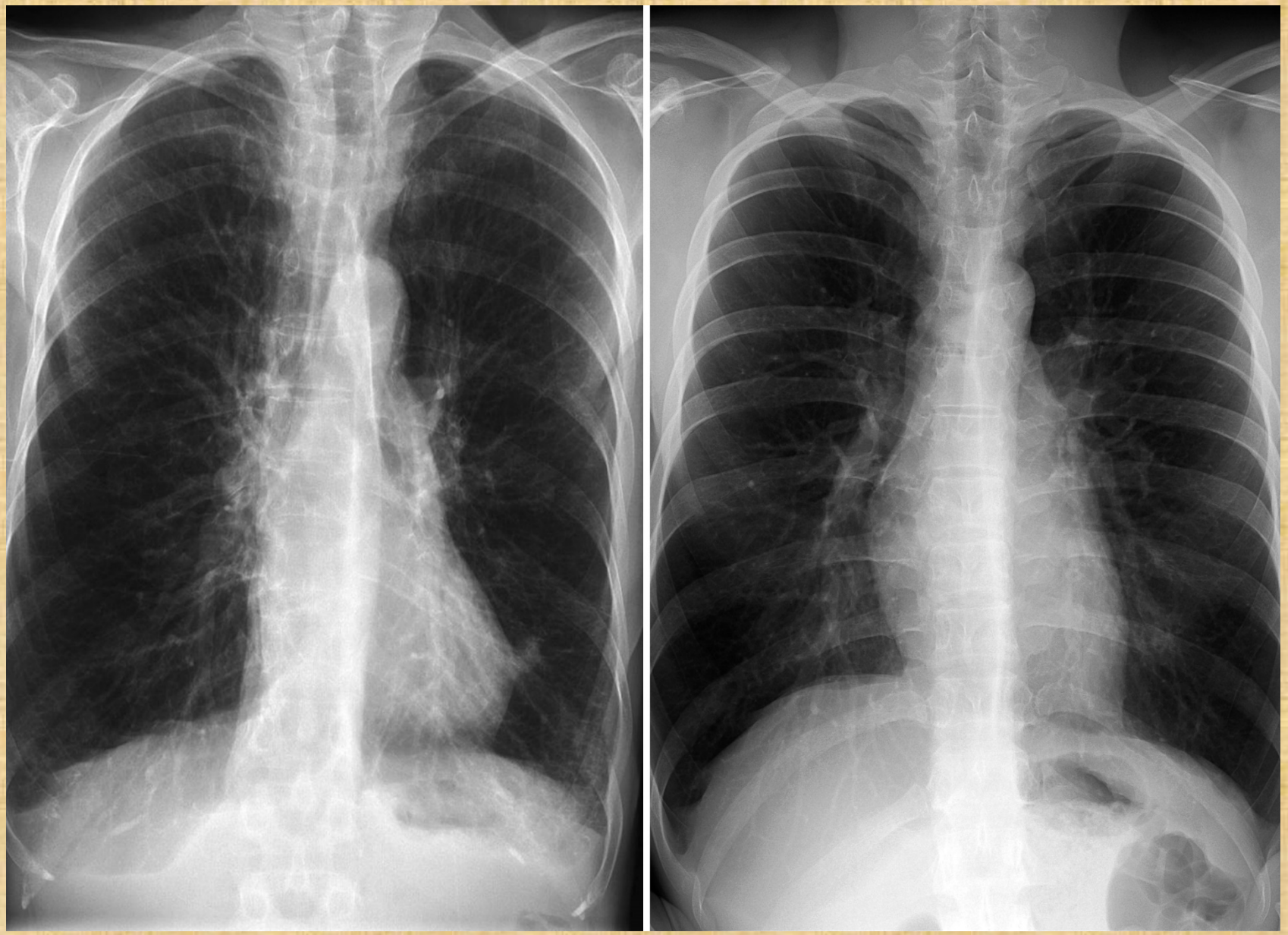
LUL

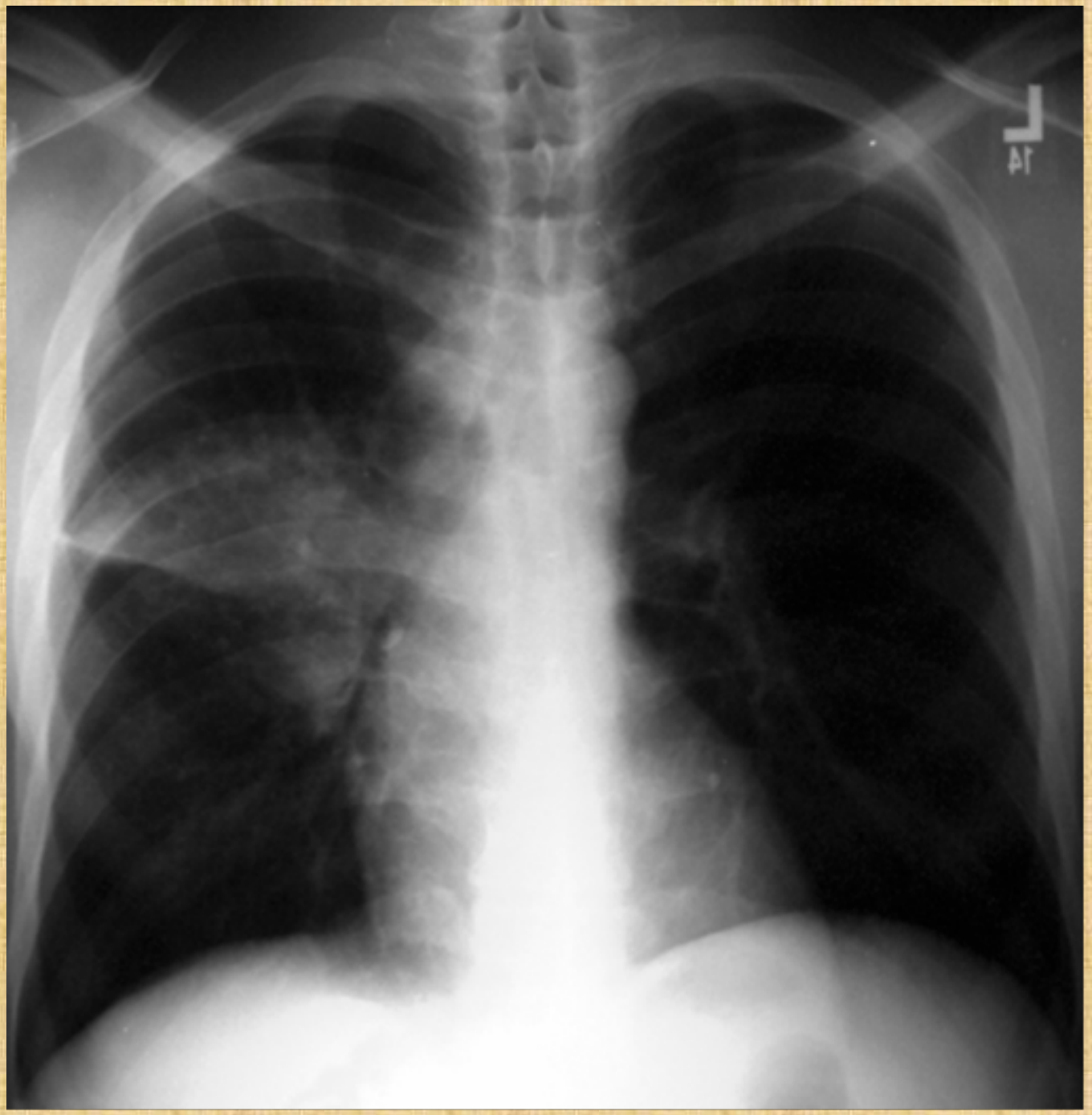
LLL

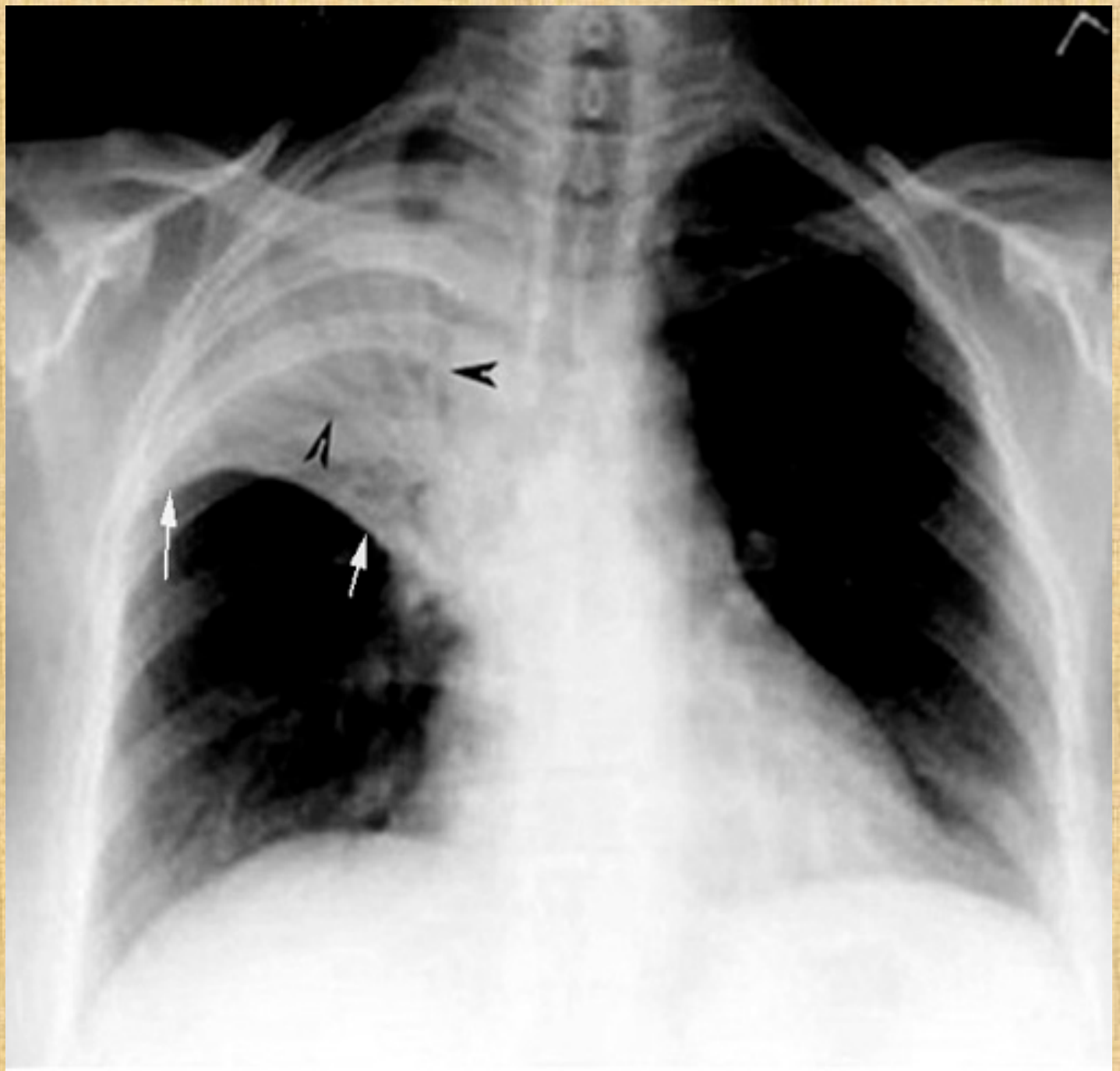
RU
L

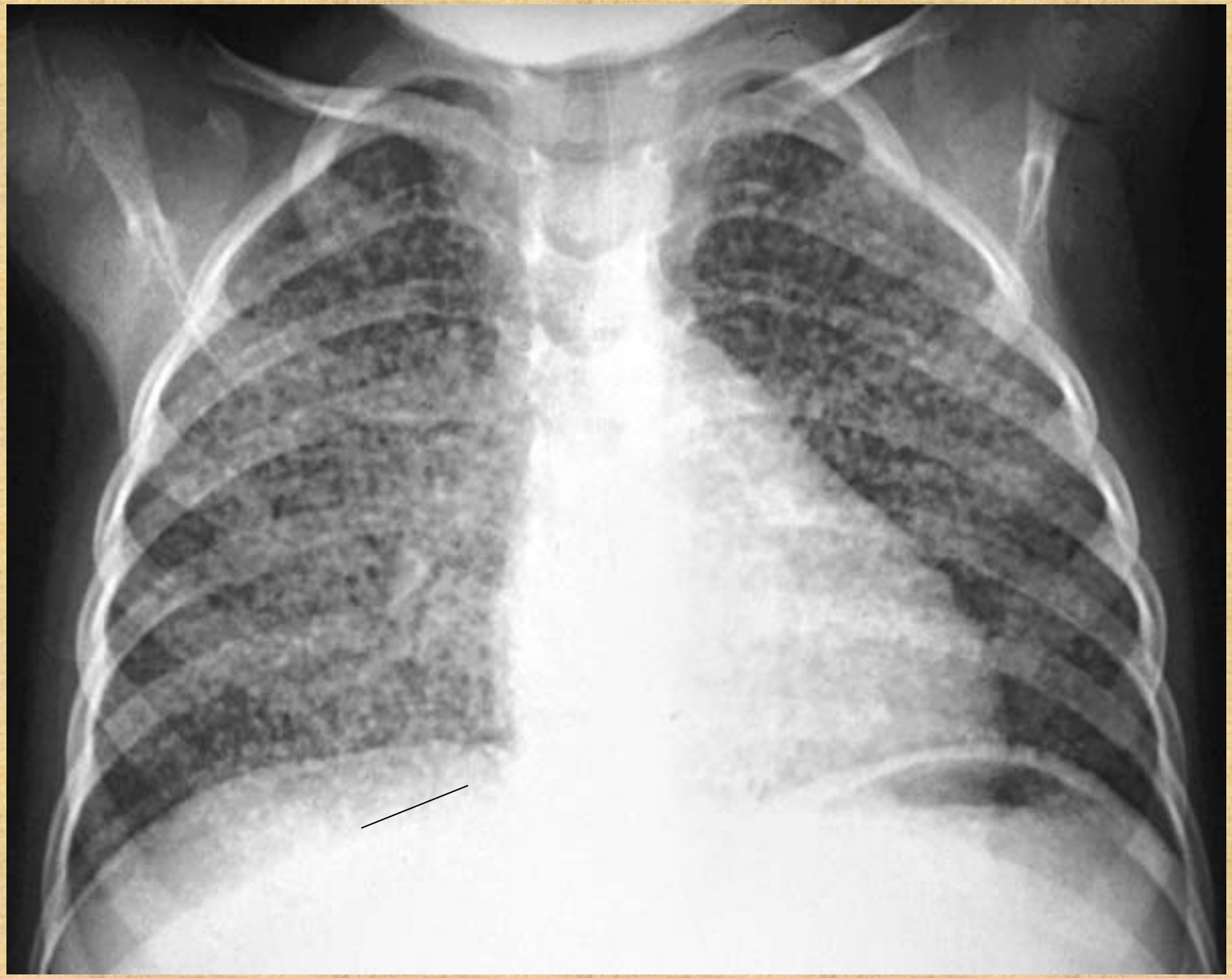
RML

RLL









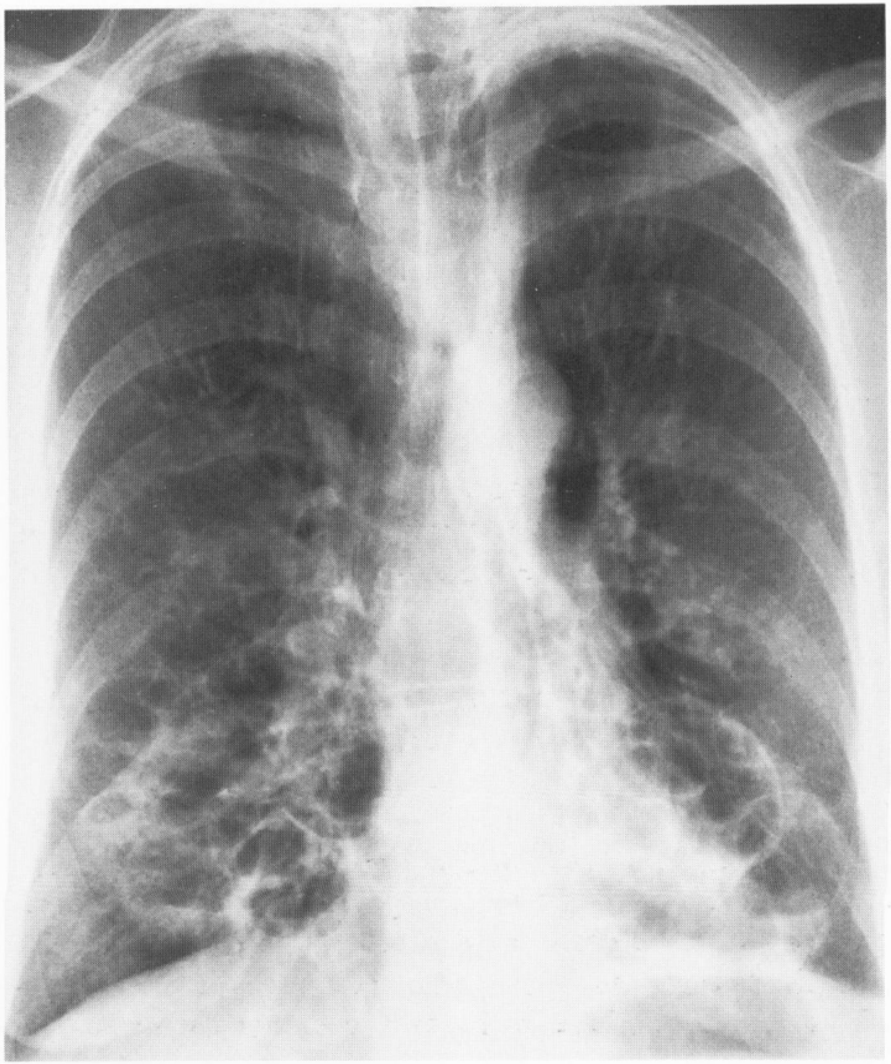
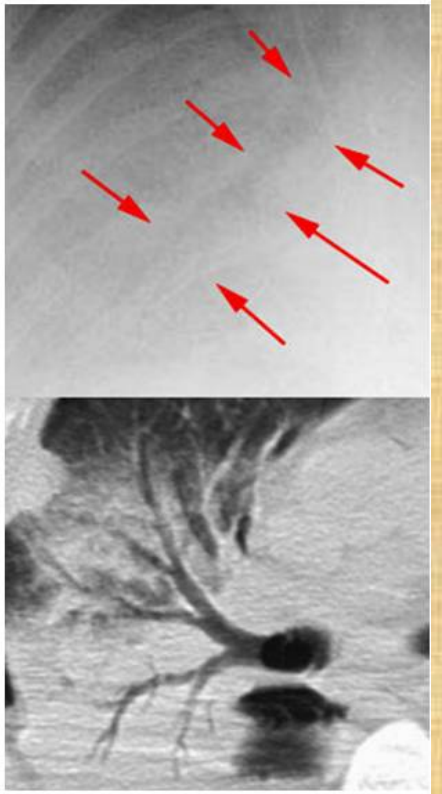
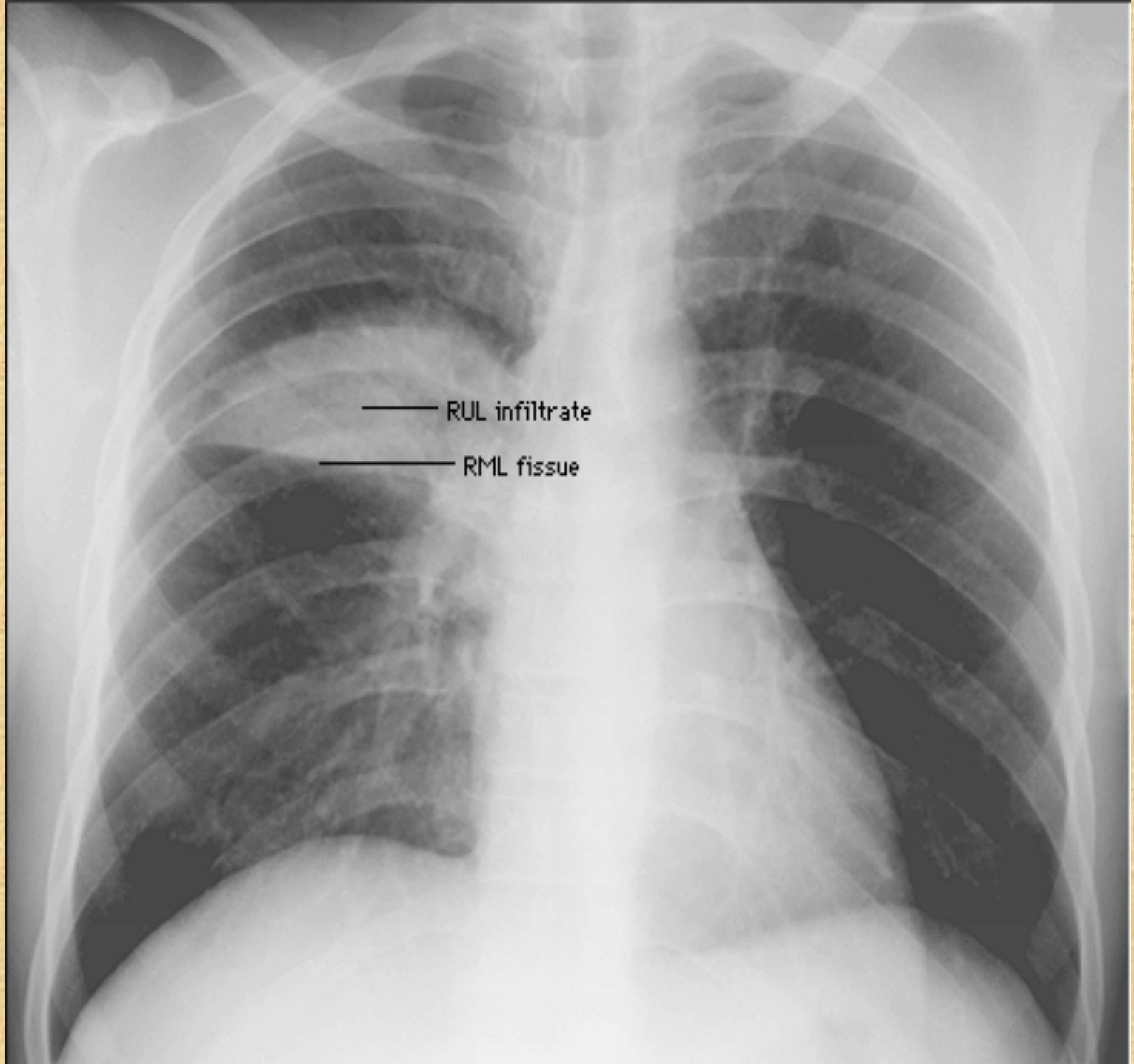


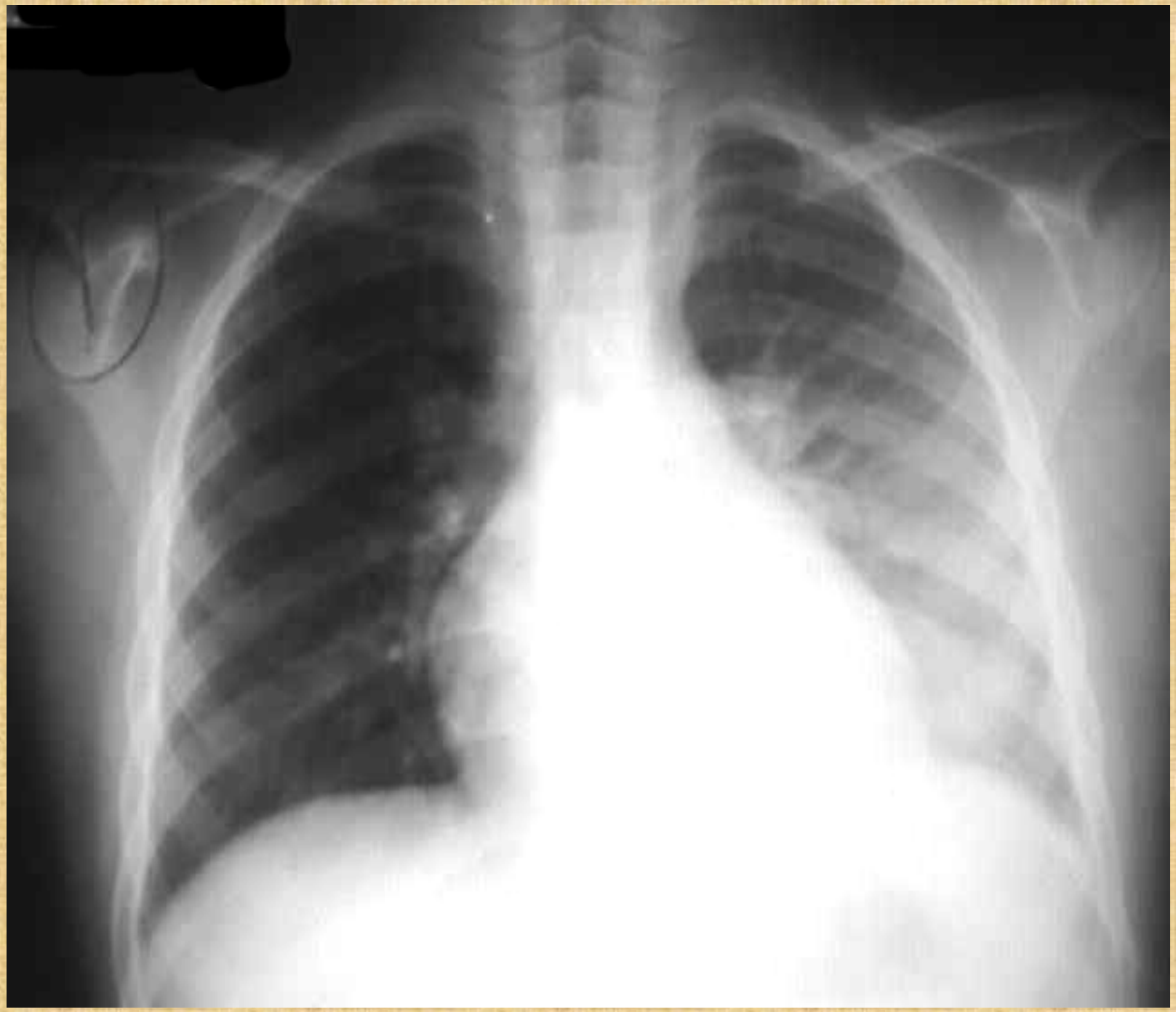
**Fig. 6.9** Bronchiectasis. Multiple ring shadows, many containing air–fluid levels, are present throughout the lower zones of this patient with cystic bronchiectasis.

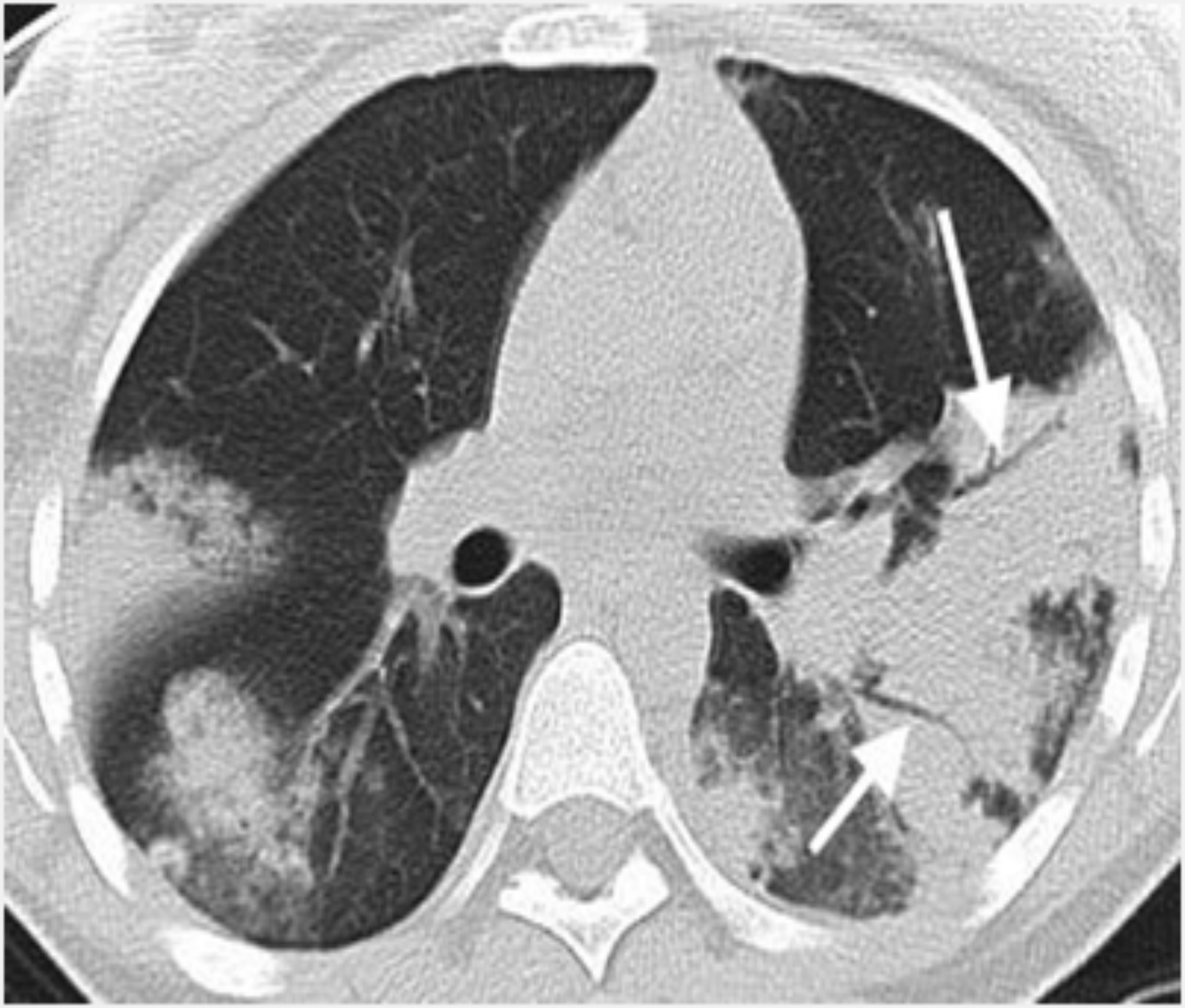
**Fig. 6.11** Cystic bronchiectasis. A CT image through the upper lobes demonstrates multiple ring shadows. More caudal images reveal these to be due to irregularly dilated bronchi.

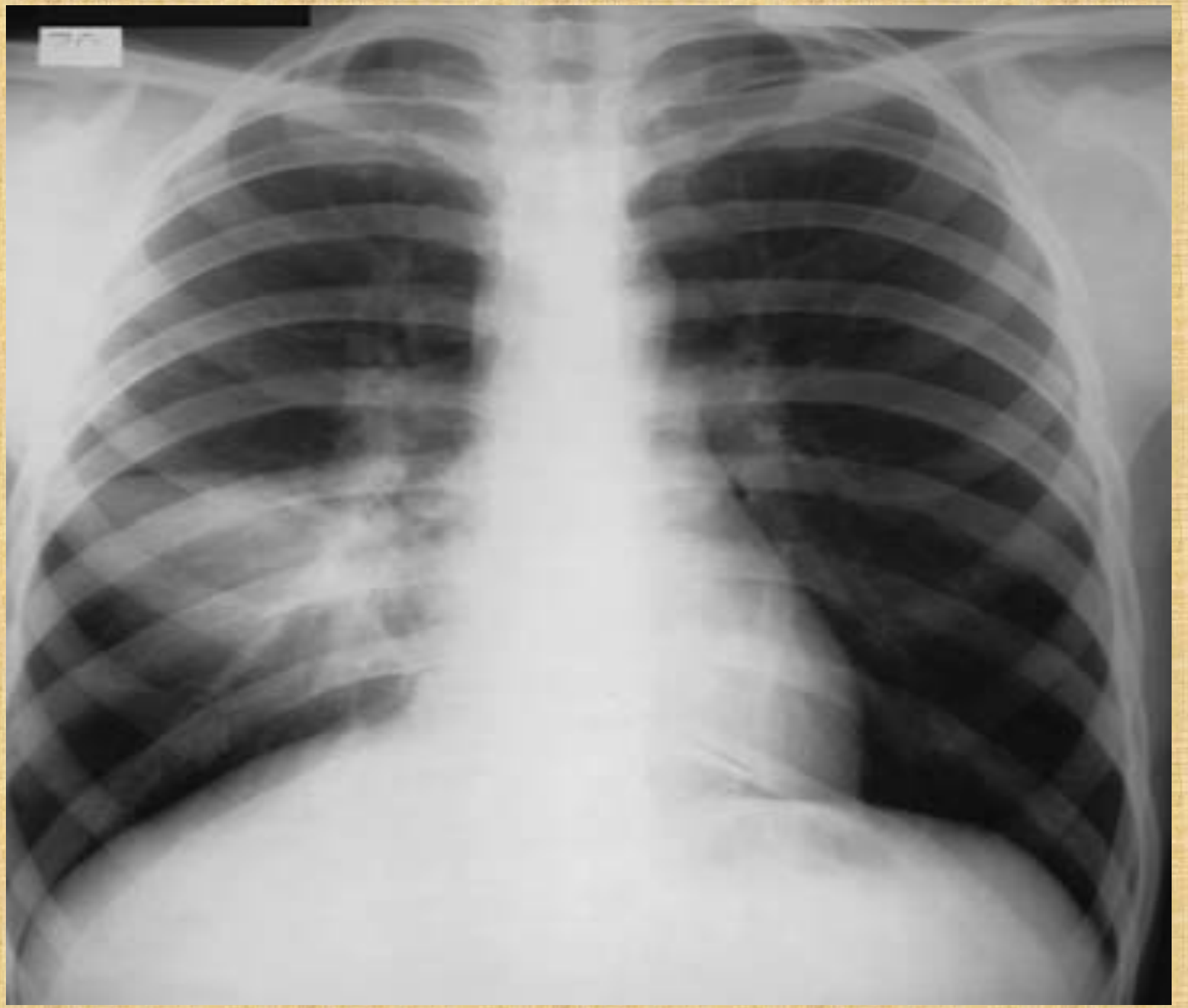
Lt lung upper + mid zone opacity

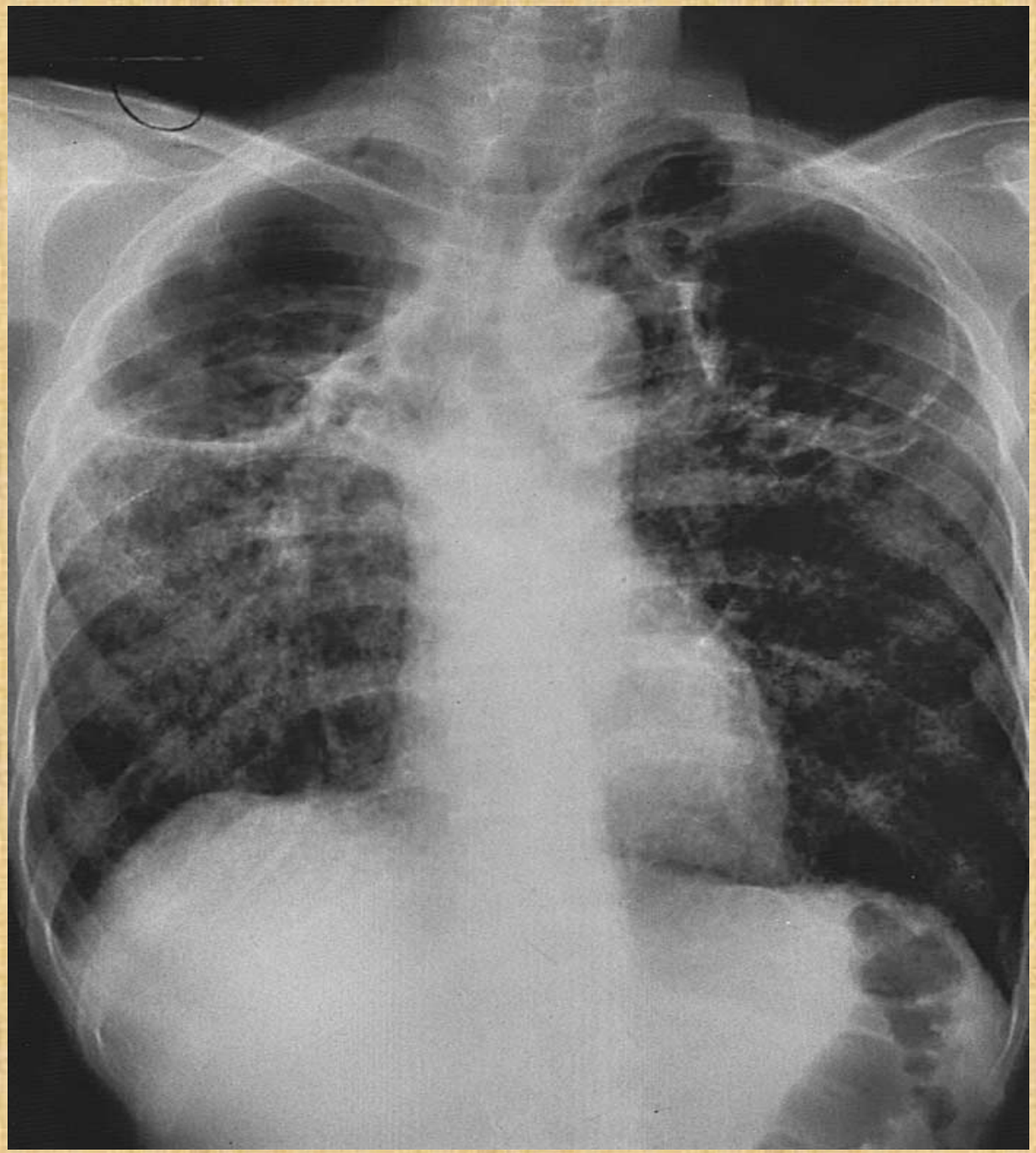


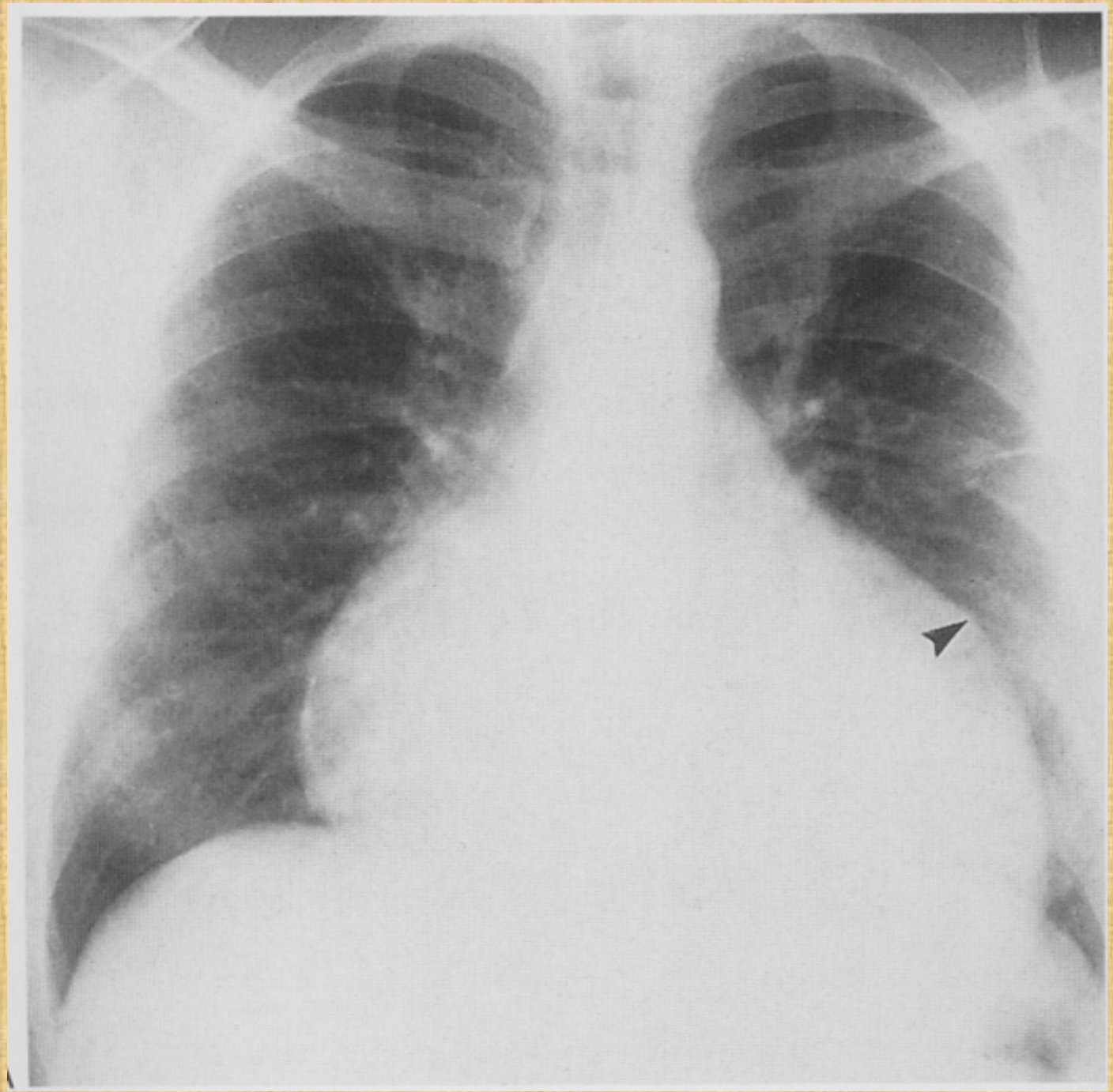

RUL infiltrate
RML fissue

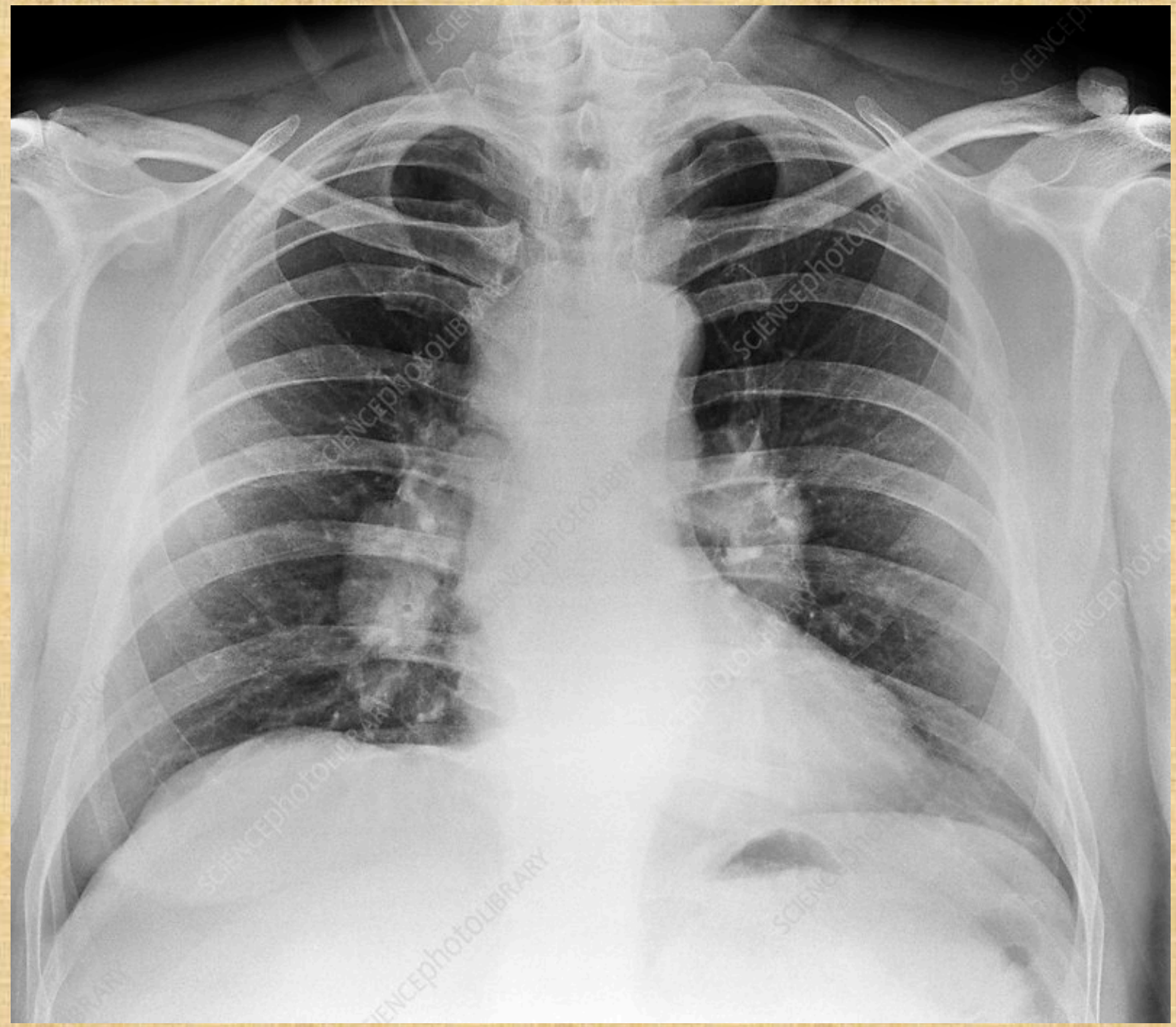


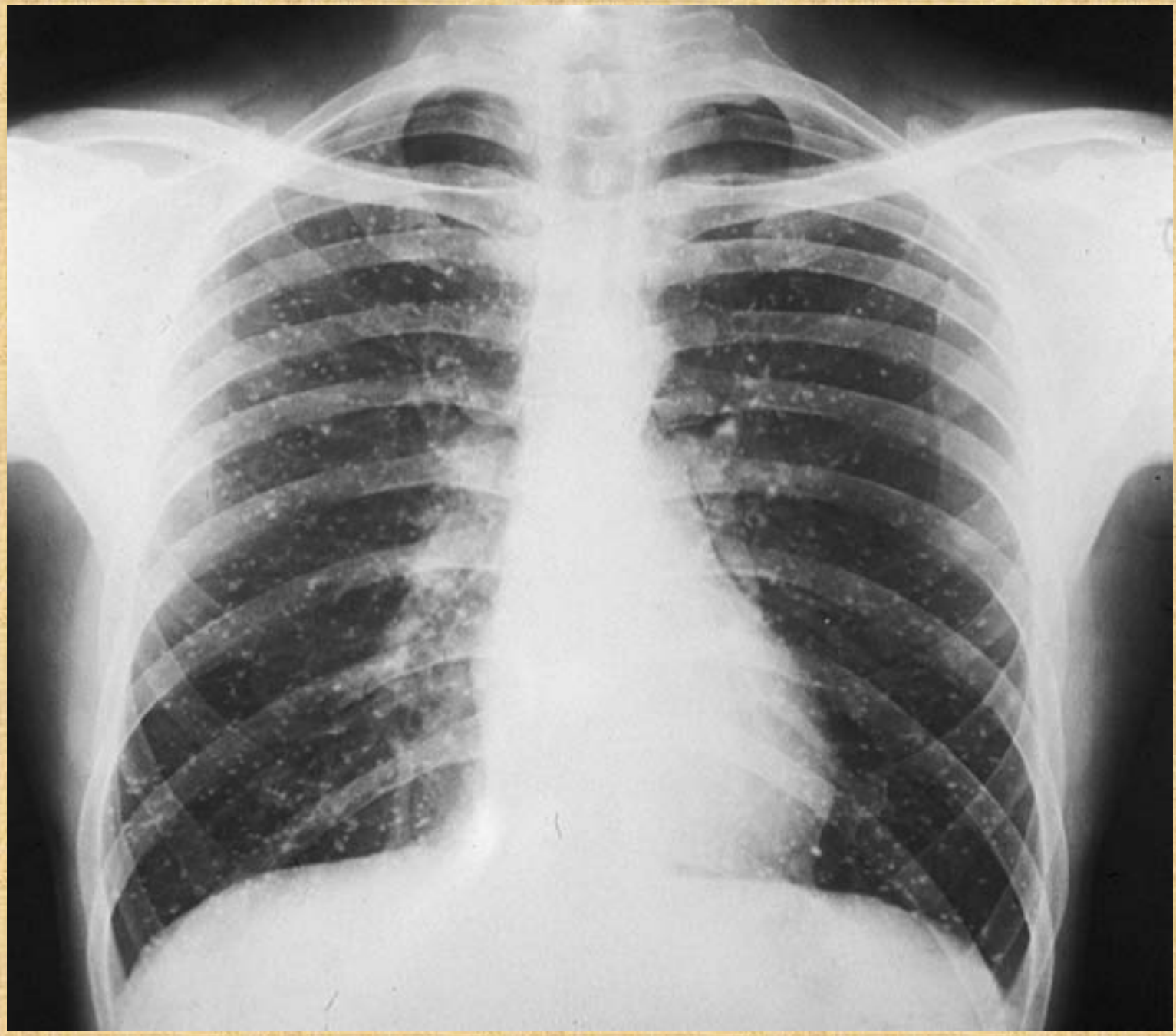


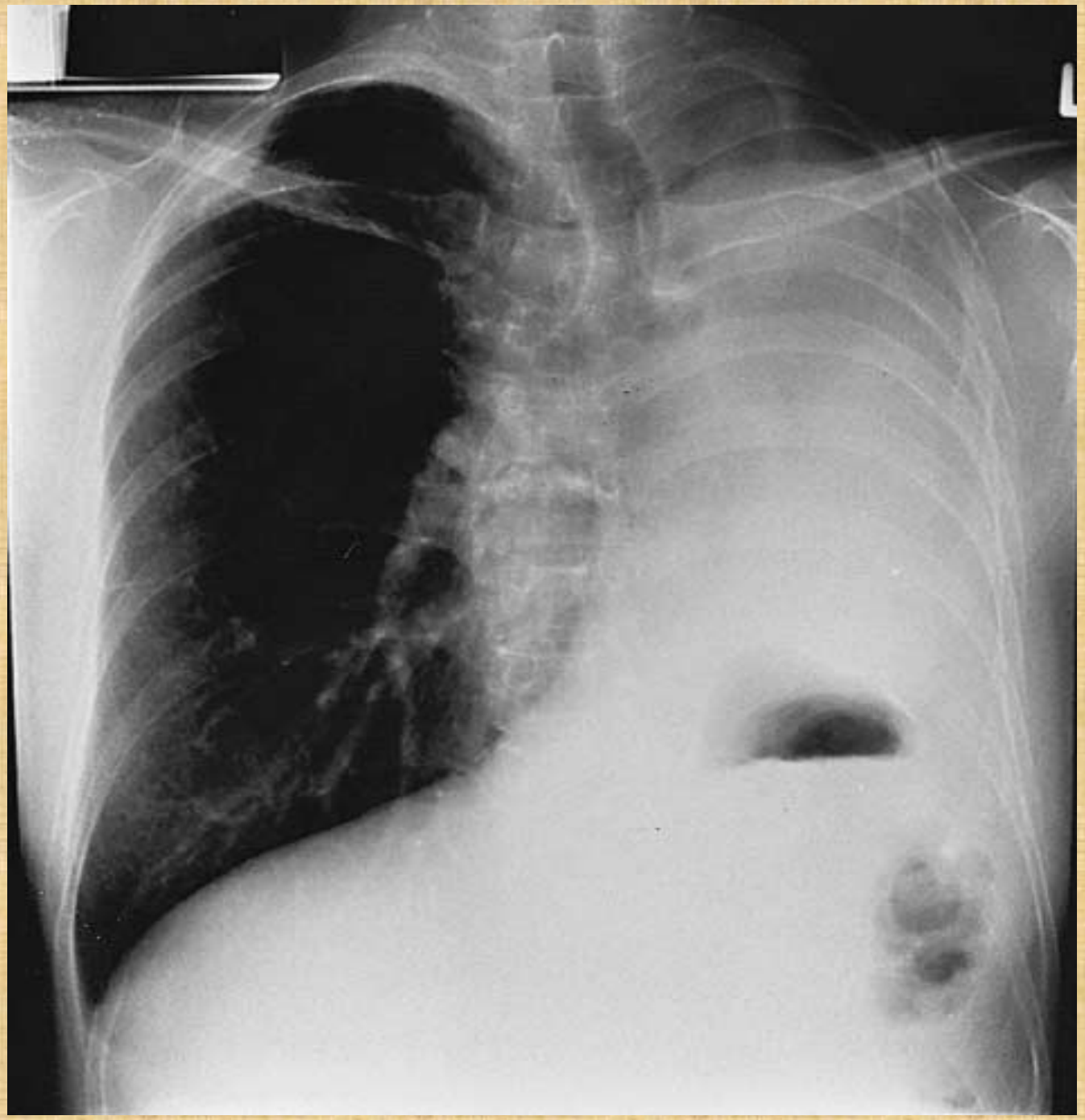








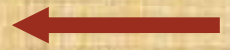


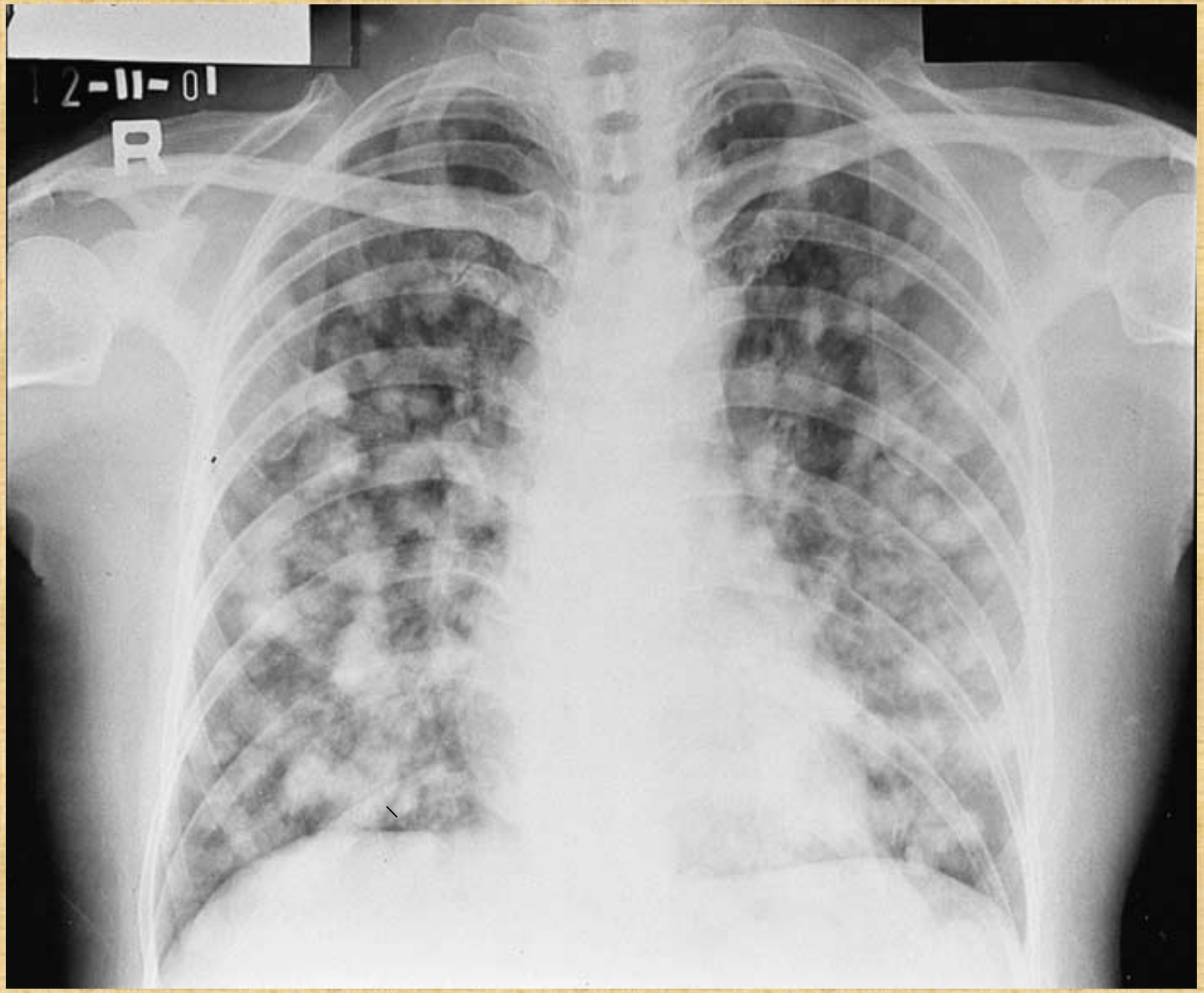


homogenous opacification of the left hemithorax.

**DD:**

1. Collapse
2. Fibrosis
3. Pneumonectomy
3. Consolidation
4. Effusion
5. Mass

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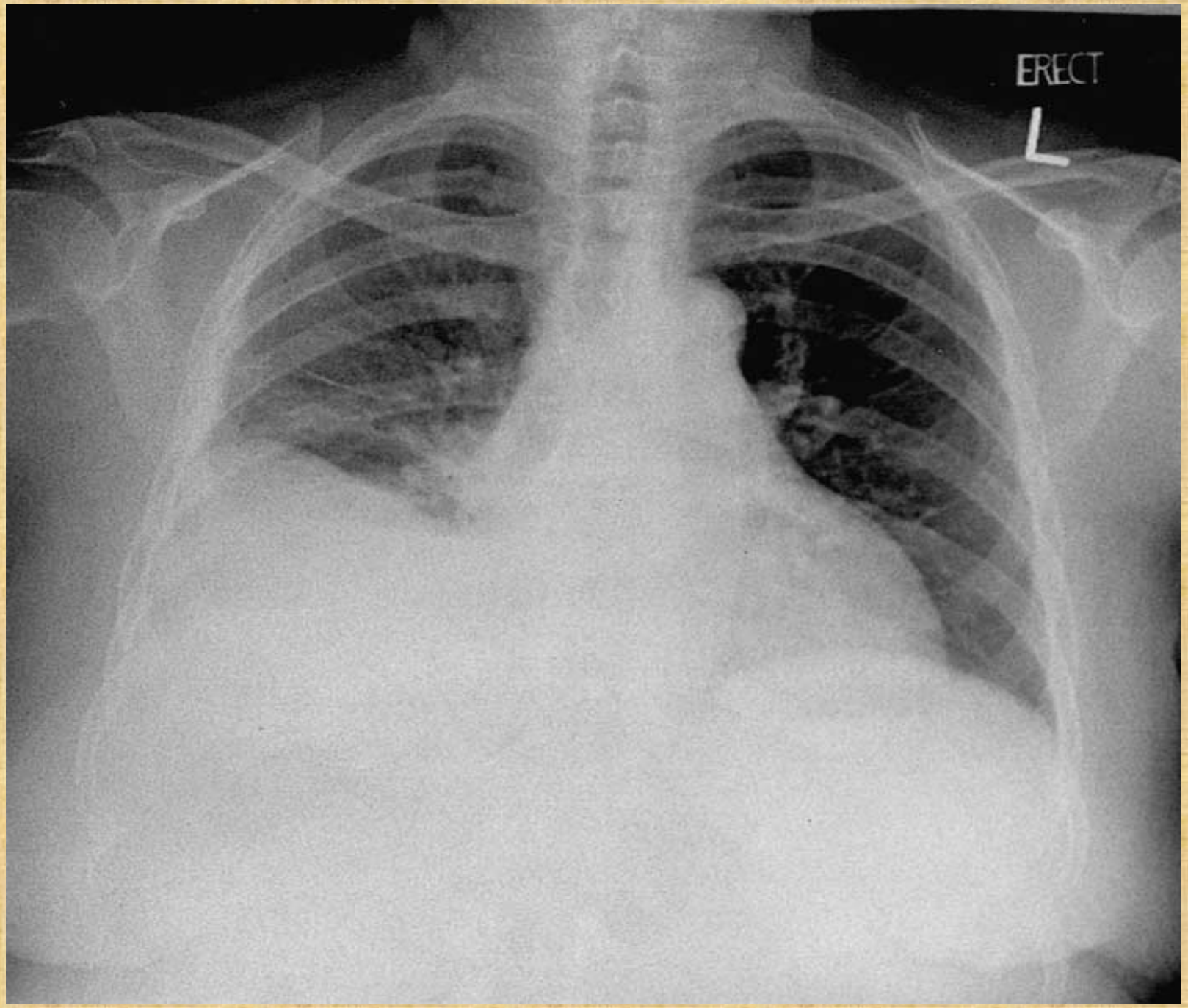
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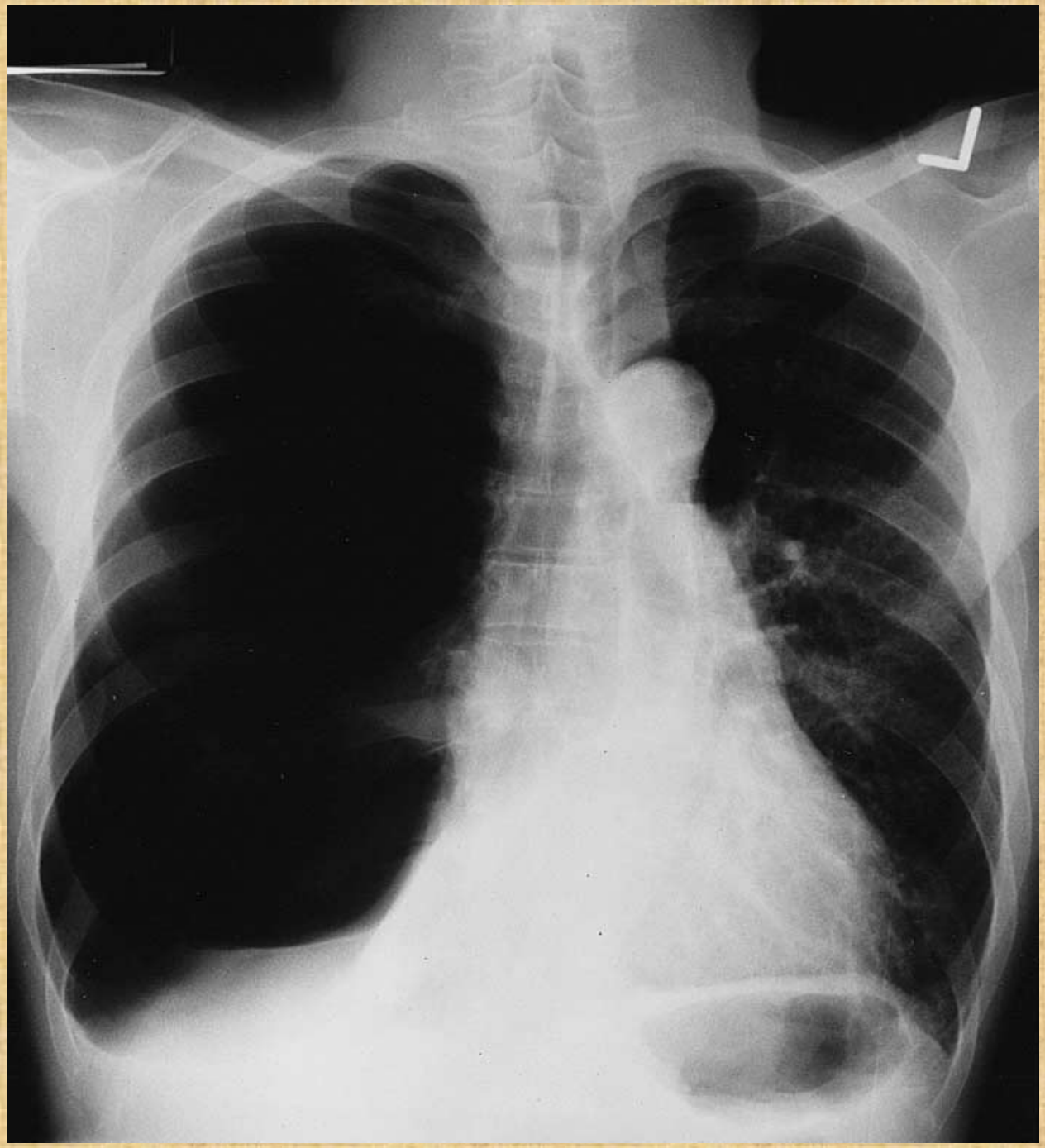

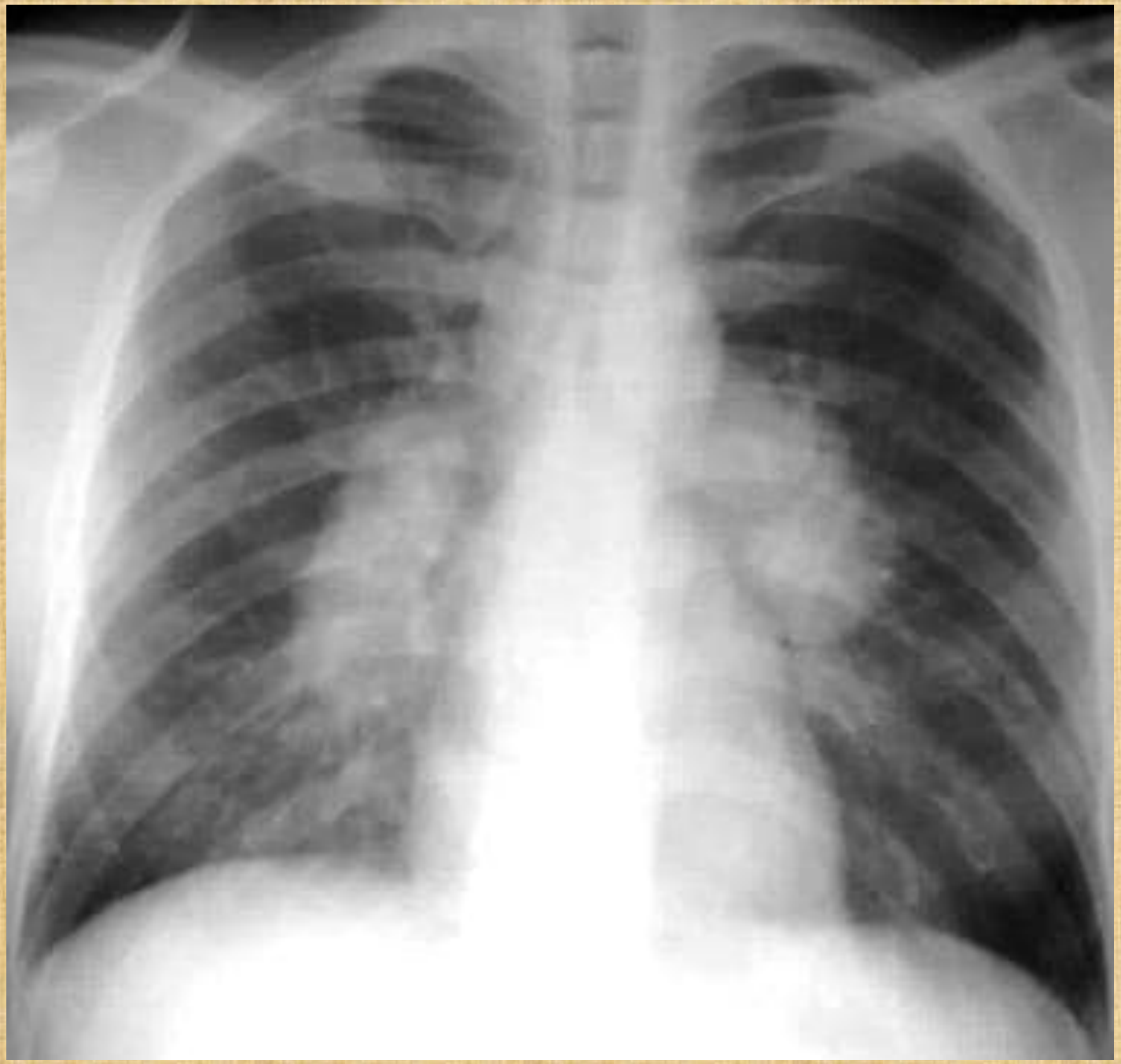

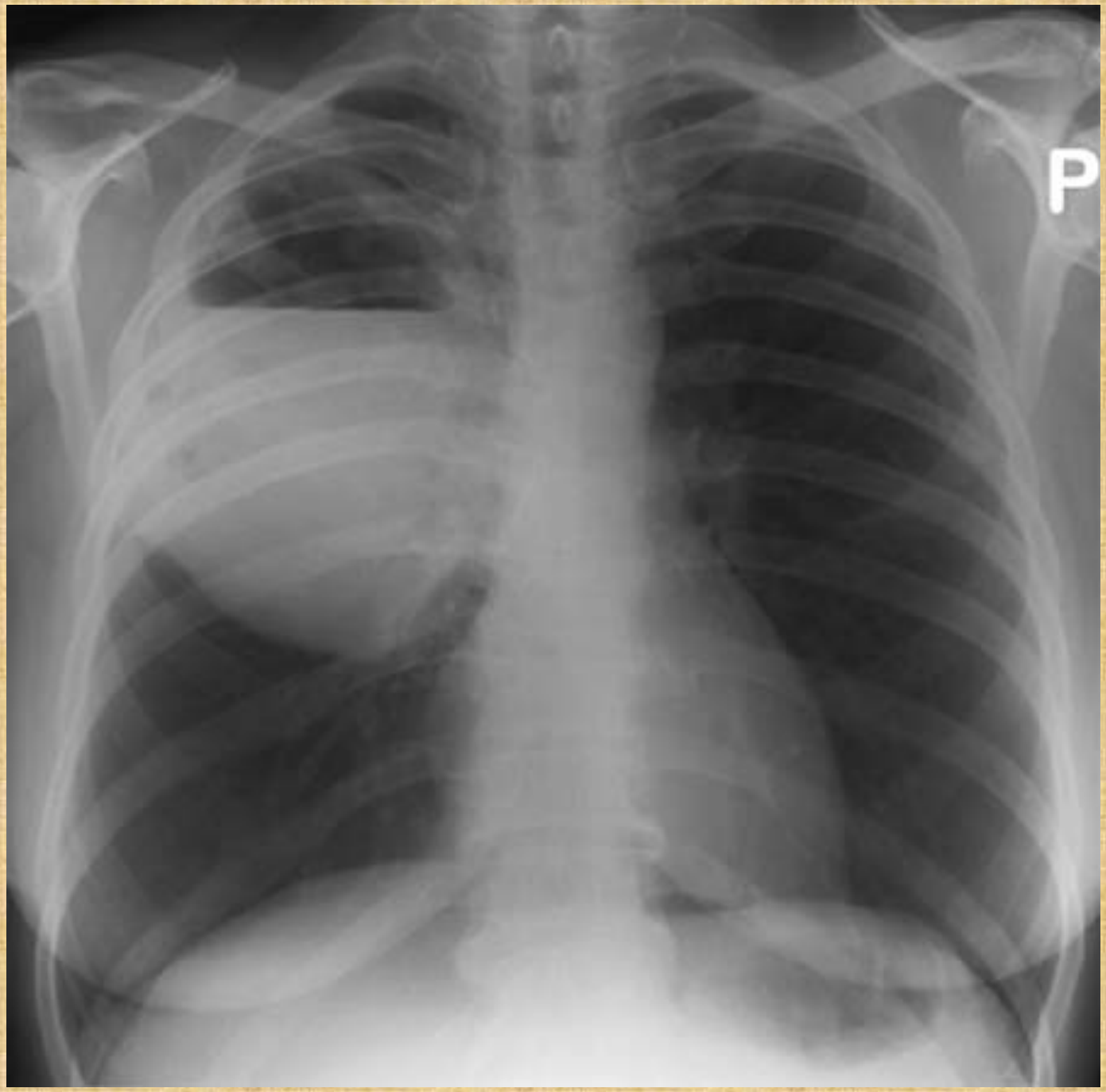
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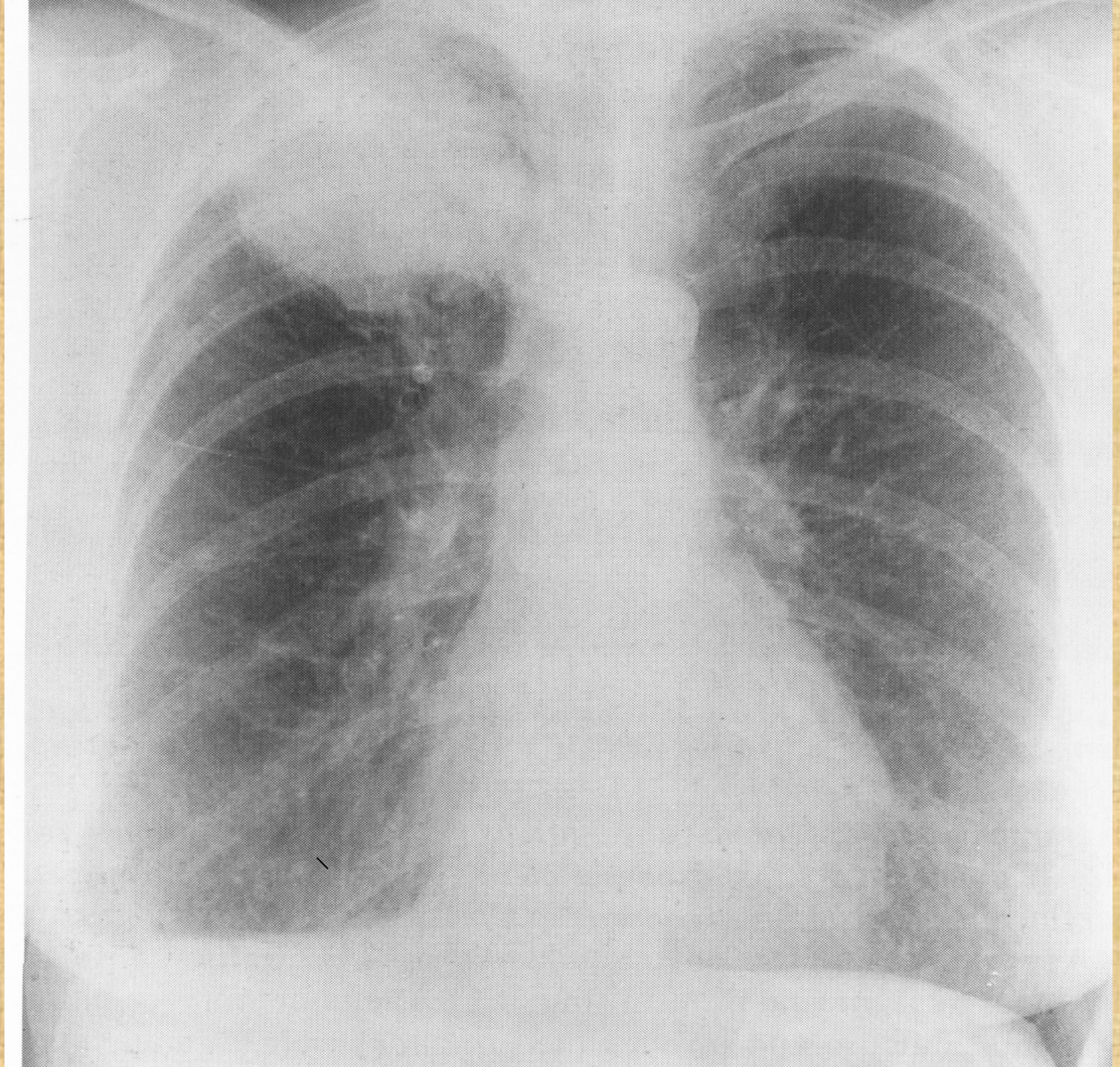
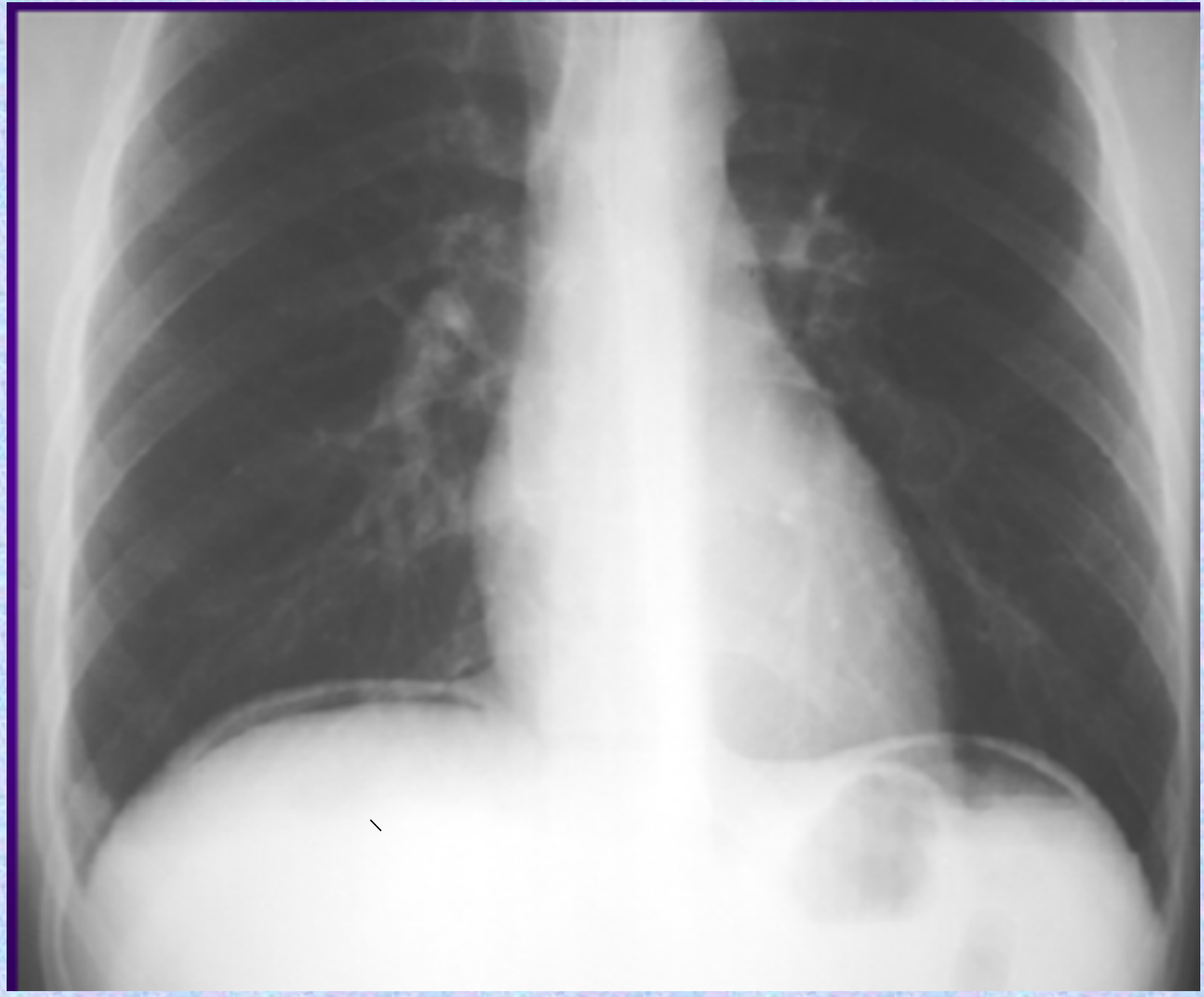
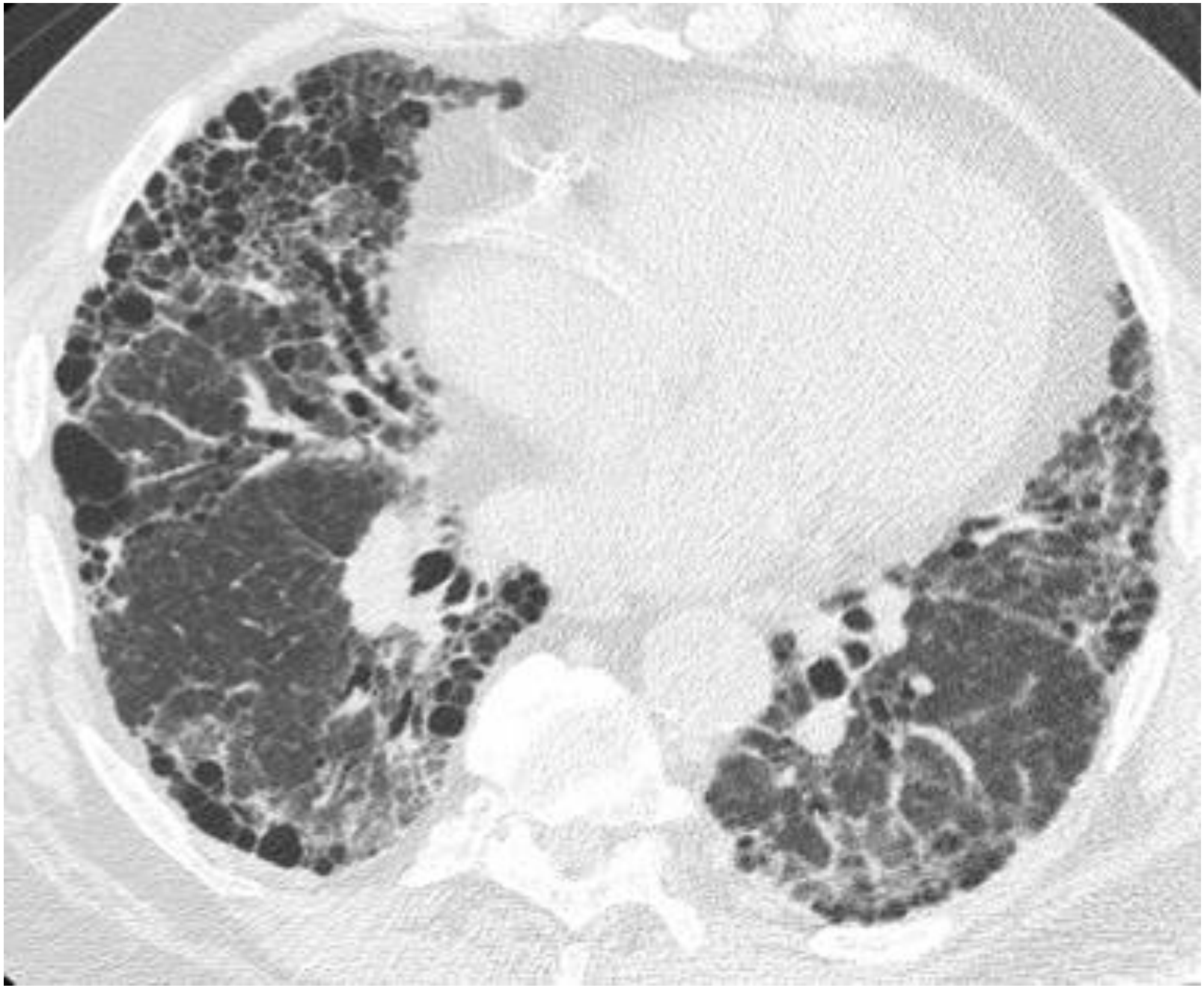
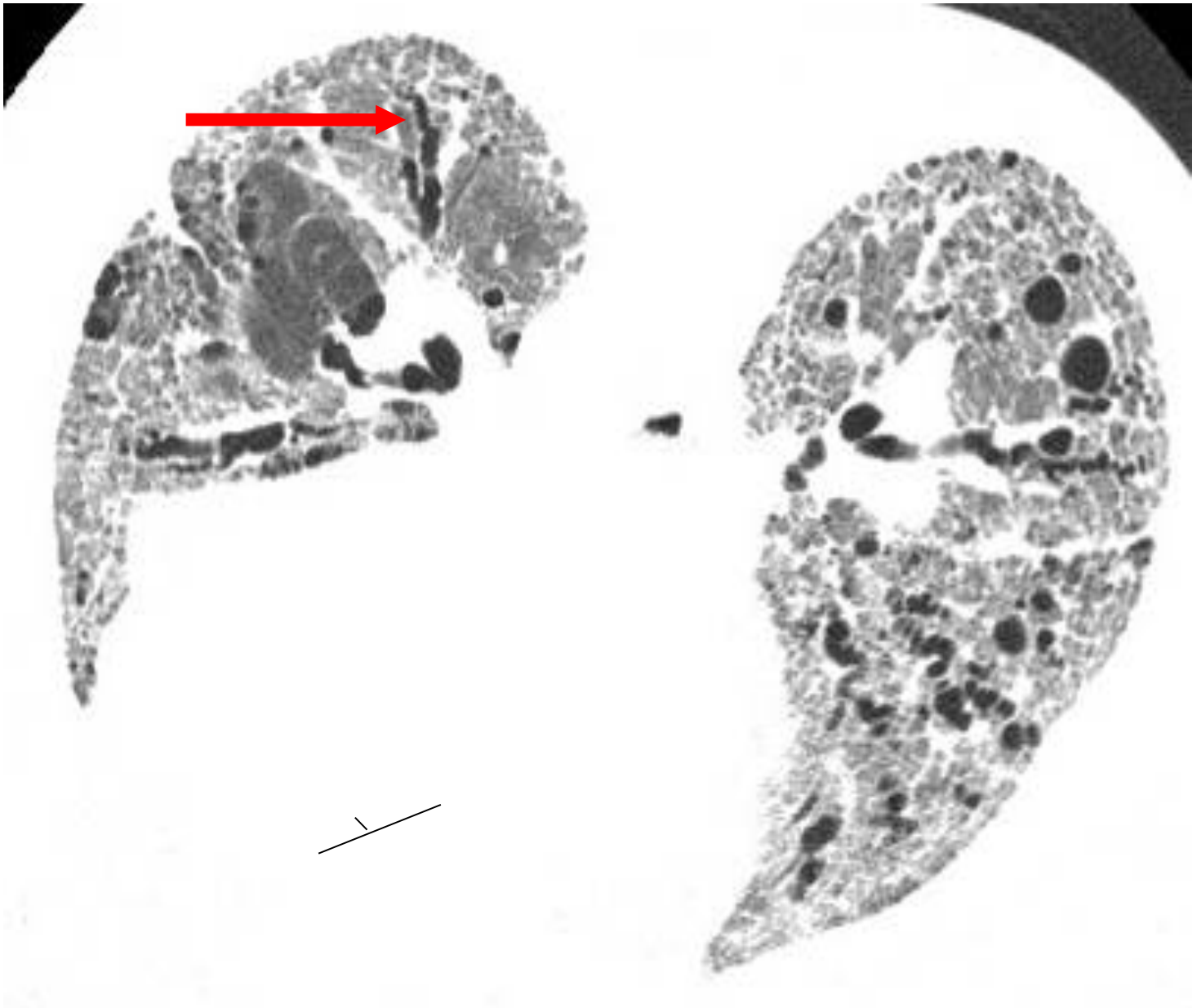
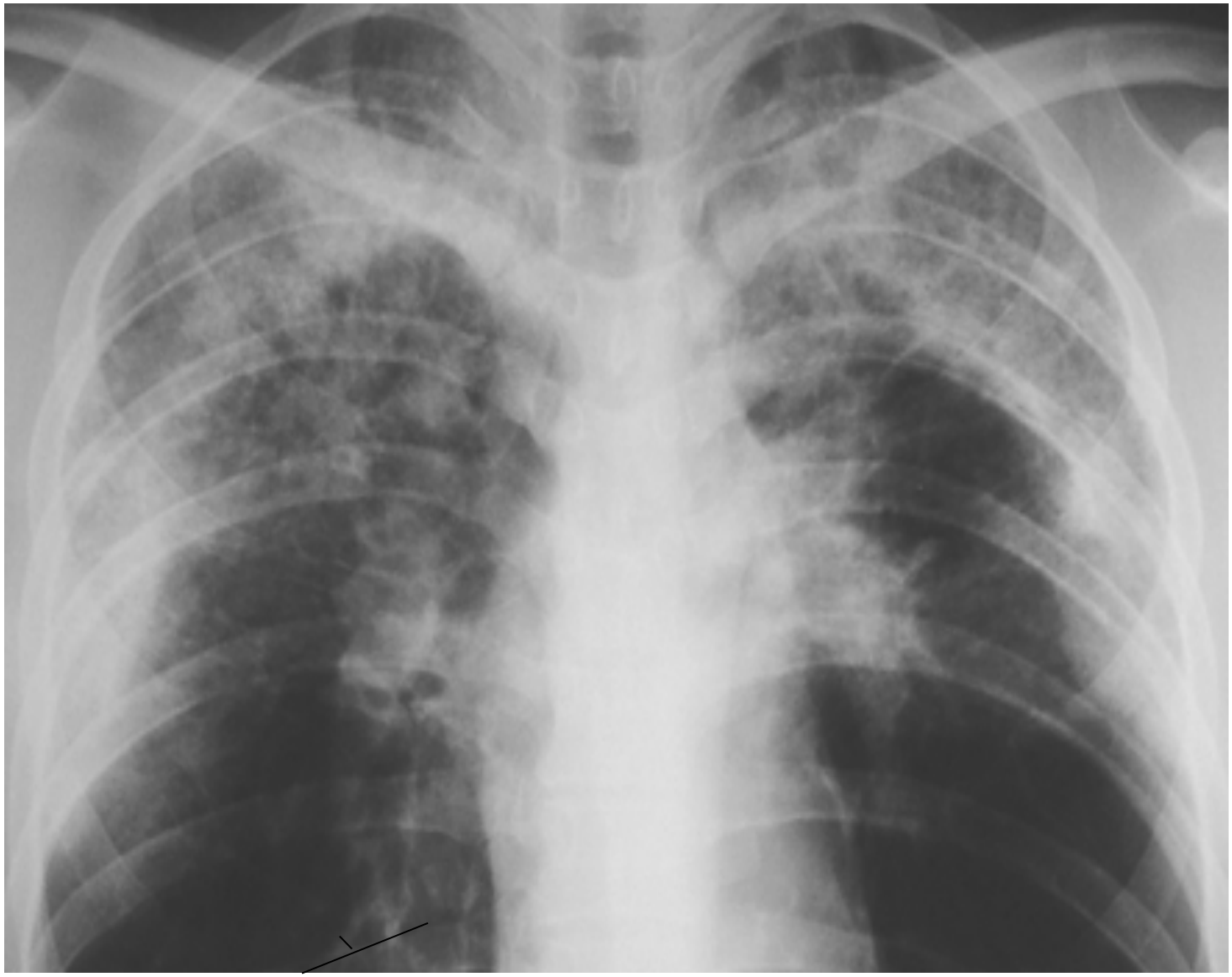




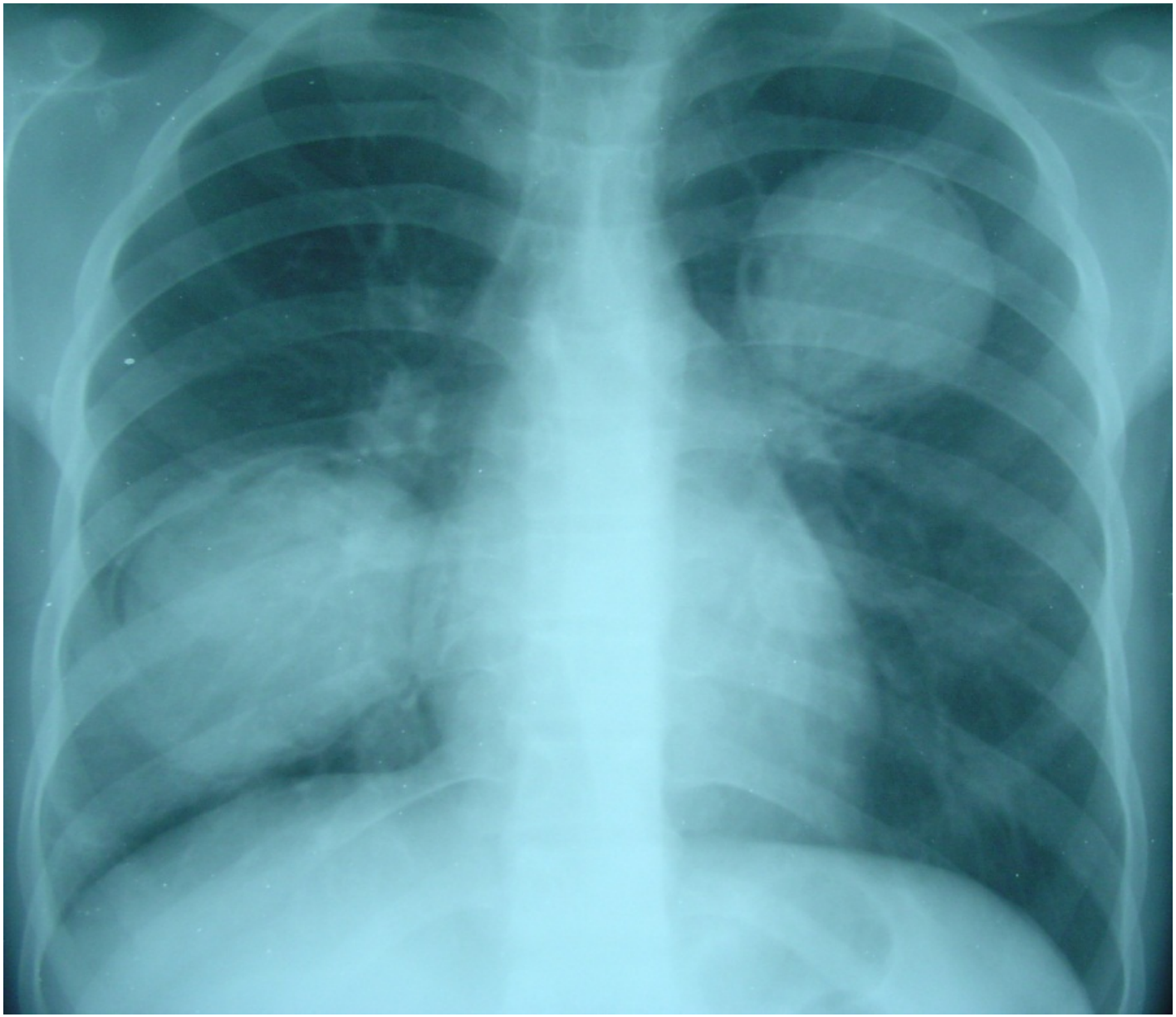


# UIP: Traction Bronchiectasis

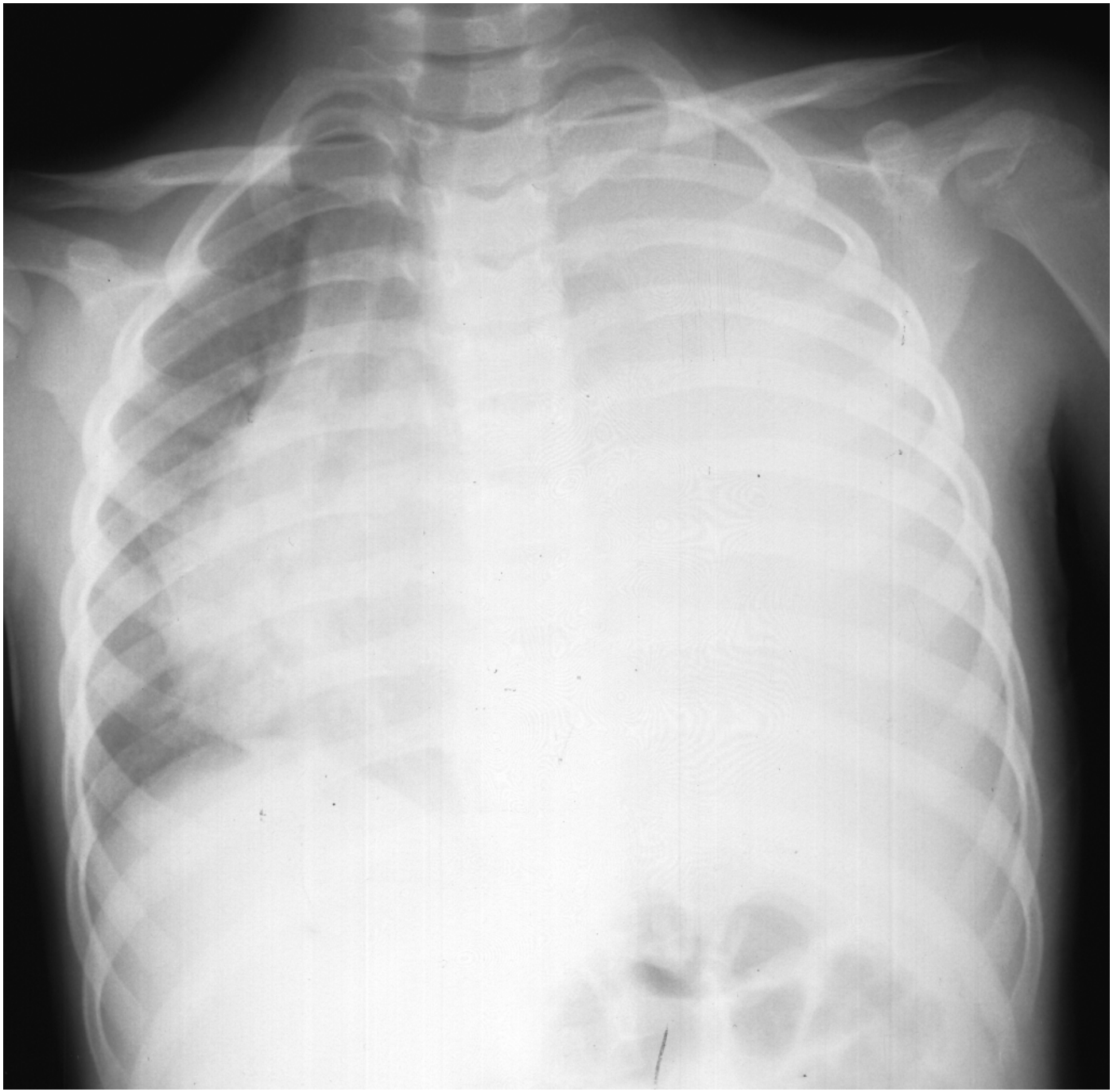


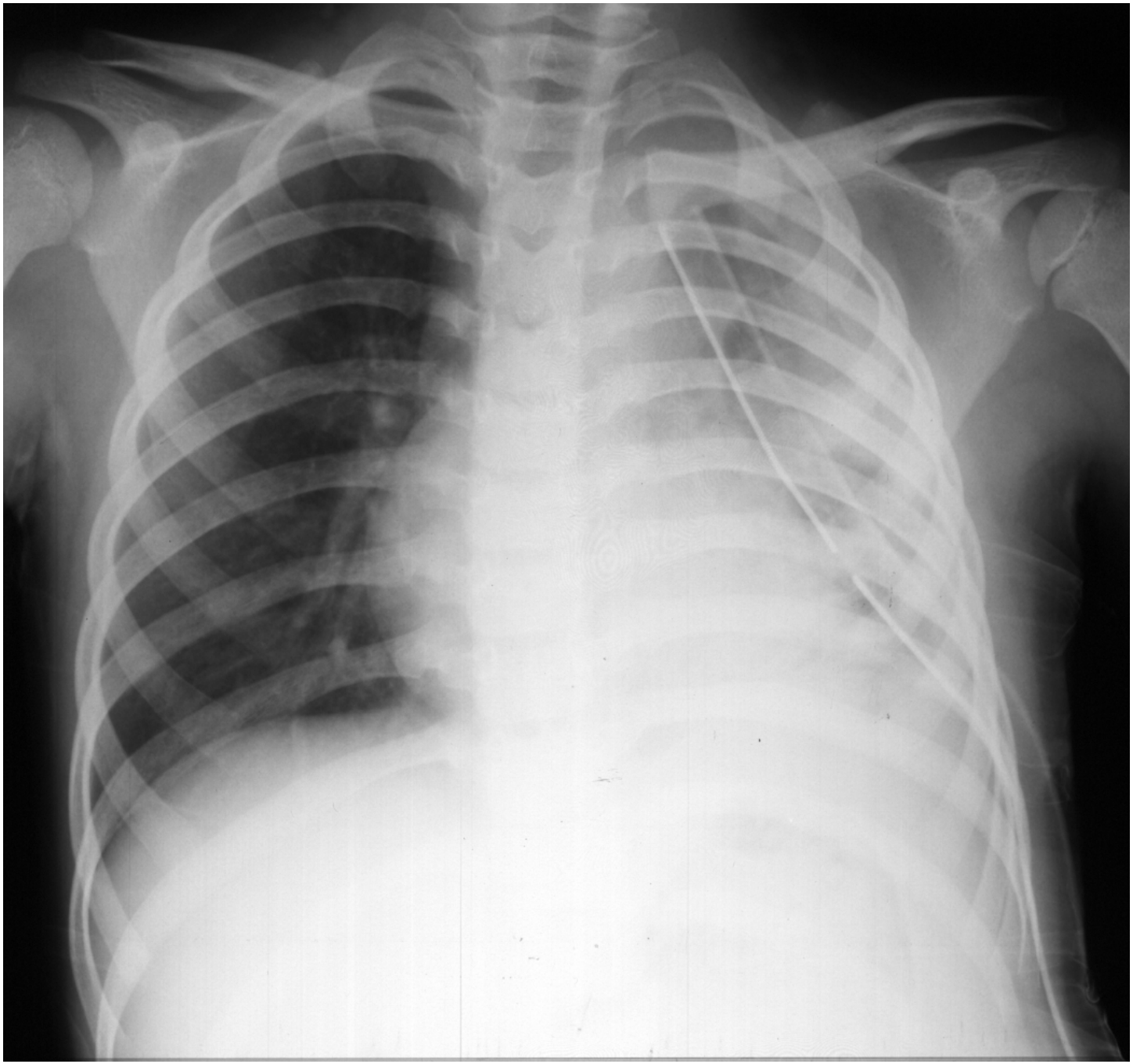


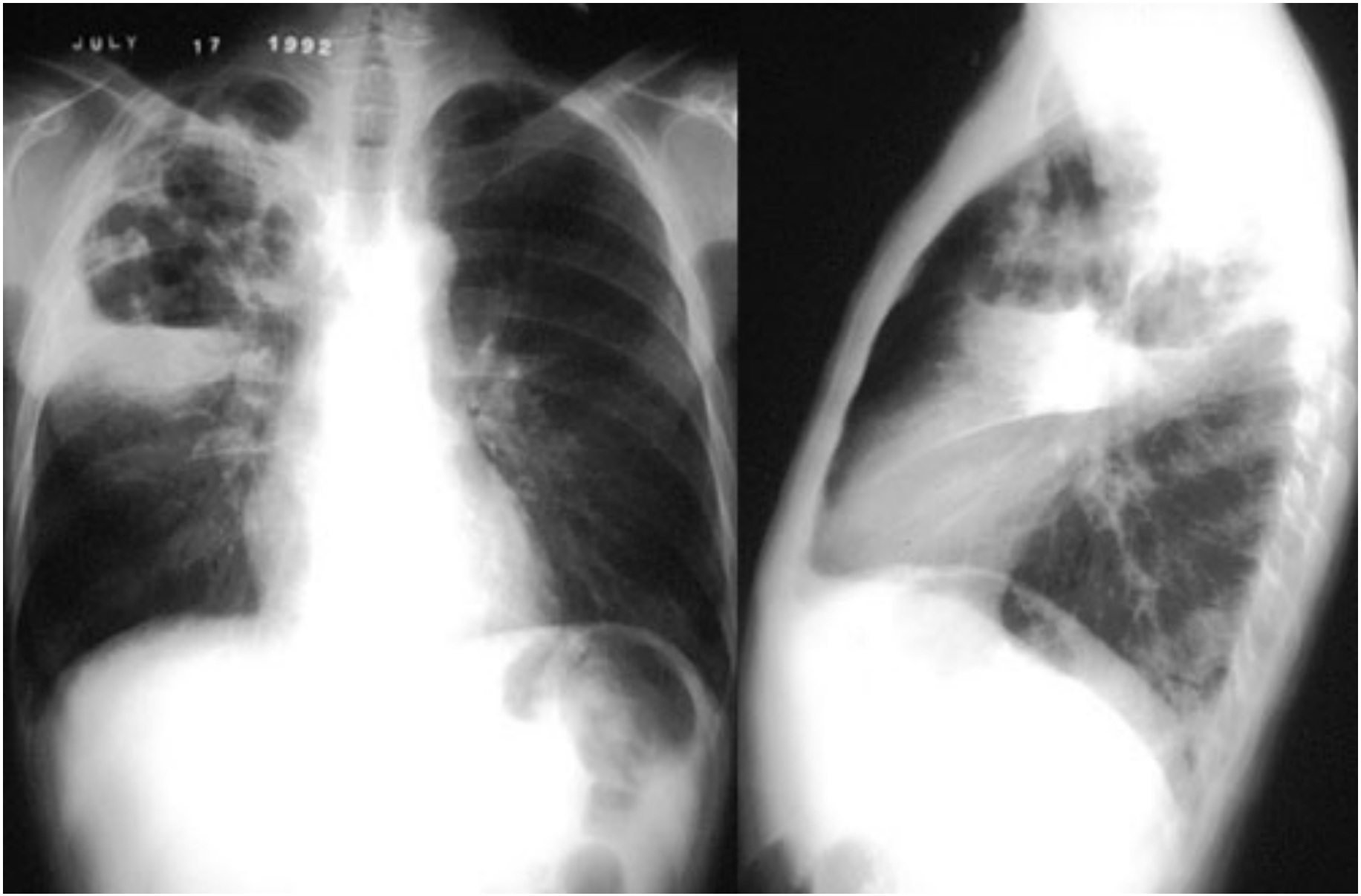
***Chest radiograph shows airspace consolidation confined mainly to the peripheral lung (photographic negative shadow of pulmonary edema).***



Air in the wall – air crescent



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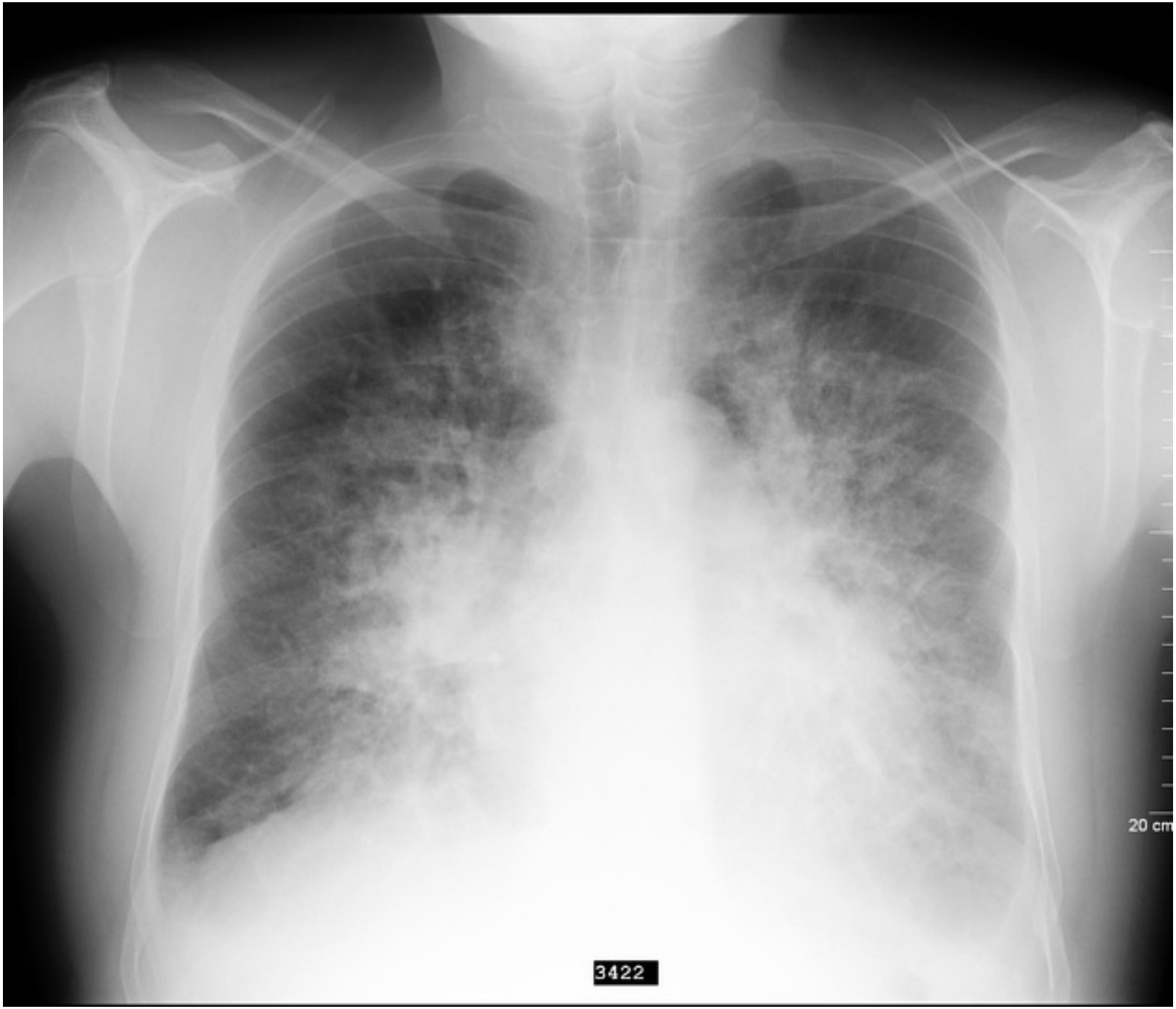
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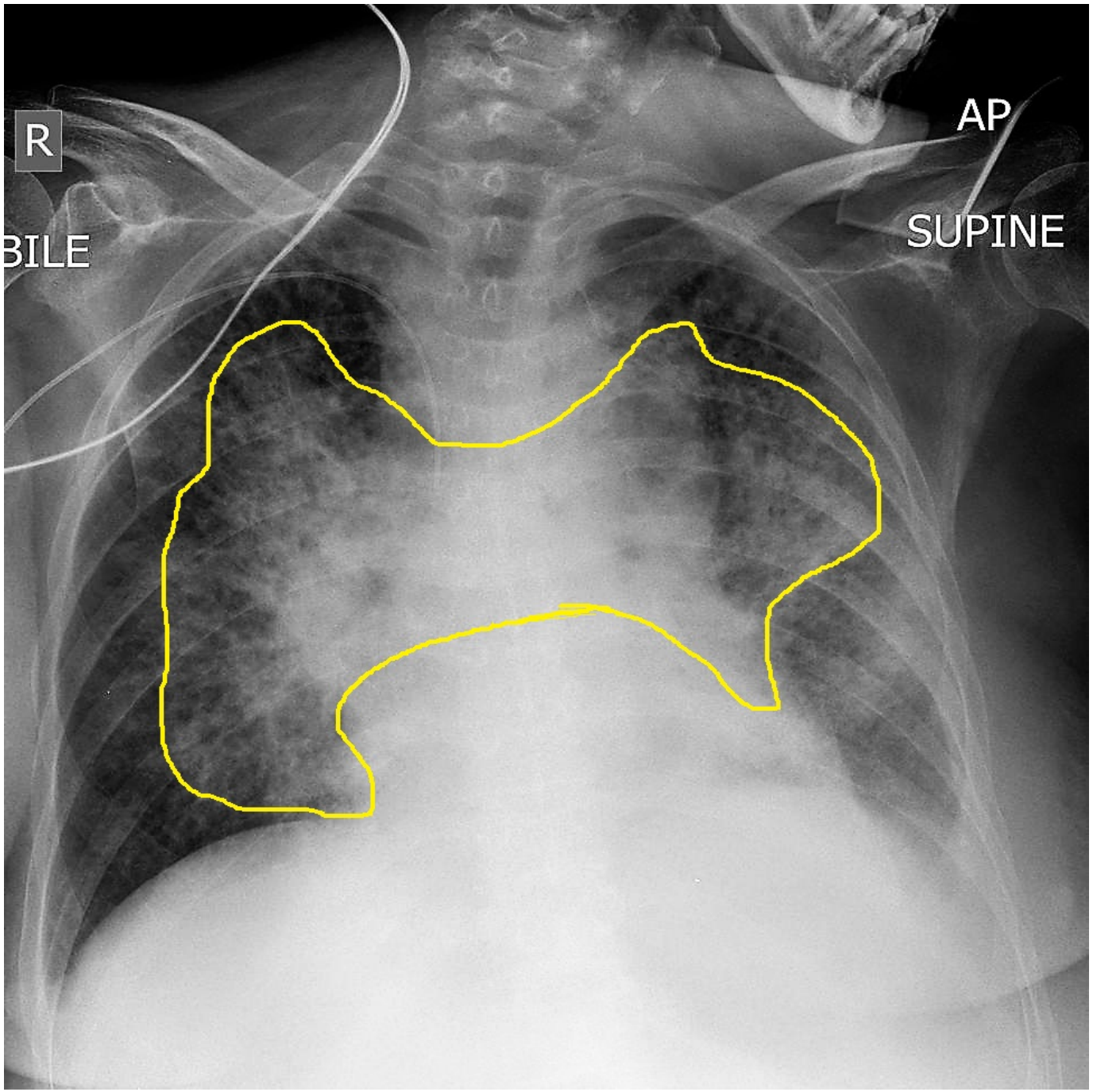
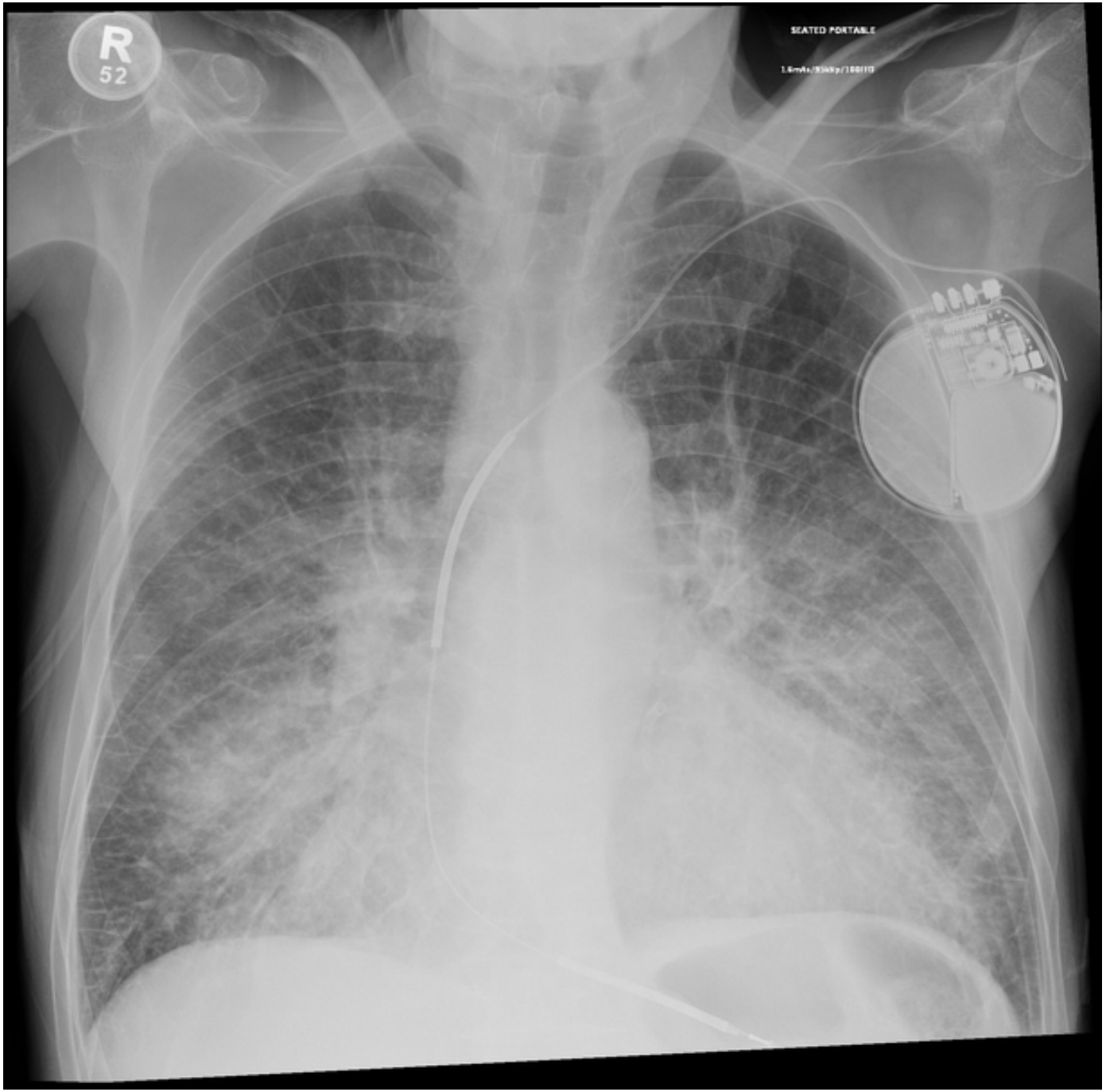
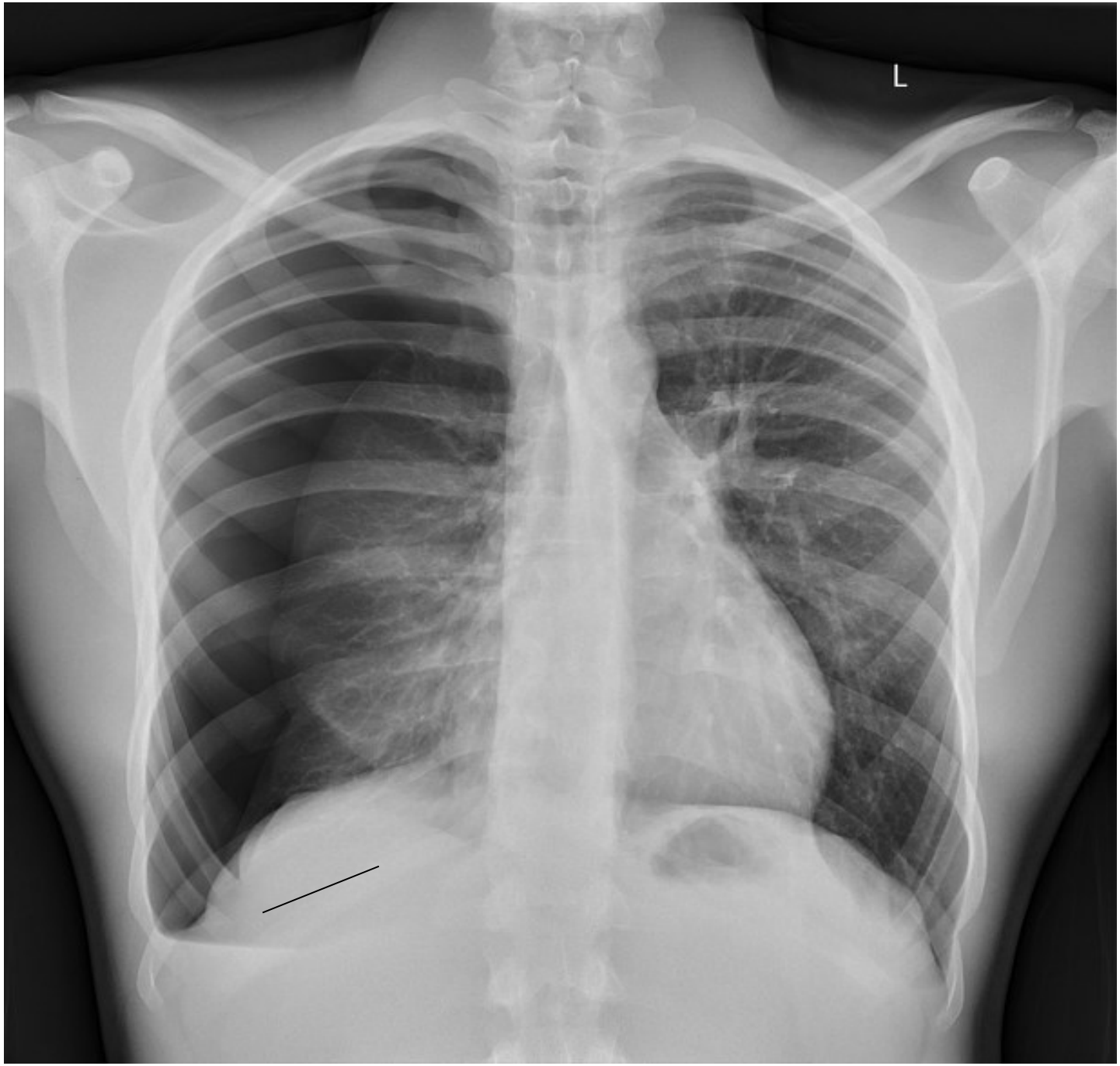

R
AP
SUPINE
BILE


R
52
SEATED PORTABLE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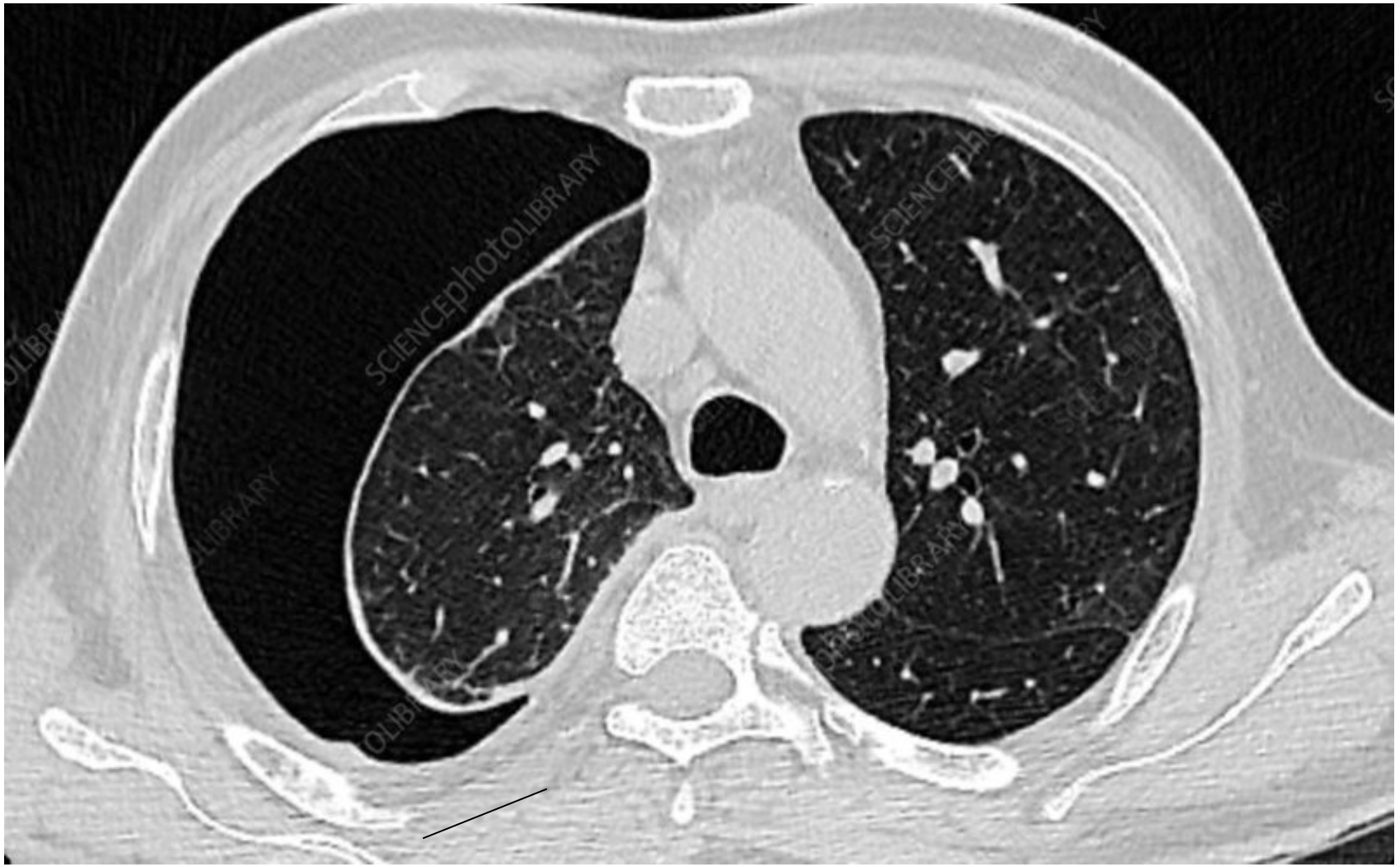
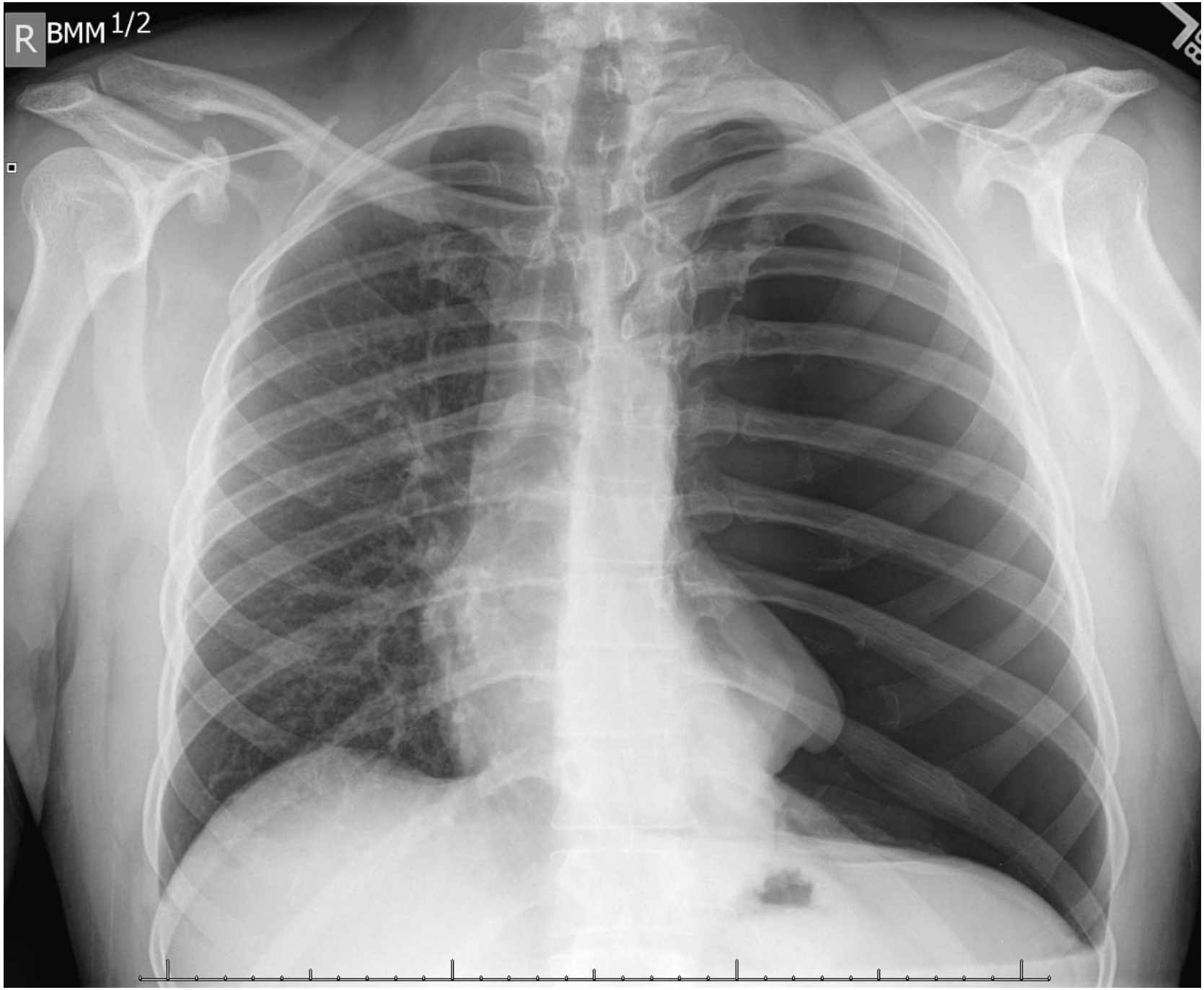

SCIENCEPHOTOLIBRARY


R BMM 1/2

# THANK YOU

سبحانك اللهم
وبحمدك
نشهد أن لا اله الا
انت

Thank you