



Brigham and Women's Hospital
Founding Member, Mass General Brigham

Chest X-ray Refresher

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- Clinical focus: Pulmonary Hypertension
- Research focus: Pulmonary Vascular Imaging

DISCLOSURES

No Disclosures



OBJECTIVES

- Review classic chest radiographic patterns
- Present images relating to relevant context
- CXR imaging in the context of pulmonary disease
 - Chronic Interstitial Lung Diseases
 - Obstructive lung disease
 - Those associated with immunosuppression or radiation



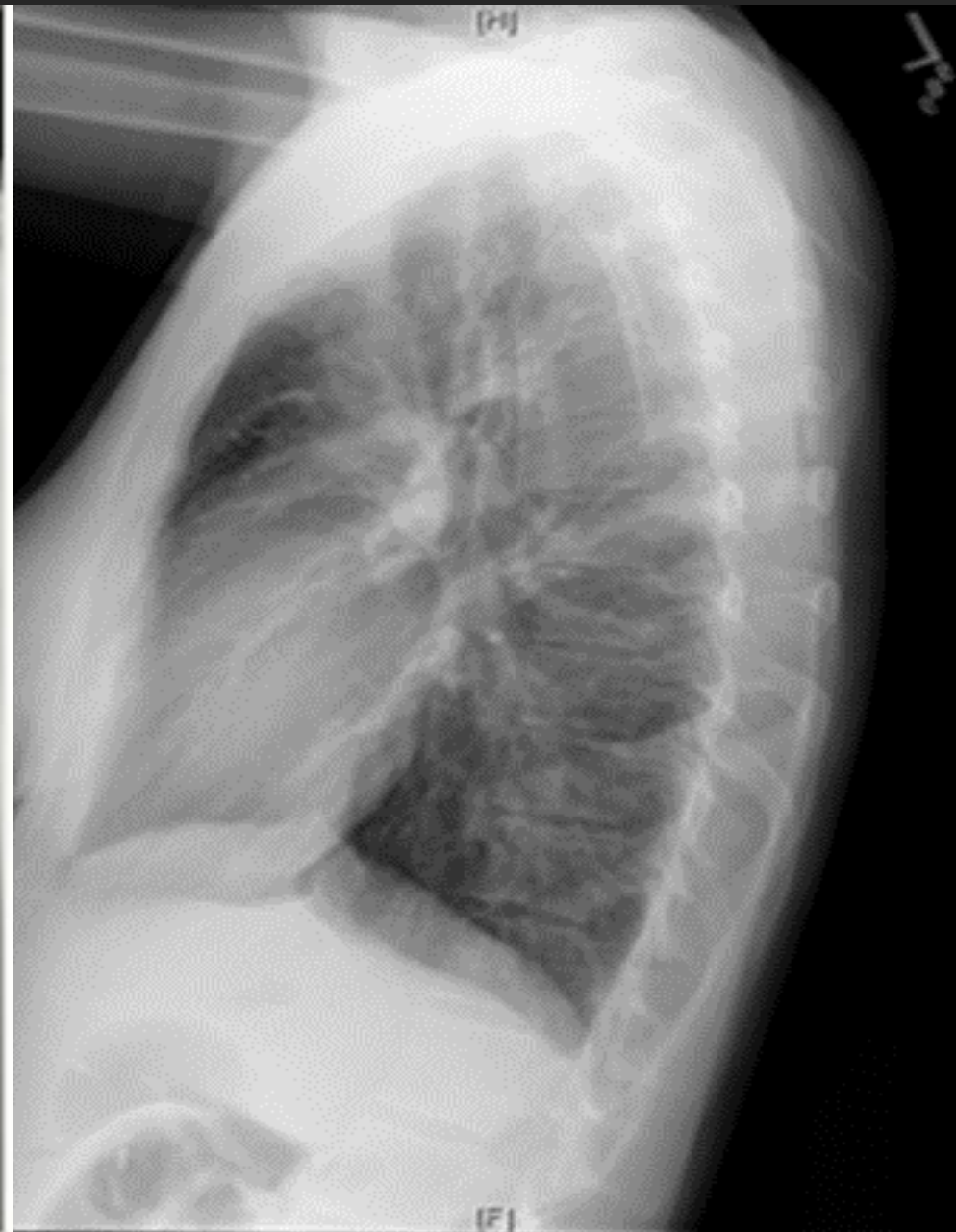
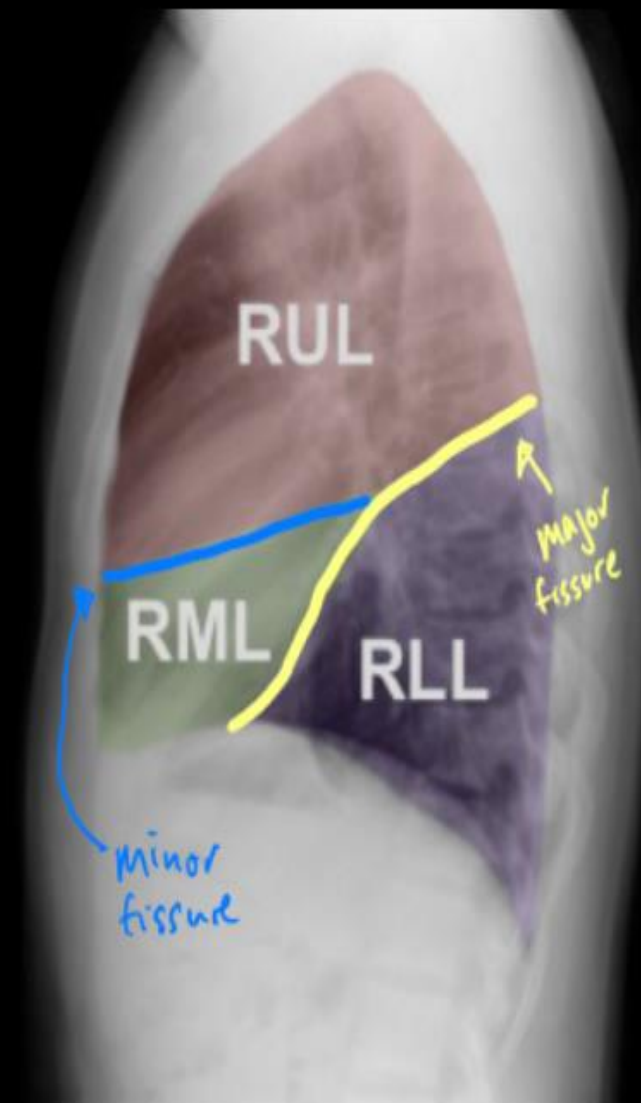
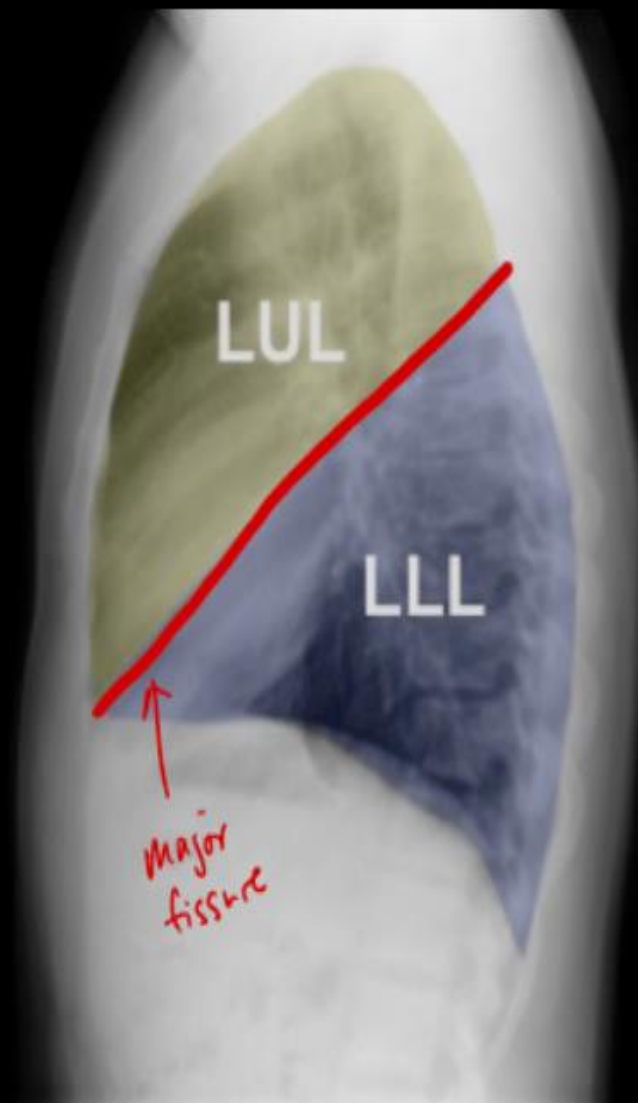
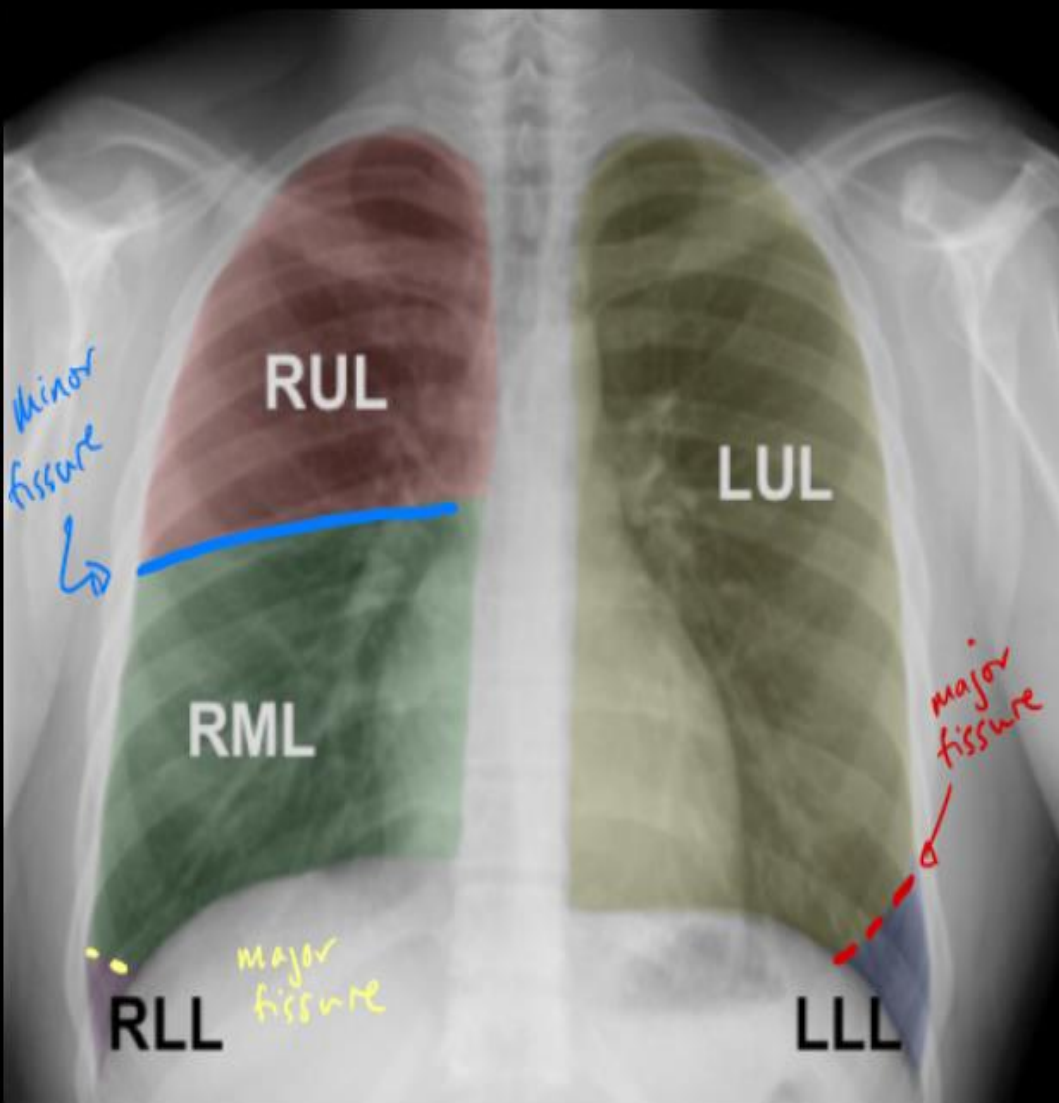
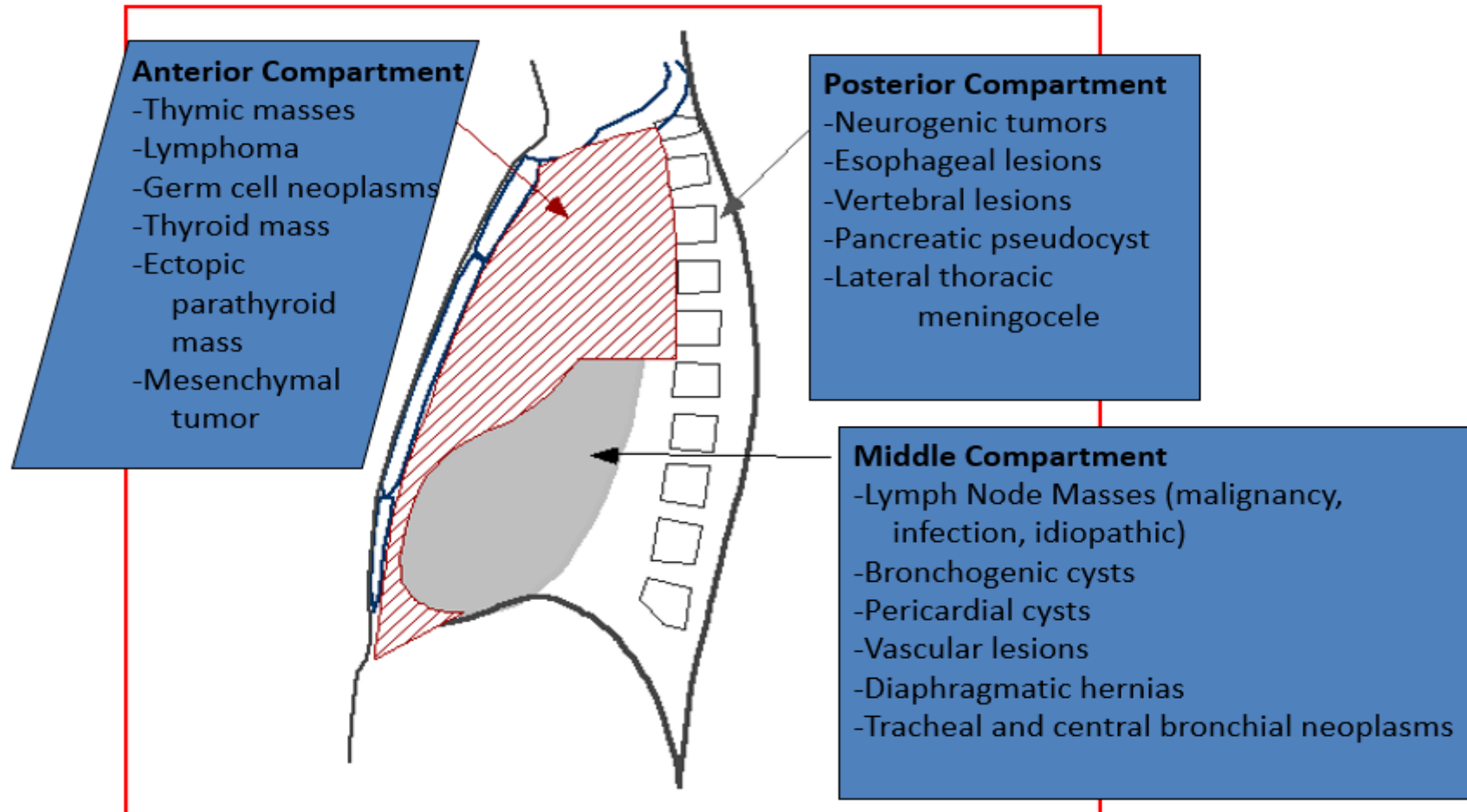


Image Courtesy of Dr. Carolyn Come



Image Courtesy of Dr. Carolyn Come





Common diagnostic possibilities of mediastinal masses The differential diagnosis of a mediastinal mass depends upon the anatomic compartment in which it arises. Redrawn from Baue, AE, et al. Glenn's Thoracic and Cardiovascular Surgery. 5th ed. Appleton & Lange, Norwalk, CT, 1991.

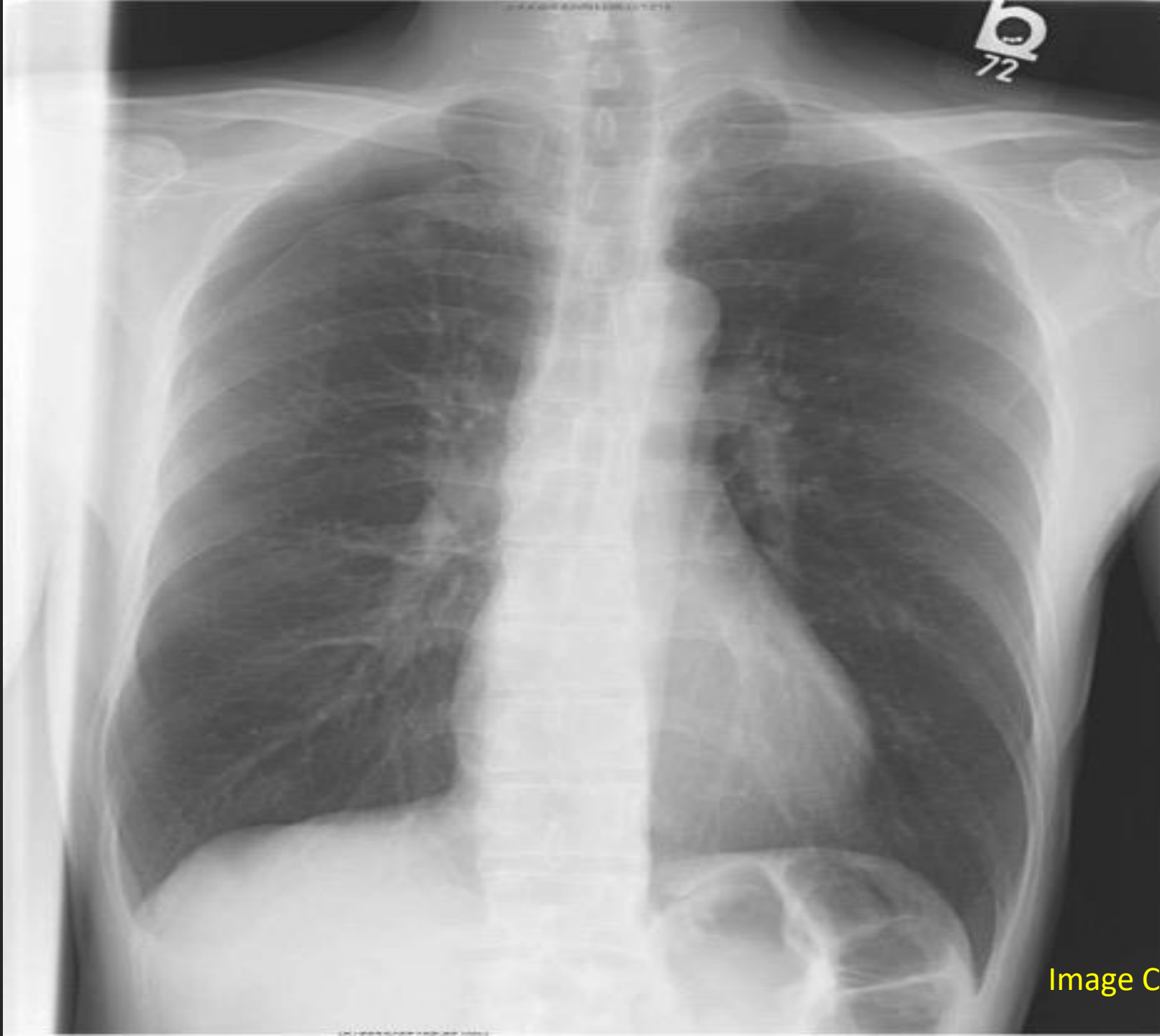


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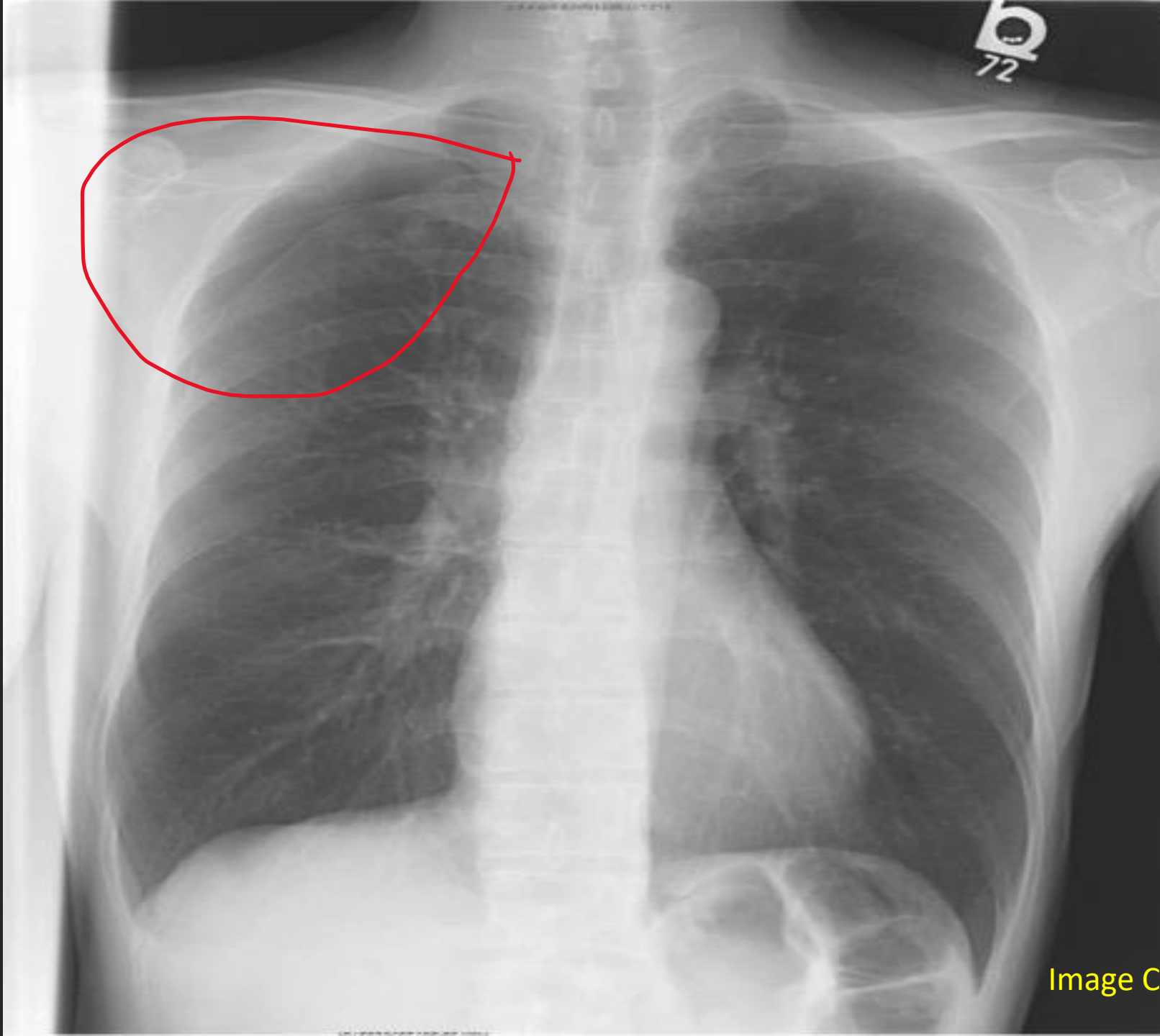


Image Courtesy of Dr. Carolyn Come

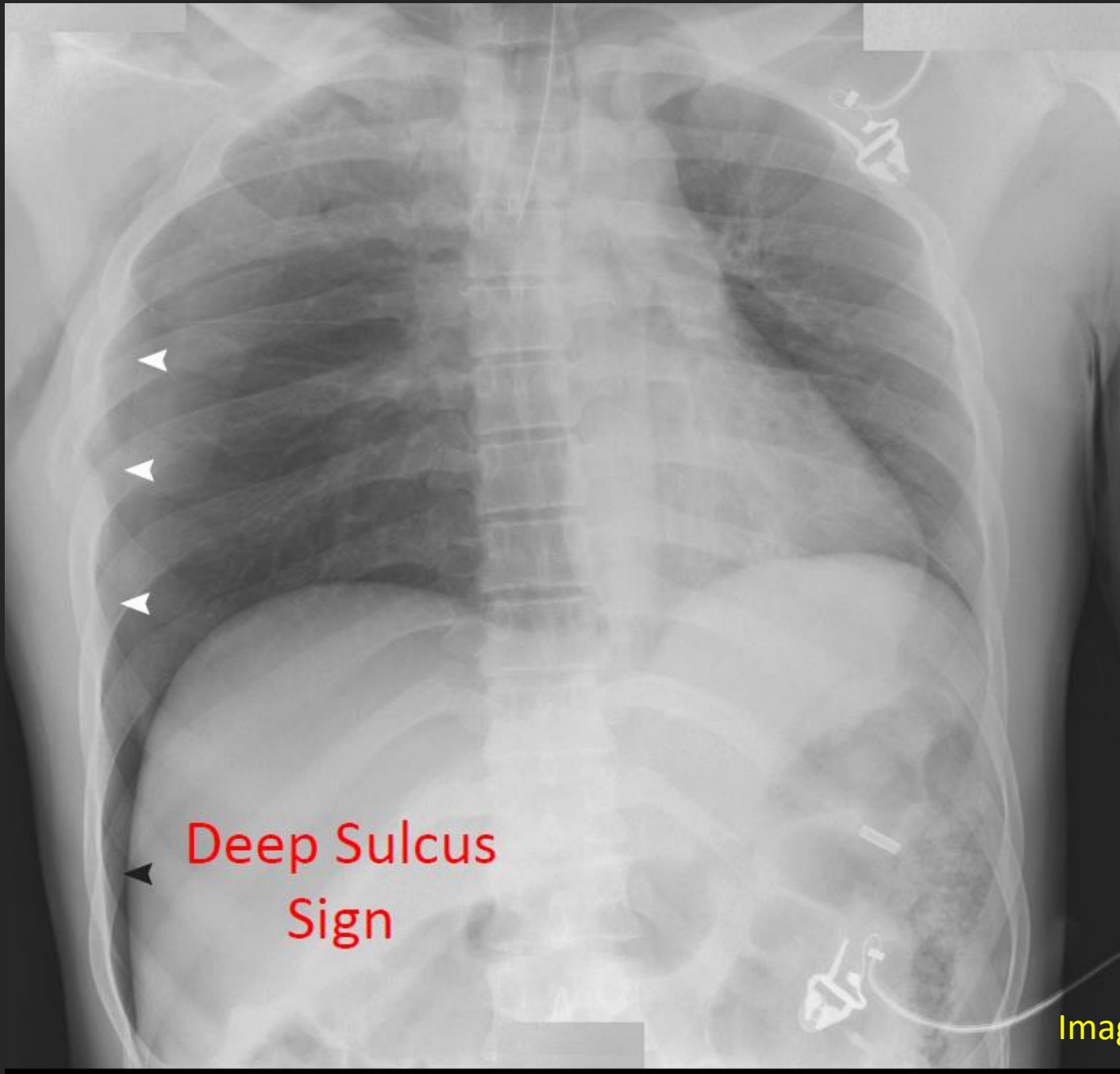
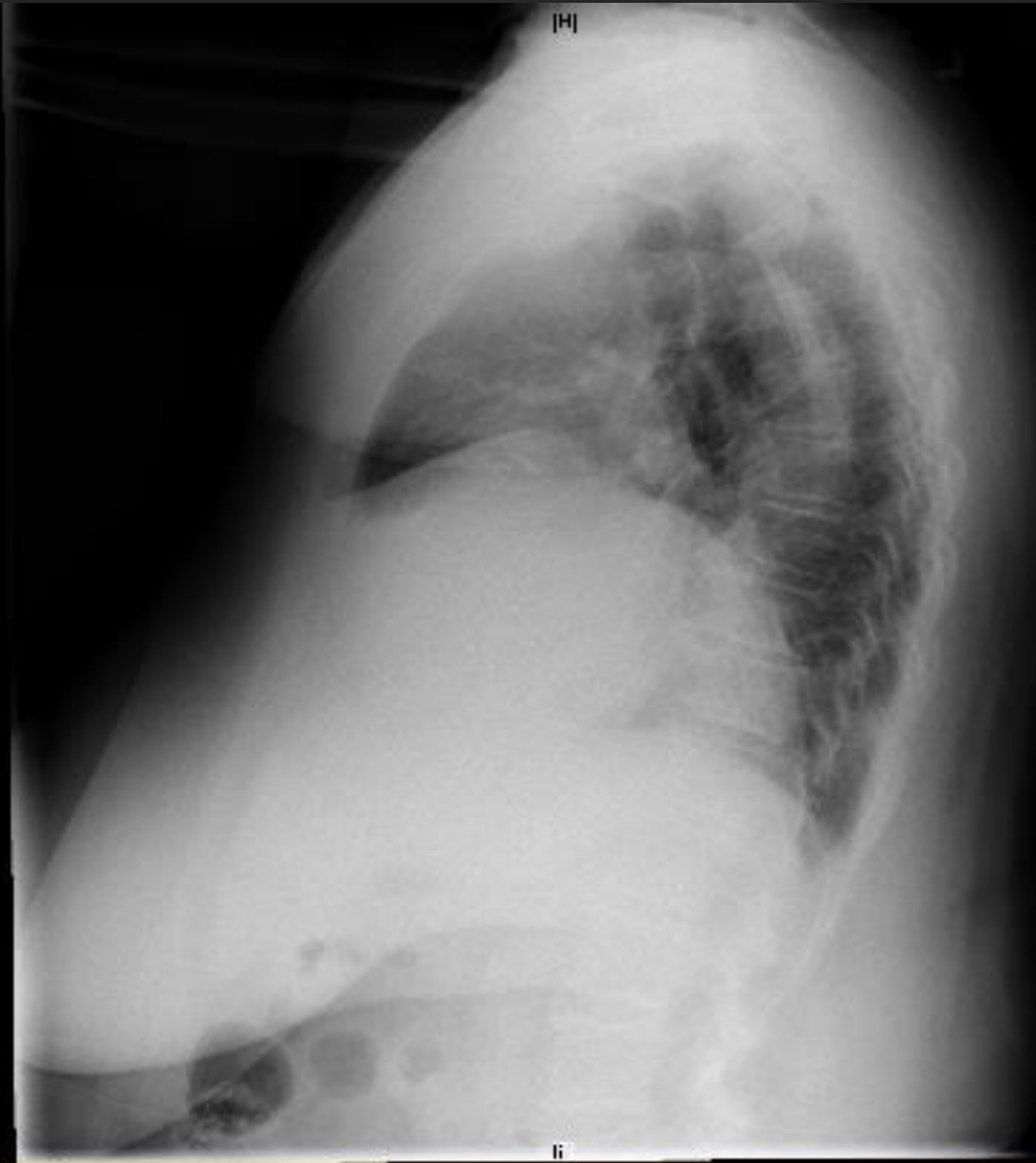
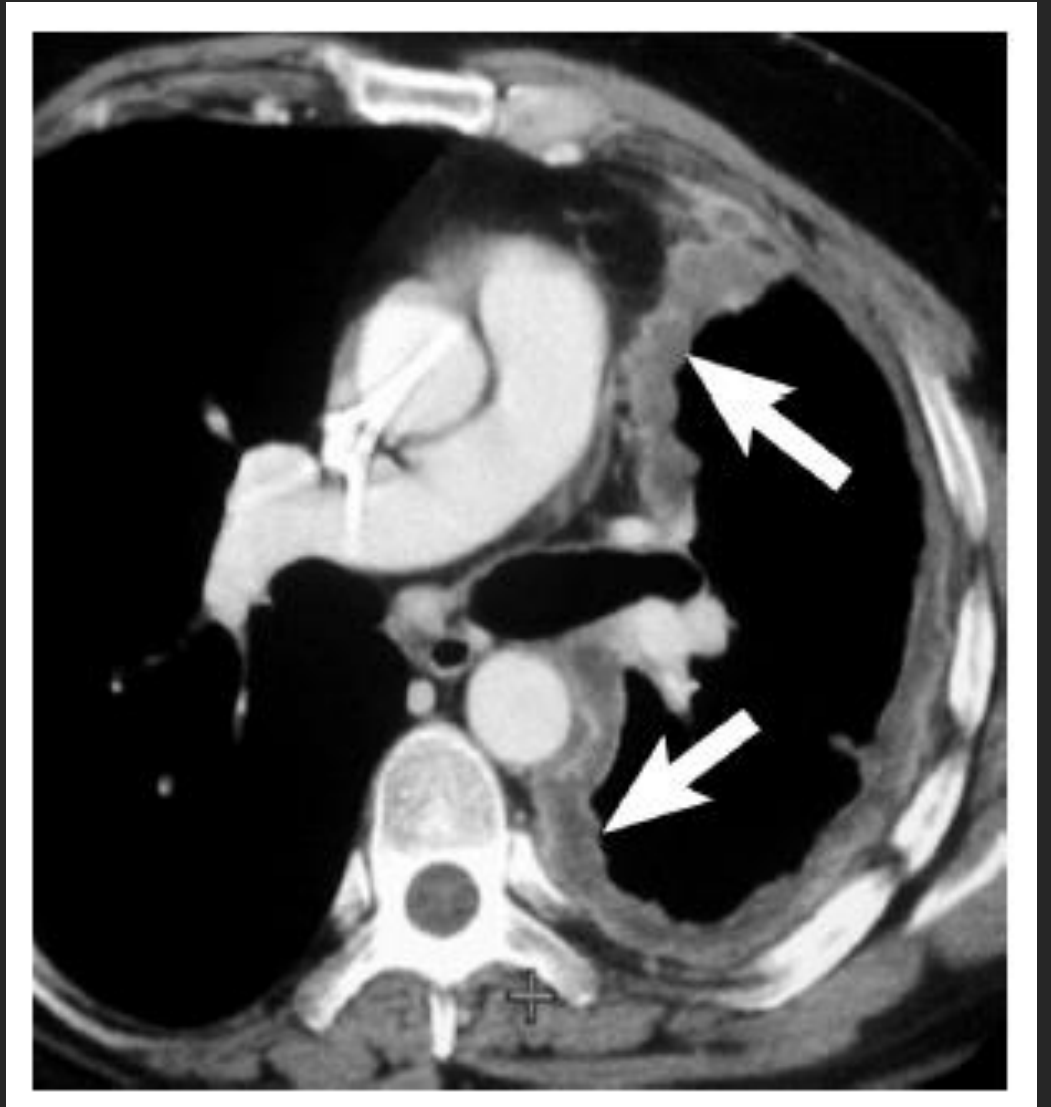


Image Courtesy of Dr. Carolyn Come





Diffuse Lung Processes

- Pay particular attention to history
- Can look at distribution and texture- BUT do not over-rely on the CXR
- ARDS, Pulmonary Edema, Pneumonias can have very variable patterns



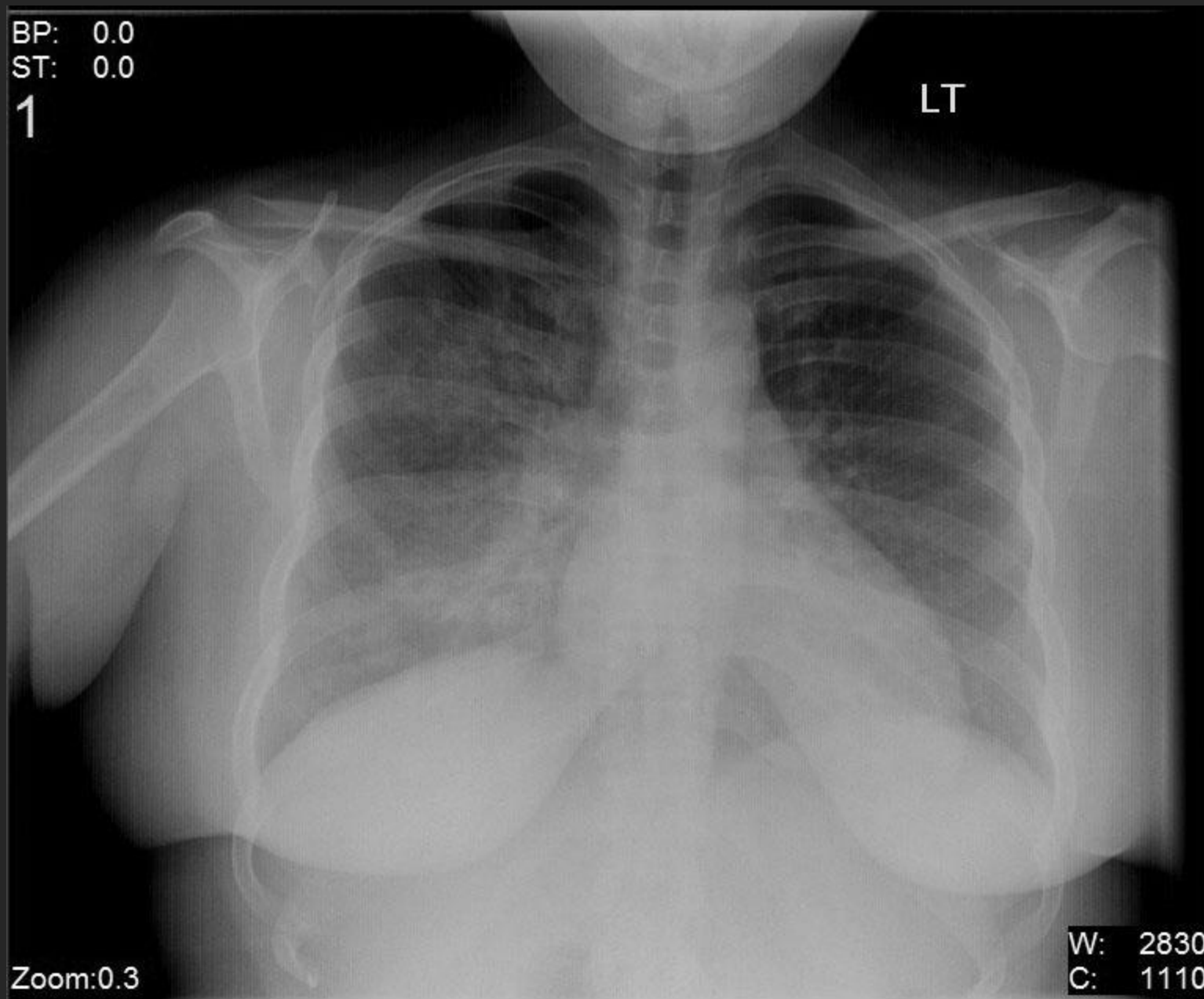


Image Courtesy of Dr. Carolyn Come

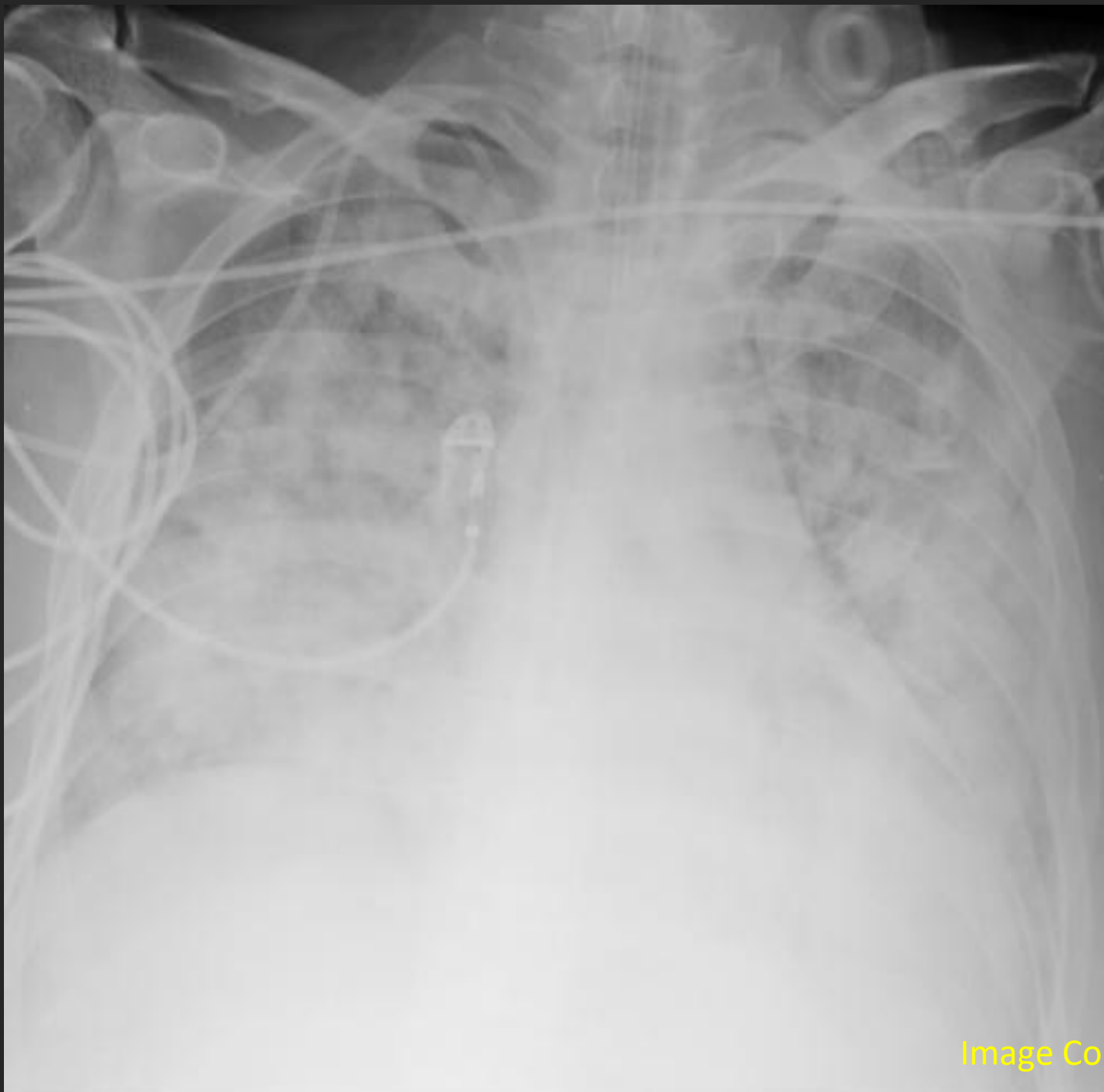


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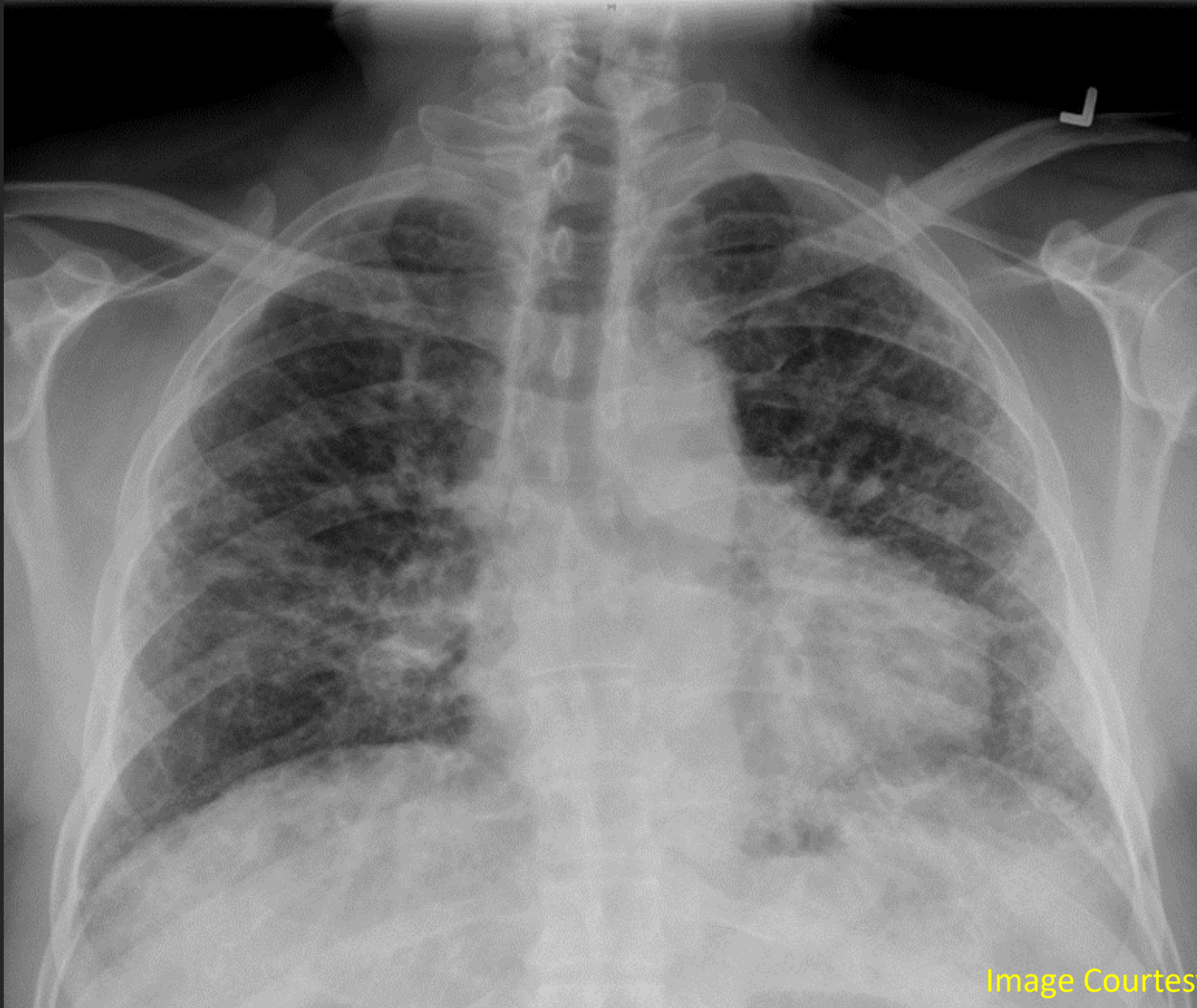
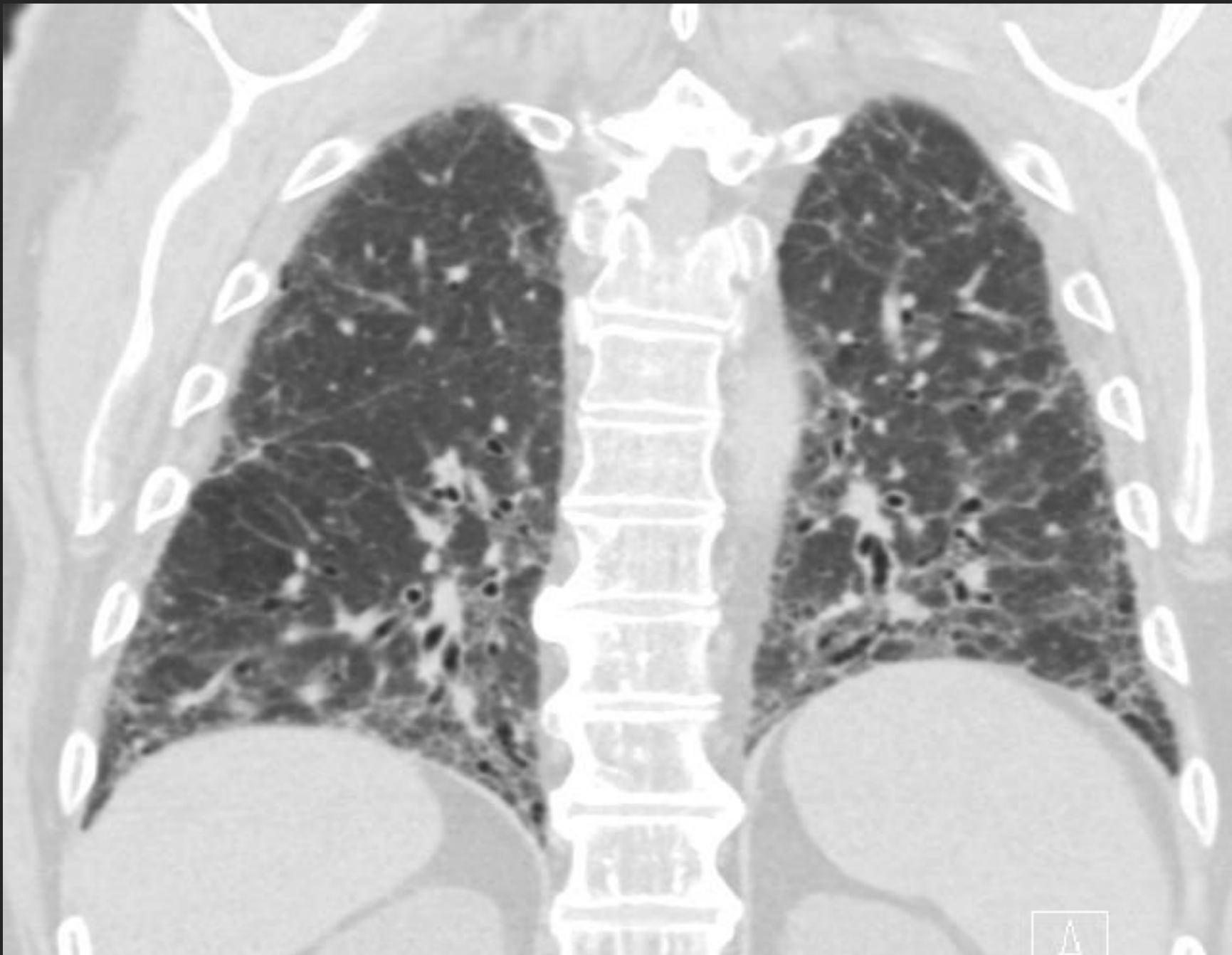


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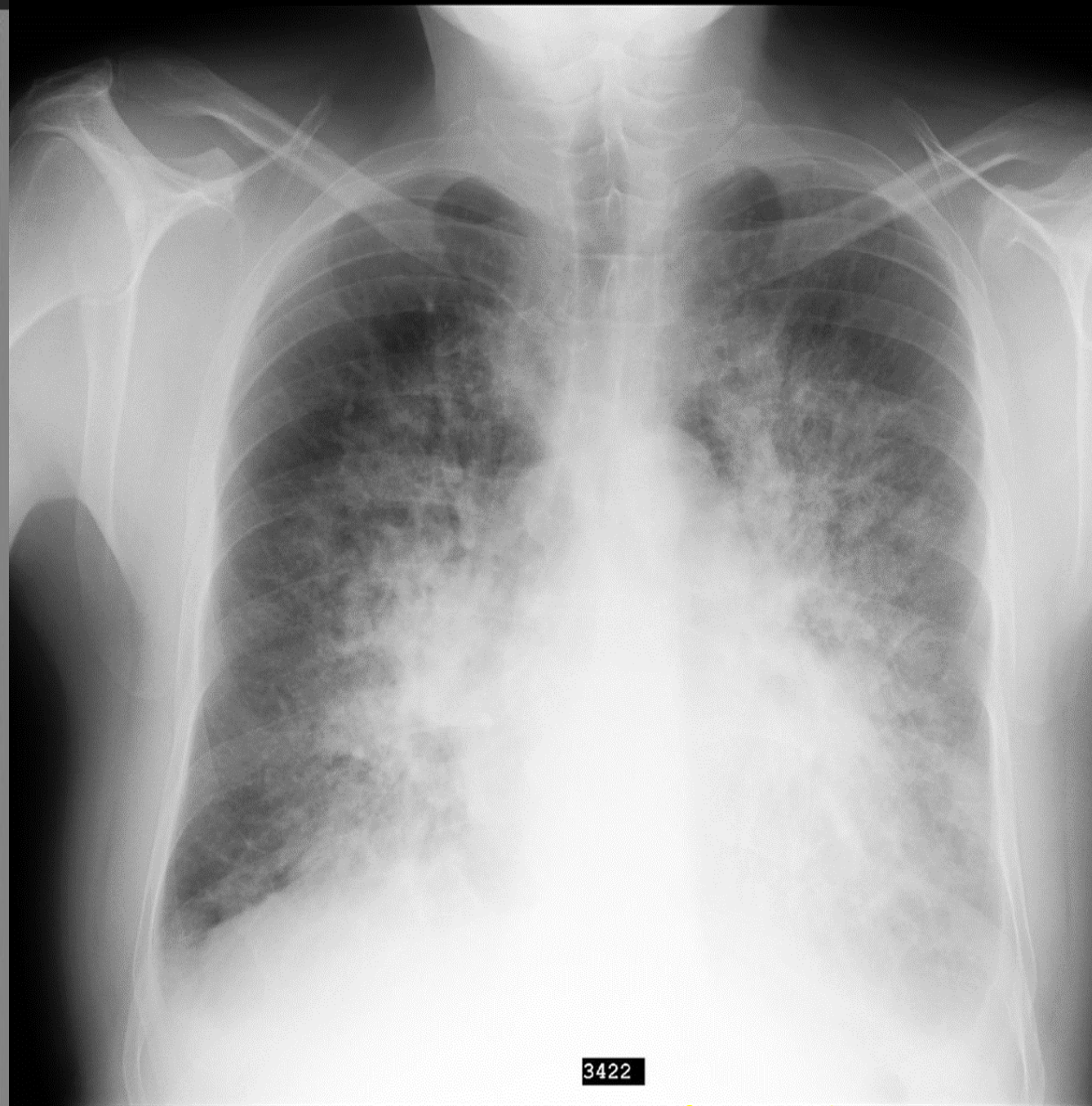






Pulmonary Venous Hypertension: Radiographic Features

- Upper zone vessel dilatation
- Interstitial edema
 - Septal (Kerley) lines
 - Peribronchial/perivascular edema
 - Hilar haze
 - Mottling of lung fields
- Alveolar edema
- Pleural effusions/thickening of fissures



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Image Courtesy of Dr. Carolyn Come

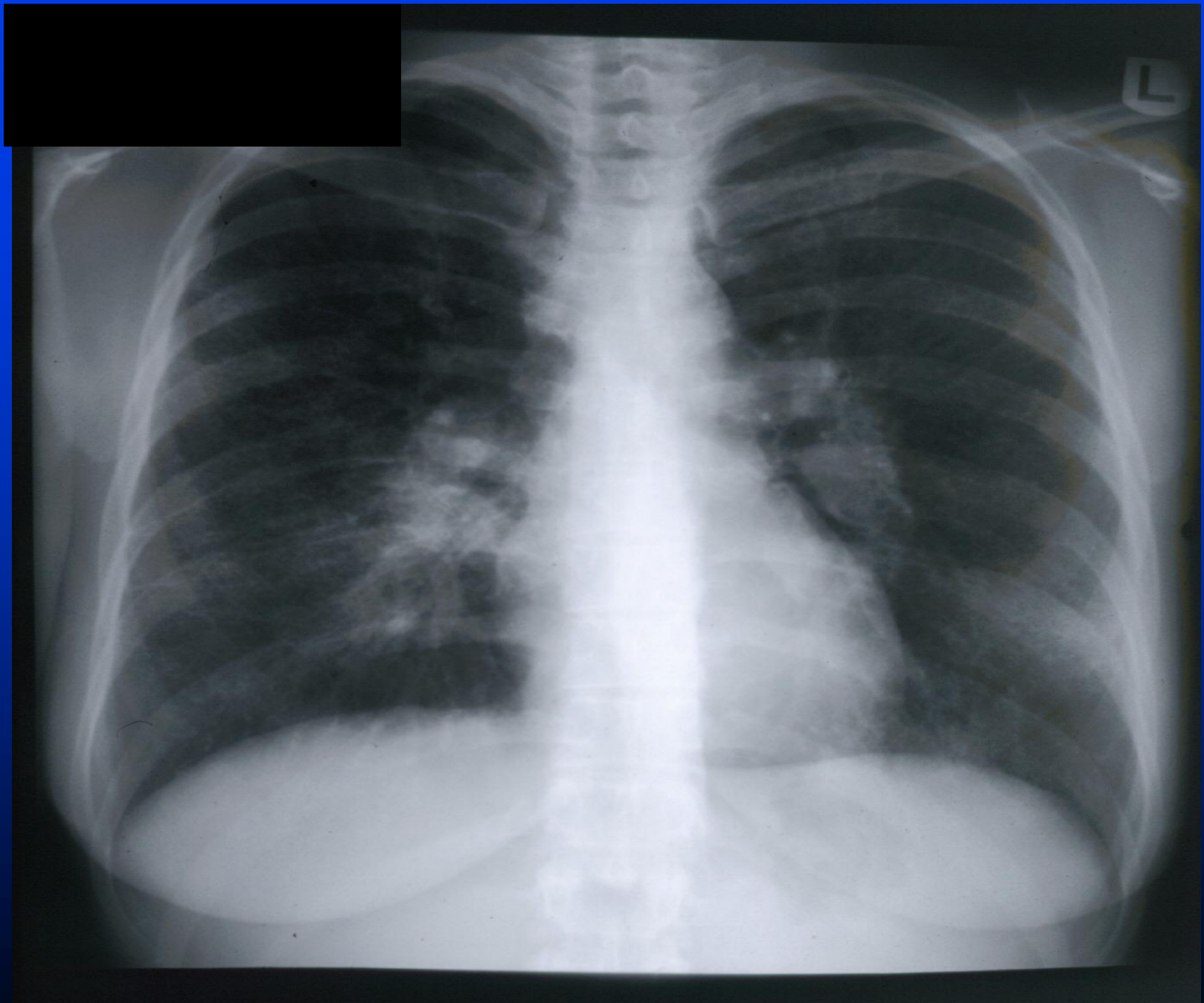


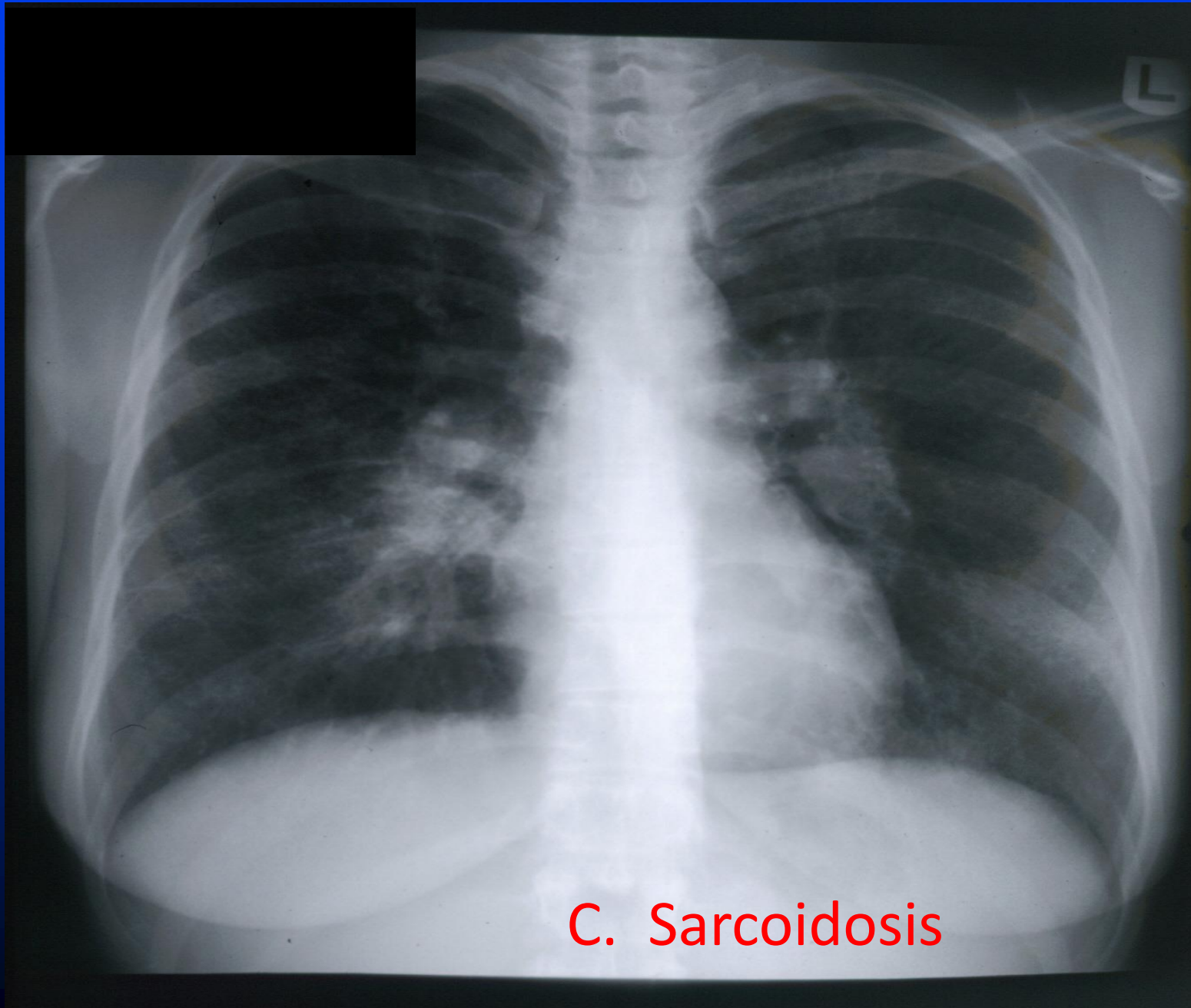
I. Chronic Interstitial Lung Disease

The patient presents to you with progressive dyspnea on exertion of more than 6 weeks' duration and a non-productive cough. On chest examination, you auscultate bilateral posterior inspiratory crackles. On further questioning, you obtain the additional history of:

I. Chronic Interstitial Lung Disease – Case Histories

- A. Work cleaning and insulating boilers for 30 years.
- B. Work as a stone-cutter in a quarry. for 20 years, now retired for 10 years.
- C. Prior episodes of erythema nodosum and uveitis.
- D. Inoperable gastric cancer.





C. Sarcoidosis





Advanced Sarcoidosis

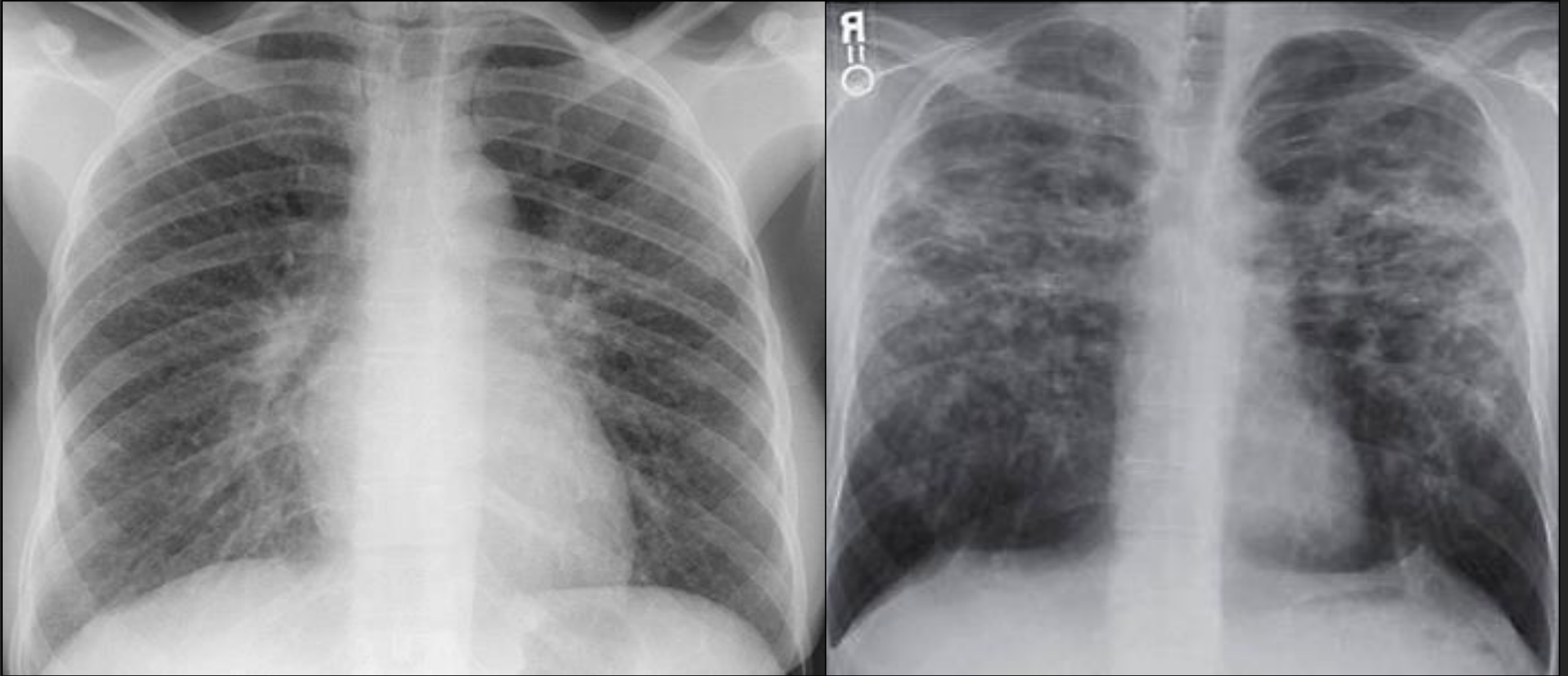
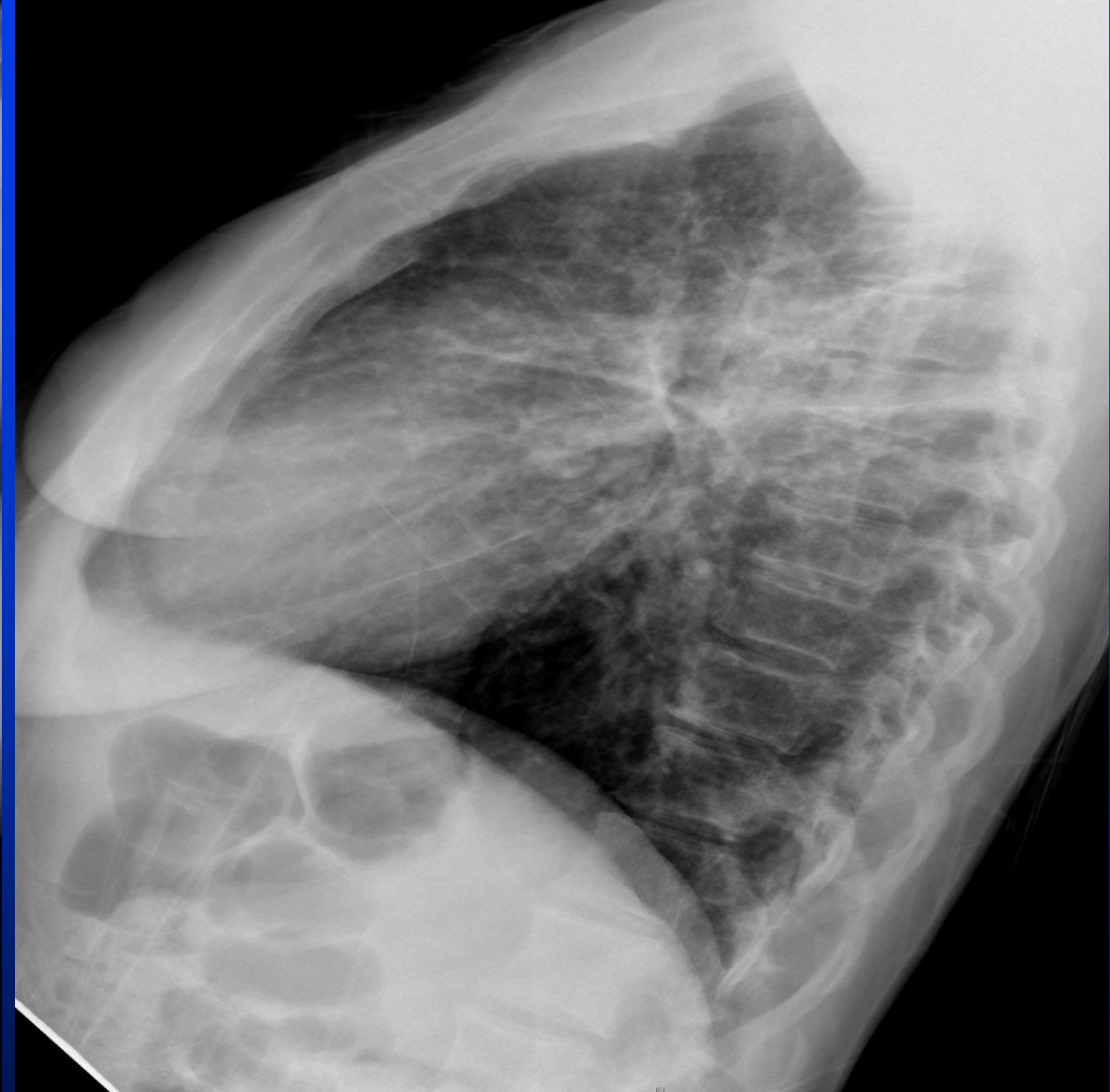


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Sarcoidosis with upper lobe predominance

Bilateral Hilar Adenopathy: Differential Dx

- Sarcoidosis
- Berylliosis
- Lymphoma
- Granulomatous disease (e.g., TB)
- Metastatic cancer

Sarcoidosis: Radiographic Features

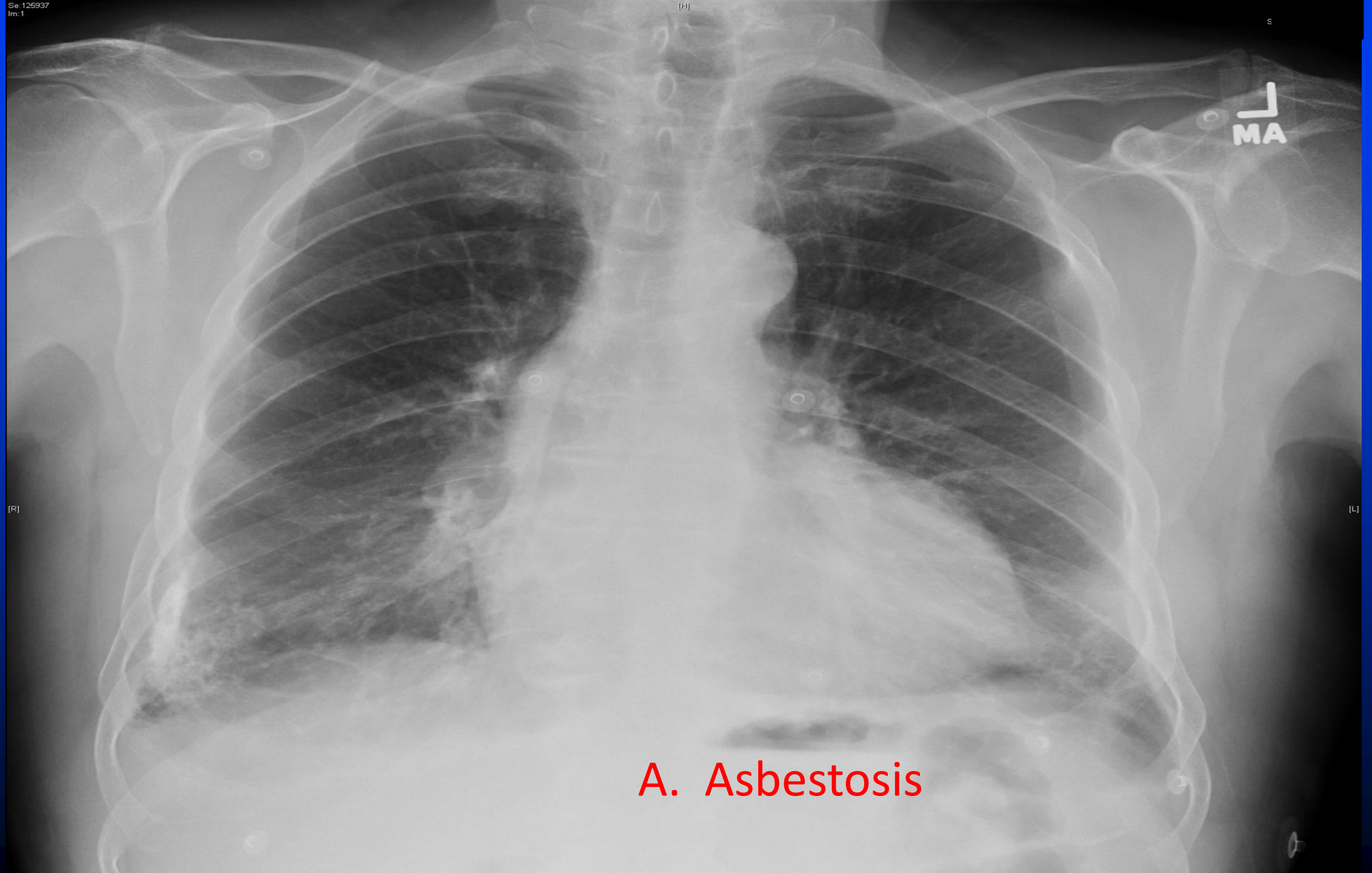
- Myriad radiographic patterns: linear, tree- in-bud nodularity, miliary, larger nodules, ground-glass opacities; fibrosis, etc.
- Thickening of bronchovascular bundles associated with obstructive pattern on PFTs
- Active disease is PET-positive
- Often upper lobe predominant

MA

[R]

[L]





A. Asbestosis

Se:3
Im:47

[A]

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[L]

75mL Ultravist 300

[P]

C-600
VW2000

A. Asbestosis



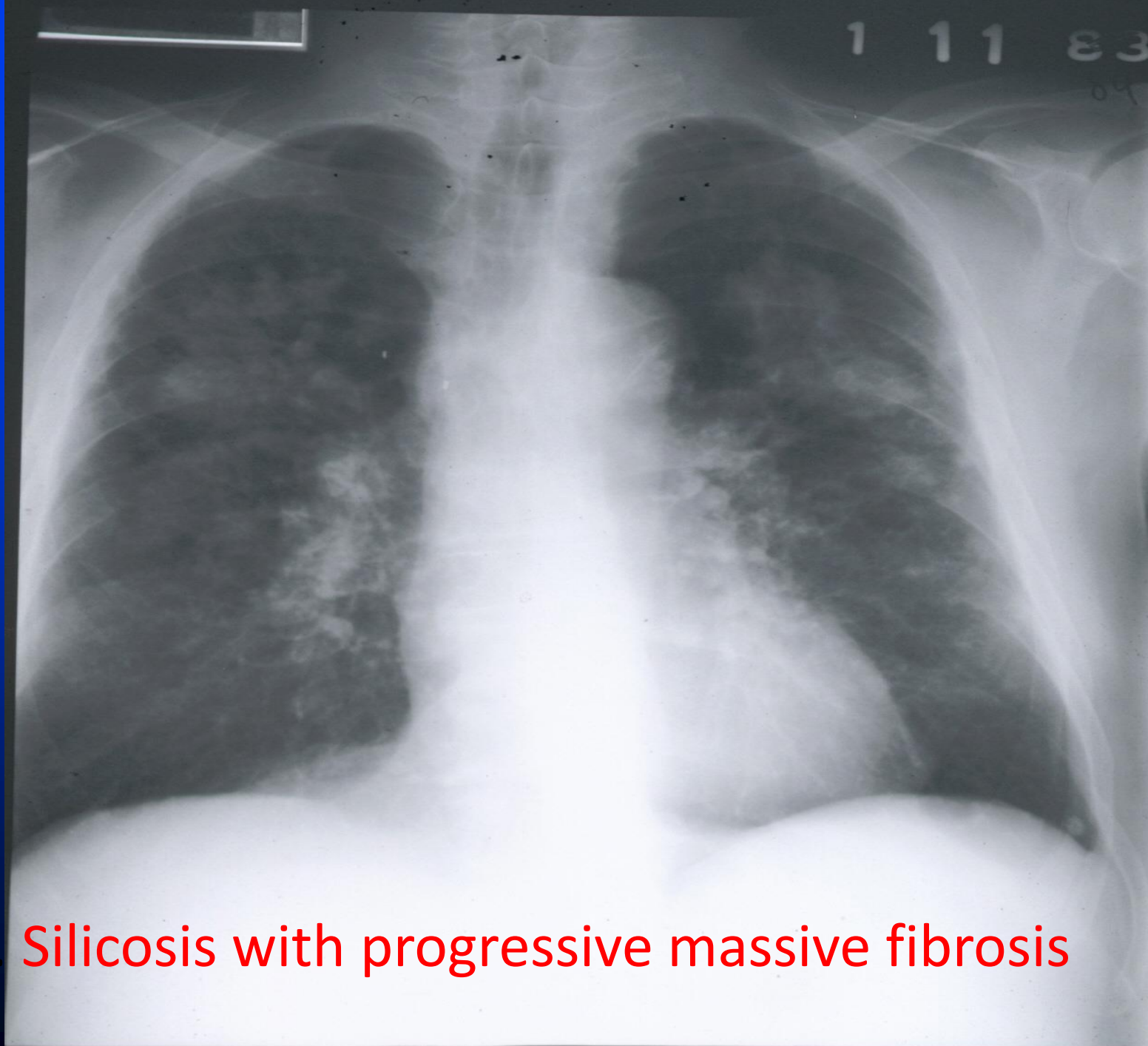
“Pop Quiz”: The Most Common Malignancy Associated with Asbestos Exposure Is Which of the Following:

- A. Hamartoma
- B. Bronchial Adenoma
- C. Bronchogenic carcinoma (lung cancer)
- D. Mesothelioma

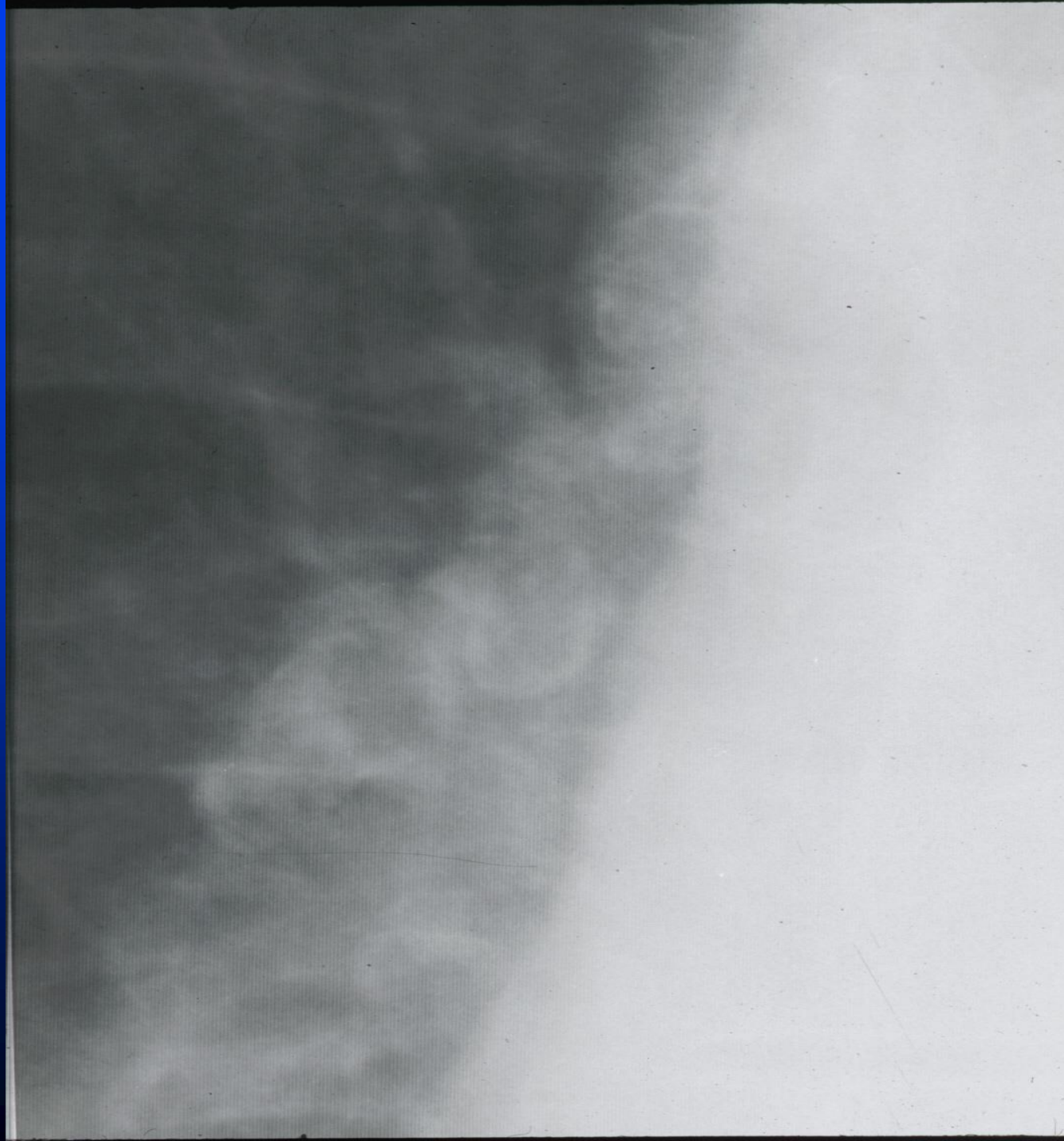
“Pop Quiz”: The Most Common Malignancy Associated with Asbestos Exposure Is Which of the Following:

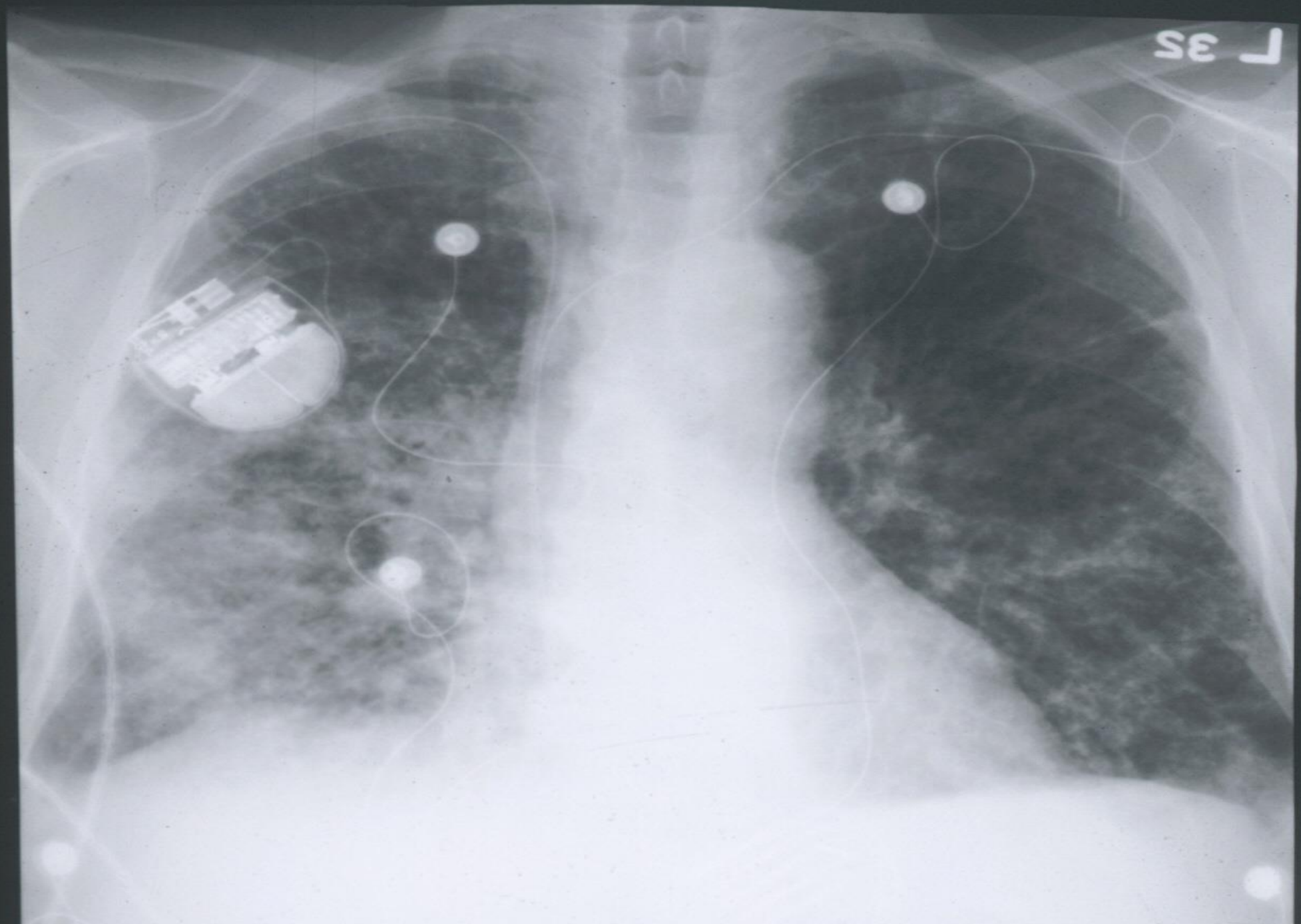
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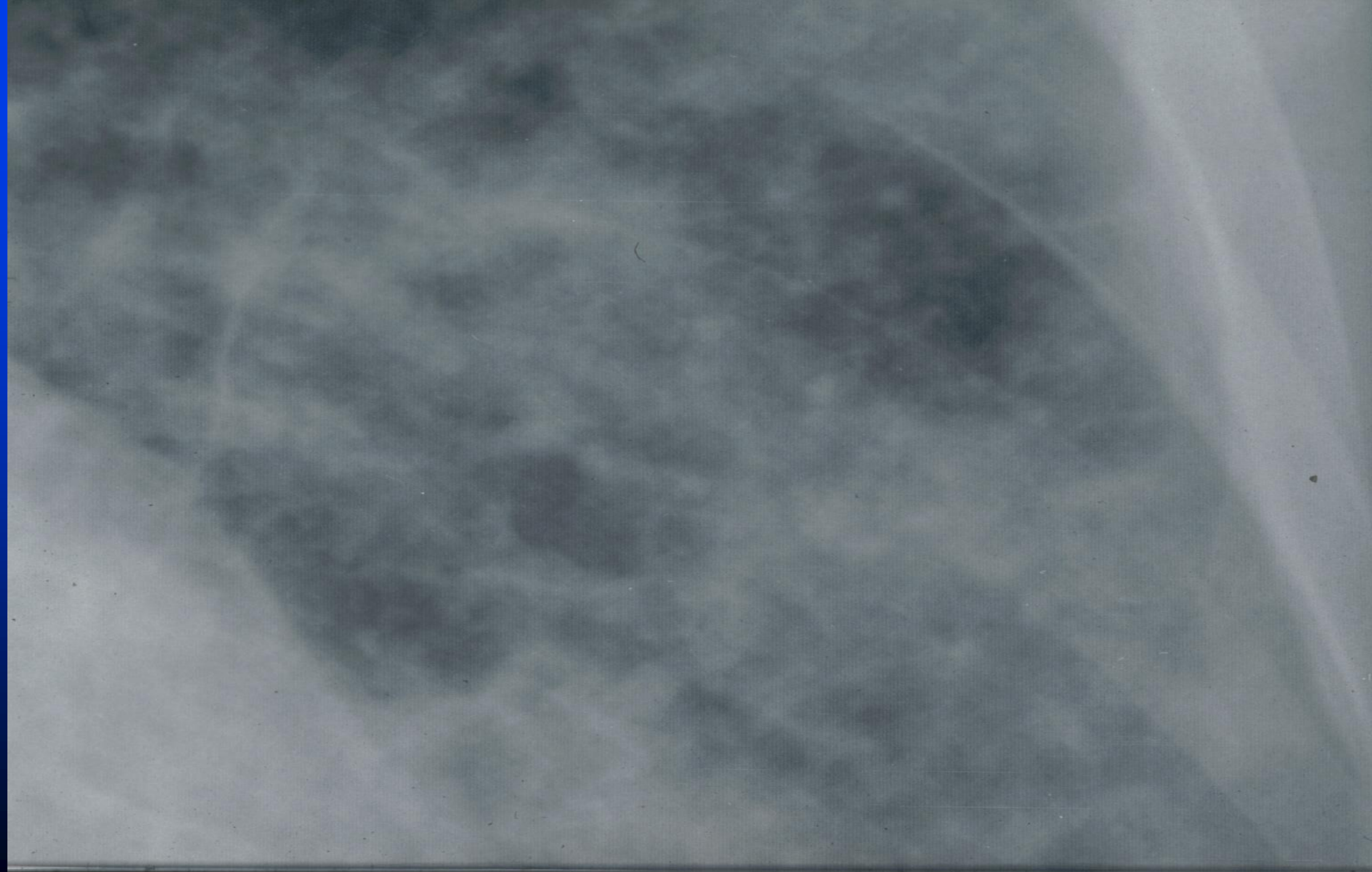


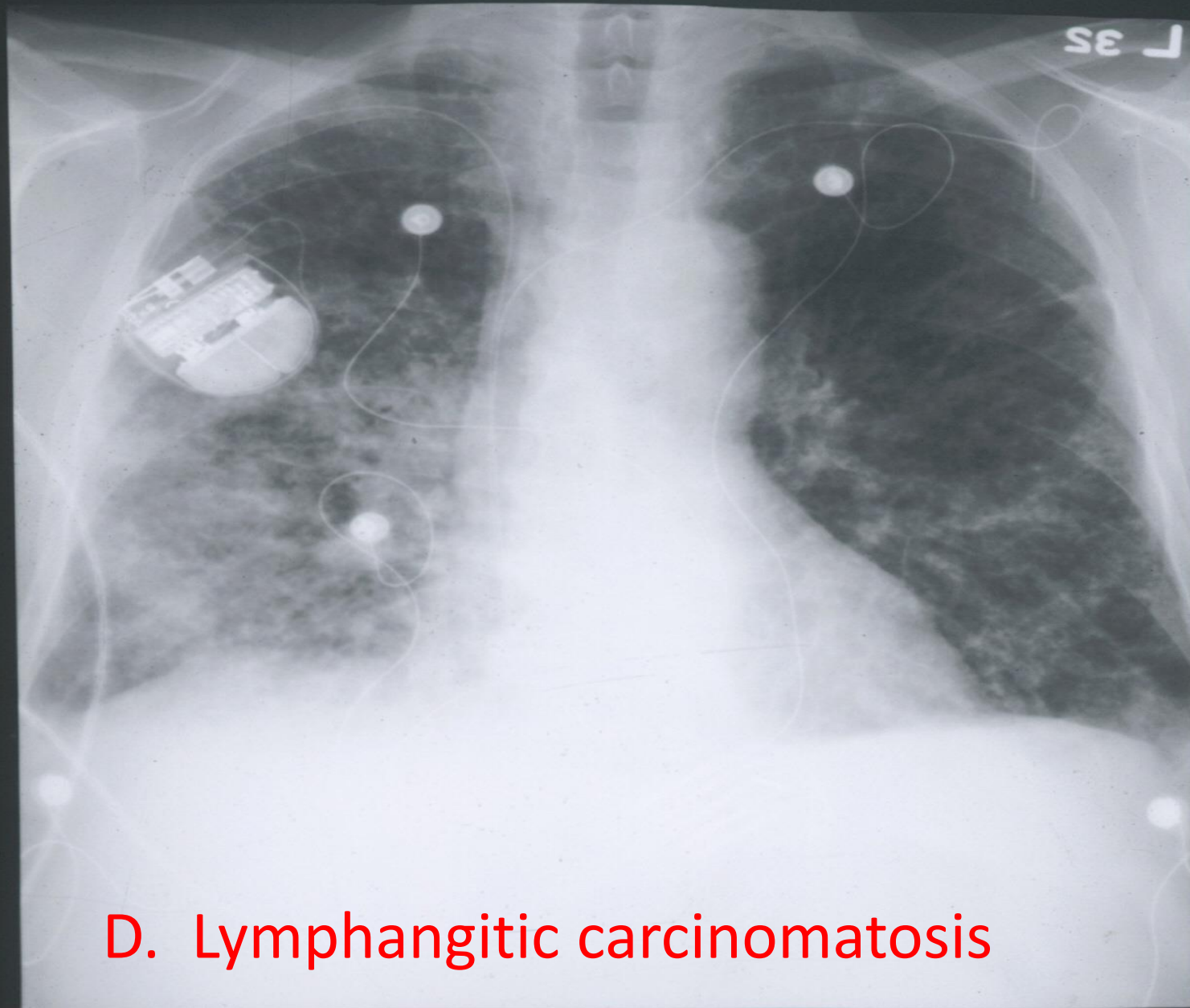


B. Silicosis with progressive massive fibrosis

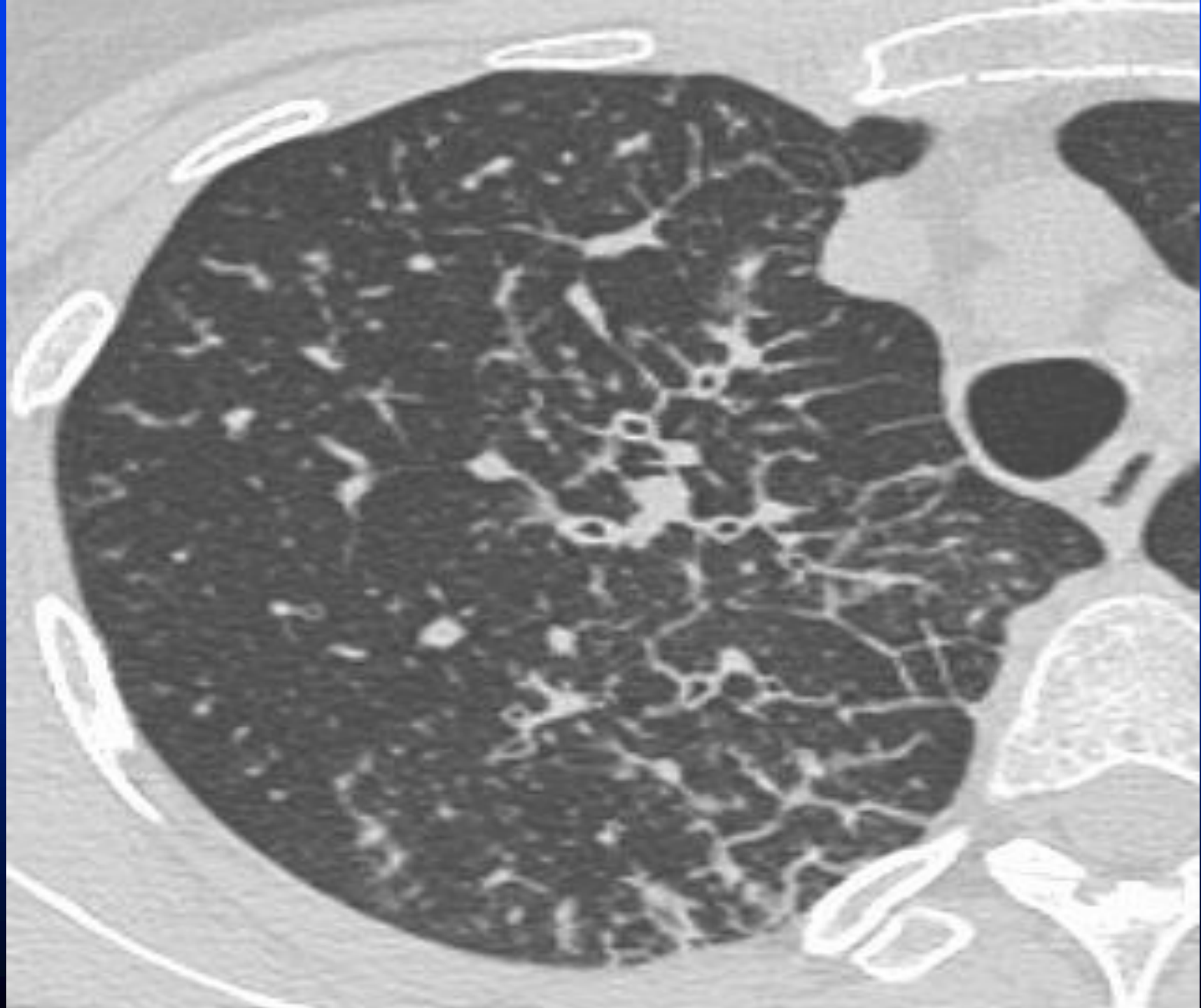








D. Lymphangitic carcinomatosis



II. Obstructive Lung Diseases

This patient complains of long-standing shortness of breath, especially on exercise, and a daily cough. By reviewing the patient's history, you learn that:

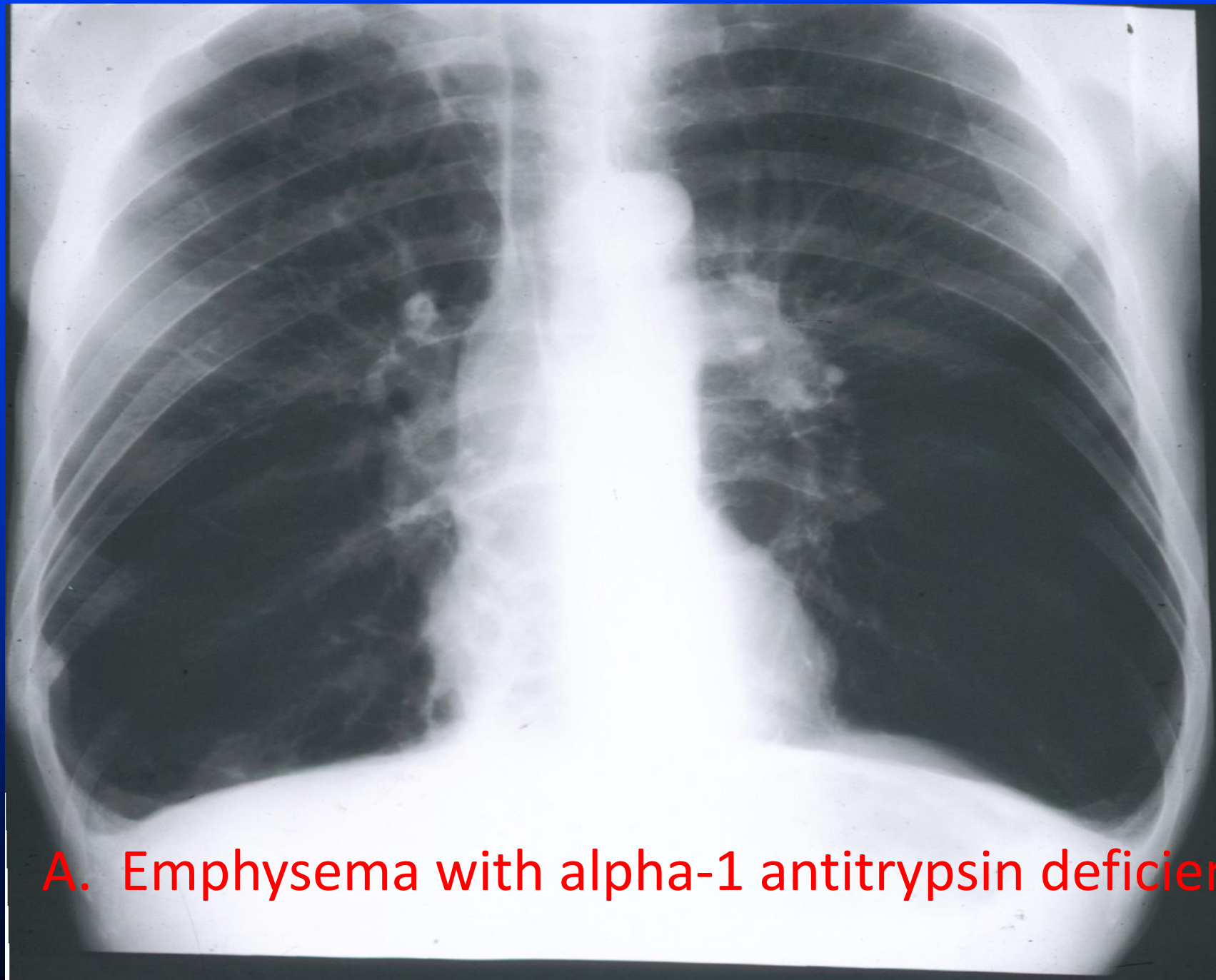
II. Obstructive Lung Diseases – Case Histories

- A. The patient's father and older brother died in their 40's of emphysema.
- B. The patient has had a chronic productive cough and recurrent sinusitis since childhood and now presents for evaluation of infertility.

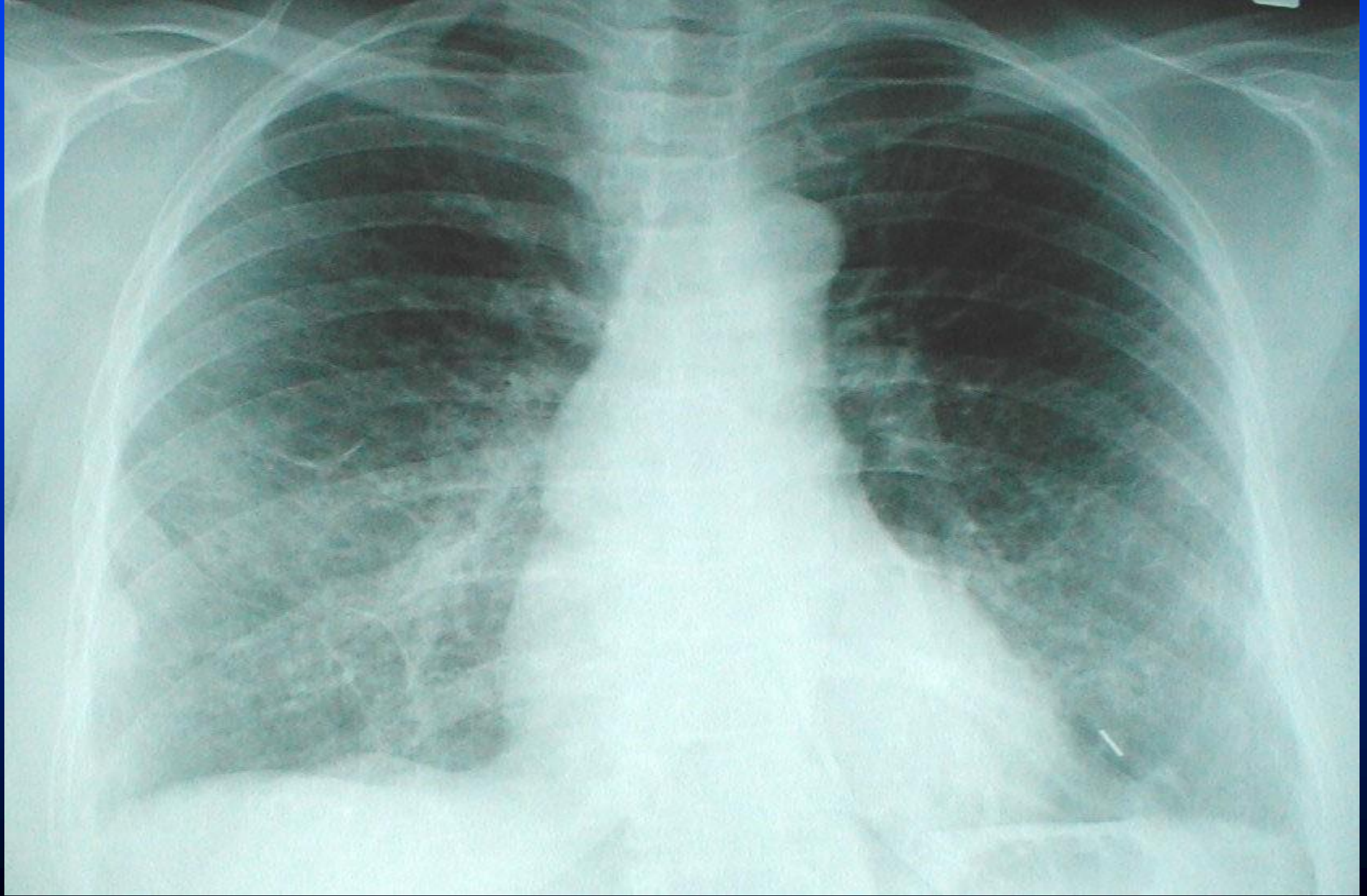
II. Obstructive Lung Diseases – Case Histories (cont.)

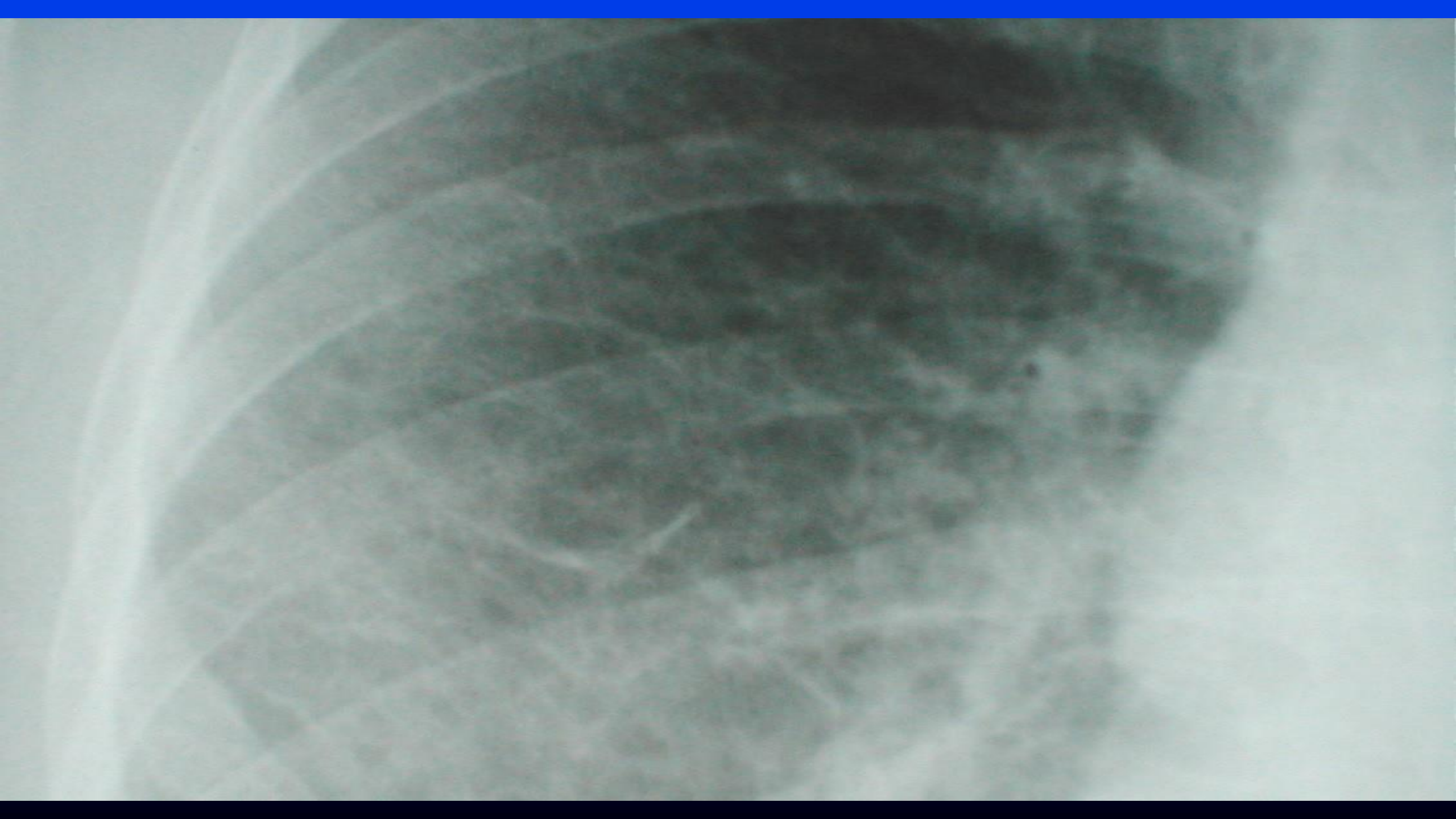
- C. The patient, a non-smoker, had recurrent pneumothoraces in the past and a pleural effusion that was said to look "milky" when drained.
- D. The patient complains of weight loss, chronic diarrhea, and sinusitis. Mucoid pseudomonas has been grown from the sputum.

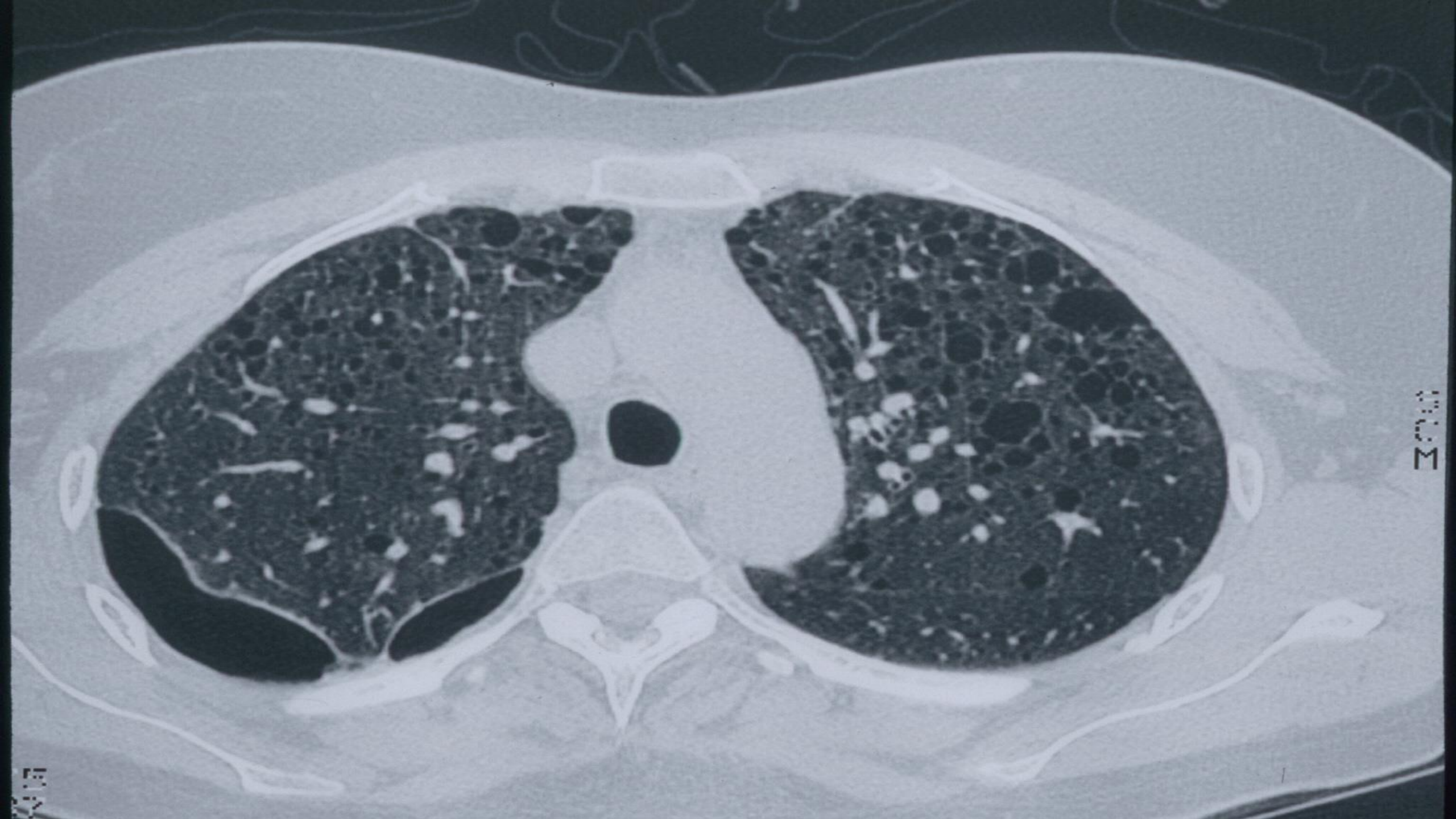


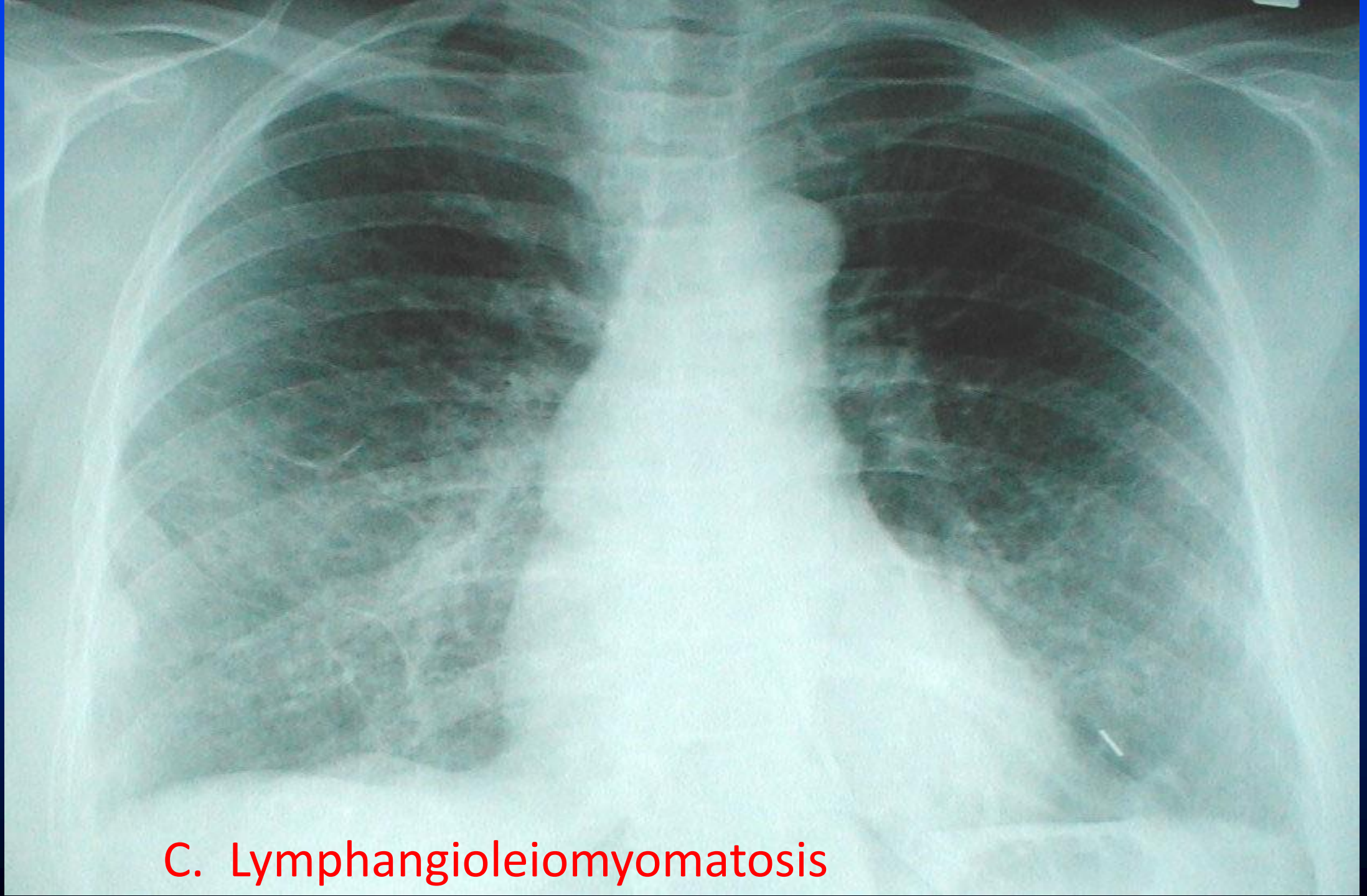


A. Emphysema with alpha-1 antitrypsin deficiency





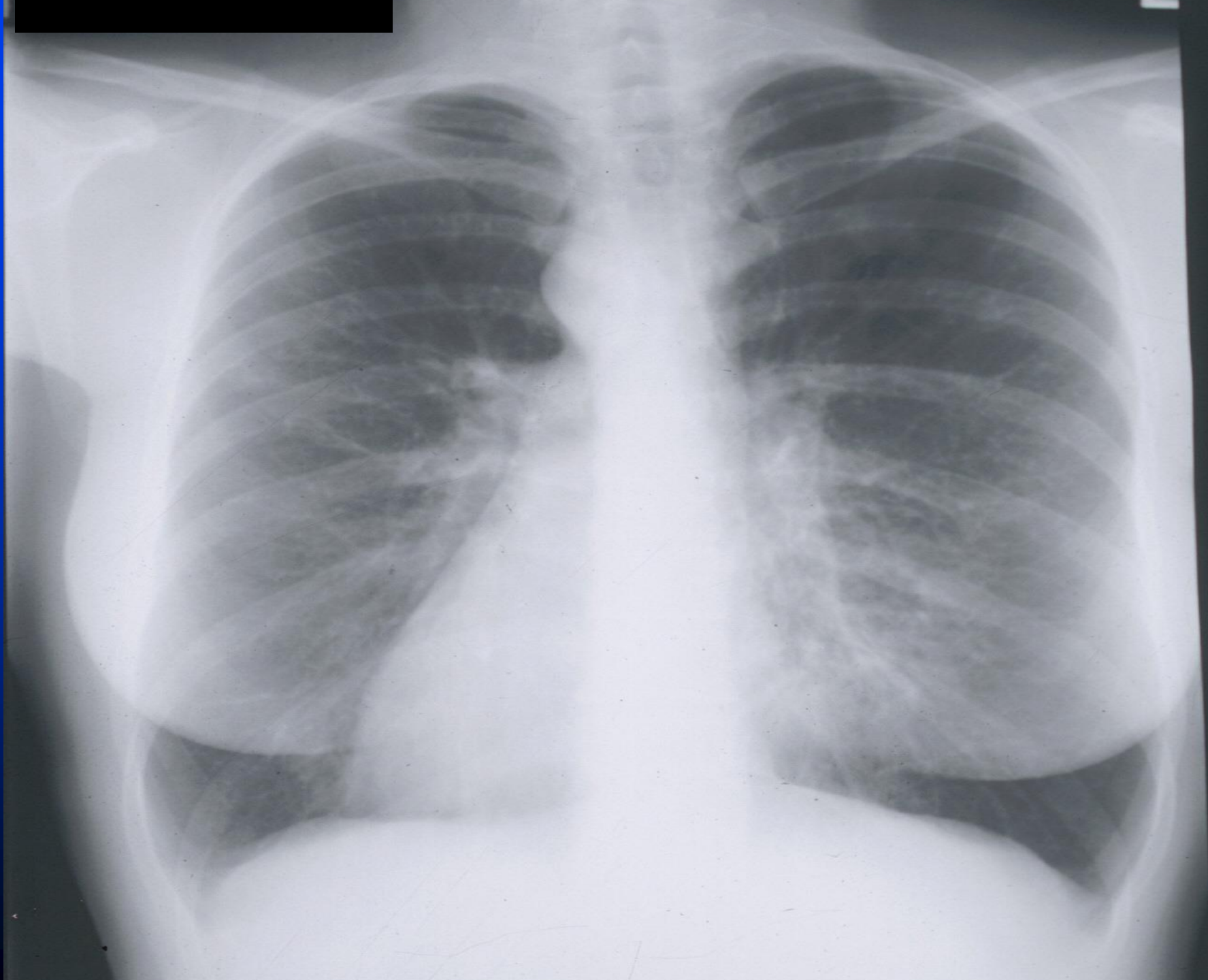


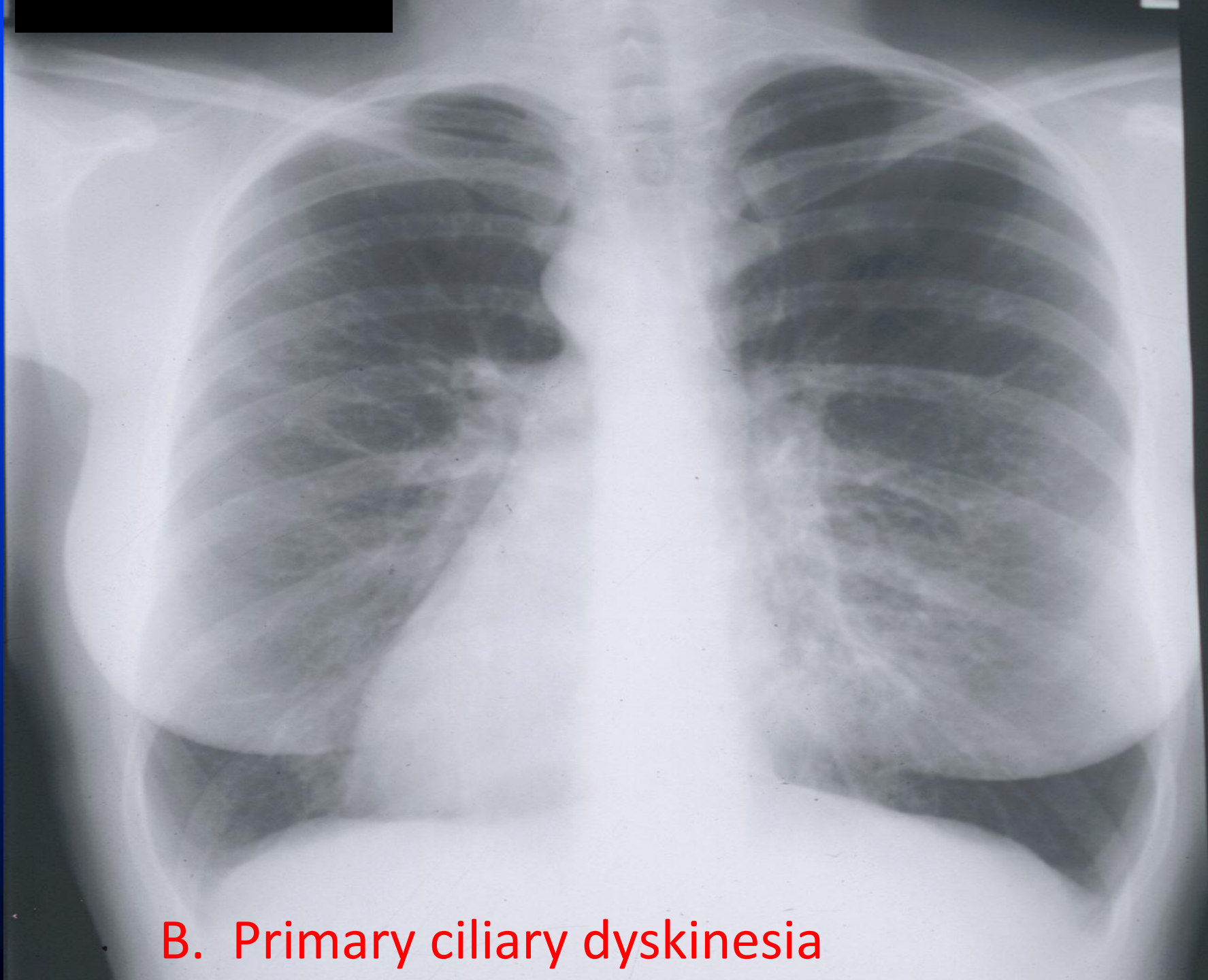


C. Lymphangioleiomyomatosis

Lymphangioliomyomatosis

- **Biology:** Inactivation to tuberous sclerosis complex (TSC 1 and 2) genes with upregulation of mammalian target of rapamycin (mTOR) pathway.
- **Association:** renal angiomyolipomas.
- **Diagnosis:** elevated serum vascular endothelial growth factor D (VEGF-D).
- **Treatment:** sirolimus (rapamycin).

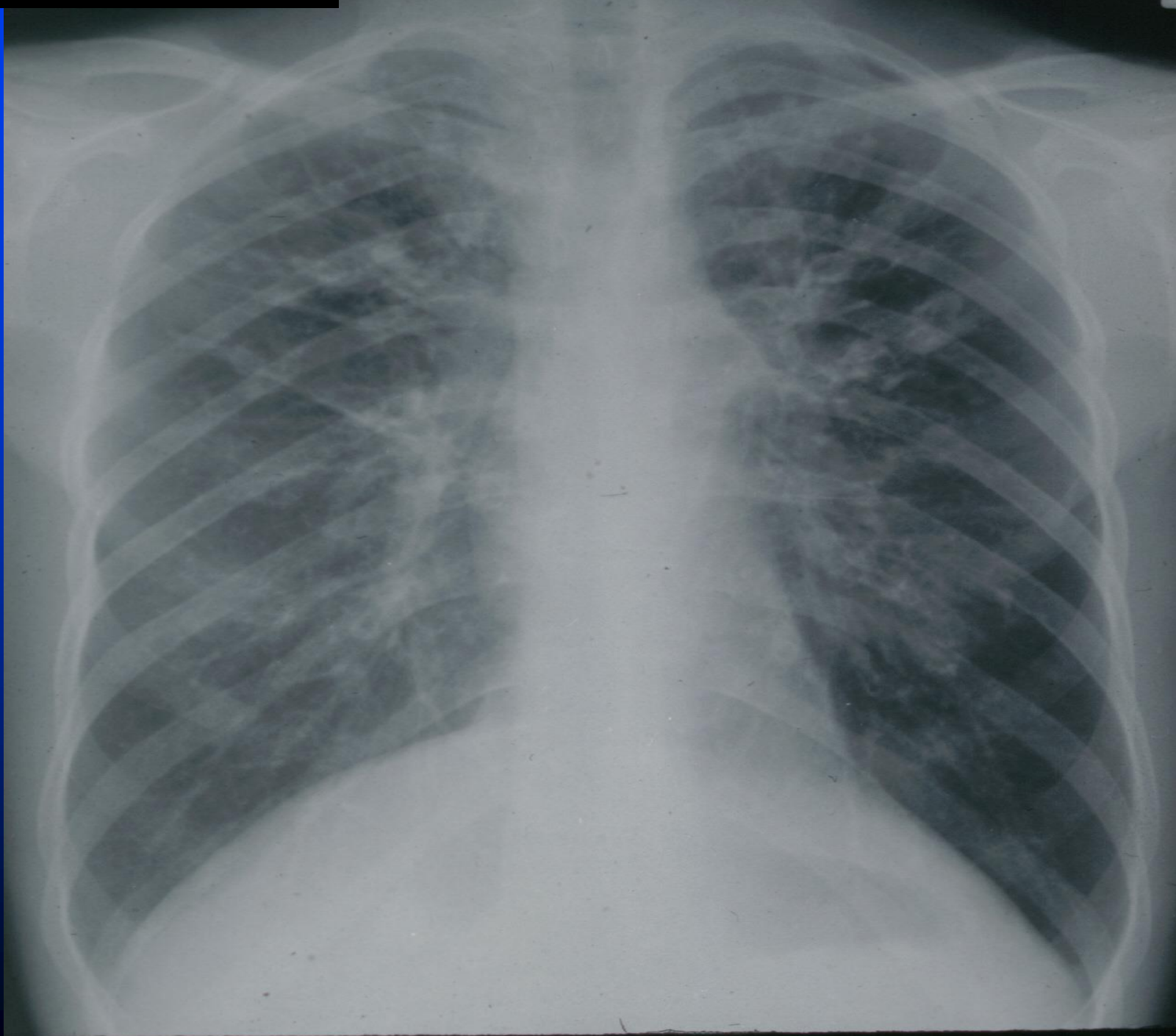




B. Primary ciliary dyskinesia

Primary Ciliary Dyskinesia (Immotile Cilia Syndrome) (Kartagener's Syndrome)

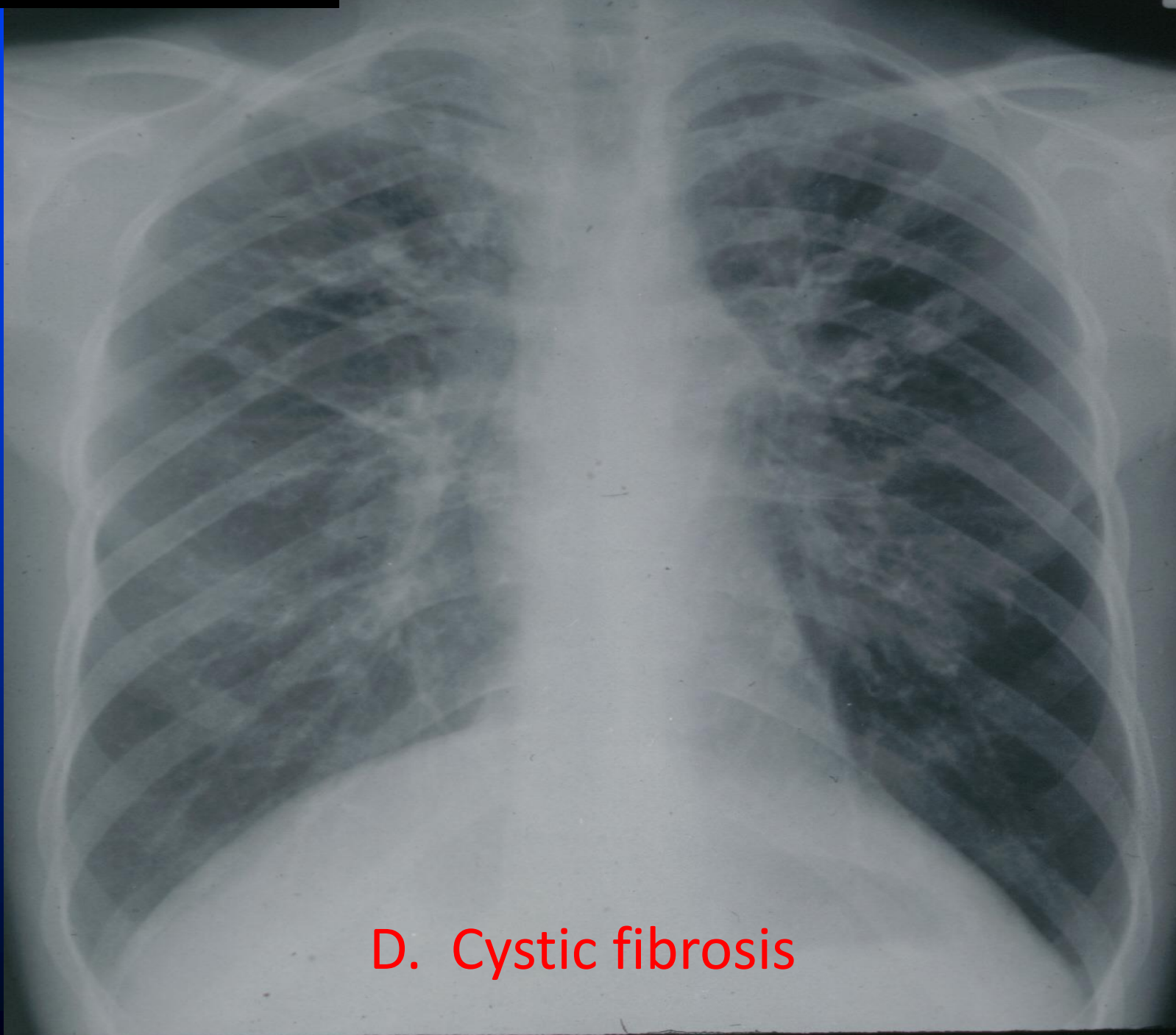
- Bronchiectasis
- Sinusitis
- Situs inversus (50%)
- Immotile sperm
 - Ultrastructural and/or functional abnormality of cilia



[R]

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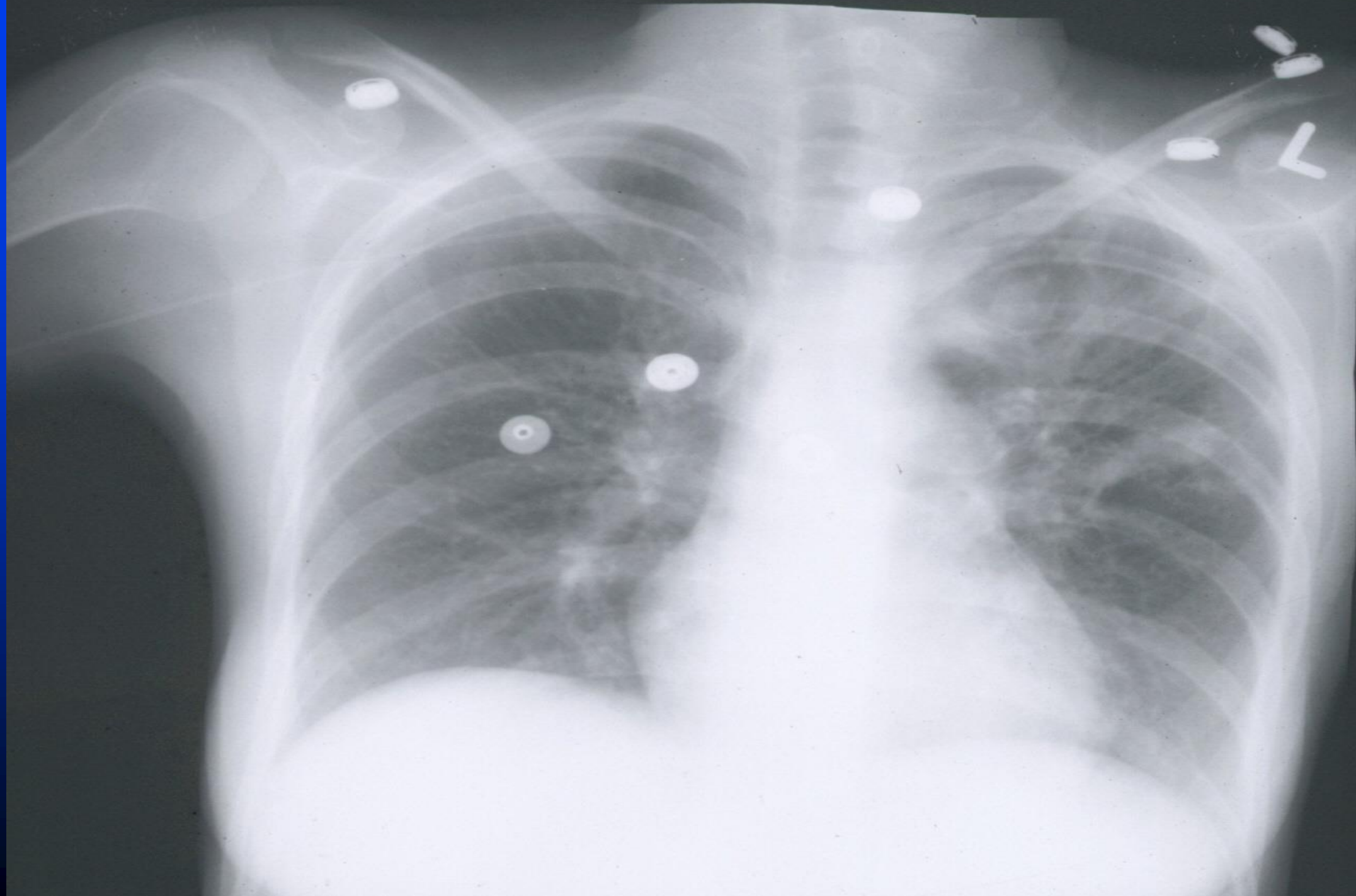
D. Cystic fibrosis

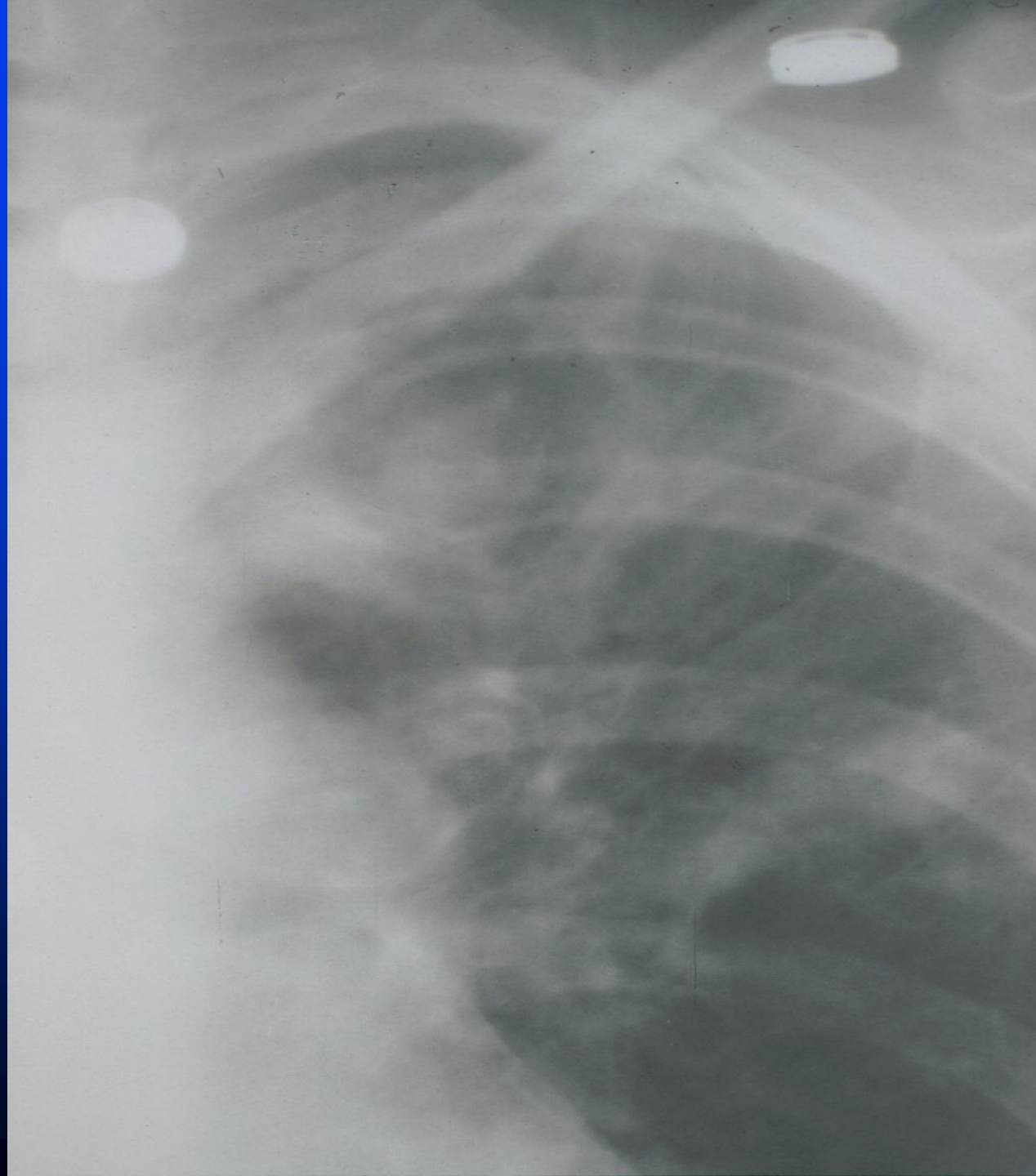
Fever and Pulmonary Infiltrates

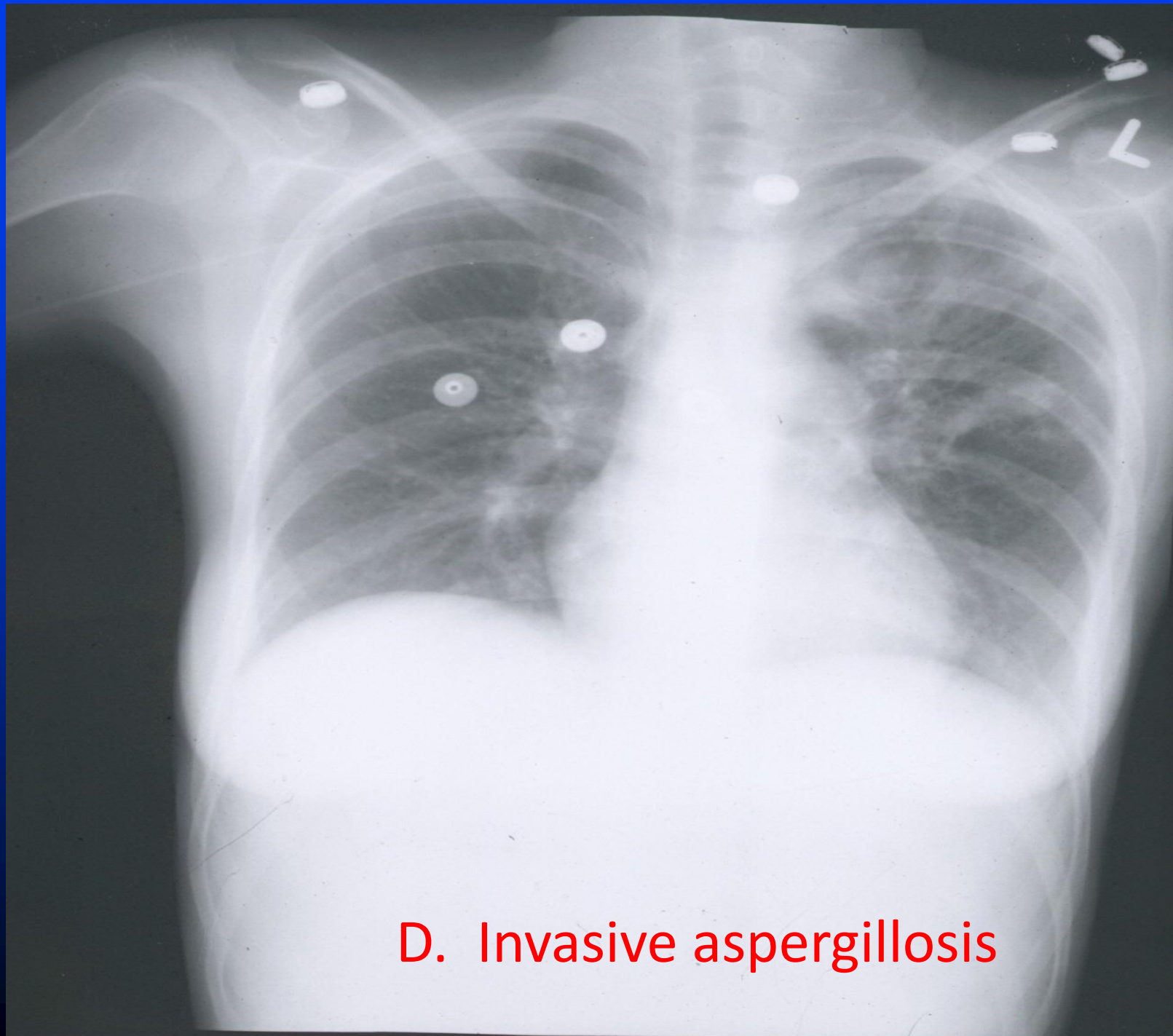
Immunocompromised/Chemotherapy/Radiation:

Clinical and Radiographic Considerations

- Diffuse vs. (multi-)focal infiltrates
 - e.g., PCP/viral vs. gram-negative bacterial
- Nature of immunocompromise
 - e.g., splenectomy vs. neutropenia
- Time of onset and tempo of illness
 - e.g., timing after RTx or BMT;
 - e.g., tempo of bacterial vs. mycobacterial infection.



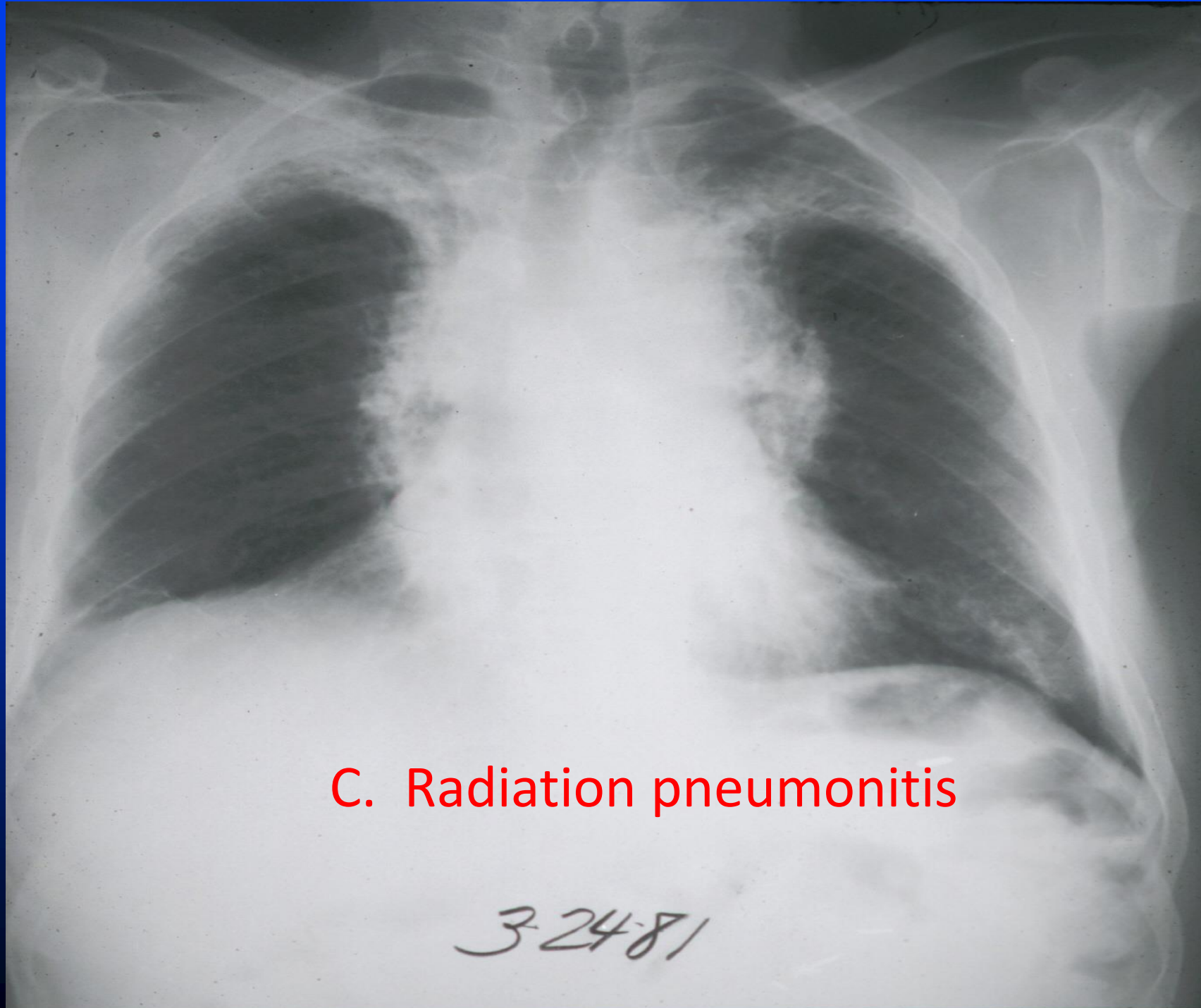




D. Invasive aspergillosis







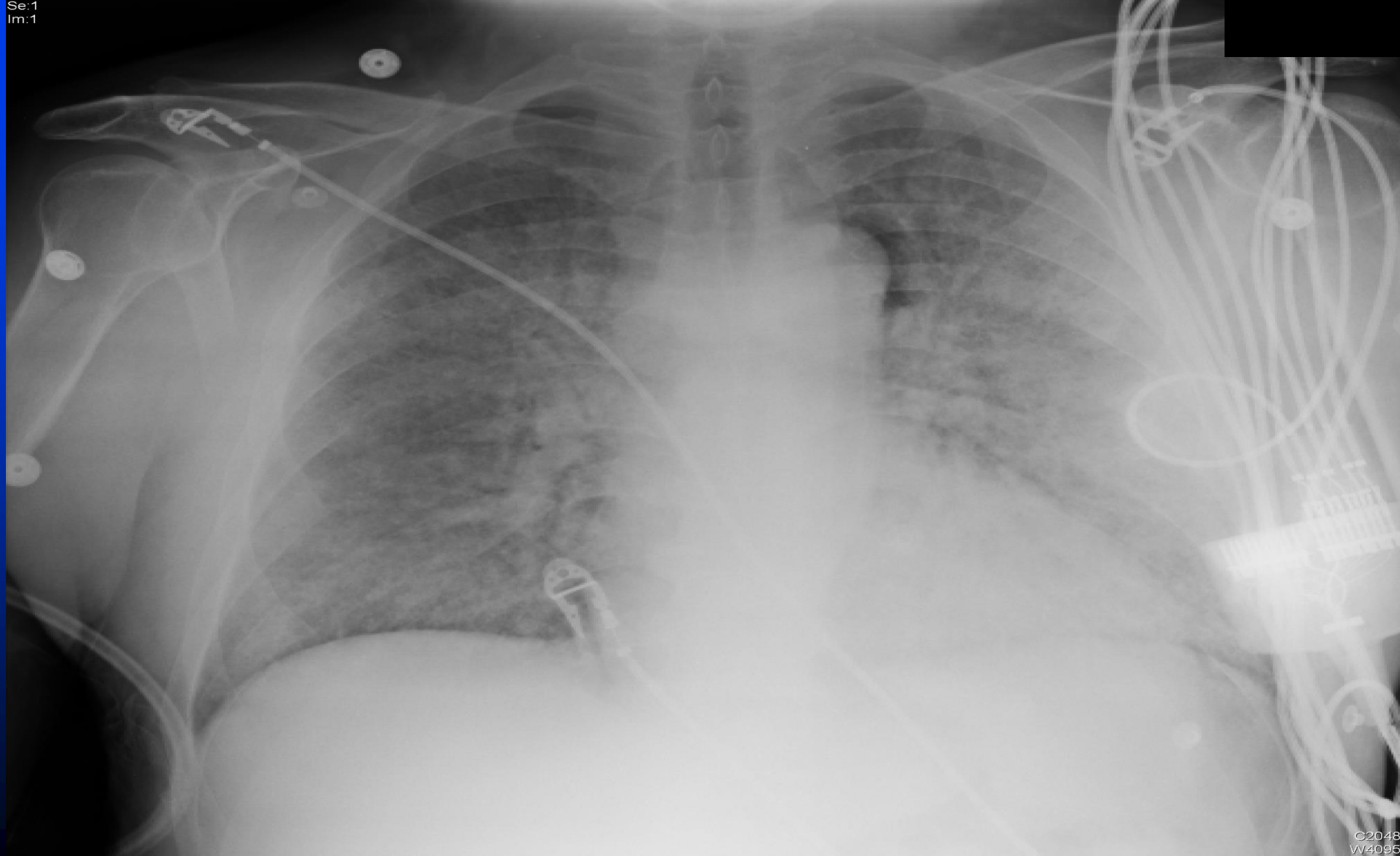
C. Radiation pneumonitis

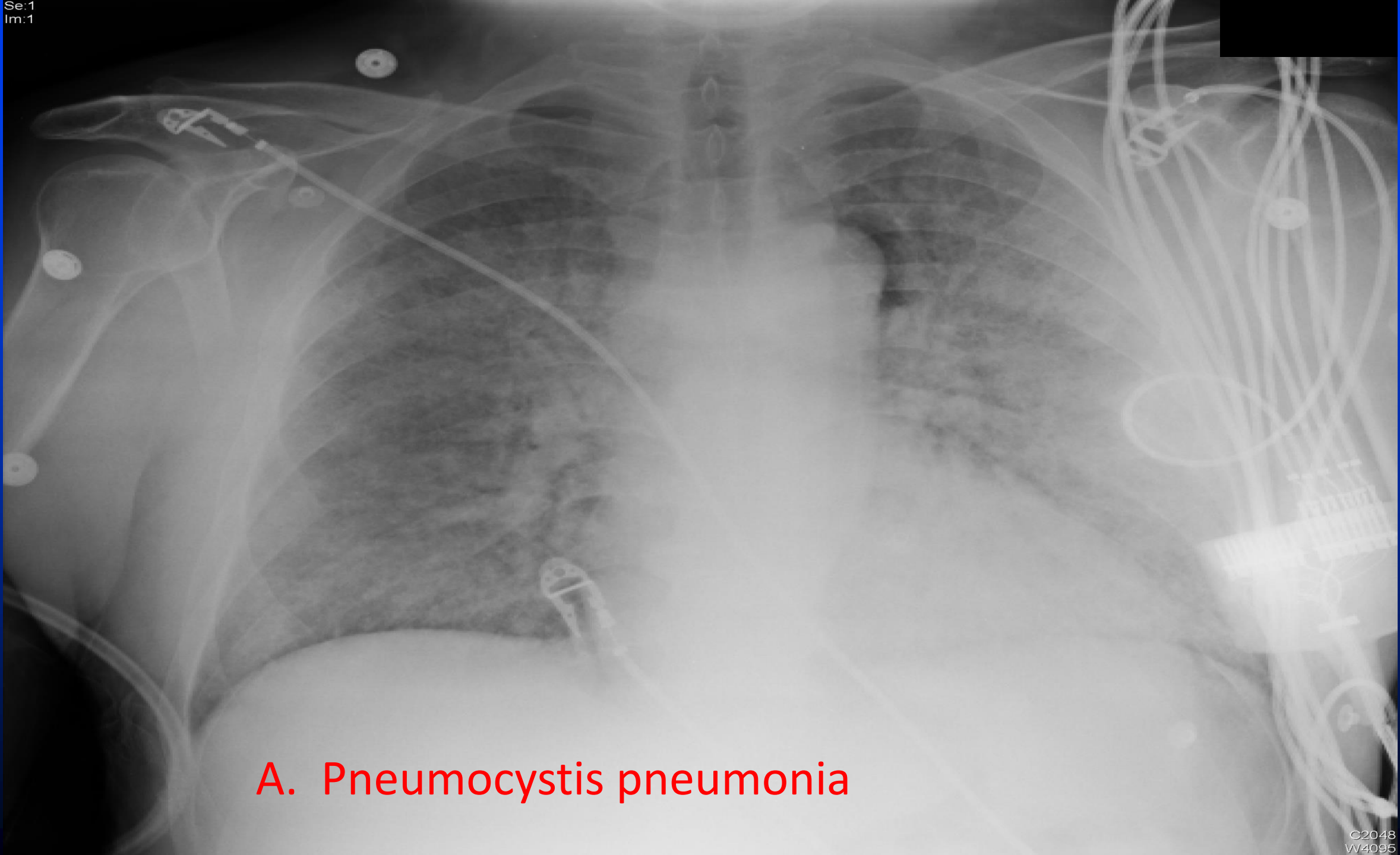
Radiation Pneumonitis: Radiographic Features

- Onset 2-6 months following completion of radiation therapy
- Defies normal anatomic boundaries
- Matches radiation fields in distribution

Diffuse Airspace (Alveolar Filling) Opacities

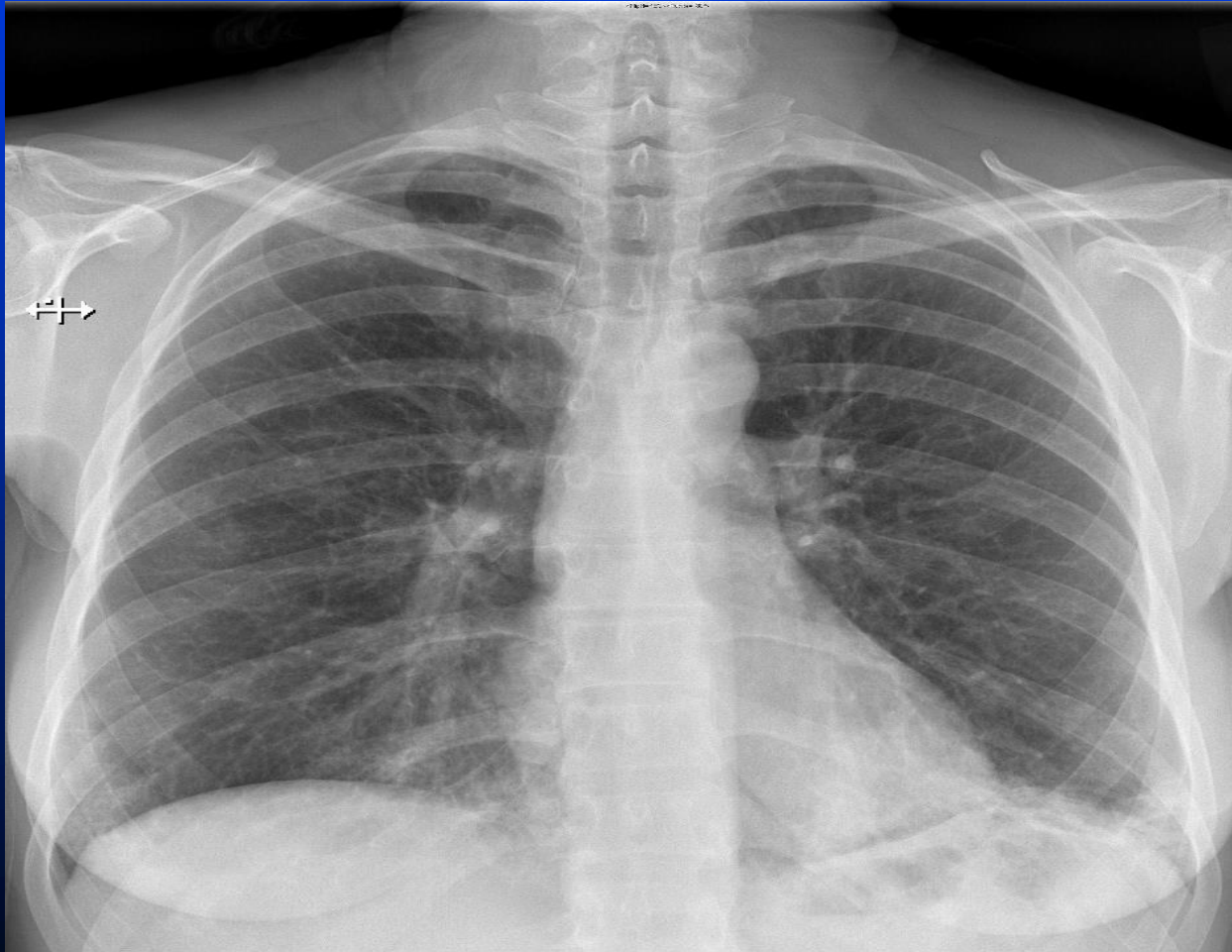
- Pneumocystis pneumonia
- Viral pneumonia: cytomegalovirus (CMV) pneumonia;
Covid-19 pneumonia
- Diffuse alveolar hemorrhage
- Others: e.g., pulmonary alveolar proteinosis; drug-induced pneumonitis



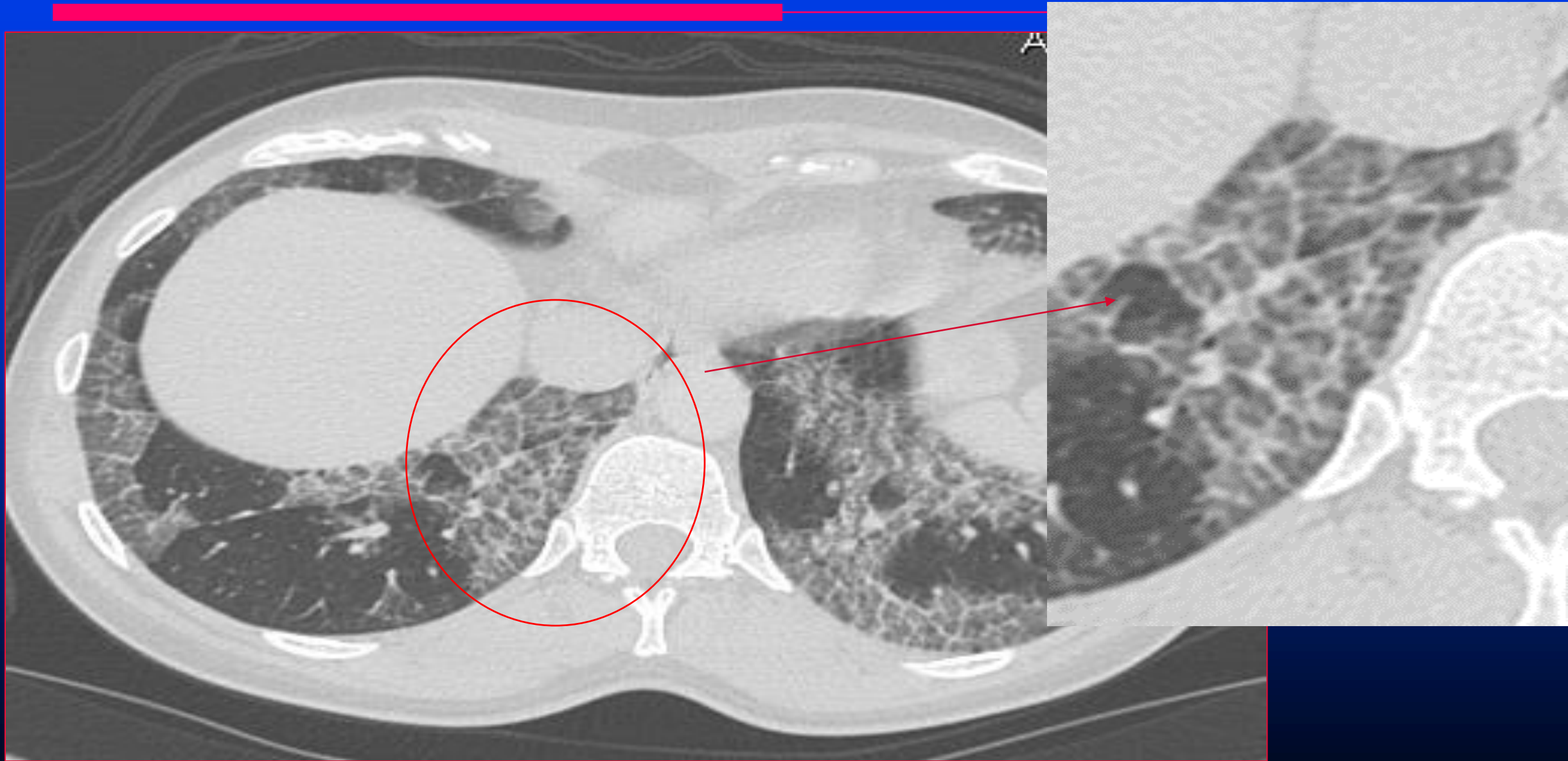


A. *Pneumocystis pneumonia*

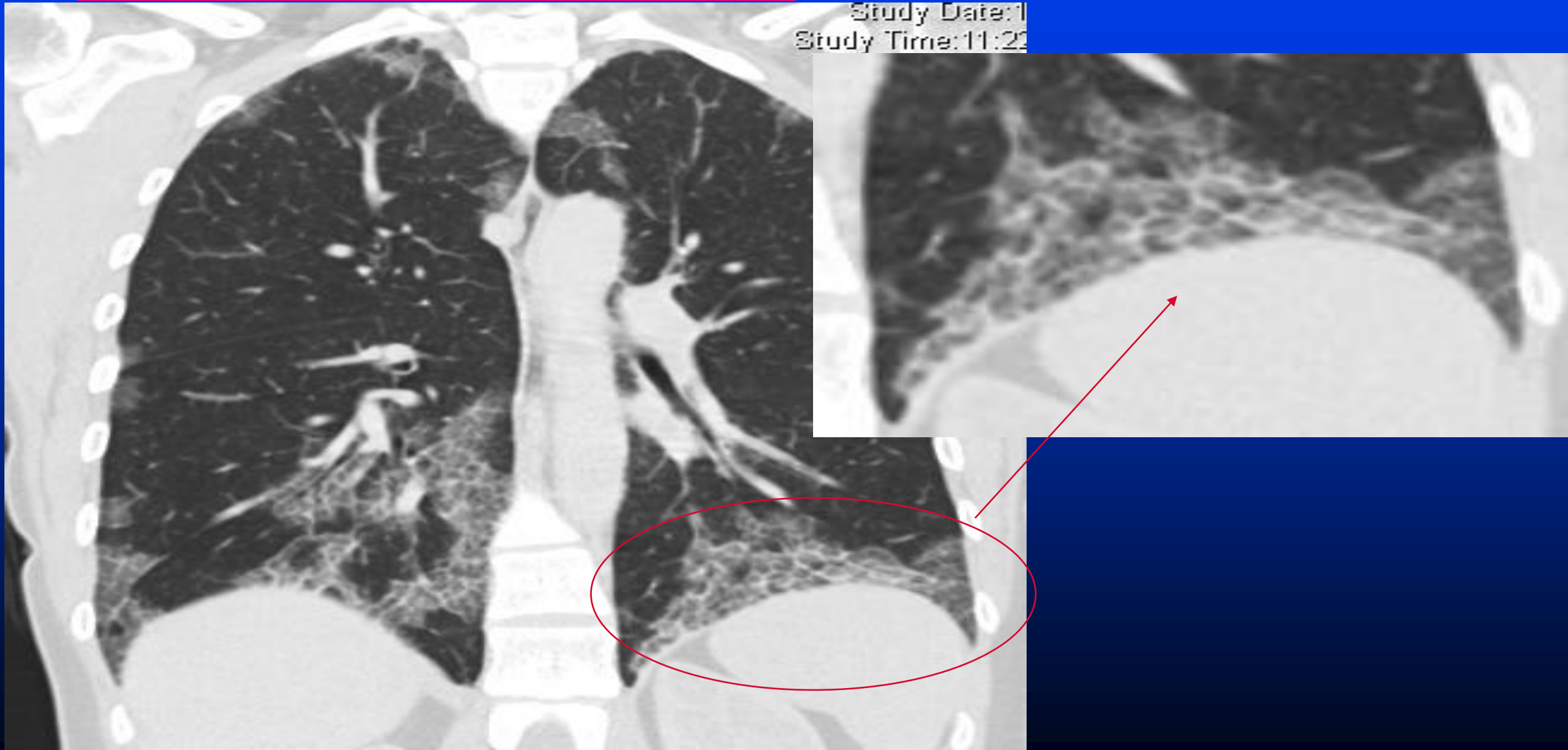
Mystery Film: 45-year-old school teacher with lingering cough for 2 years, despite Rx for pneumonia and GERD.



Mystery Film: 45 year-old school teacher



Mystery Film: 45 year-old school teacher



Question #1:

The best description for the radiographic pattern on her chest CT scan is:

- A. Traction bronchiectasis
- B. Honeycombing
- C. Reverse halo sign
- D. Crazy paving
- E. Mosaic attenuation

Question #1:

The best description for the radiographic pattern on her chest CT scan is:

- A. Traction bronchiectasis
- B. Honeycombing
- C. Reverse halo sign
- ☒ D. Crazy paving
- E. Mosaic attenuation

Question #2:

The most likely diagnosis is:

- A. Idiopathic pulmonary fibrosis
- B. Pulmonary alveolar proteinosis
- C. Langerhans cell histiocytosis
- D. Cystic fibrosis
- E. Lymphangioleiomyomatosis

Question #2:

The most likely diagnosis is:

- A. Idiopathic pulmonary fibrosis
- ☒ B. Pulmonary alveolar proteinosis
- C. Langerhans cell histiocytosis
- D. Cystic fibrosis
- E. Lymphangioleiomyomatosis

MOC REFLECTIVE STATEMENT (BRIEF TAKE HOME NOTES FOR REFERENCE)

- You can tell a lot from a chest x-ray, but its use is very context sensitive- Does your impression fit the story?
- Lateral view can be used for localization and seeing what is behind the heart
- Many abnormalities will require CT imaging to clarify, particularly in the initial diagnostic stage



References

- Goodman LR. *Felson's Principles of Chest Roentgenology: A Programmed Text* (3rd ed.). Philadelphia: Saunders Elsevier, 2007.
- McLoud TC, Boisell PM. *Thoracic Radiology: The Requisites* (2nd ed.). Philadelphia: Mosby Elsevier, 2010.
- Fraser RS, et al. *Fraser and Pare's Diagnosis of Diseases of the Chest* (4th ed. – 4 volume set). Philadelphia: Saunders, 1999.

