TBILISI LUNG HEALTH CONFERENCE 2024 / 18 – 20 OCTOBER 2024

HRCT: Case Discussion

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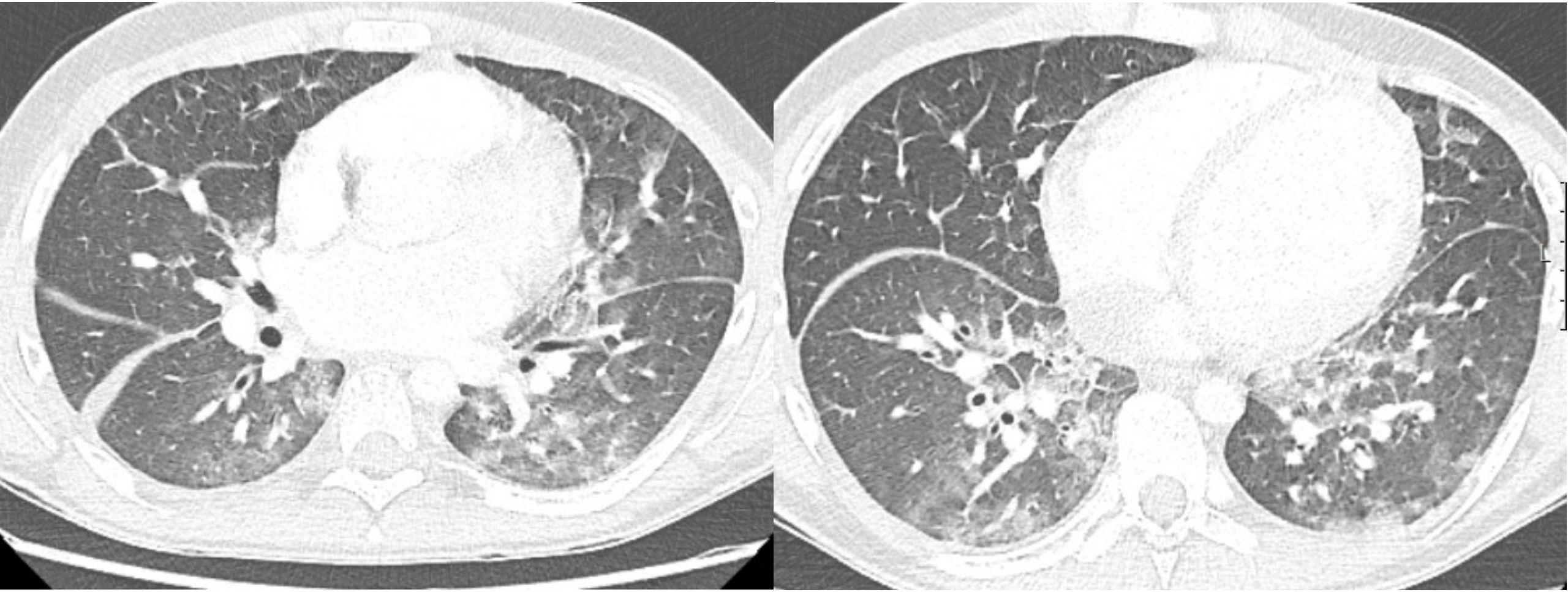
LEARNING OBJECTIVES

- Radiological anatomy of the lung
- Interpreting current CT findings
- Approach to diagnosis with different cases

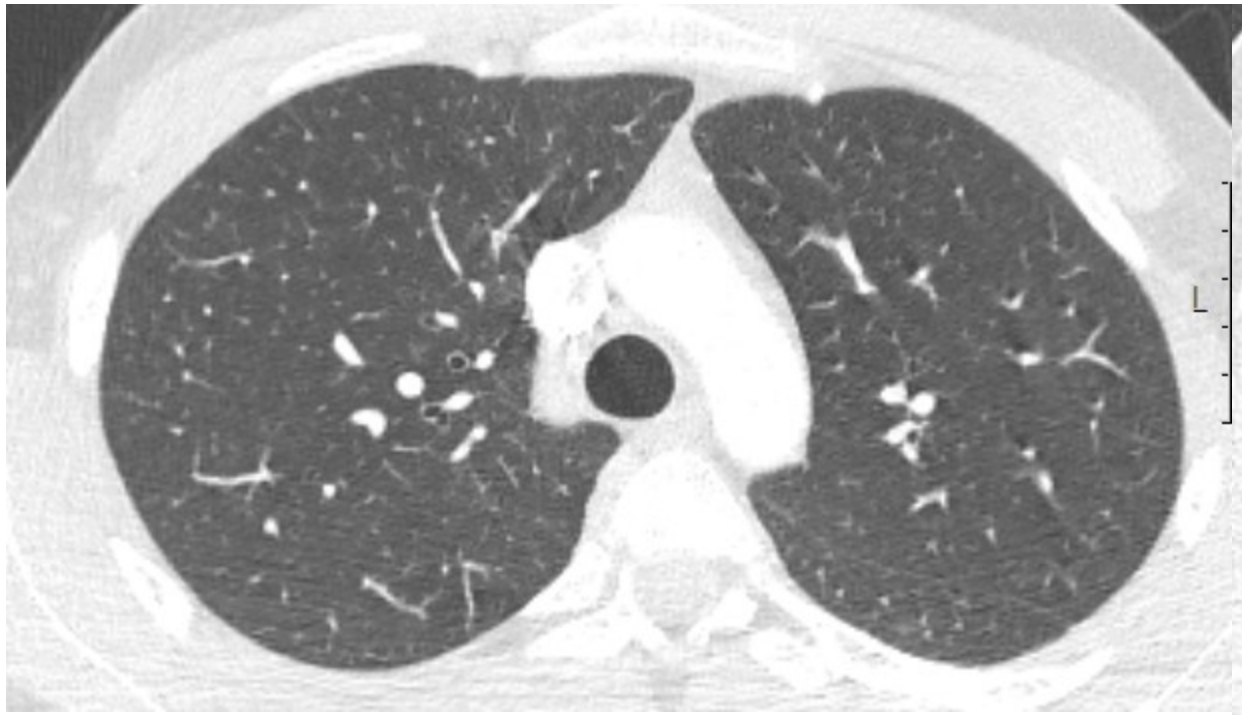
Case 1

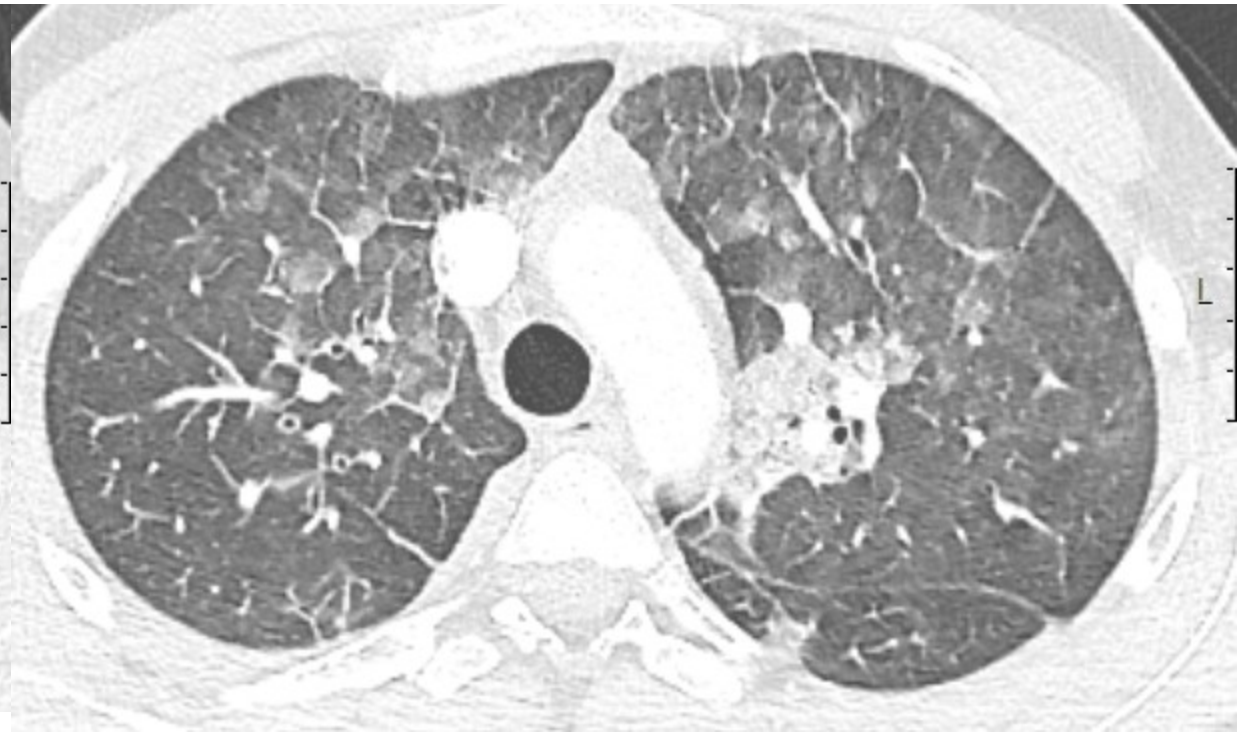
- 18-year-old male, AML patient
- Dyspnea started in the last week
- Pulmonary thromboembolism? Fungal pneumonia?
- HRCT examination requested



CT- Lung parenchymal window

Ground glass appearance and interlobular septal thickening in both lungs

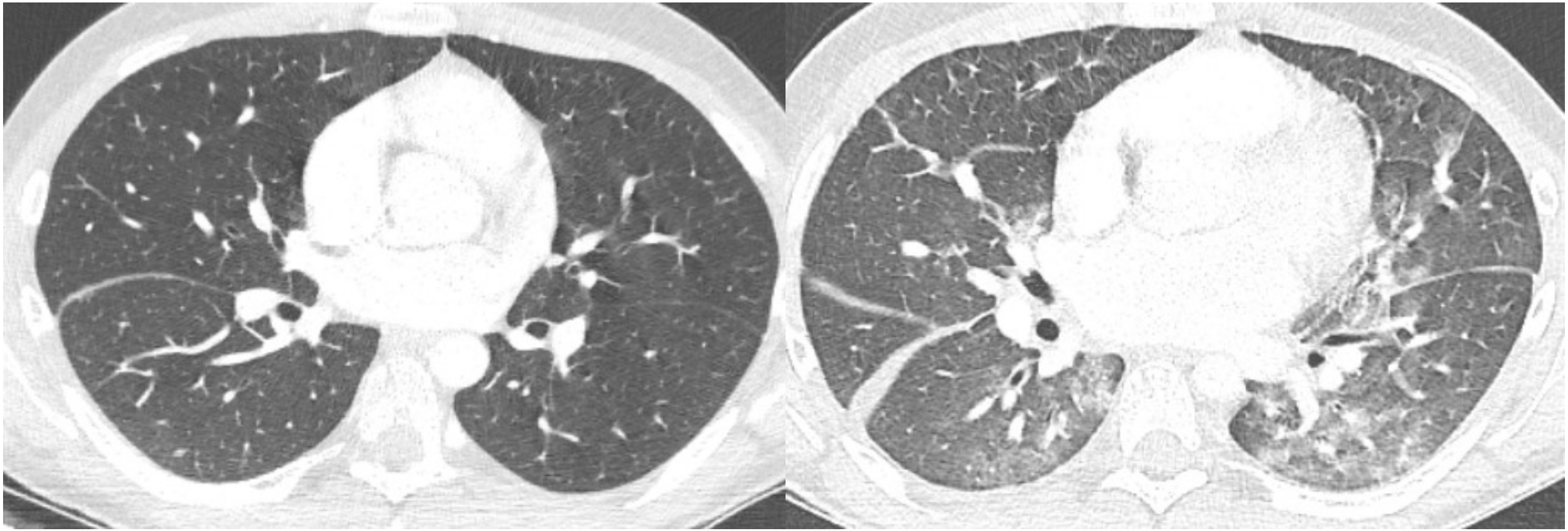




7 days ago CT normal

10.09.2021

17.09.2021



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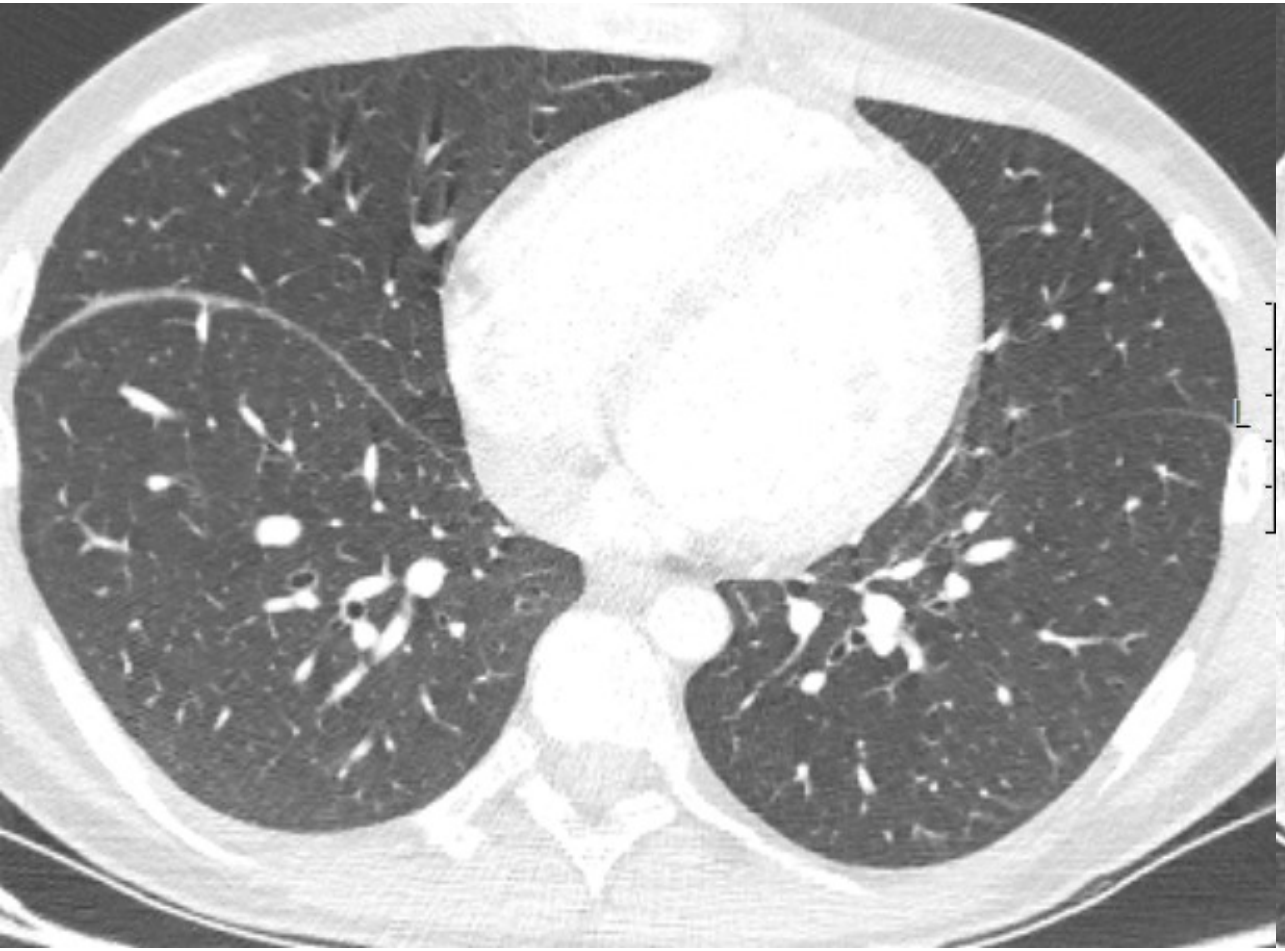

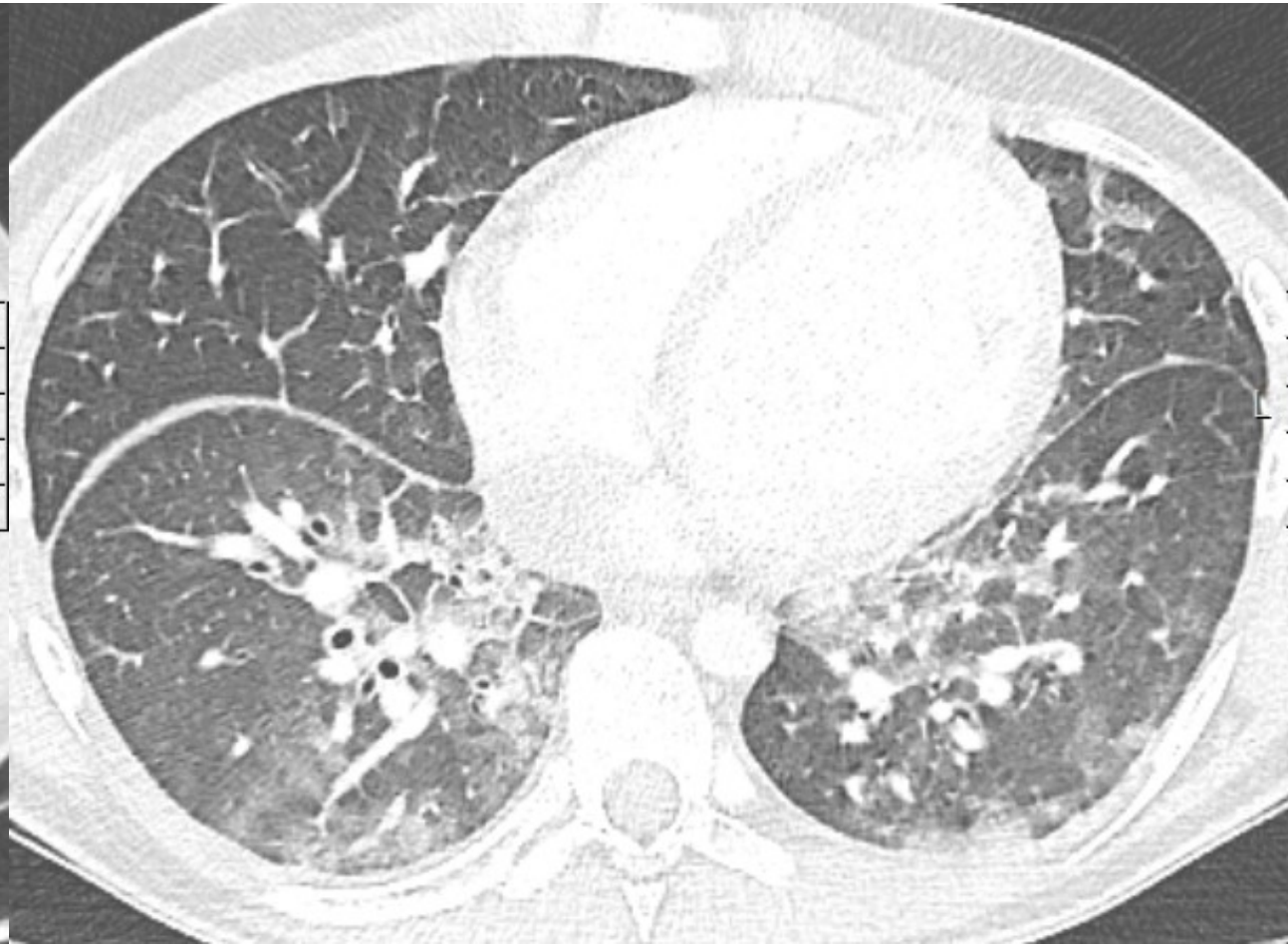

7 days ago CT normal

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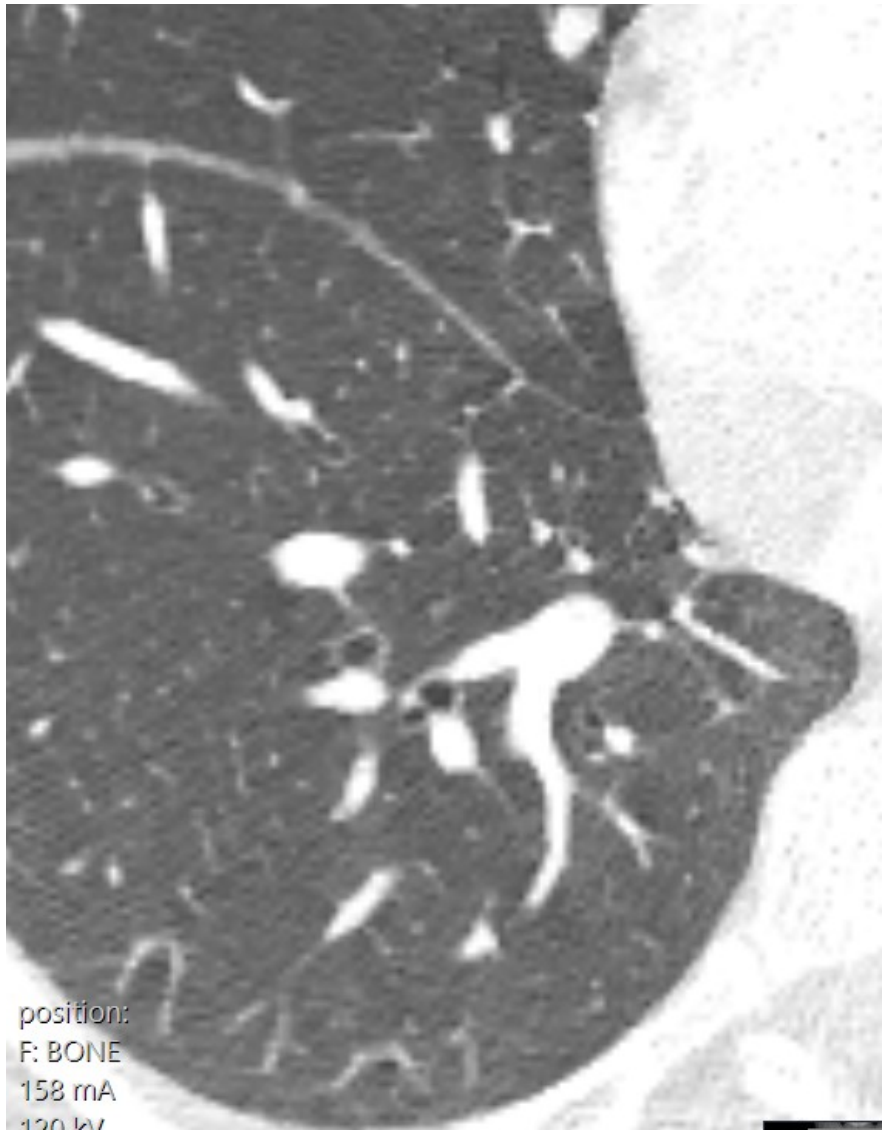

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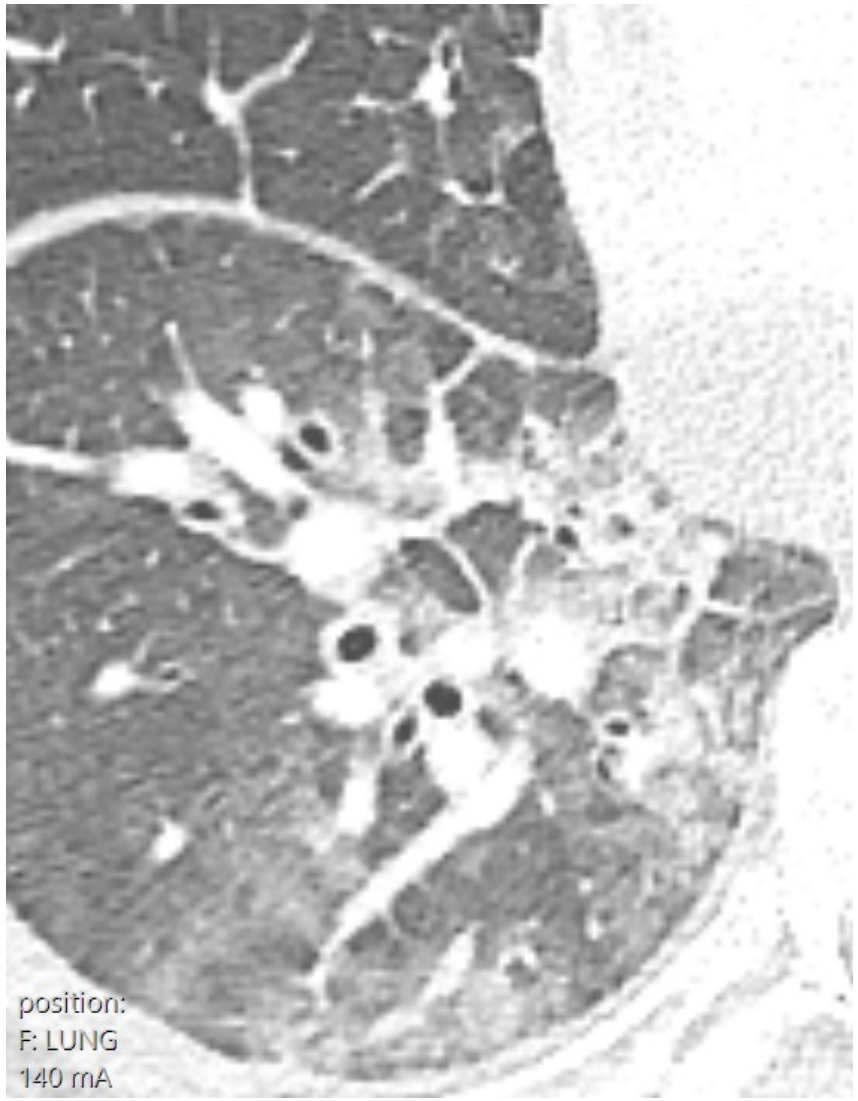

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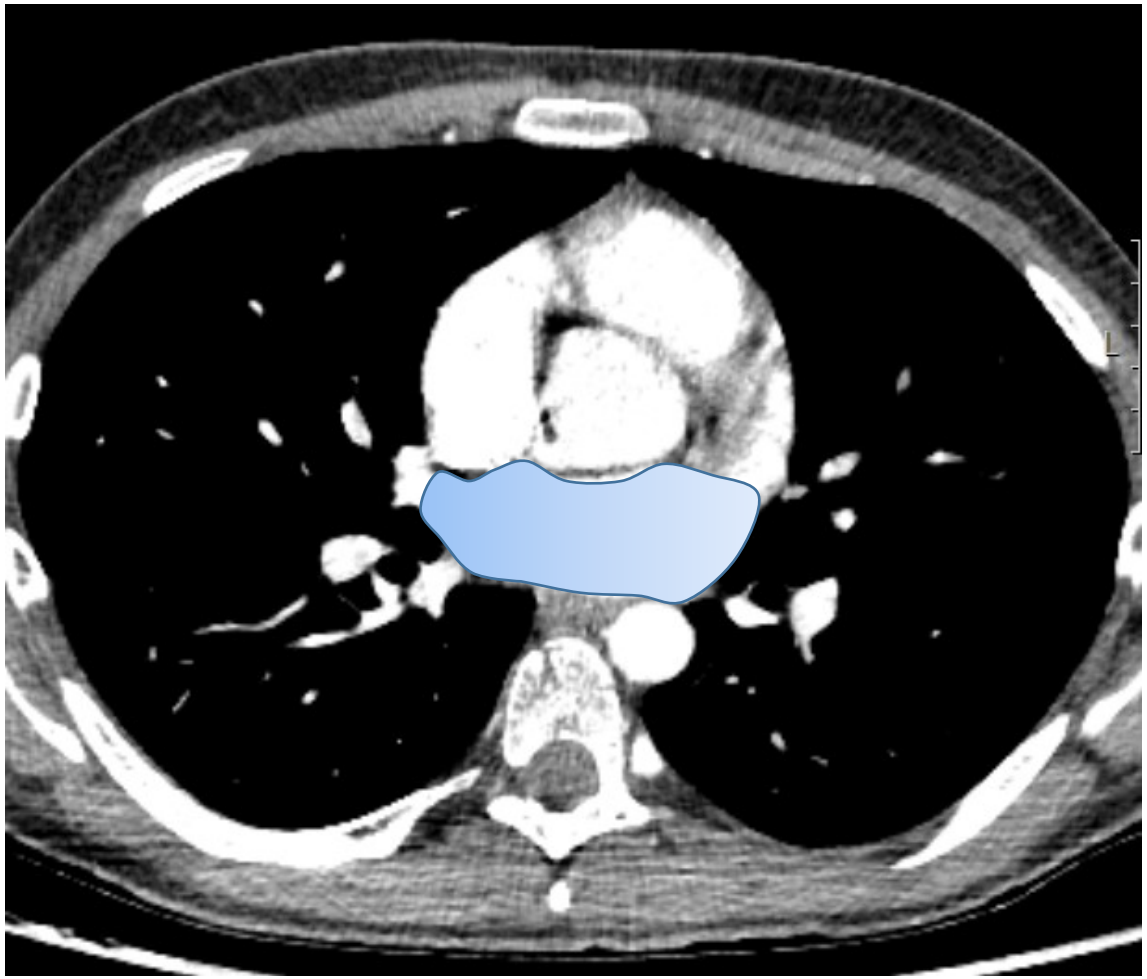
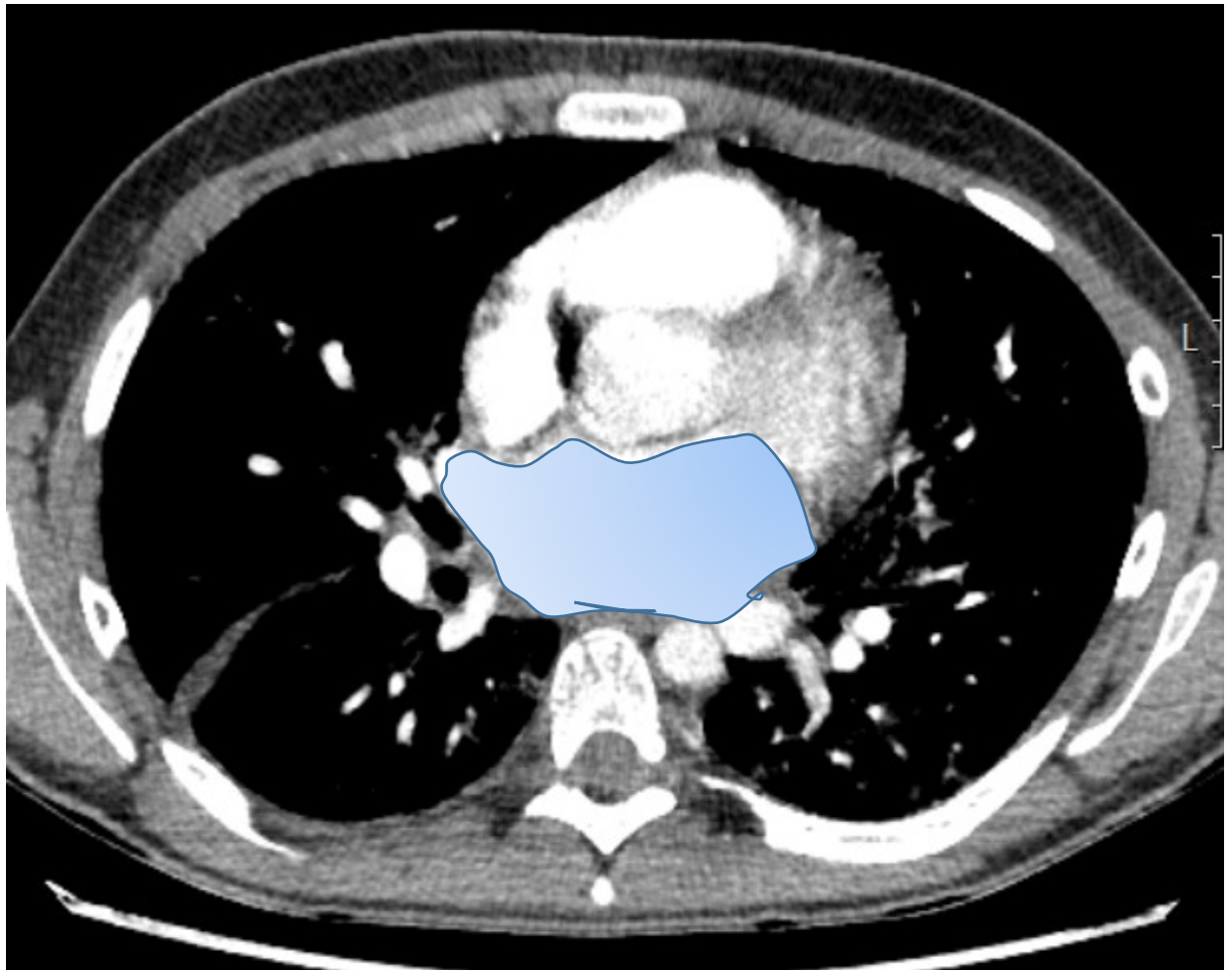


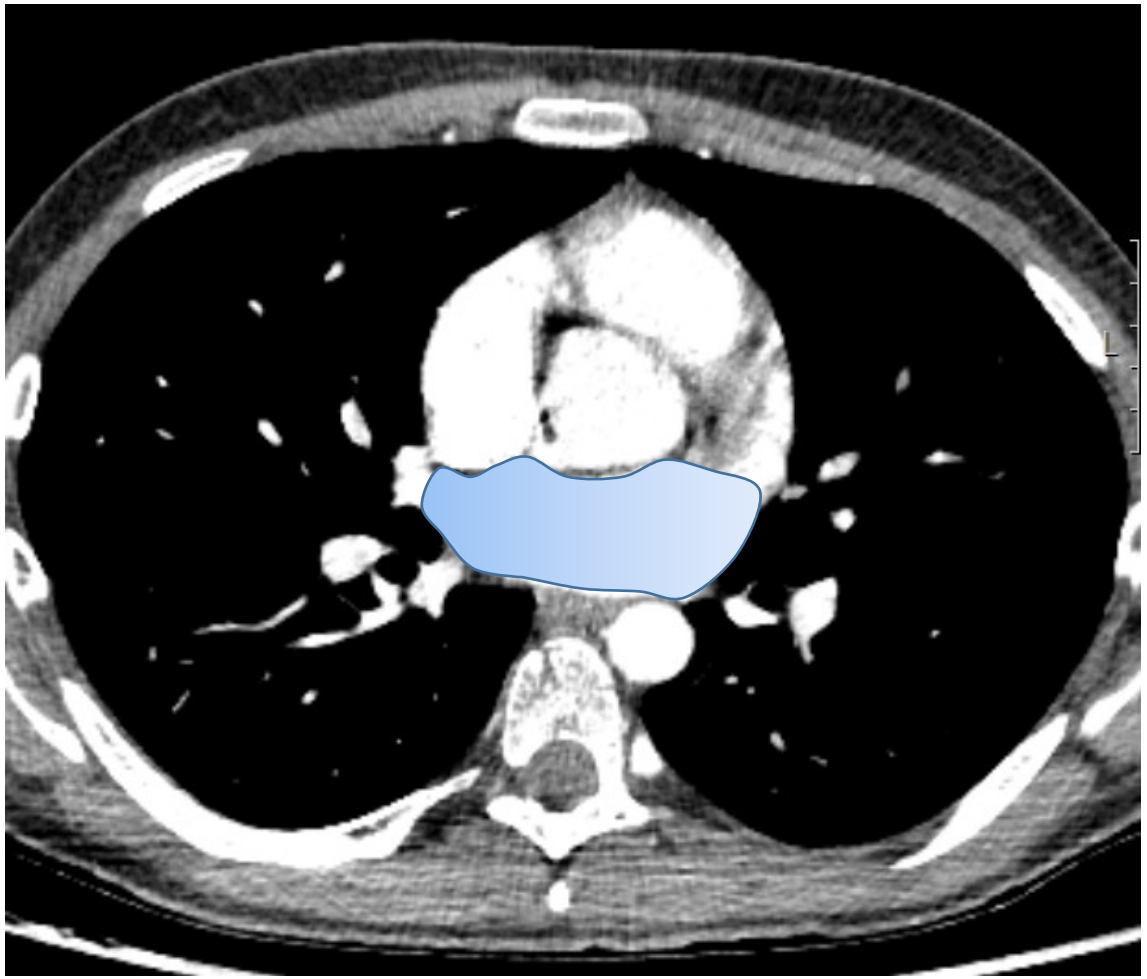


Left atrium enlarged

10.09.2021

17.09.2021

EF value in echocardiography is 25%



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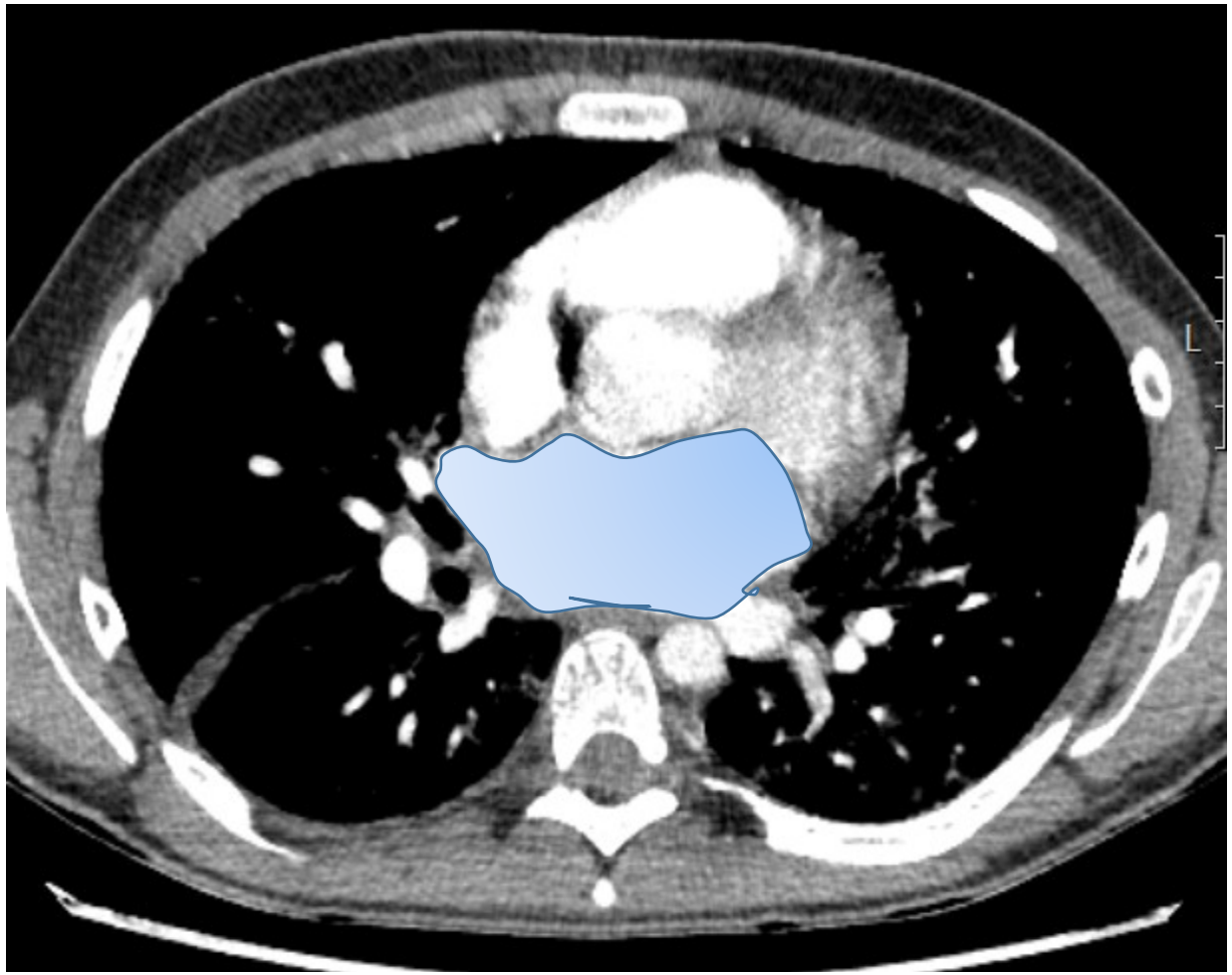


17.09.2021

CT diagnosis

Pulmonary edema and cardiac failure

Clinical diagnosis

Anthracycline-induced cardiotoxicity

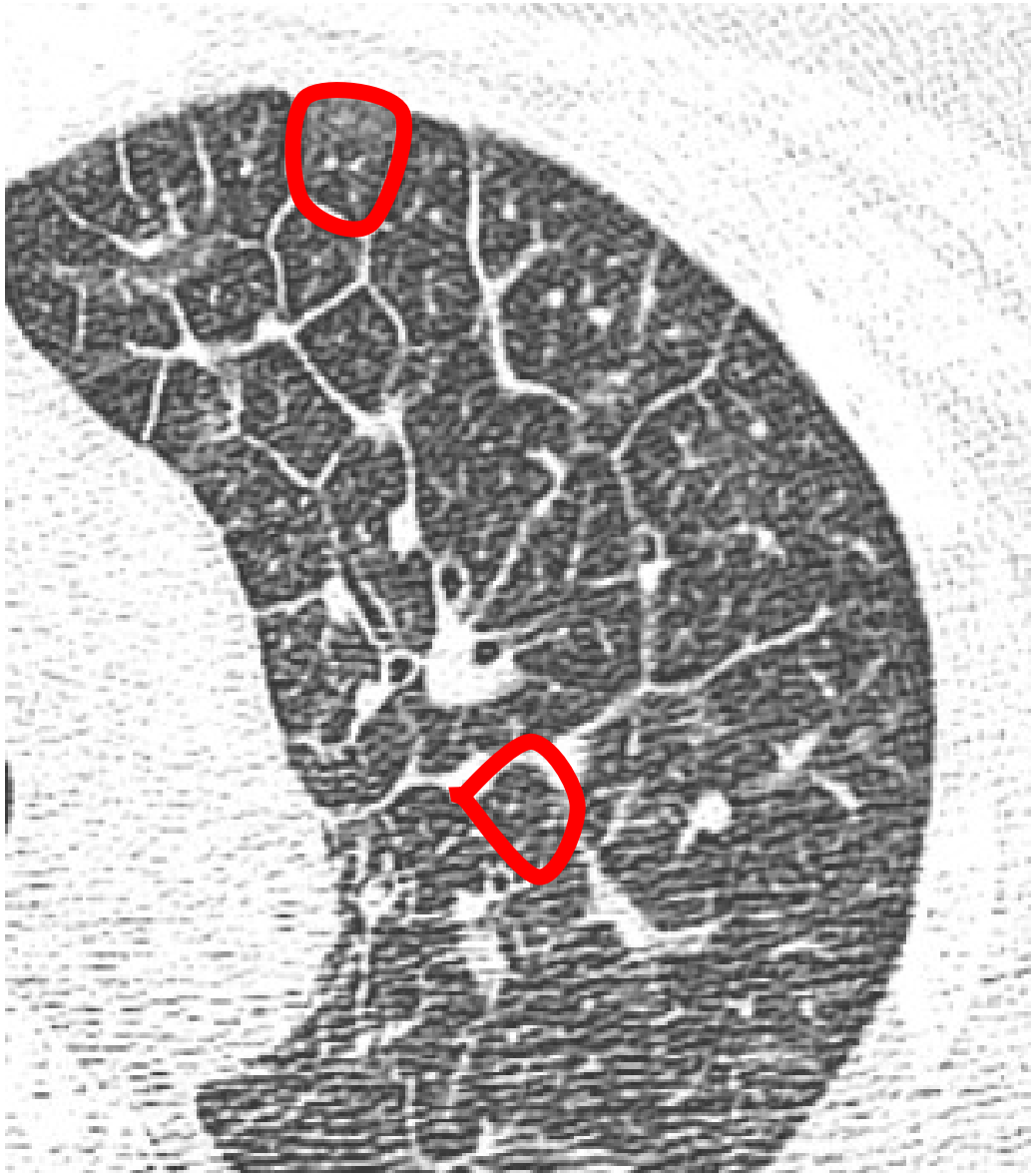
Anthracycline-induced cardiotoxicity

- Anthracycline is a class of commonly used agents for the treatment of solid and hematologic cancers.
- Anthracycline-induced cardiotoxicity (AIC) accounts for greater than 30% of cardiotoxicity from cancer-related therapy.

- When symptoms and signs of cardiotoxicity such as congestive heart failure are identified early, discontinuation of anthracycline, initiating appropriate medical management followed by frequent monitoring of cardiac function can help to alleviate further decline of cardiac function.

Chong EG, Lee EH, Sail R, Denham L, Nagaraj G, Hsueh CT. Anthracycline-induced cardiotoxicity: A case report and review of literature. World J Cardiol. 2021 Jan 26;13(1):28-37.

INTERSTITIUM



PULMONARY INTERSTITIUM

1.Axial :

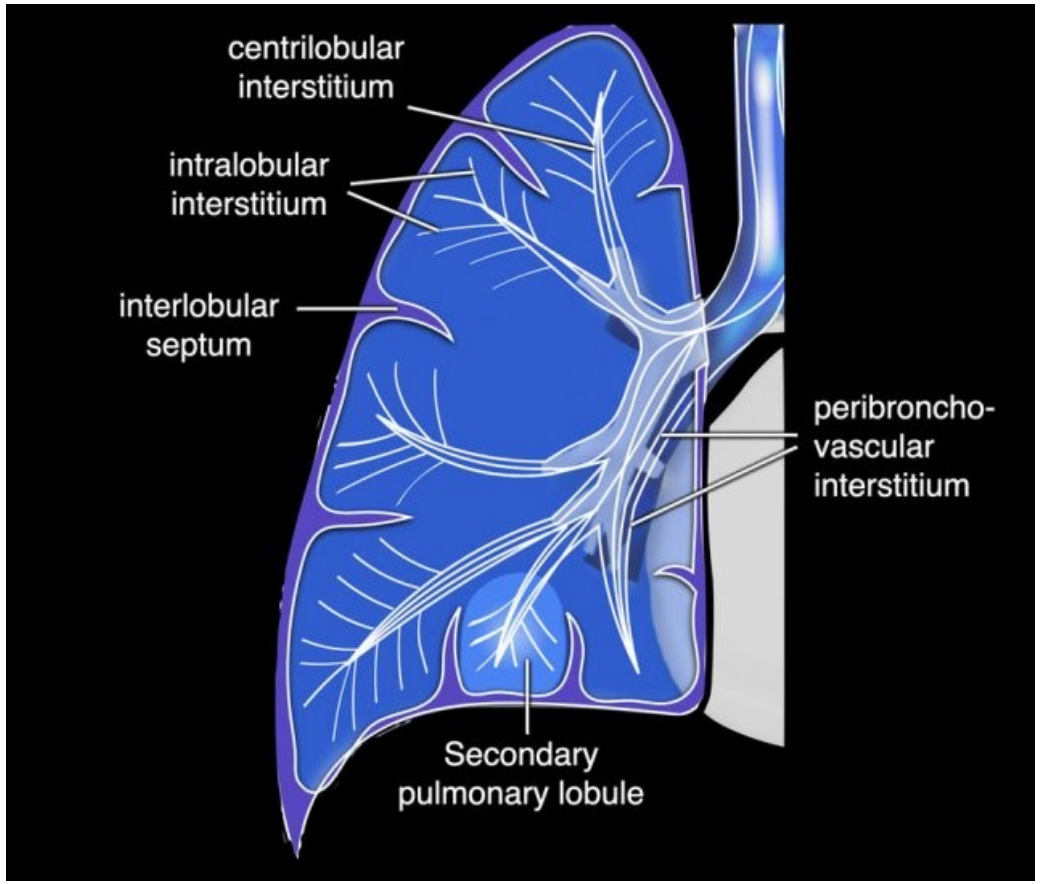
surrounding the bronchovascular tree

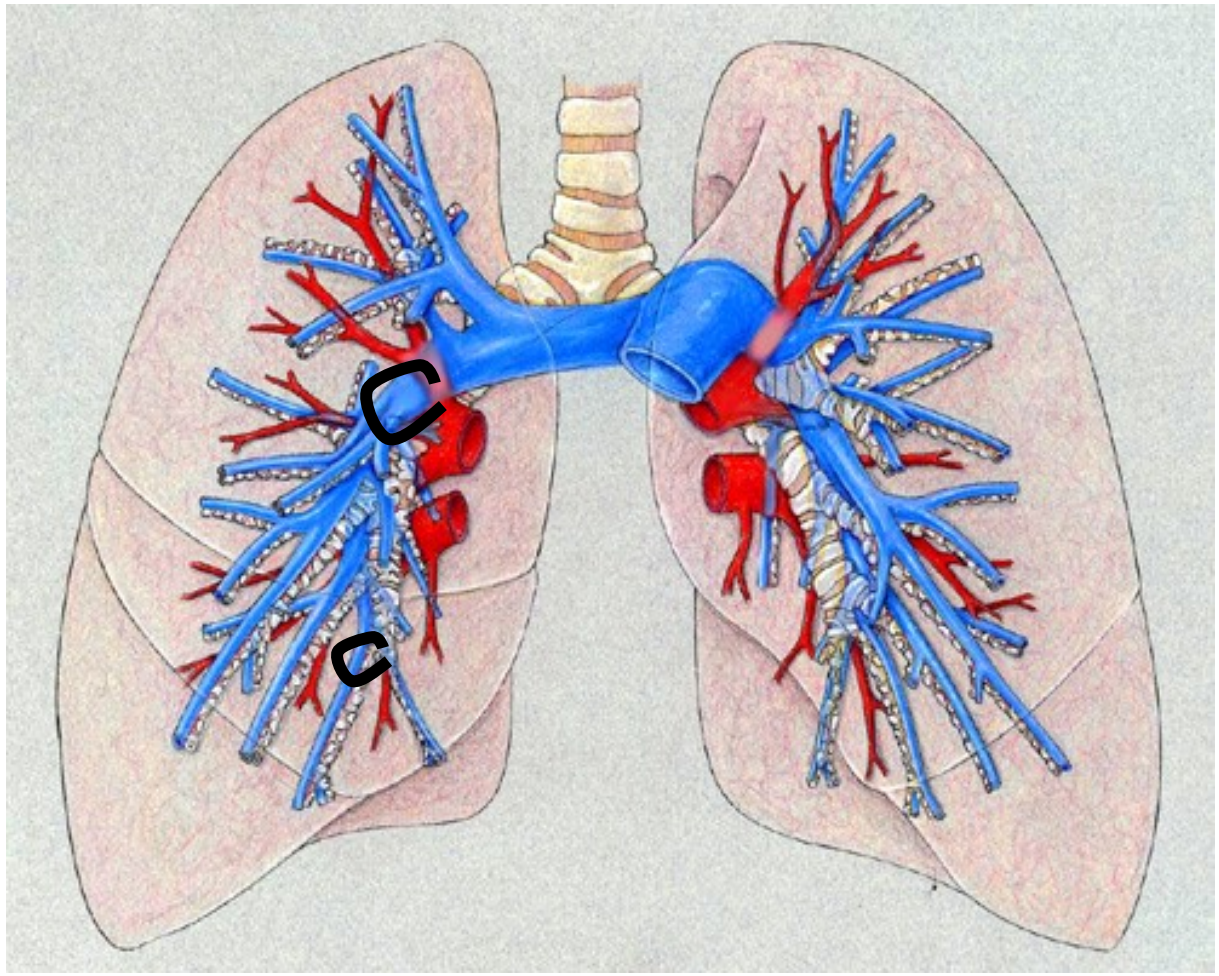
2.Peripheral:

adjacent to the pleura

3. Parenchymal :

surrounding parenchyma

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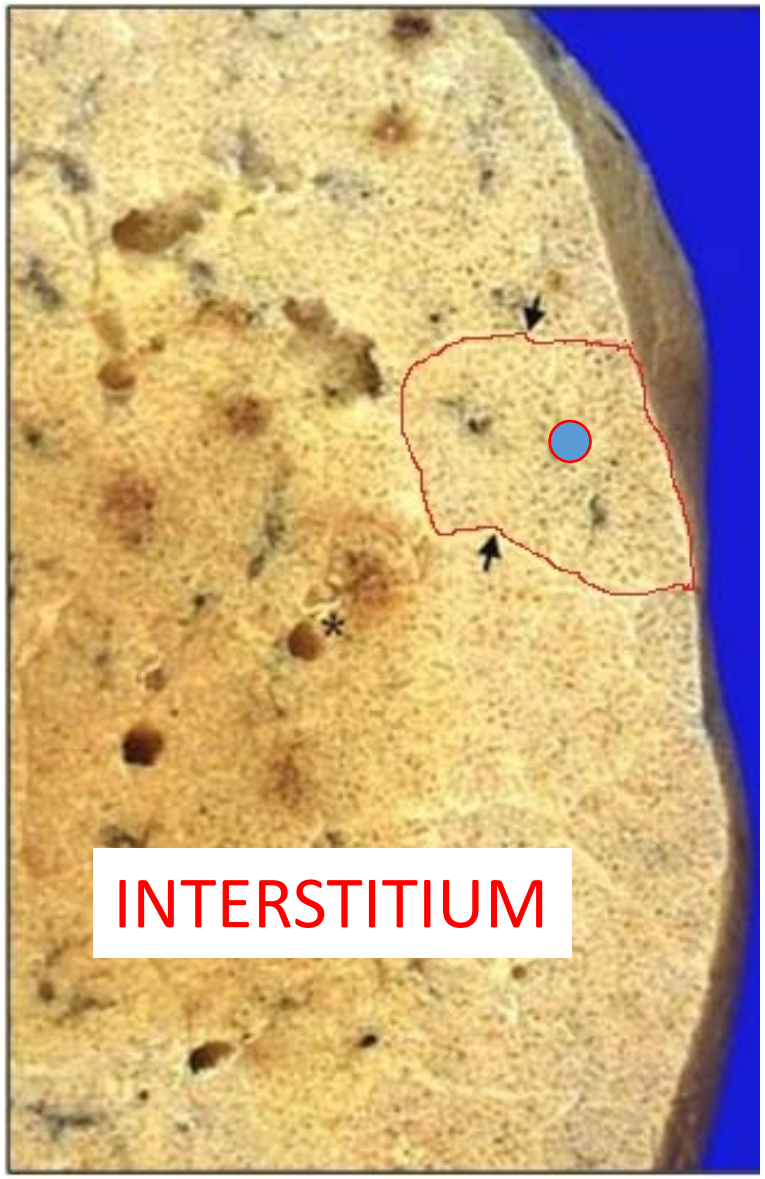
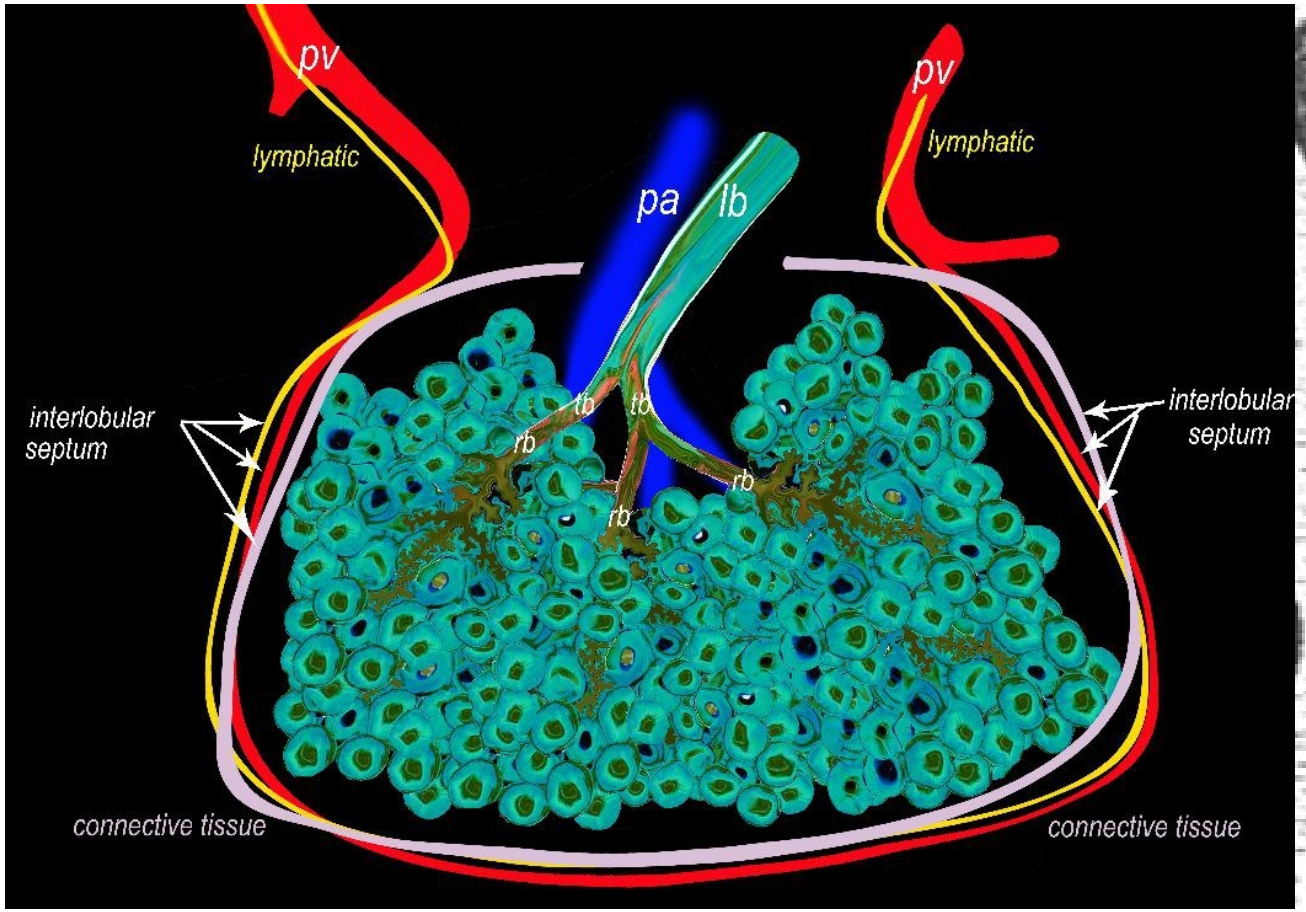
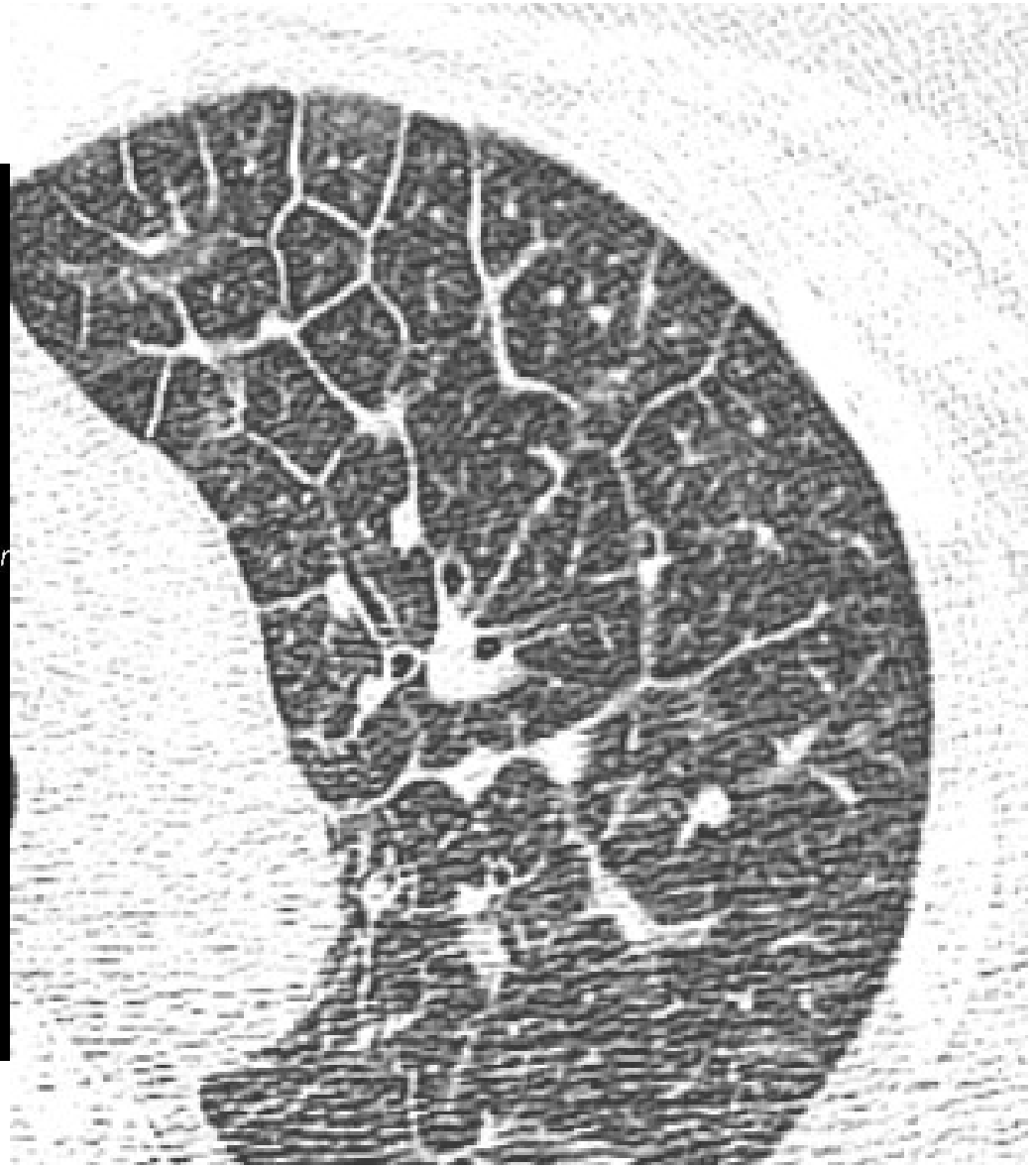
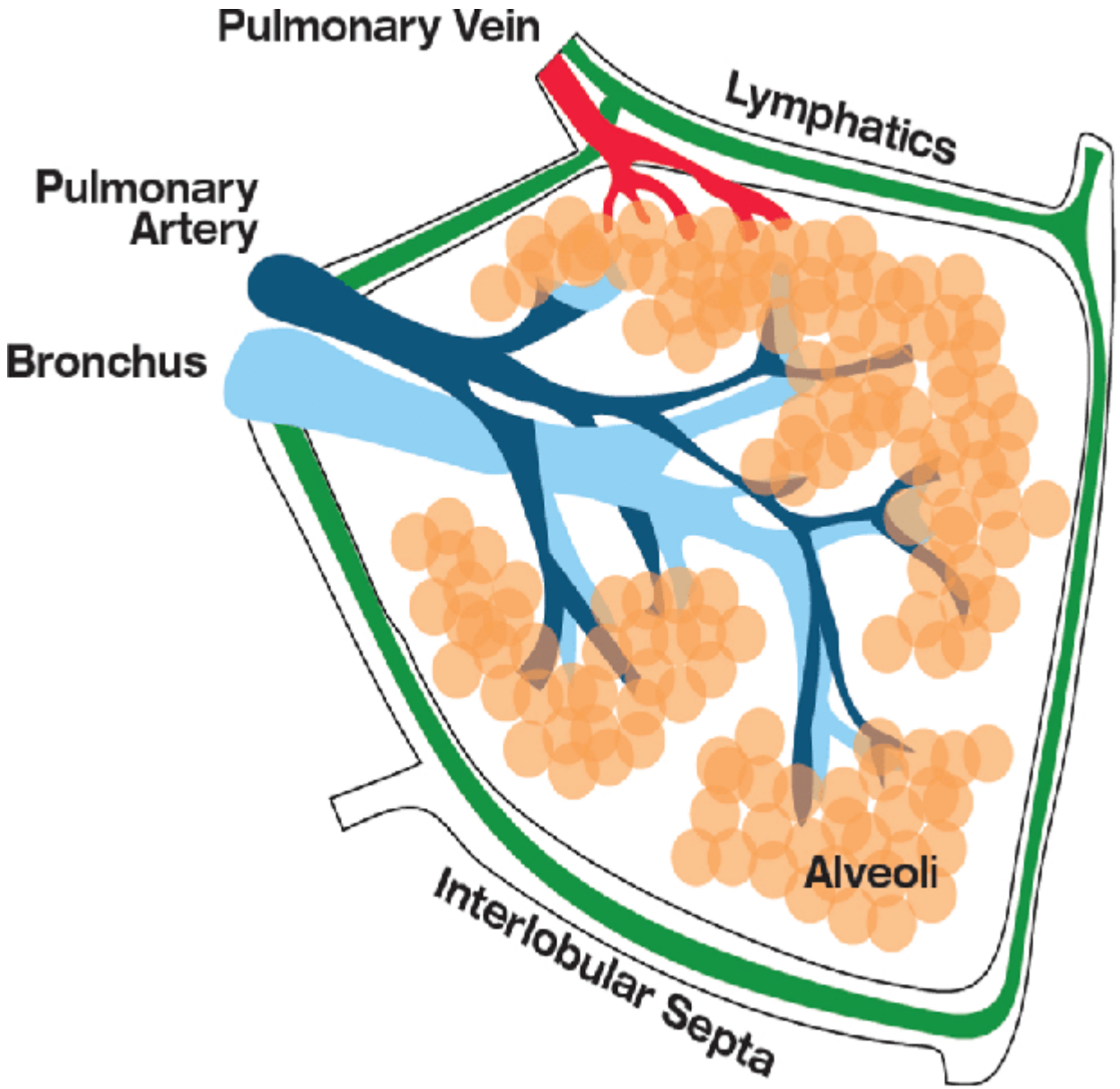
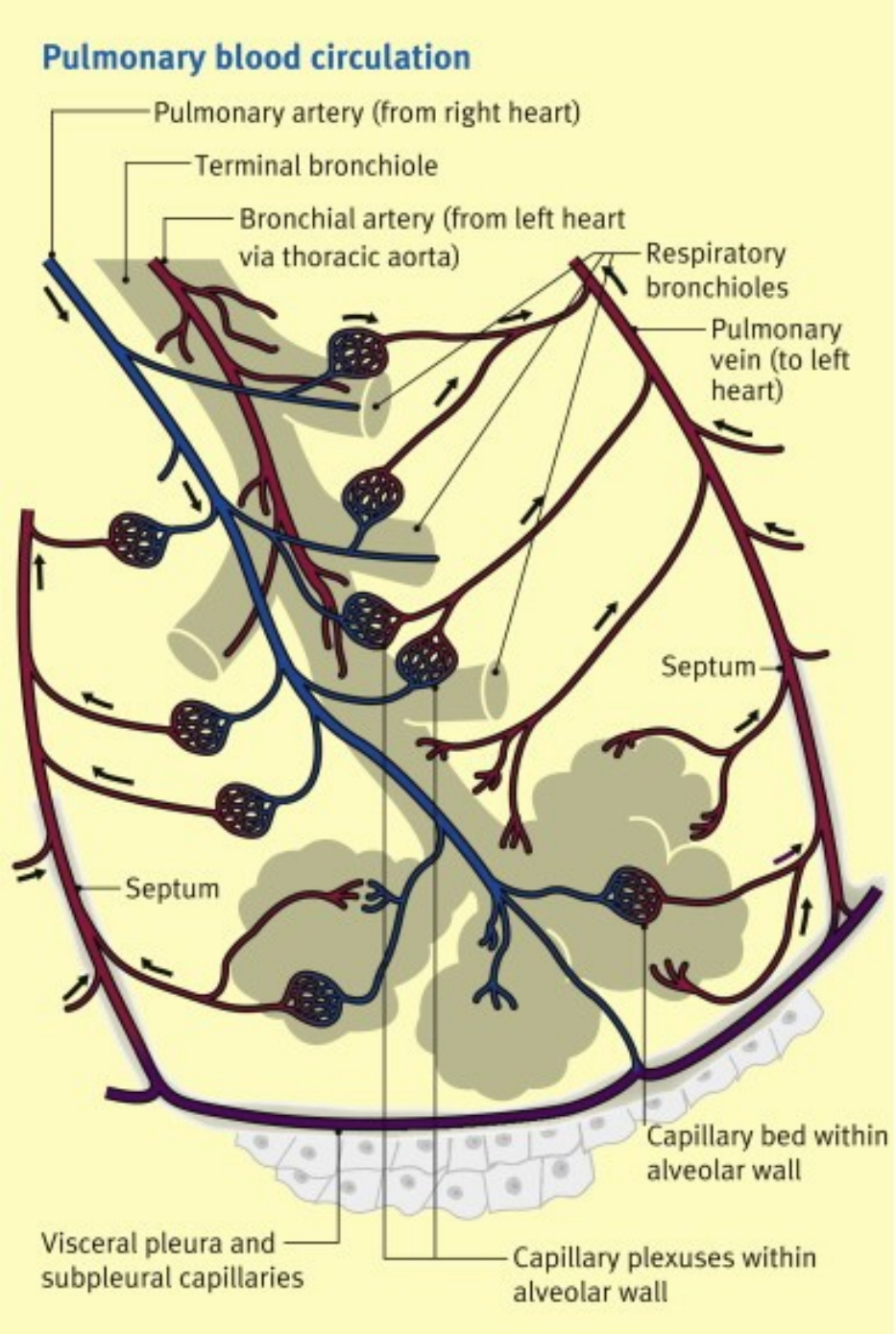

INTERSTITIUM

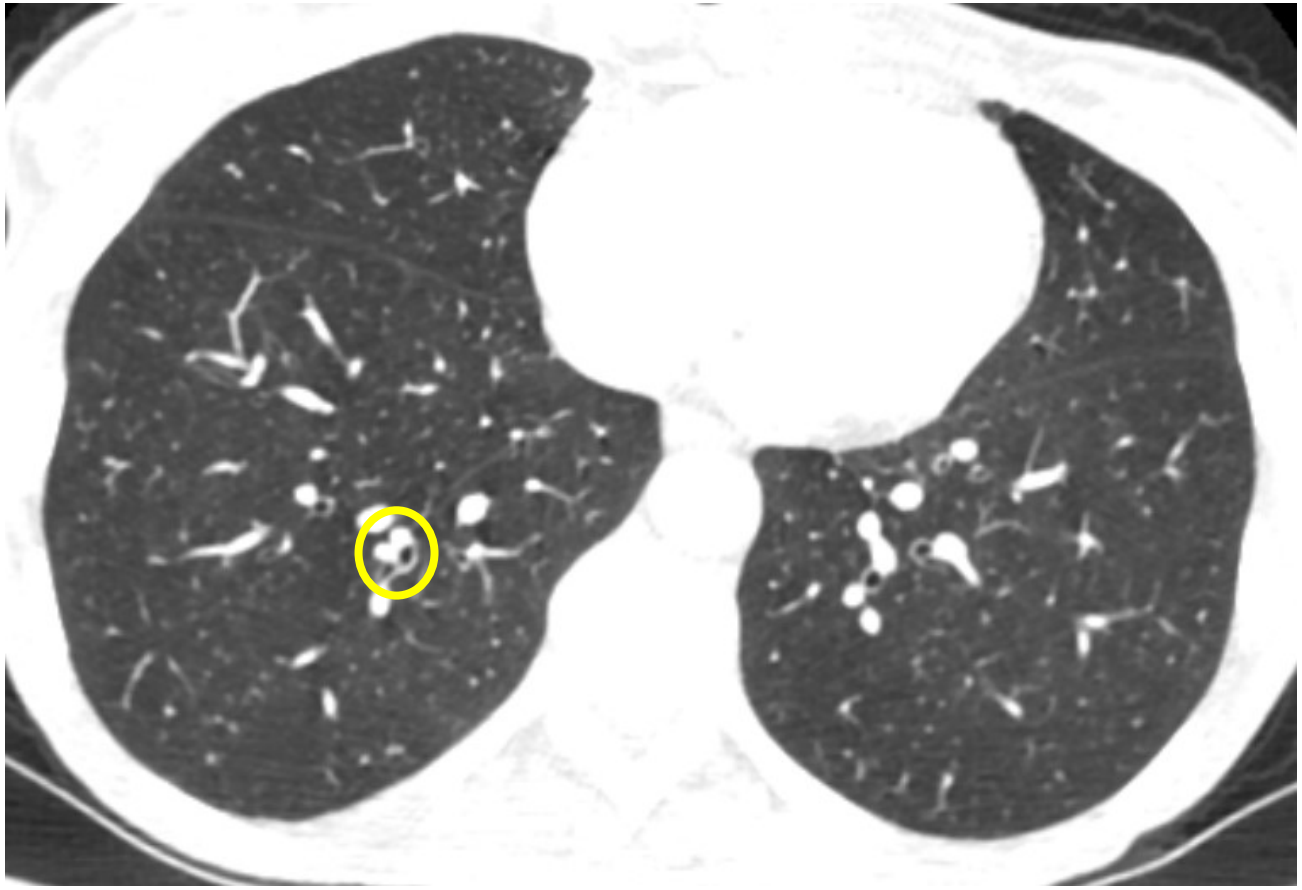

PARENCHYMA

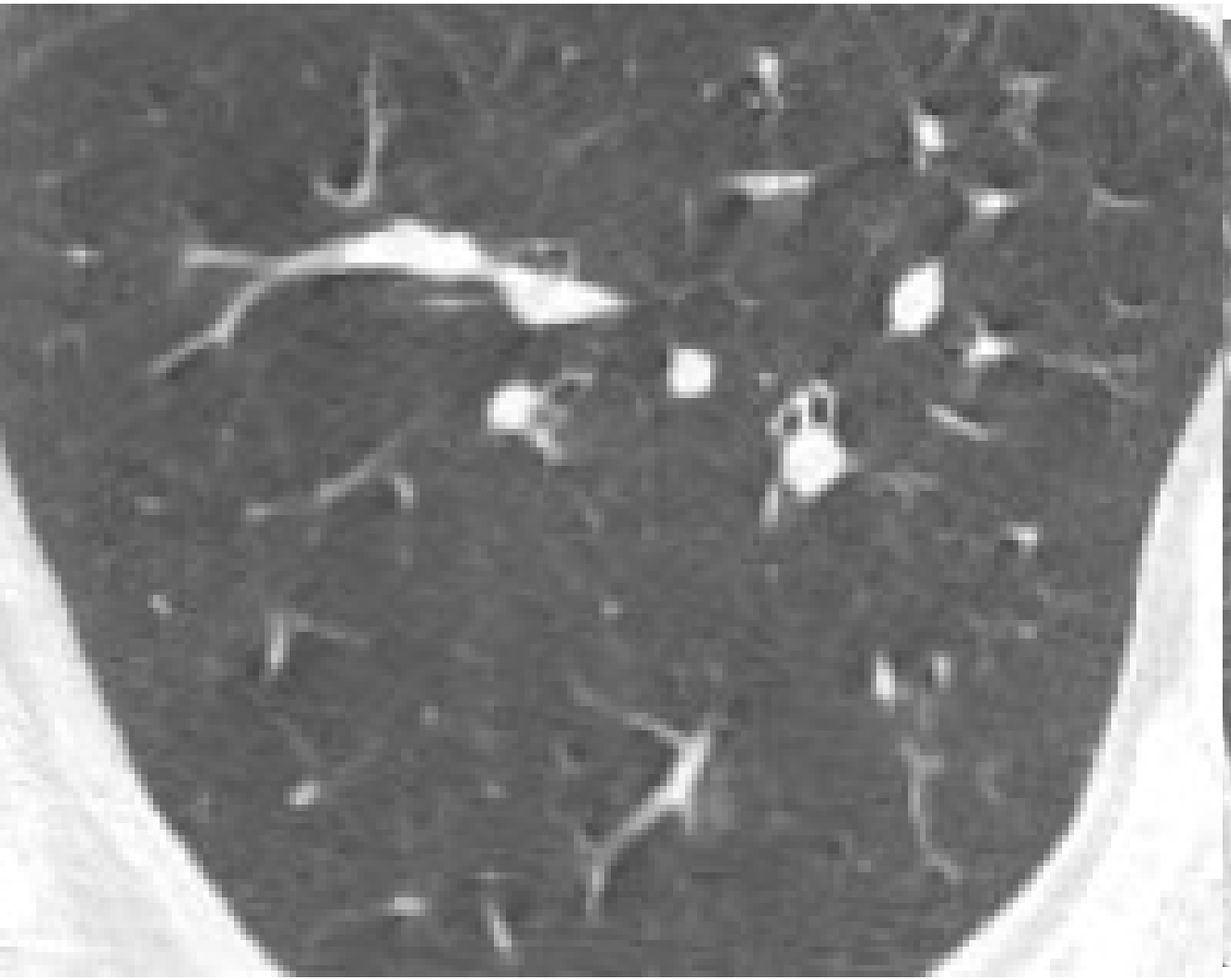

pv
lymphatic
pa
lb
pv
lymphatic
interlobular septum
tb
tb
rb
rb
rb
interlobular septum
connective tissue
connective tissue




Pulmonary Vein
Lymphatics
Pulmonary Artery
Bronchus
Alveoli
Interlobular Septa

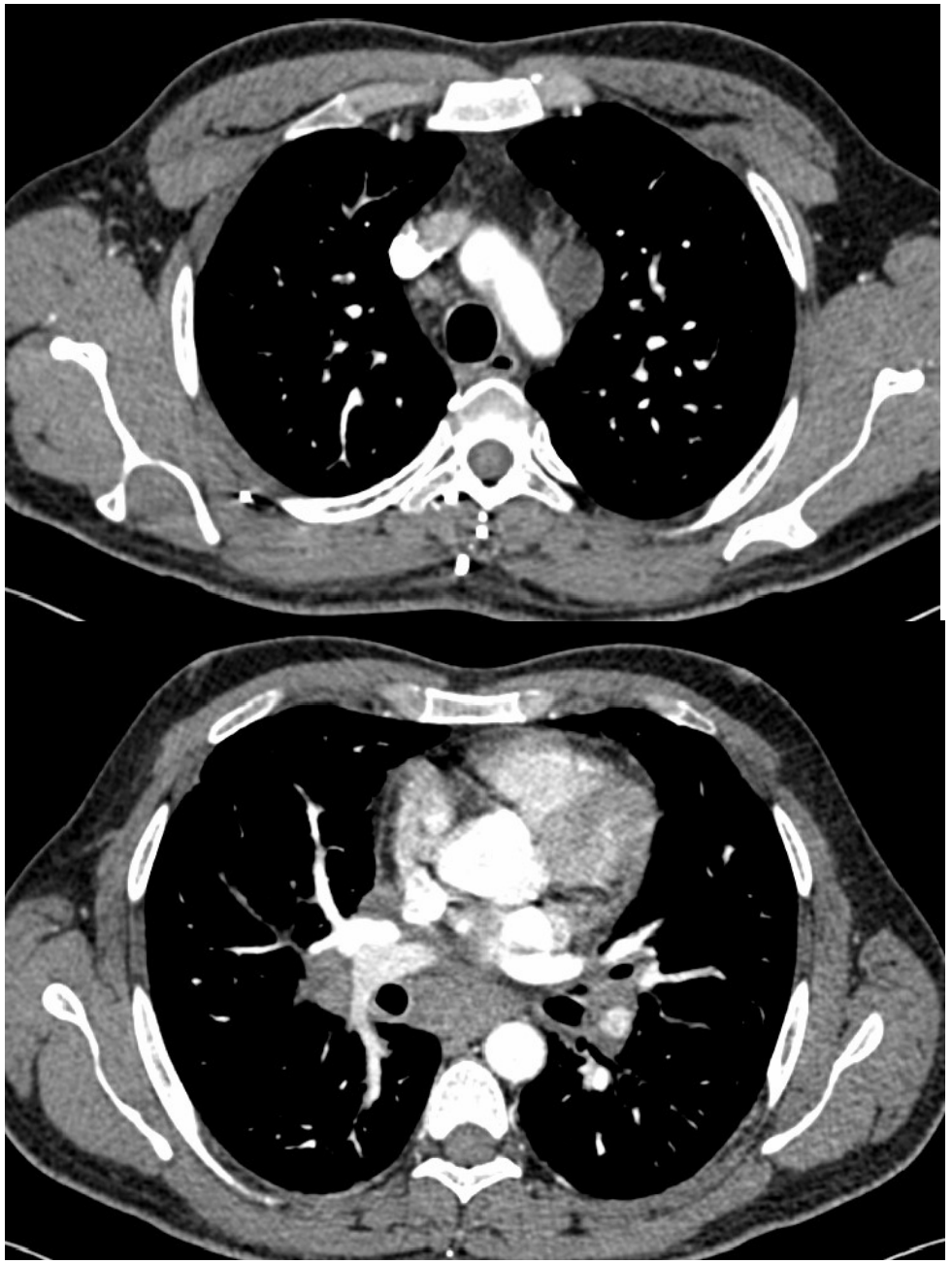

Pulmonary blood circulation
Pulmonary artery (from right heart)
Terminal bronchiole
Bronchial artery (from left heart via thoracic aorta)
Respiratory bronchioles
Pulmonary vein (to left heart)
Septum
Septum
Capillary bed within alveolar wall
Visceral pleura and subpleural capillaries
Capillary plexuses within alveolar wall

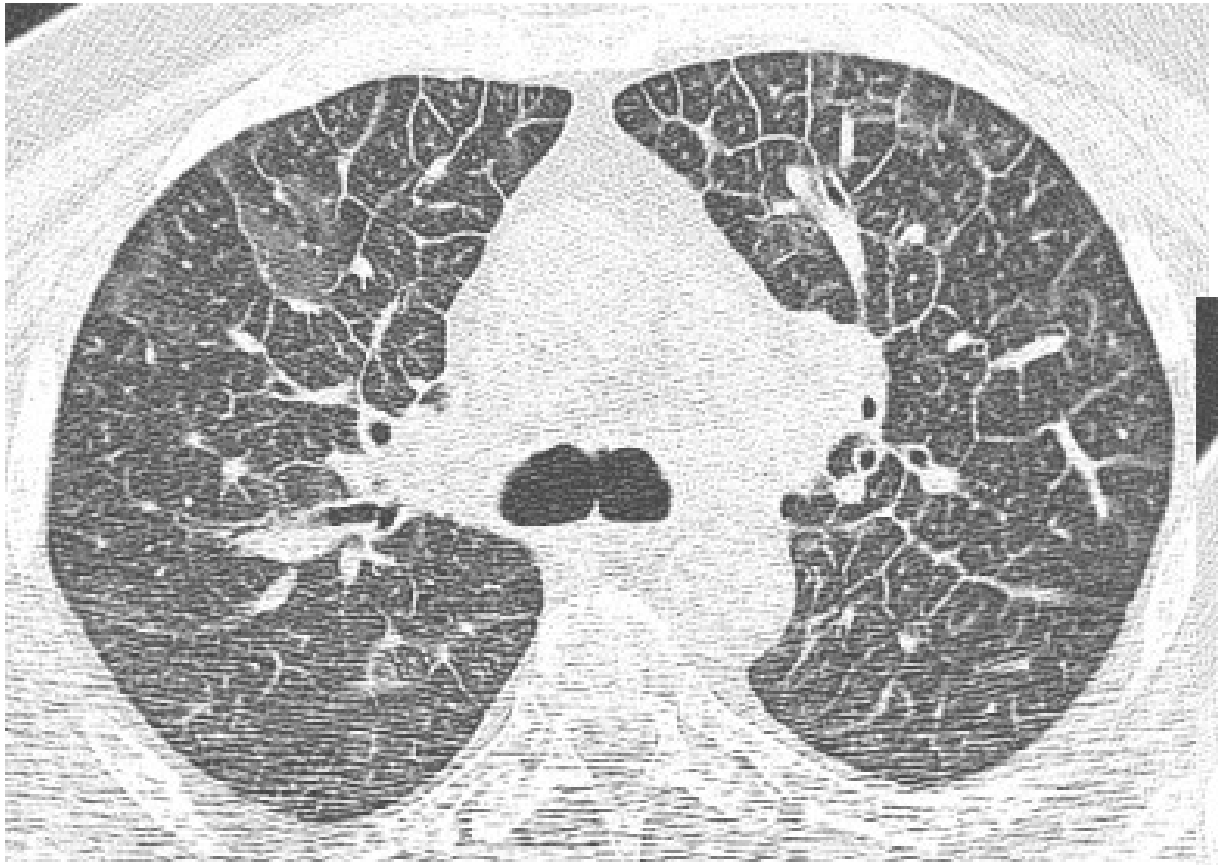




Normal

Bronchovascular bundle thickening





LYMPHANGITIC METASTASIS,
STOMACH CA

Causes of interlobular and bronchovascular bundle thickening

- Pulmonary edema
- Lymphangitic carcinomatosis
- Lymphoma, leukemia
- Sarcoidosis
- UIP and NSIP
- Asbestosis, silicosis, coal worker's pneumoconiosis (CWP)
- Amyloidosis
- Lymphocytic interstitial pneumonia (LIP), et al …

Case 2

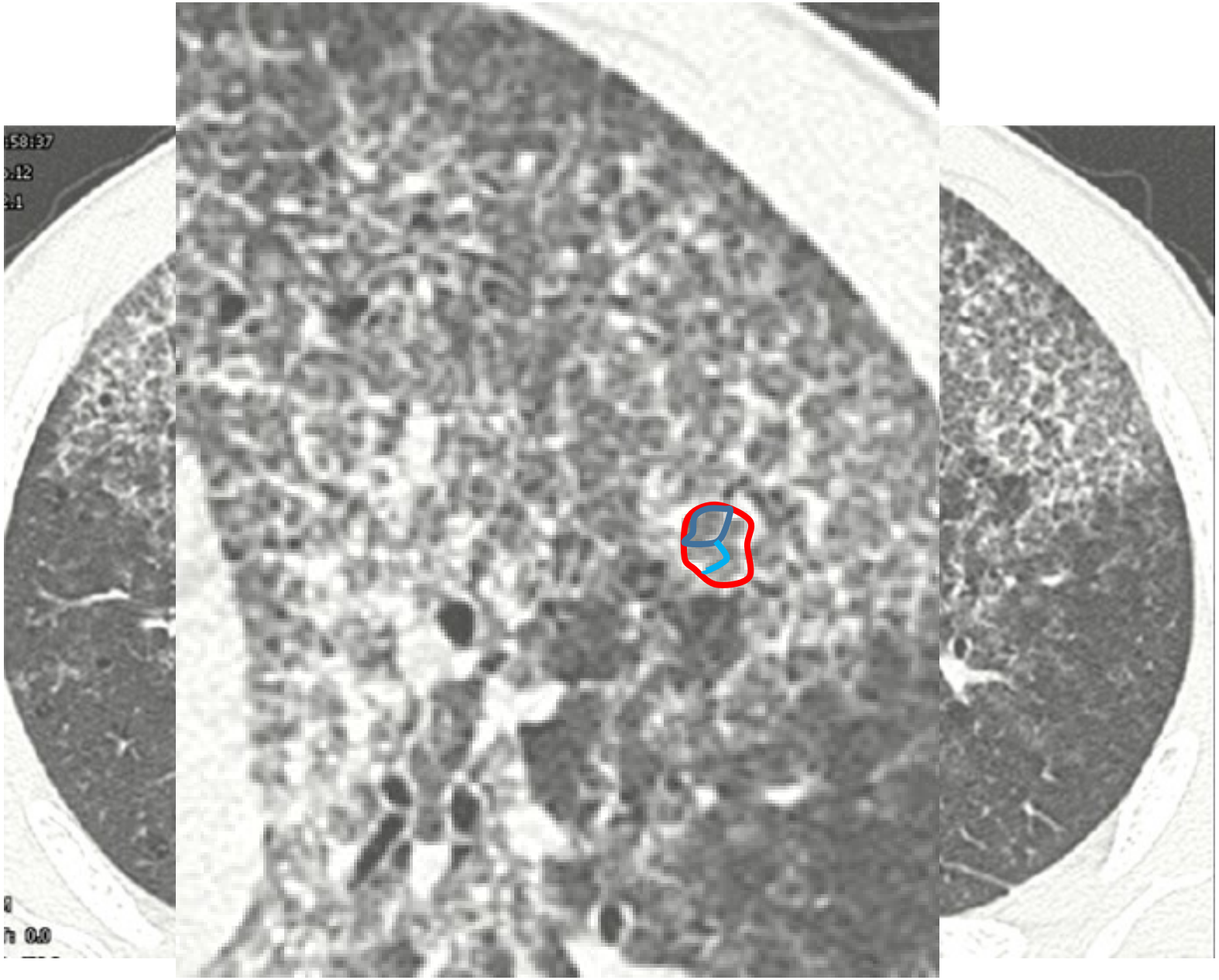
- 40 year old female patient
- Prolonged cough and dyspnea
- Crackles on bilateral auscultation

Ground glass appearance, inter- and intralobular septal thickening

Crazy paving pattern on CT

“crazy-paving” pattern

- It consists of scattered or diffuse ground-glass attenuation with superimposed interlobular septal thickening and intralobular lines.



Pulmonary alveolar proteinosis (PAP)

Pulmonary alveolar proteinosis (PAP)

- Lung disease characterized by an abnormal intra-alveolar accumulation of surfactant-derived lipoproteinaceous material.
- Lung changes are of either patchy or geographic distribution and may have a slightly lower lobe predilection
- Ground glass opacity typically resolves after therapeutic bronchoalveolar lavage, although septal thickening may persist .

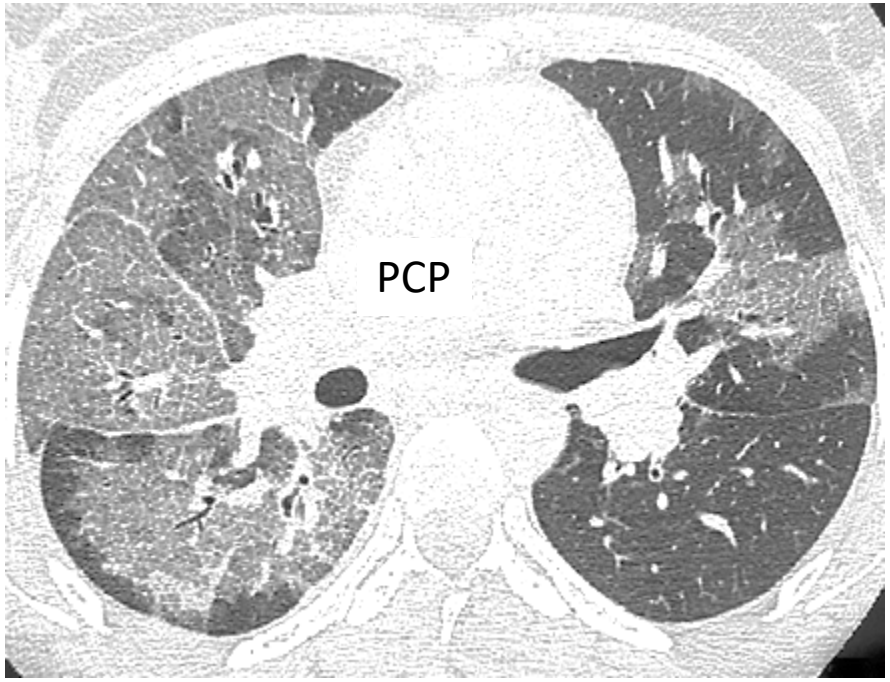
“crazy-paving” pattern

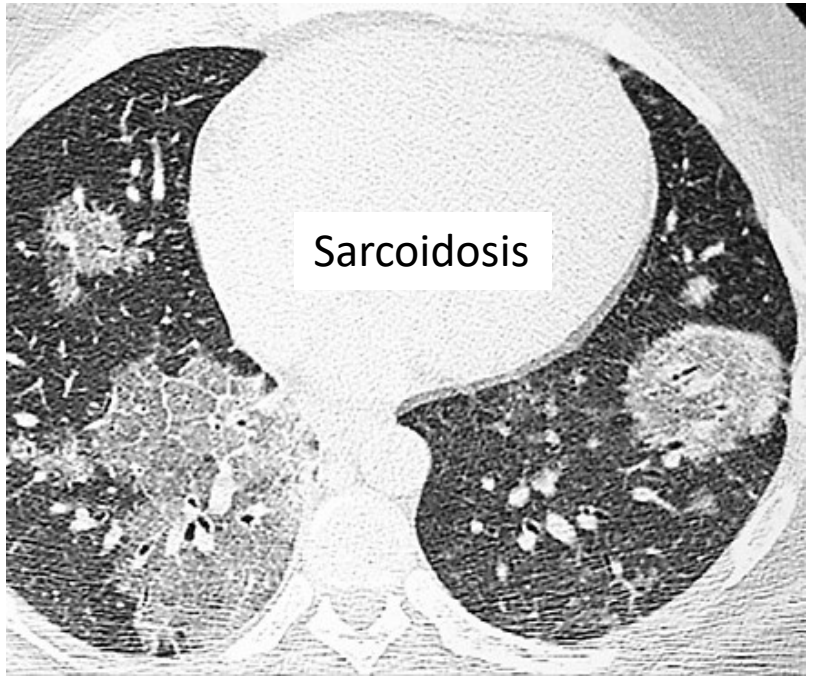
- Common causes:
  - pulmonary edema (most common)
  - acute respiratory distress syndrome (ARDS)
  - bacterial pneumonia
  - acute interstitial pneumonia: ARDS of unknown etiology
  - pulmonary alveolar proteinosis (PAP): the great majority of patients with PAP demonstrate crazy paving

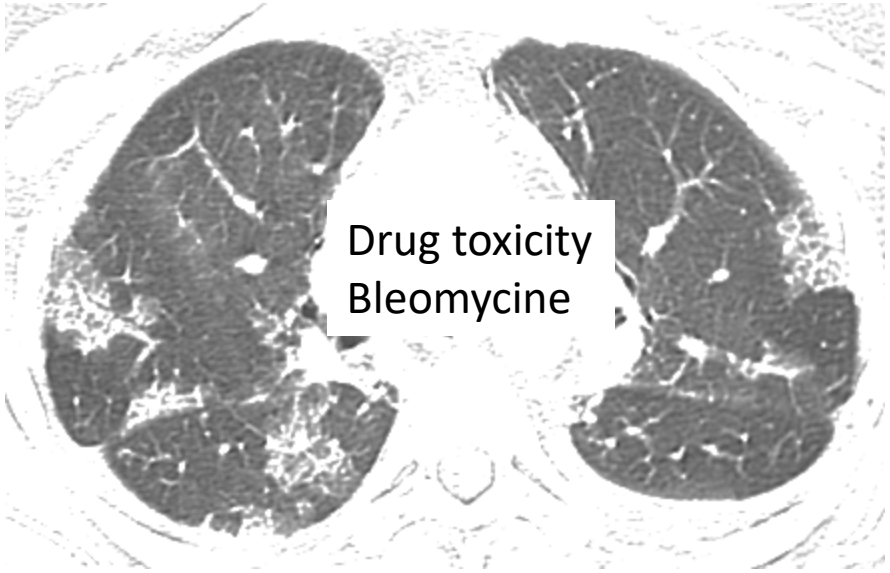
“crazy-paving” pattern

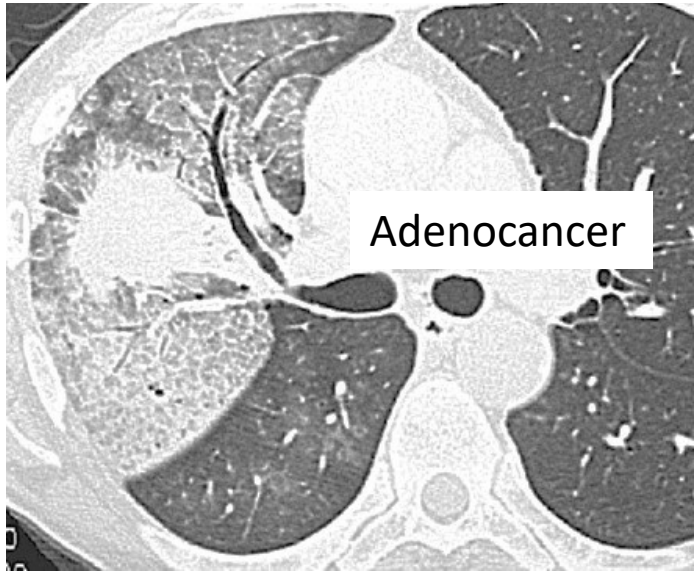
Less common causes:

- drug-induced pneumonitis
- radiation pneumonitis
- pulmonary hemorrhage / diffuse pulmonary hemorrhage
- Goodpasture syndrome
- chronic eosinophilic pneumonia
- usual interstitial pneumonia (UIP) with superimposed diffuse alveolar damage
- pulmonary infections
- mycoplasma pneumonia
- obstructive pneumonia
- tuberculosis
- Pneumocystis jirovecii pneumonia (PCP)
- COVID-19
- pulmonary cryptococcosis 6
- cryptogenic organizing pneumonia (COP, formerly BOOP)
- invasive mucinous adenocarcinoma of the lung (formerly mucinous bronchoalveolar carcinoma)
- sarcoidosis, especially alveolar sarcoidosis
- lipoid pneumonia


PCP

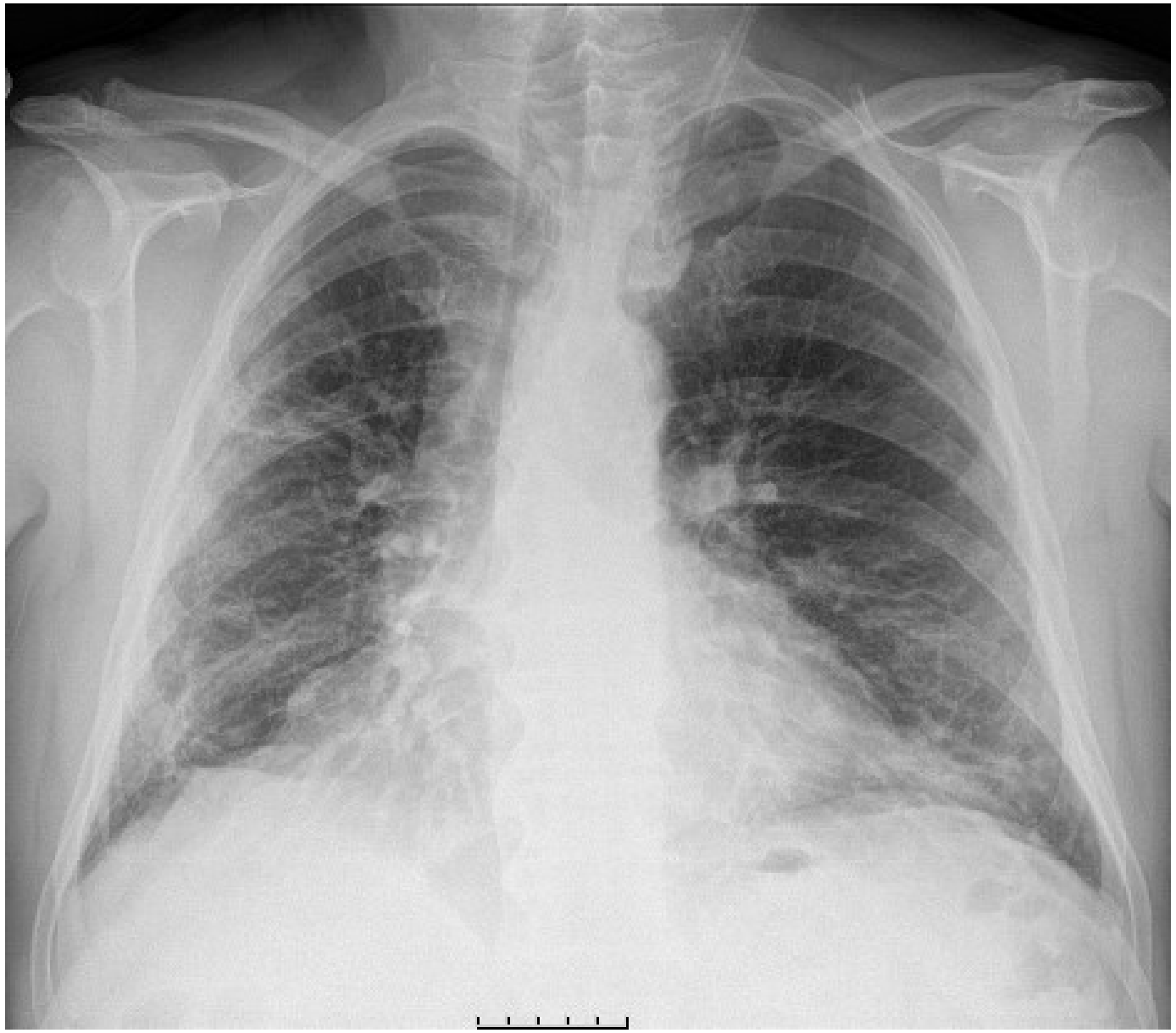

Sarcoidosis


Drug toxicity
Bleomycine

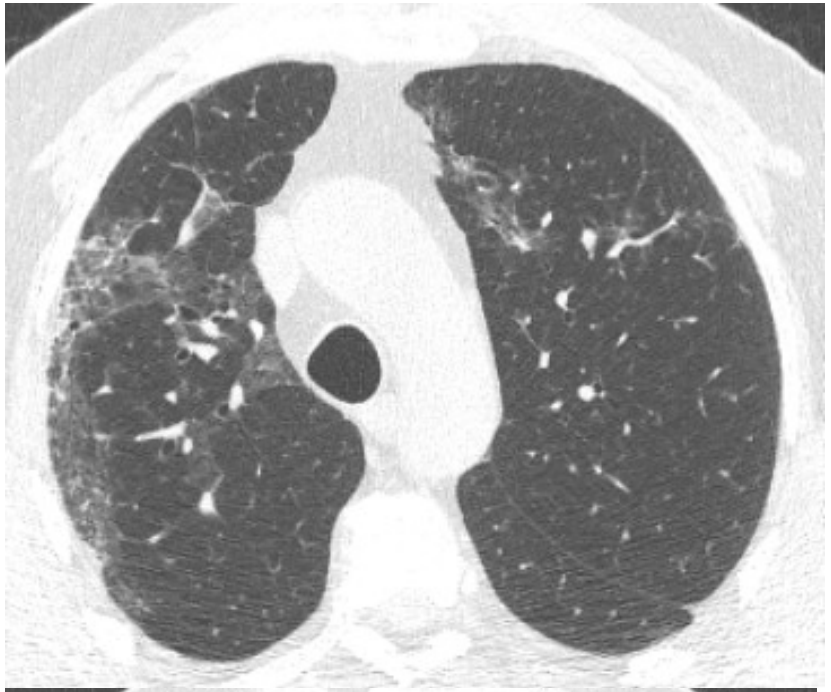

Adenocancer

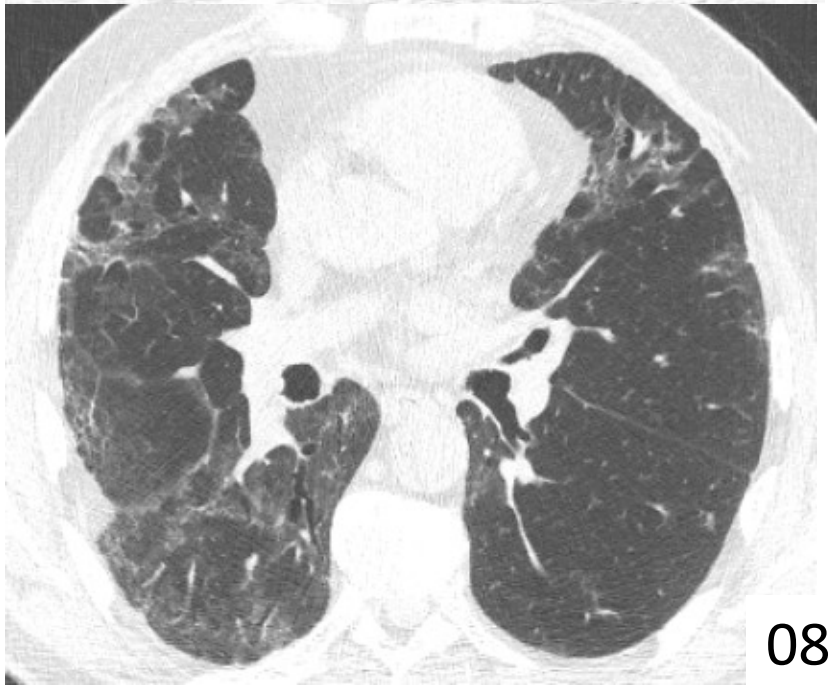
Case 3

- 59-year-old male
- Diabetes Mellitus (+),
- PA chest X-ray and HRCT are performed due to persistent respiratory distress for 3-4 months.



08.03.2022





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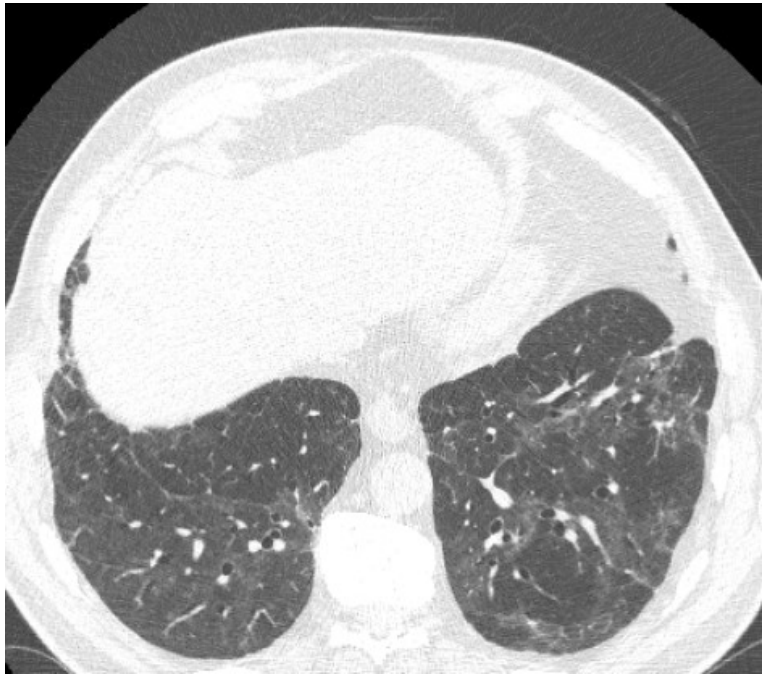
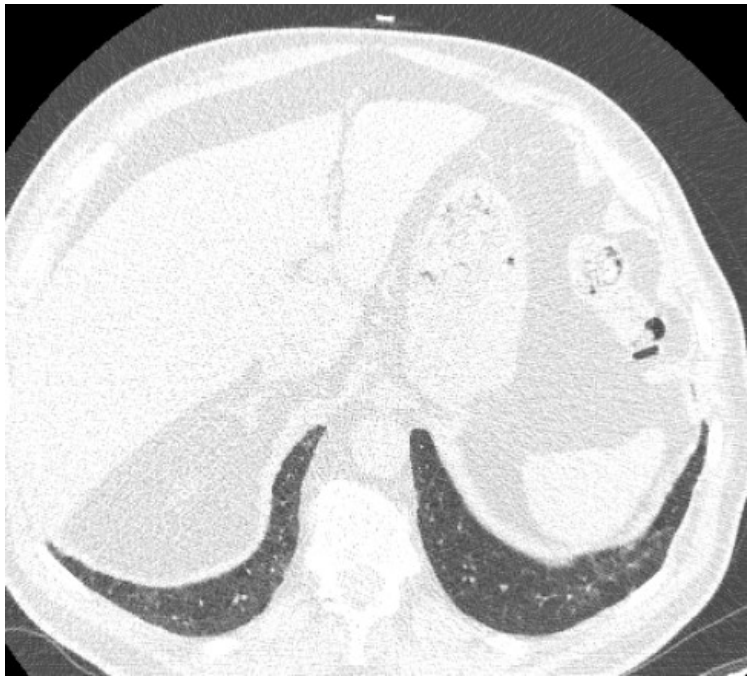
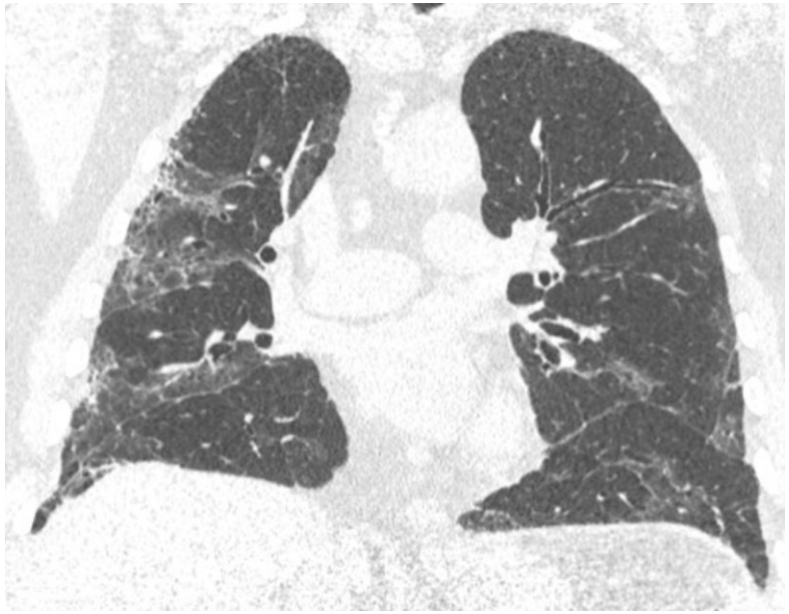


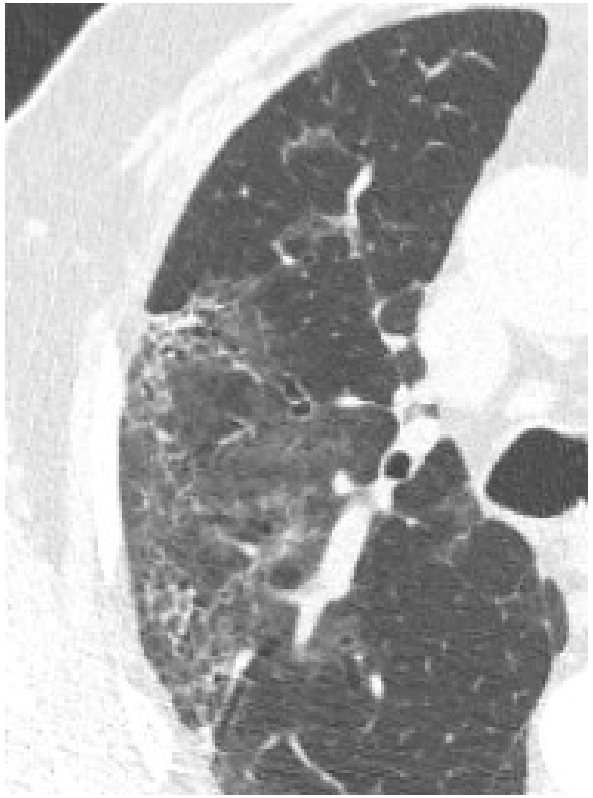




08.03.2022

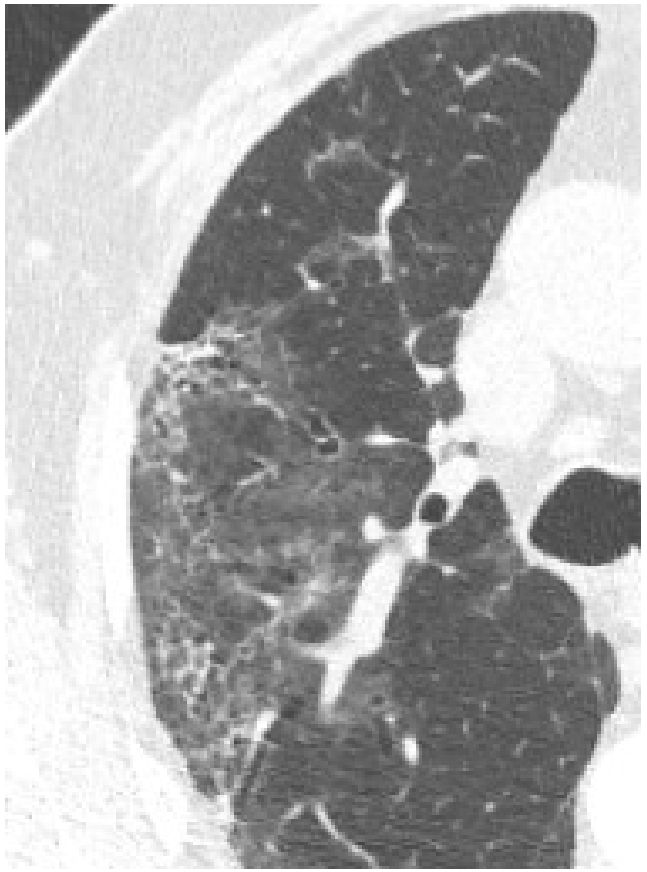
CT findings:

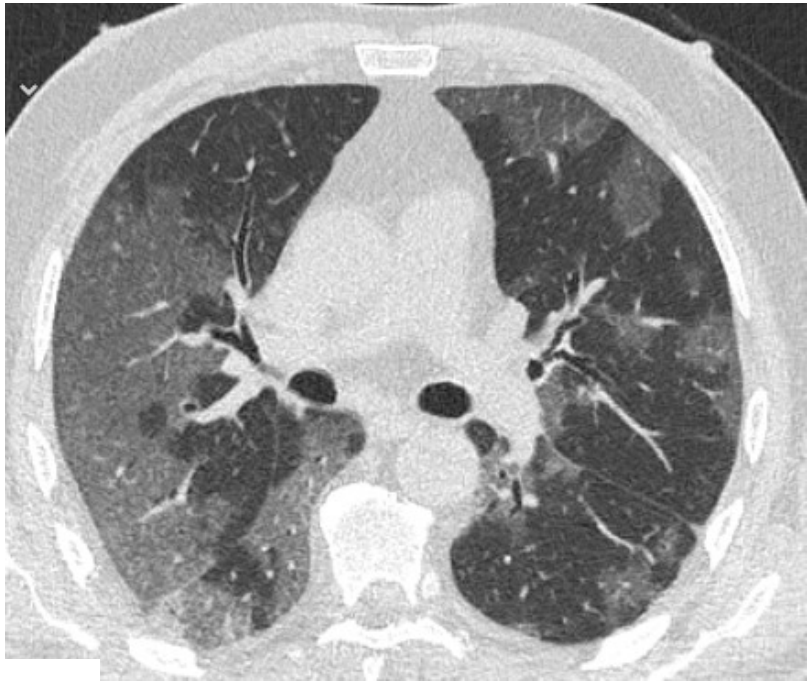
- Ground glass
- Peripheral reticulation
- Traction bronchiectasis



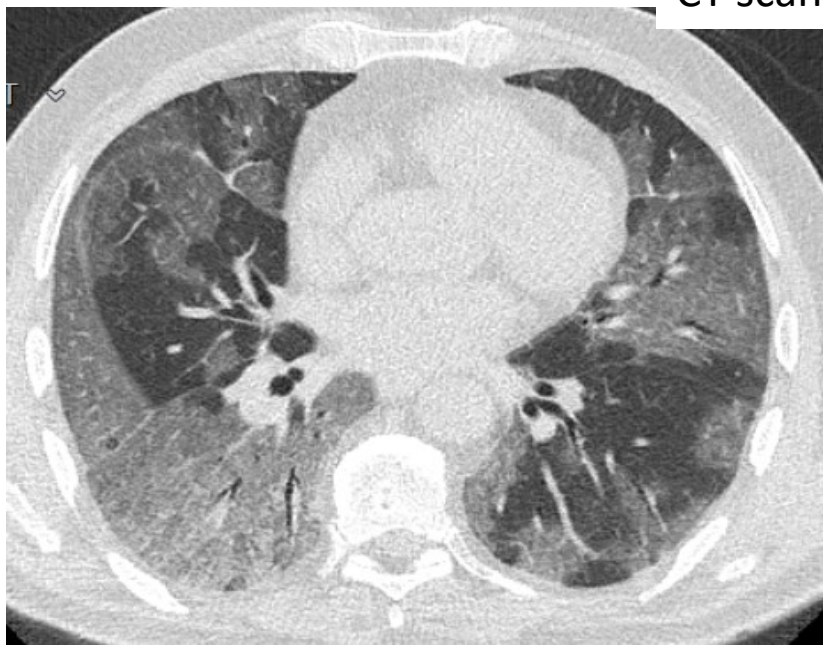
What do you think would be the most likely diagnosis?

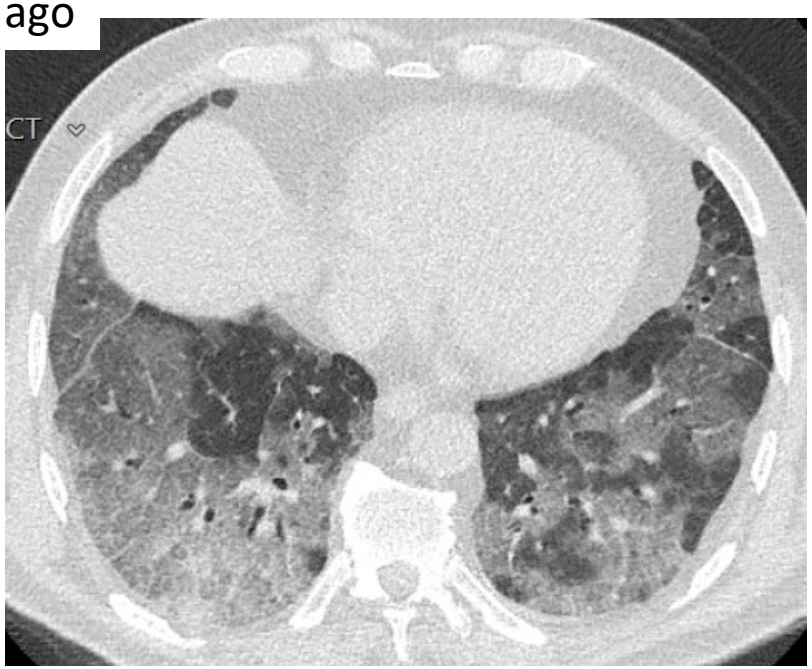
a) Drug reaction
b) Chronic eosinophilic pneumonia
c) Connective tissue disease
d) Possible UIP
e) Postinfectious process





CT scan about 4 months ago

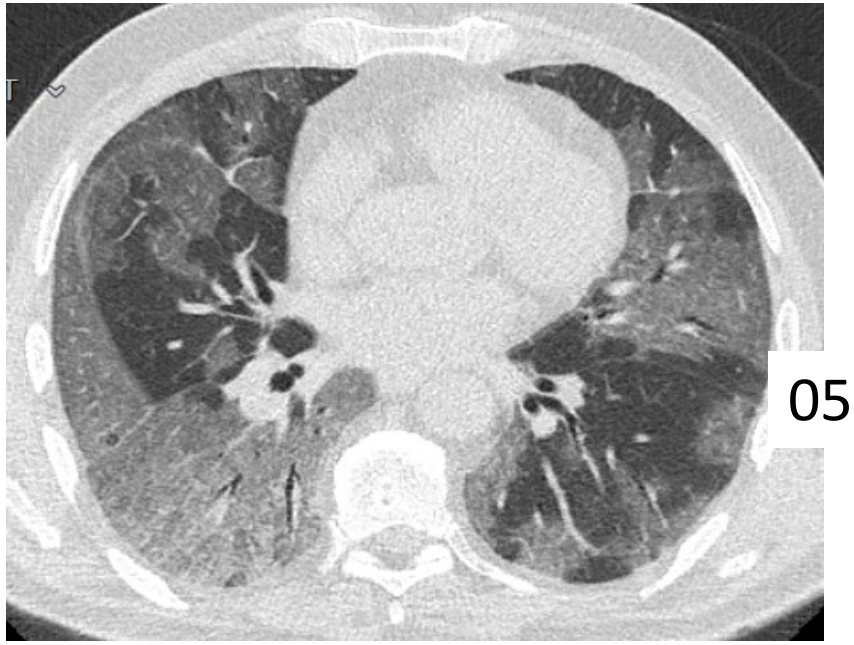




05.11.2021

What would be your diagnosis for a CT scan 3 months ago?

a) Covid 19 infection
b) Pulmonary Alveolar Proteinosis
c) Chronic eosinophilic pneumonia
d) Drug reaction
e) SLE-Connective tissue disease



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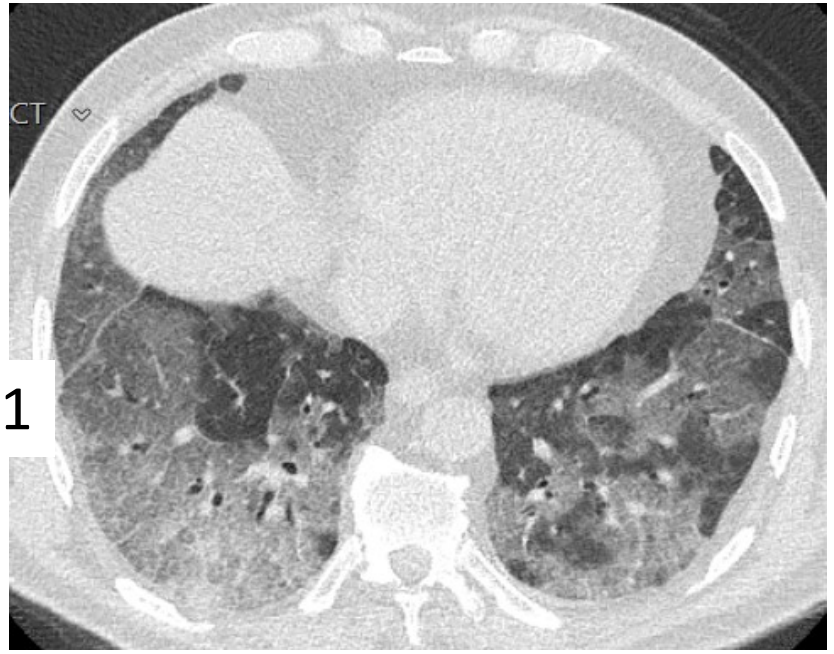
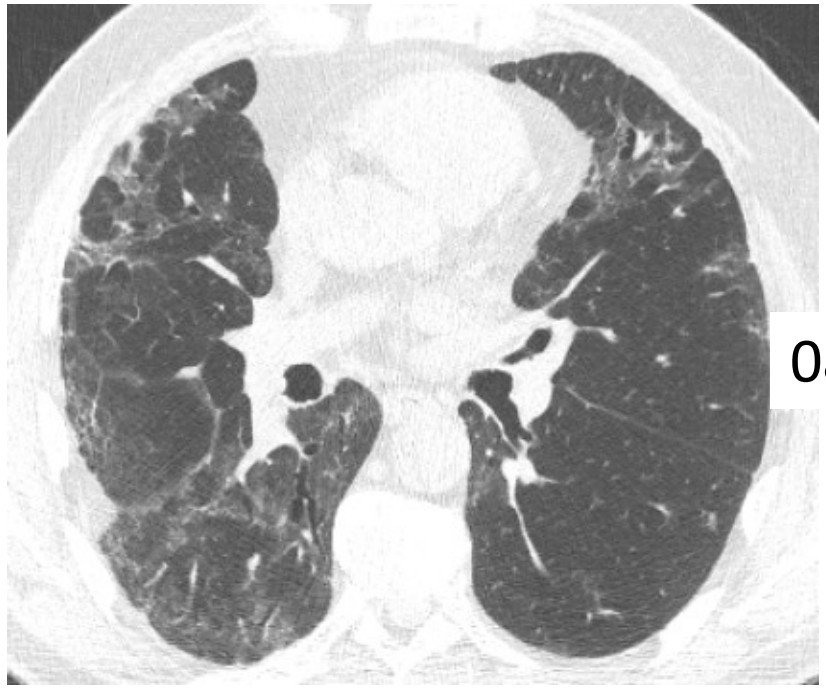




08.03.2022

What would be your diagnosis for a CT scan 3 months ago?

a) Covid 19 infection
b) Pulmonary Alveolar Proteinosis
c) Chronic eosinophilic pneumonia
d) Drug reaction
e) SLE-Connective tissue disease

COVID 19
LONG-TERM LUNG CT FINDINGS

-It may heal completely,
-Septal thickening, coarse reticular pattern,
-Fibrous band and irregular interface findings may be permanent,
-Bronchial dilatation,
-Mosaic attenuation,
-Volume loss may develop.
-Finally, traction bronchiectasis and rarely honeycombing
-The findings are most prominent in the lower lobes of both lungs.

Yu Met al. Prediction of the Development of Pulmonary Fibrosis Using Serial Thin-Section CT and Clinical Features in Patients Discharged after Treatment for COVID-19 Pneumonia. Korean J Radiol. 2020 Jun;21(6):746-755.

COVID AND FIBROSIS FEATURES

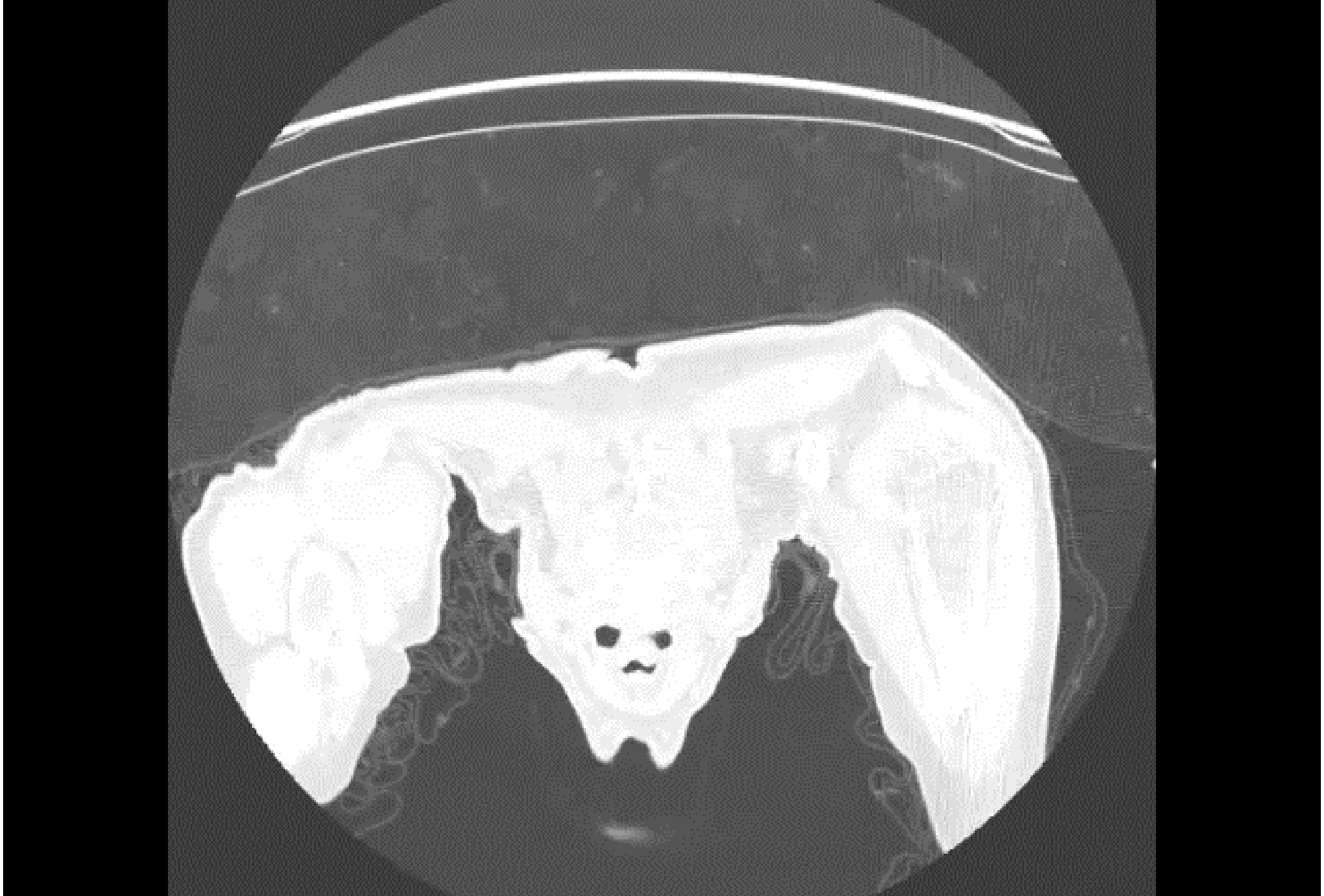
- Fibrosis occurring in Covid 19 is either absent or very little honeycombing in the lung bases and peripheral areas
- COVID-19-induced fibrosis is characterized by parenchymal bands, traction bronchiectasis, volume loss and damage to the parenchymal structure and reticular opacities.

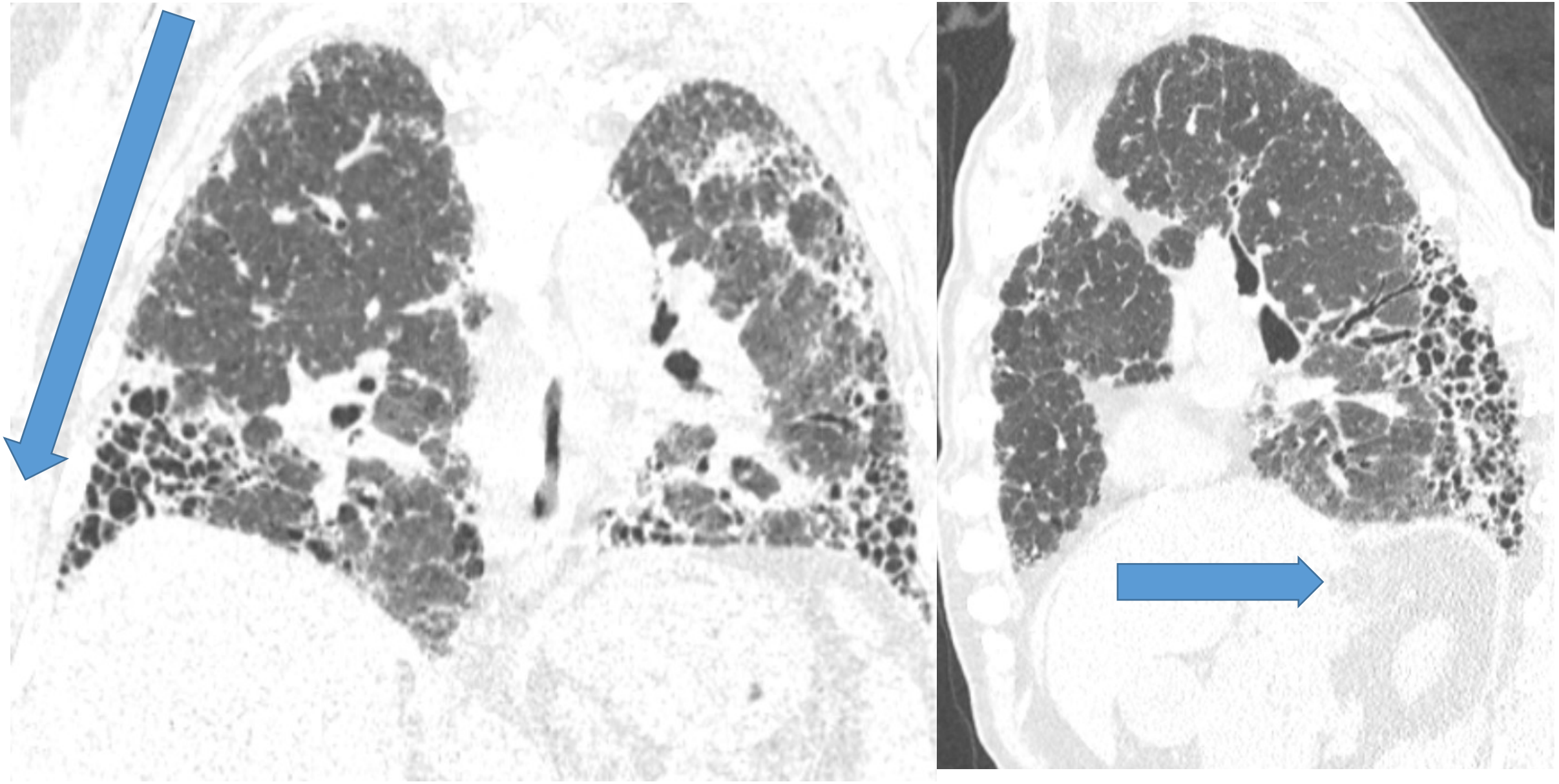
Danielle T al. Imaging of COVID-19.In press, Seminars in Roentgenology. October 2021 online. https://doi.org/10.1053/j.ro.2021.10.002

Case 4

- 72 year old male
- Prolonged cough and dyspnea


EGE
54





CT findings

- Honeycomb appearance increasing towards the lower zones
- Traction bronchiectasis
- Heterogeneous appearance with less ground glass
- Signs of volume loss
- Increase in findings from top to bottom and front to back

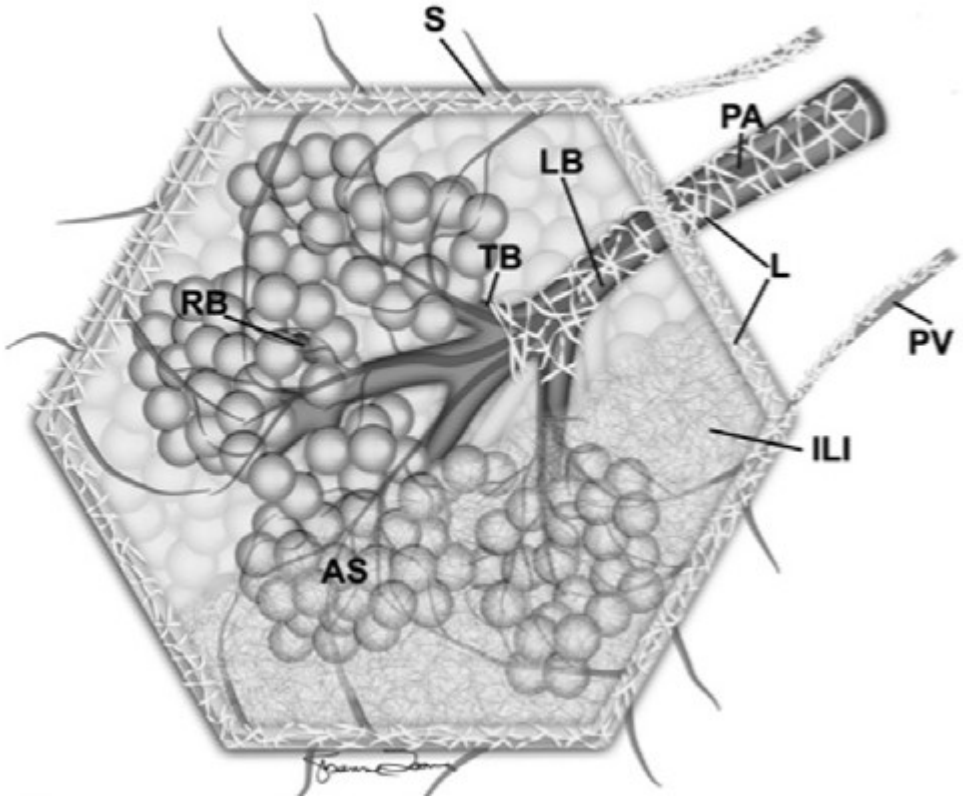
HONEYCOMB APPEARANCE

- Terminal airway dilatation and
- Fibrotic alveolar septal collapse

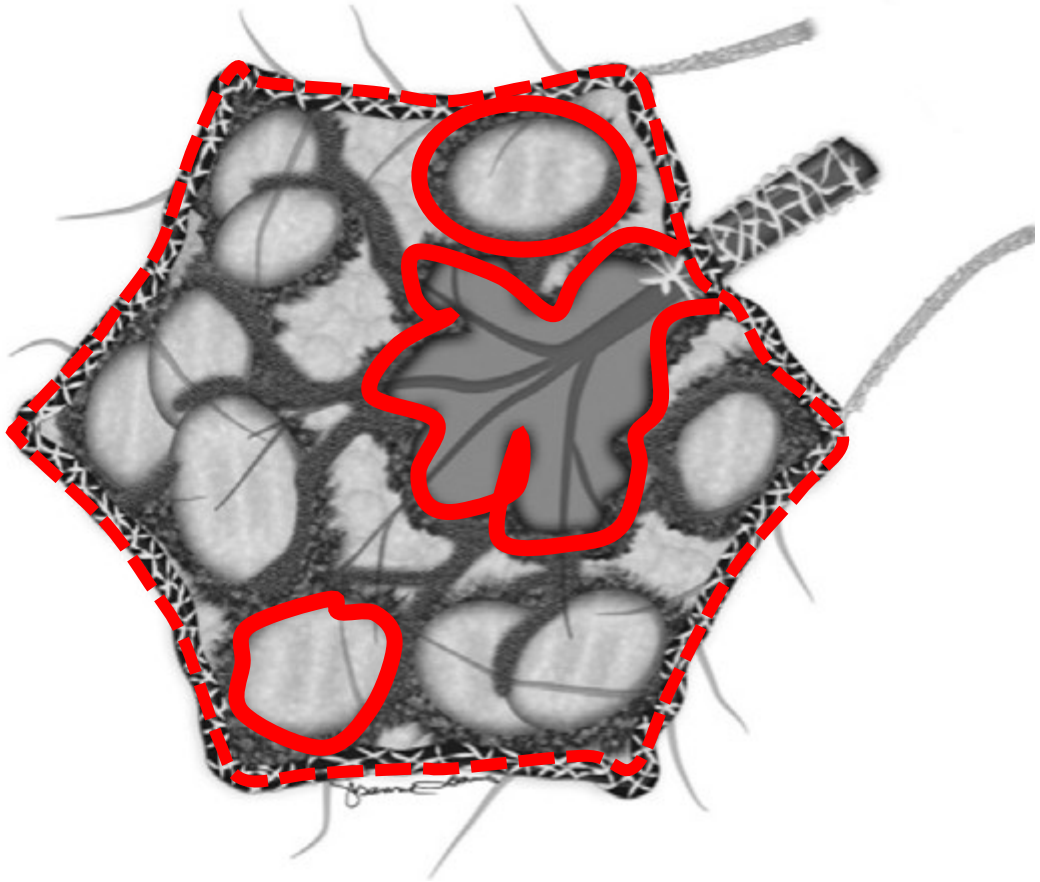
Bronchiolar cyst developing as a result of

Idiopathic Pulmonary Fibrosis (an Update) and Progressive Pulmonary Fibrosis in Adults
An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline
Am J Respir Crit Care Med Vol 205, Iss 9, pp e18–e47, May 1, 2022

Secondary pulmonary lobule



Normal



Honeycomb appearance

Irregularity and volume loss in the interlobular septum, dilatation and cysts in the centrlobular bronchioles

DISEASES THAT MAKE HONEYCOMB IN CT?

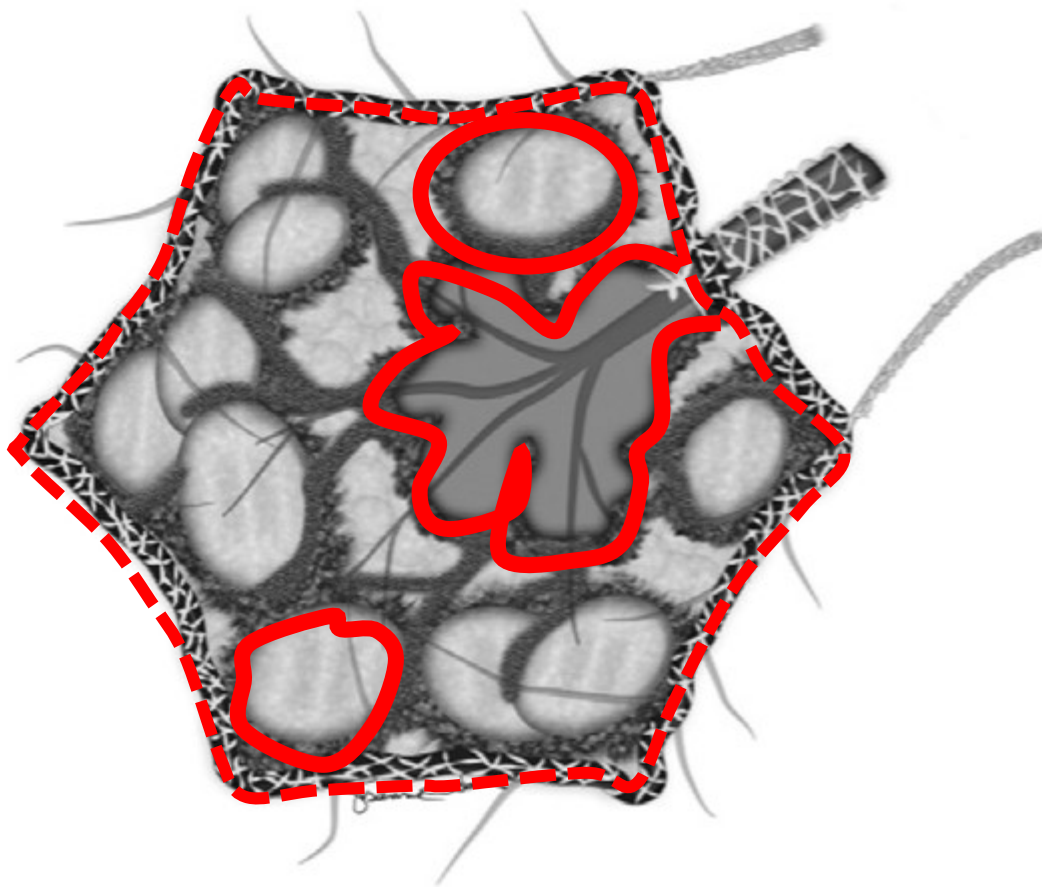
Reasons for HONEYCOMB APPEARANCE

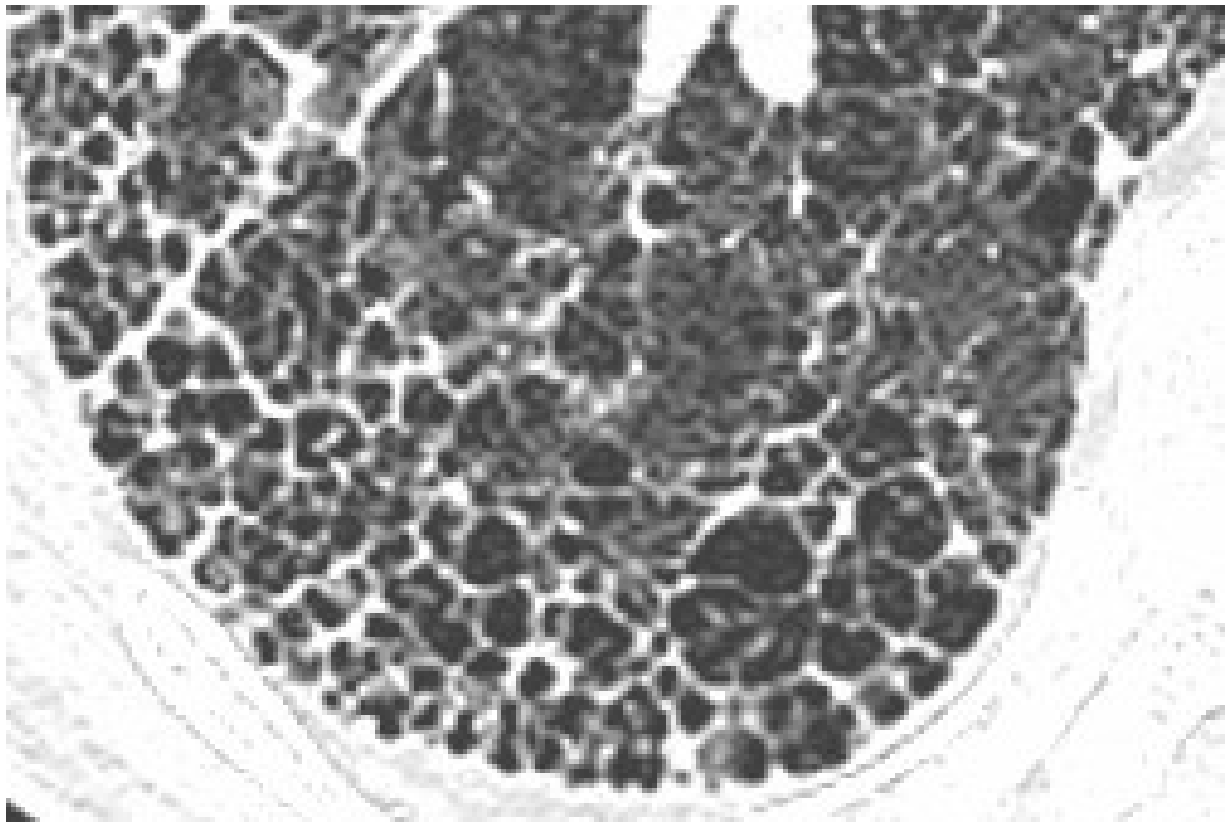
- **UIP-IPF**
  - -Lower zone
  - -Peripheral
  - -Small cysts

- **NSIP**
- **IPF DIŞI UIP**
  - -Fibrotic HP
  - -Sarcoidosis
  - -Drug reactions
  - -Connective tissue diseases
  - -Vasculitis
  - -Asbestosis
  - -Chronic aspiration

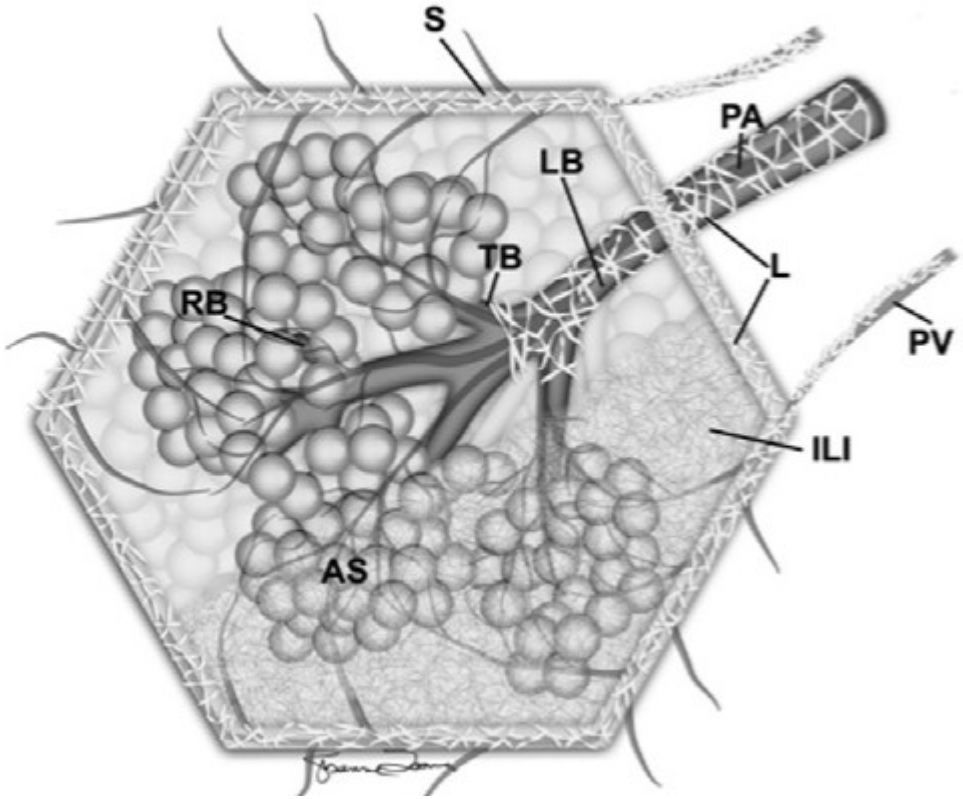
	HRCT Pattern			
	UIP Pattern	**Probable UIP Pattern**	**Indeterminate for UIP**	**CT Findings Suggestive of an Alternative Diagnosis**
Level of confidence for UIP histology	Confident (>90%)	Provisional high confidence (70–89%)	Provisional low confidence (51–69%)	Low to very low confidence (≤50%)
Distribution	• Subpleural and basal predominant • Often heterogeneous (areas of normal lung interspersed with fibrosis) • Occasionally diffuse • May be asymmetric	• Subpleural and basal predominant • Often heterogeneous (areas of normal lung interspersed with reticulation and traction bronchiectasis/ bronchiolectasis)	• Diffuse distribution without subpleural predominance	• Peribronchovascular predominant with subpleural sparing (consider NSIP) • Perilymphatic distribution (consider sarcoidosis) • Upper or mid lung (consider fibrotic HP, CTD-ILD, and sarcoidosis) • Subpleural sparing (consider NSIP or smoking-related IP)
CT features	• Honeycombing with or without traction bronchiectasis/ bronchiolectasis • Presence of irregular thickening of interlobular septa • Usually superimposed with a reticular pattern, mild GGO • May have pulmonary ossification	• Reticular pattern with traction bronchiectasis/ bronchiolectasis • May have mild GGO • Absence of subpleural sparing	• CT features of lung fibrosis that do not suggest any specific etiology	• Lung findings ◦ Cysts (consider LAM, PLCH, LIP, and DIP) ◦ Mosaic attenuation or three-density sign (consider HP) ◦ Predominant GGO (consider HP, smoking-related disease, drug toxicity, and acute exacerbation of fibrosis) ◦ Profuse centrilobular micronodules (consider HP or smoking-related disease) ◦ Nodules (consider sarcoidosis) ◦ Consolidation (consider organizing pneumonia, etc.) • Mediastinal findings ◦ Pleural plaques (consider asbestosis) ◦ Dilated esophagus (consider CTD)

Idiopathic Pulmonary Fibrosis (an Update) and Progressive Pulmonary Fibrosis in Adults An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline
Am J Respir Crit Care Med Vol 205, Iss 9, pp e18–e47, May 1, 2022





Secondary pulmonary lobule



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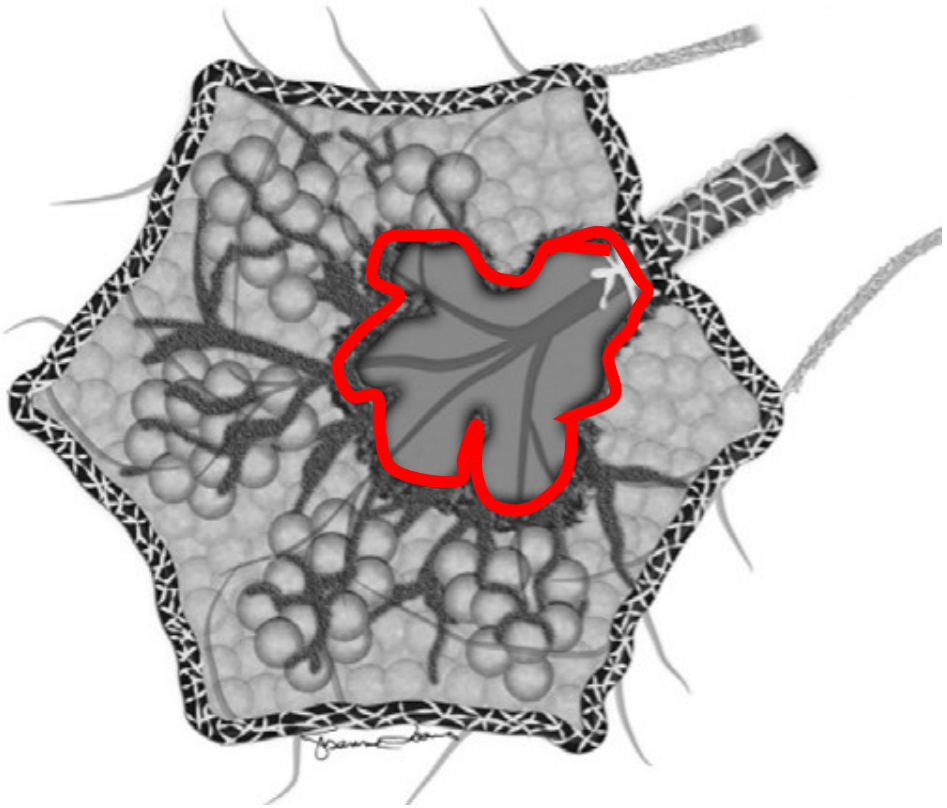
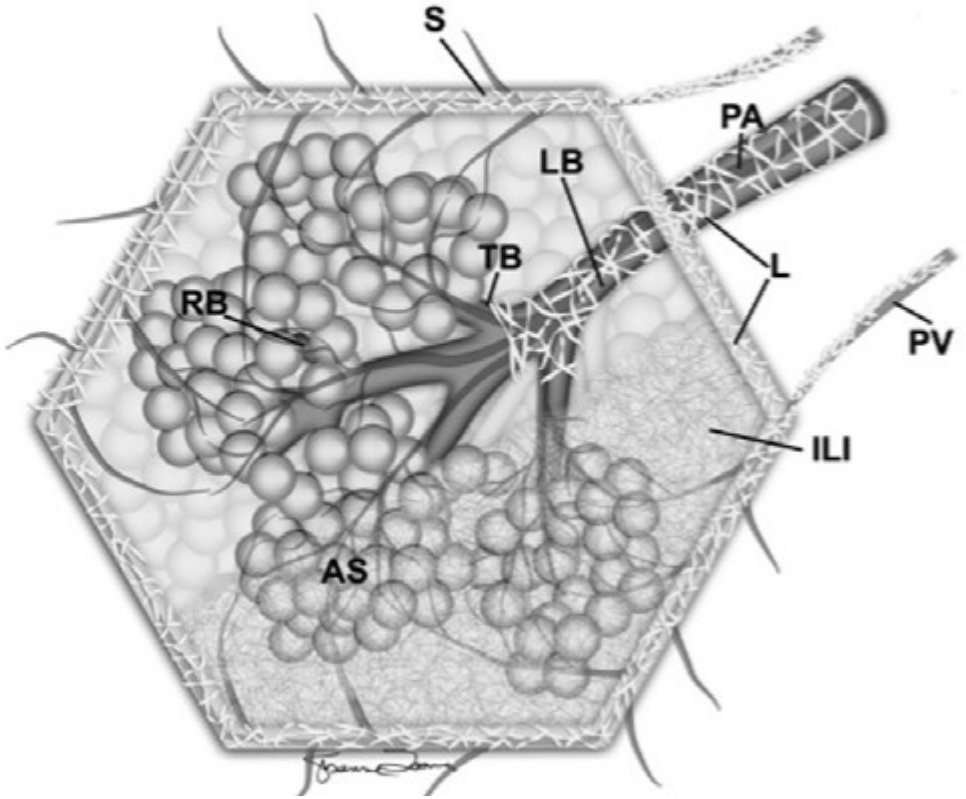


Traction bronchiectasis

Secondary pulmonary lobule



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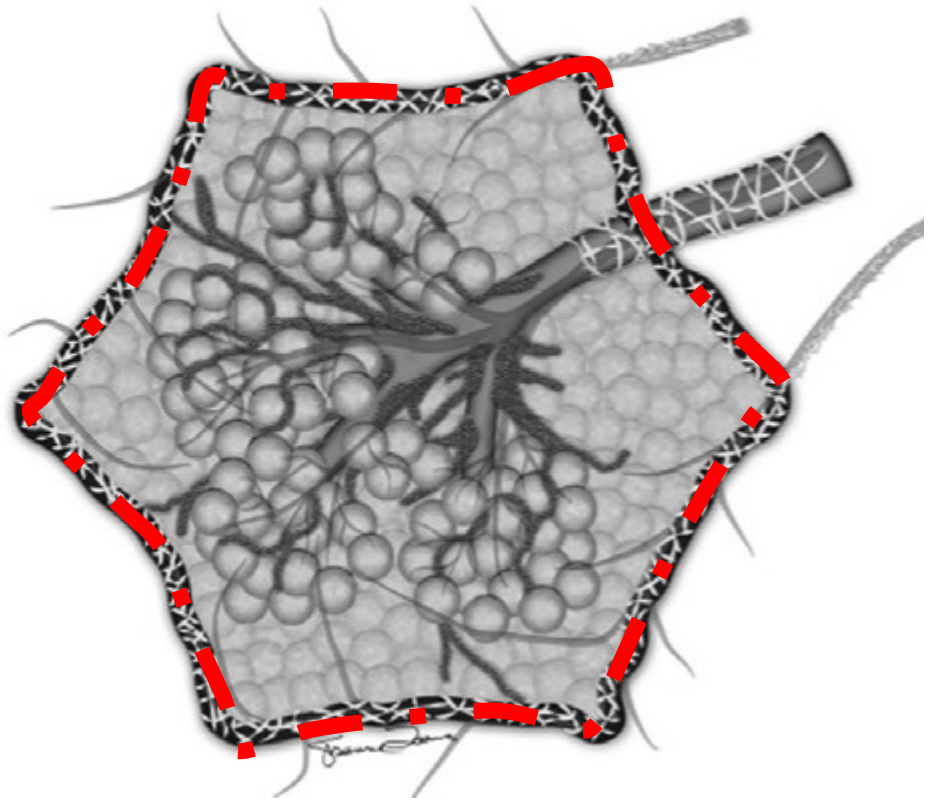
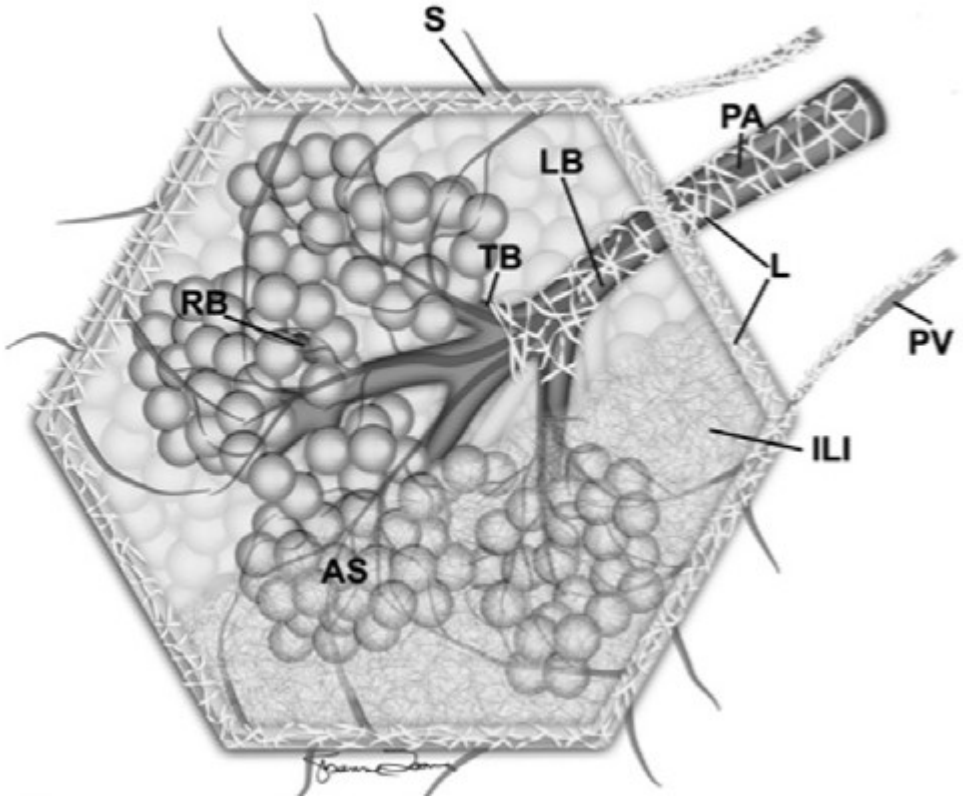


Reticulation

Secondary pulmonary lobule



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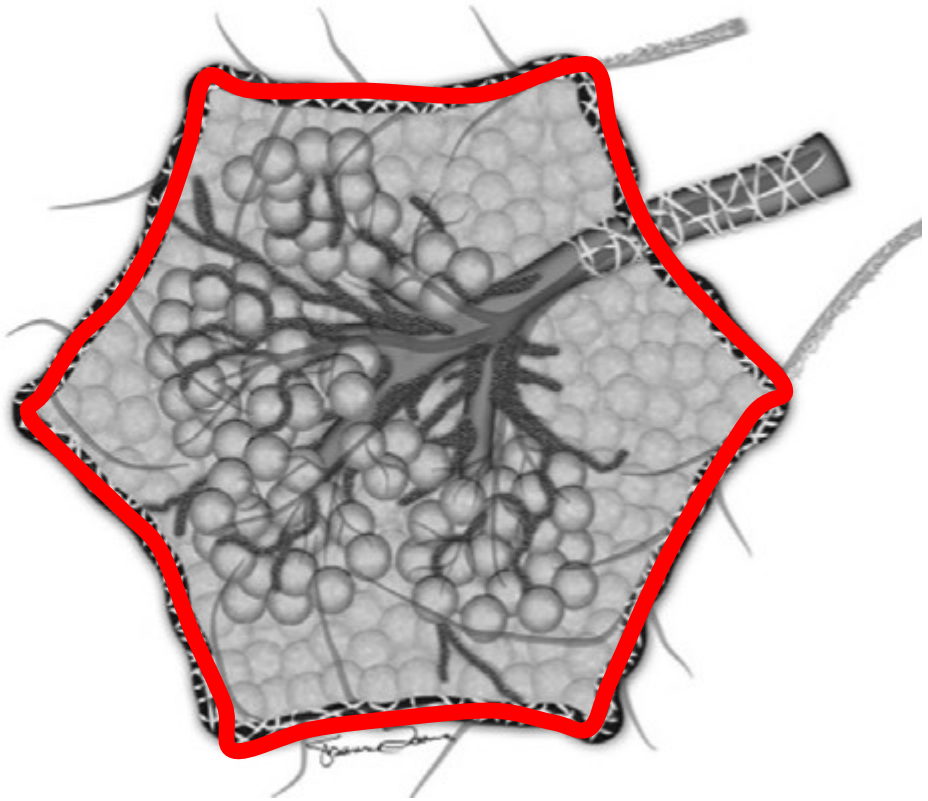
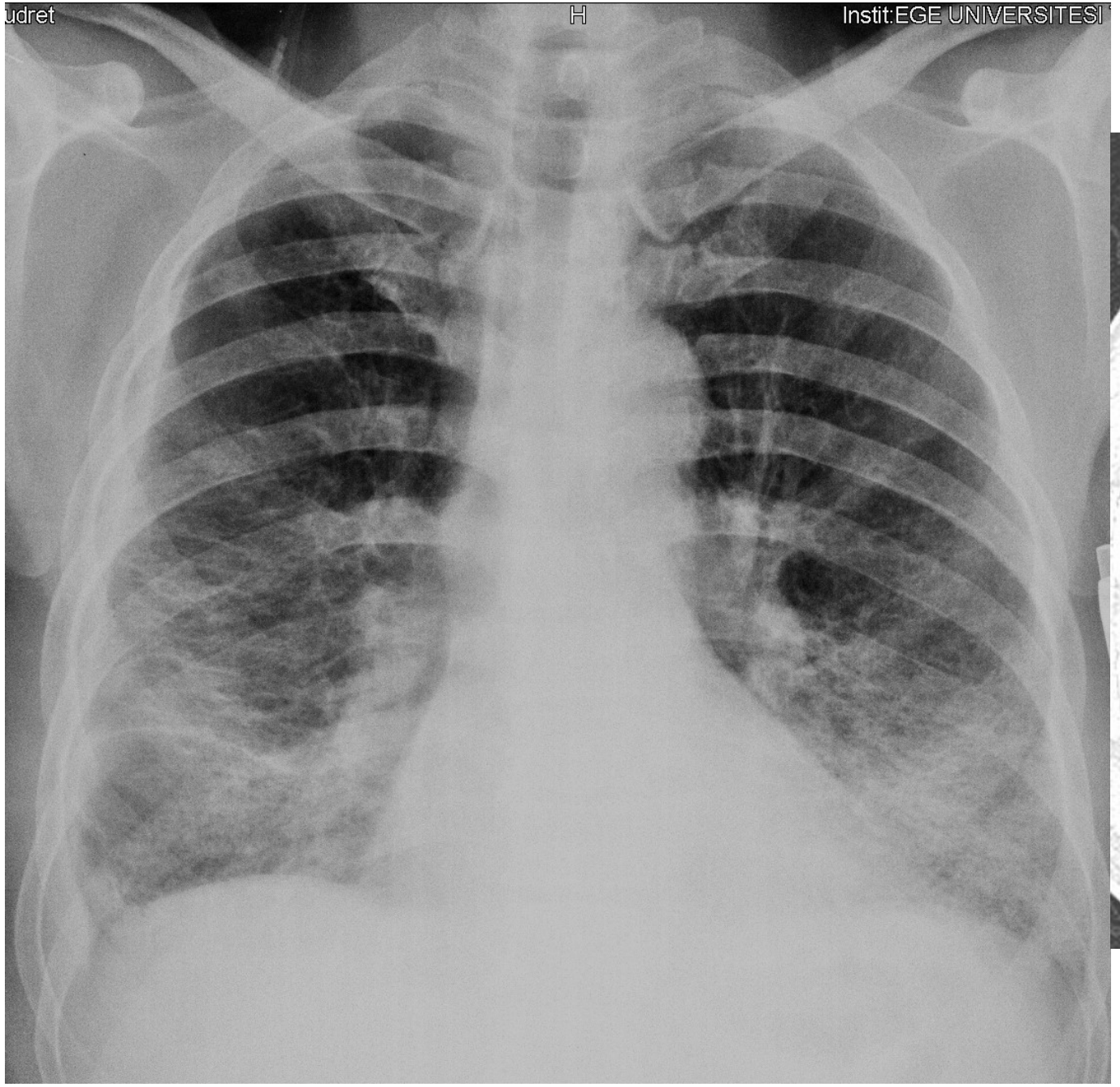
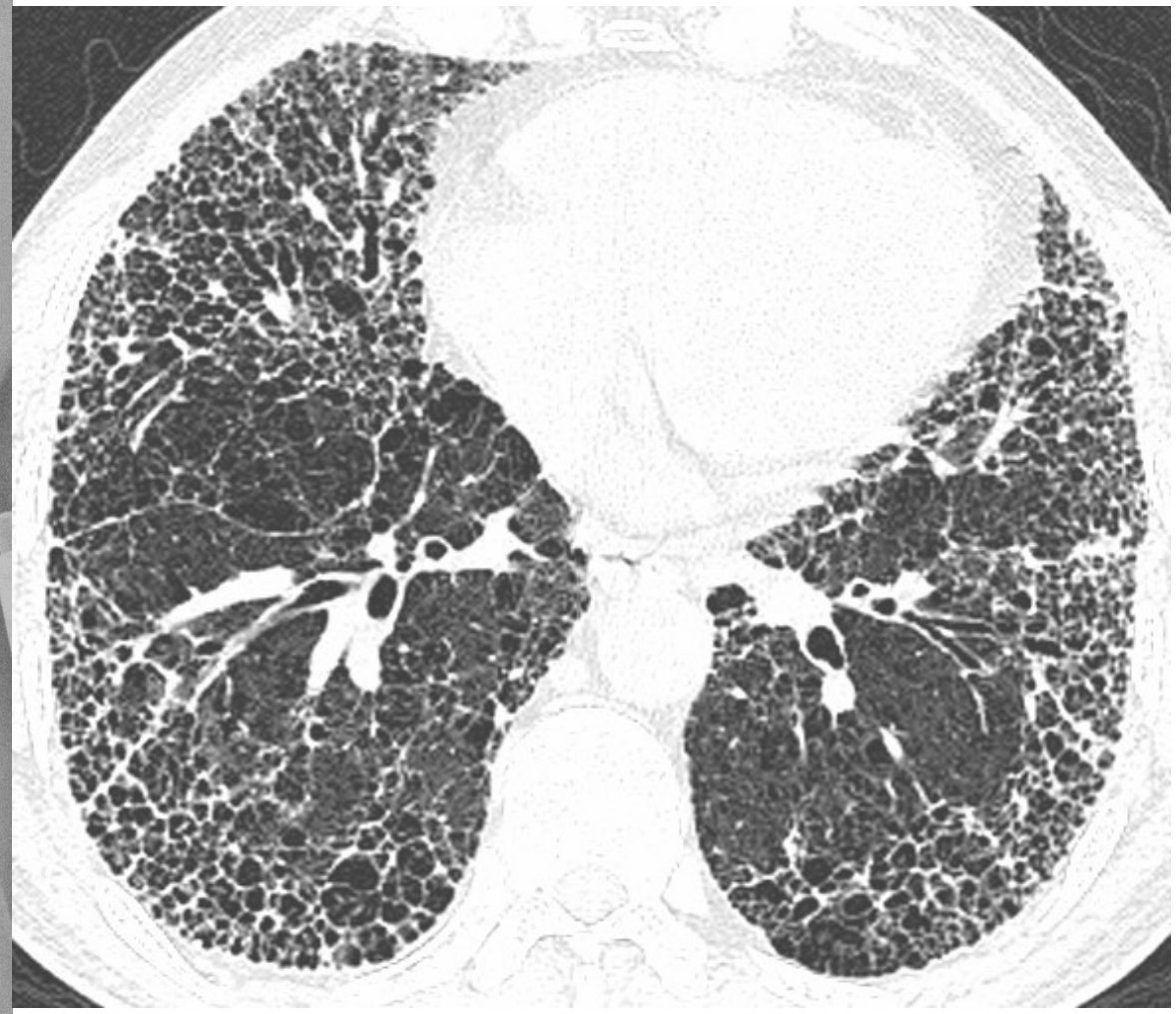


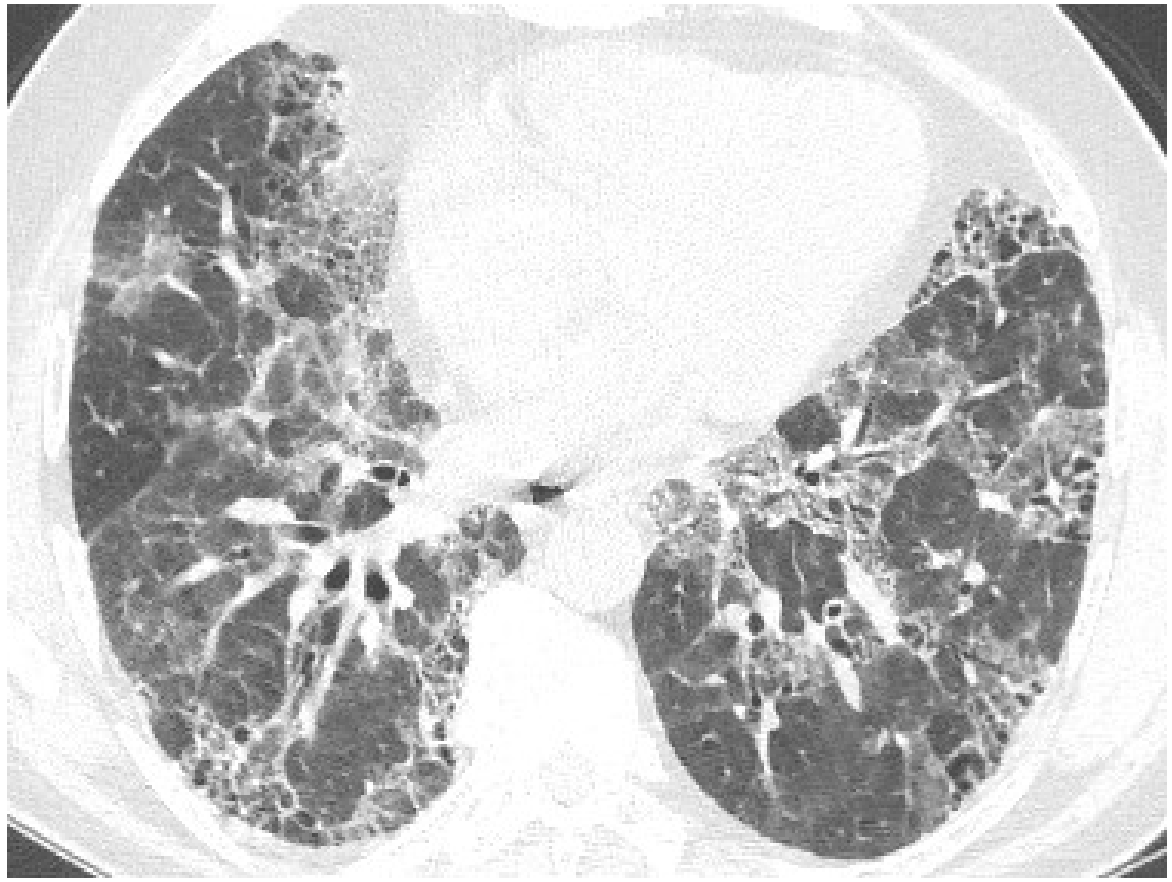
Septal thickening





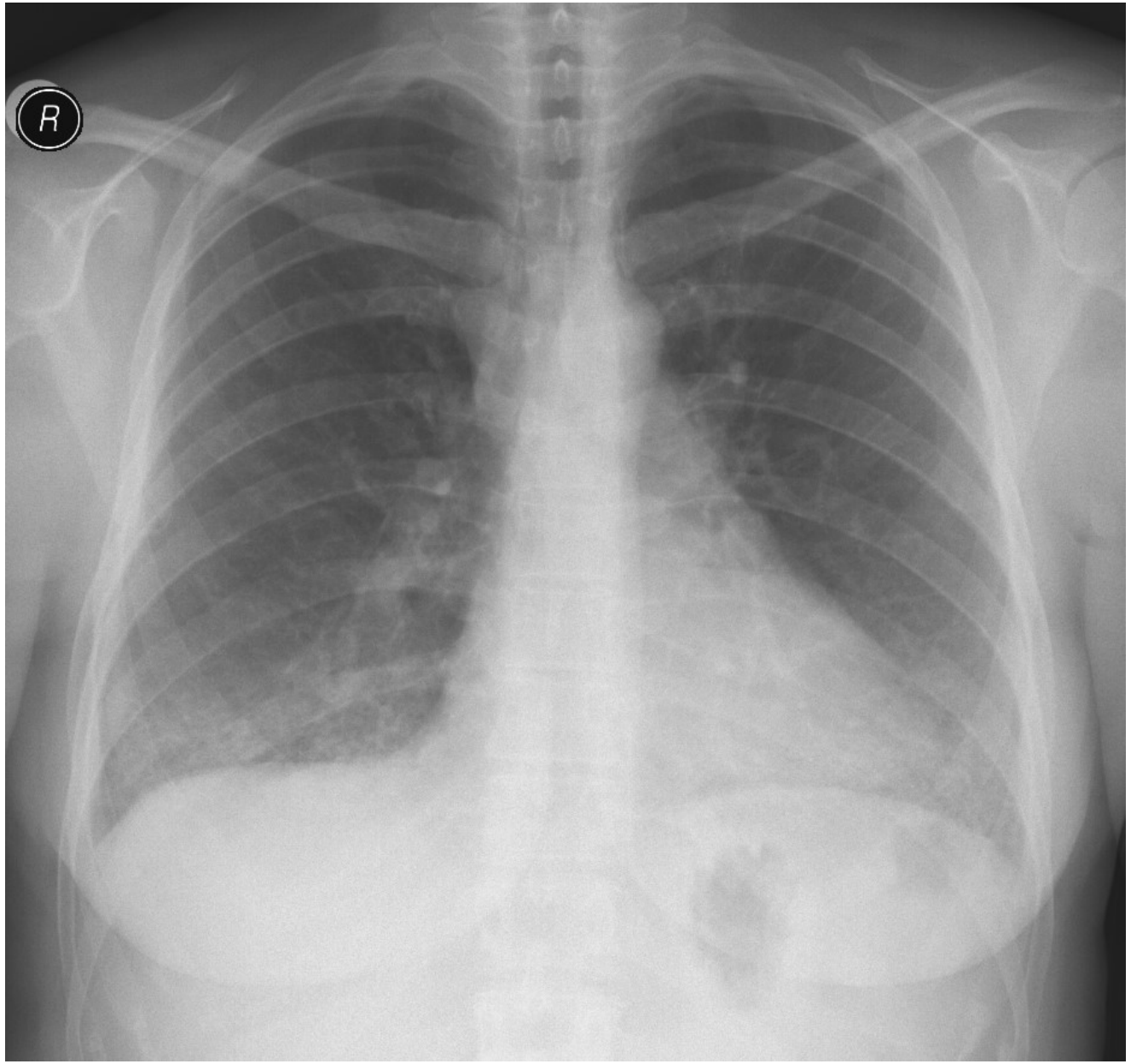
Honeycomb pattern

NON-IPF UIP

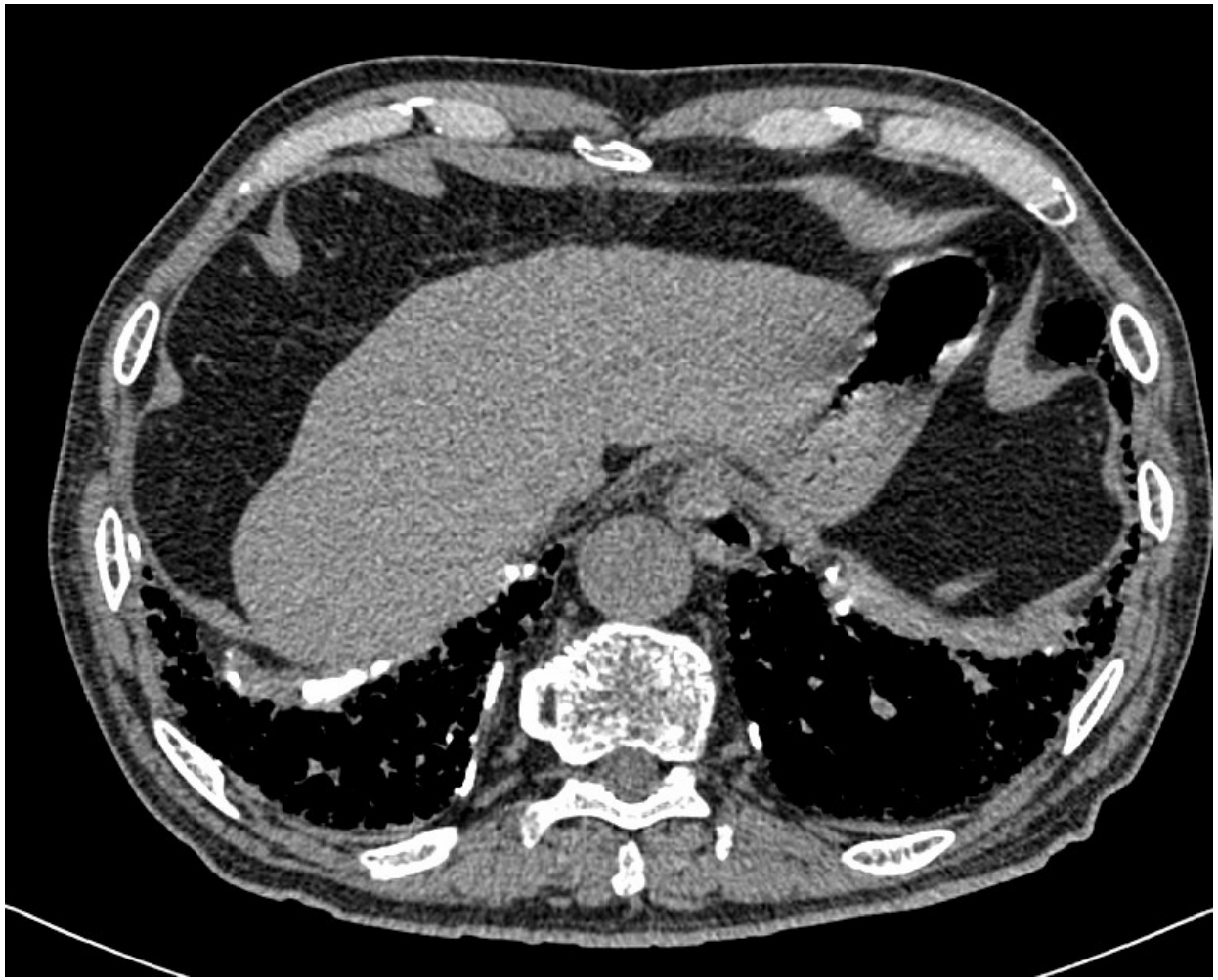


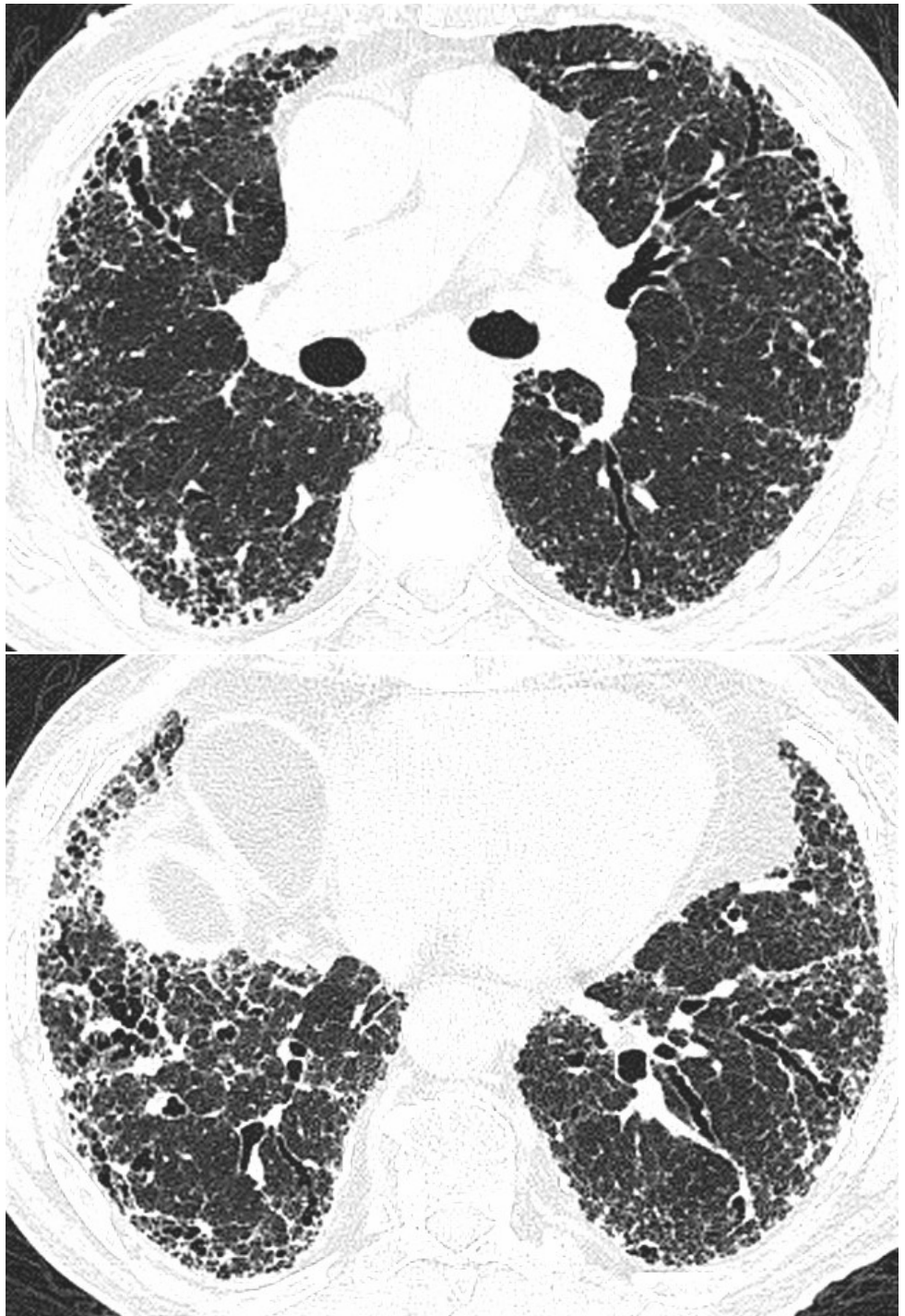
Marked mosaic attenuation

Fibrotic HP



SCLERODERMA

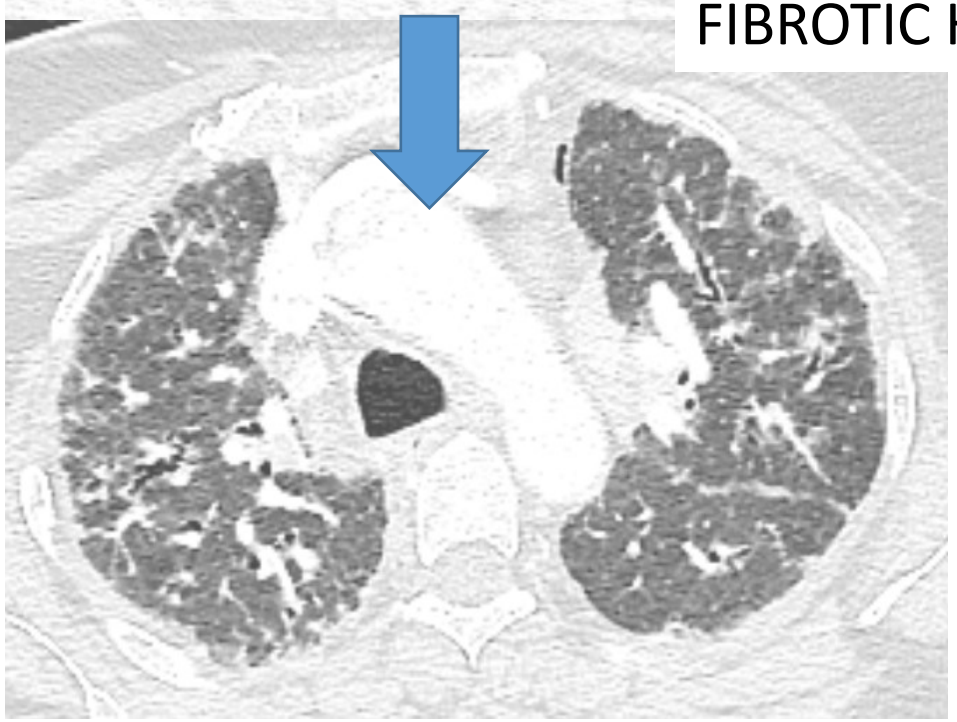




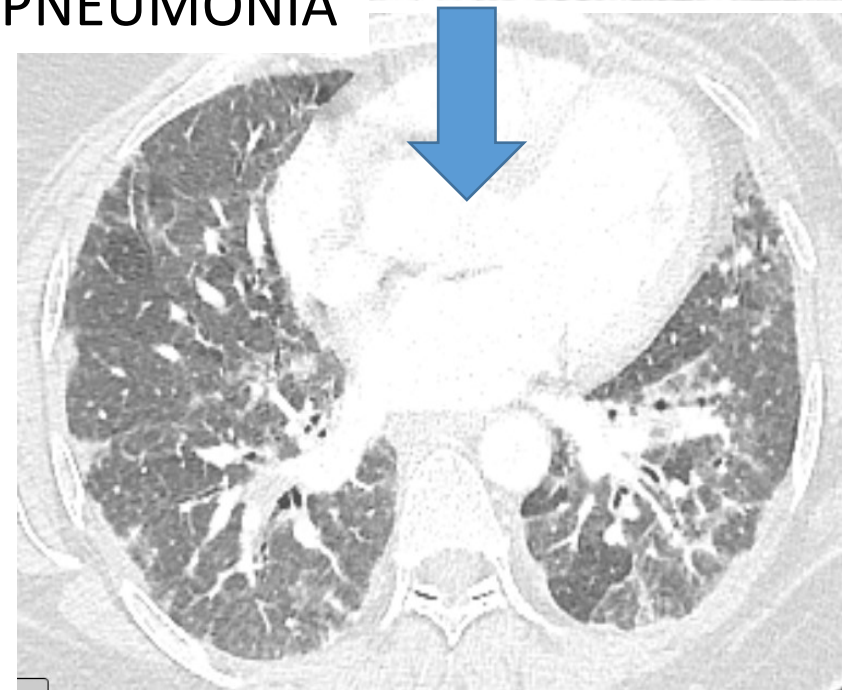
ASBESTOSIS

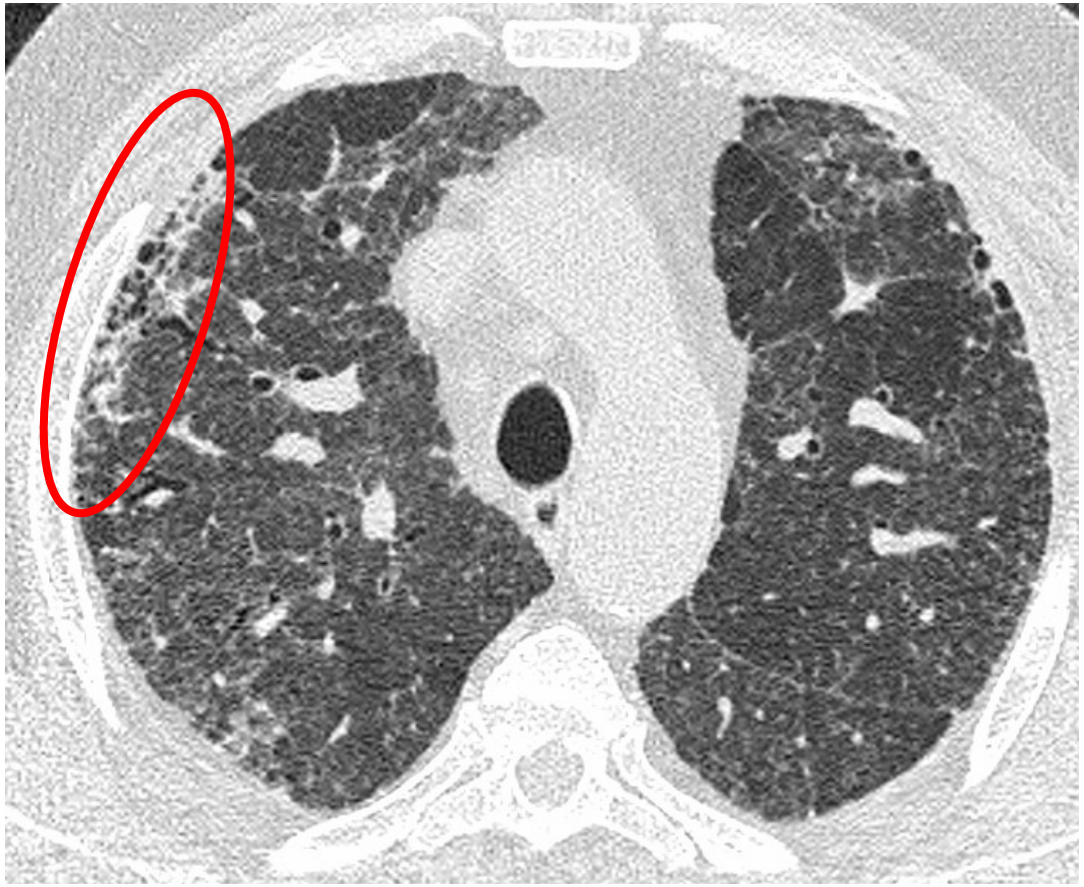
2015

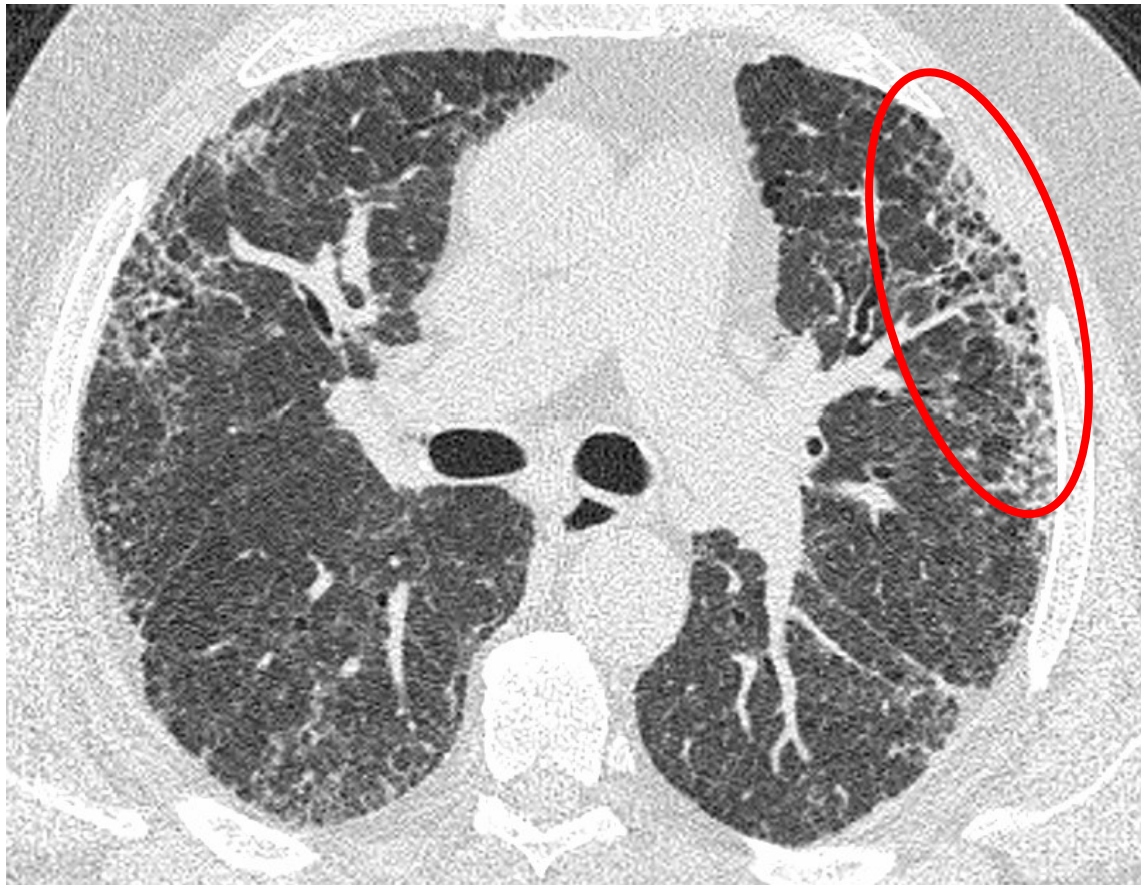
FIBROTIC HYPERSENSITIVITY PNEUMONIA



2017

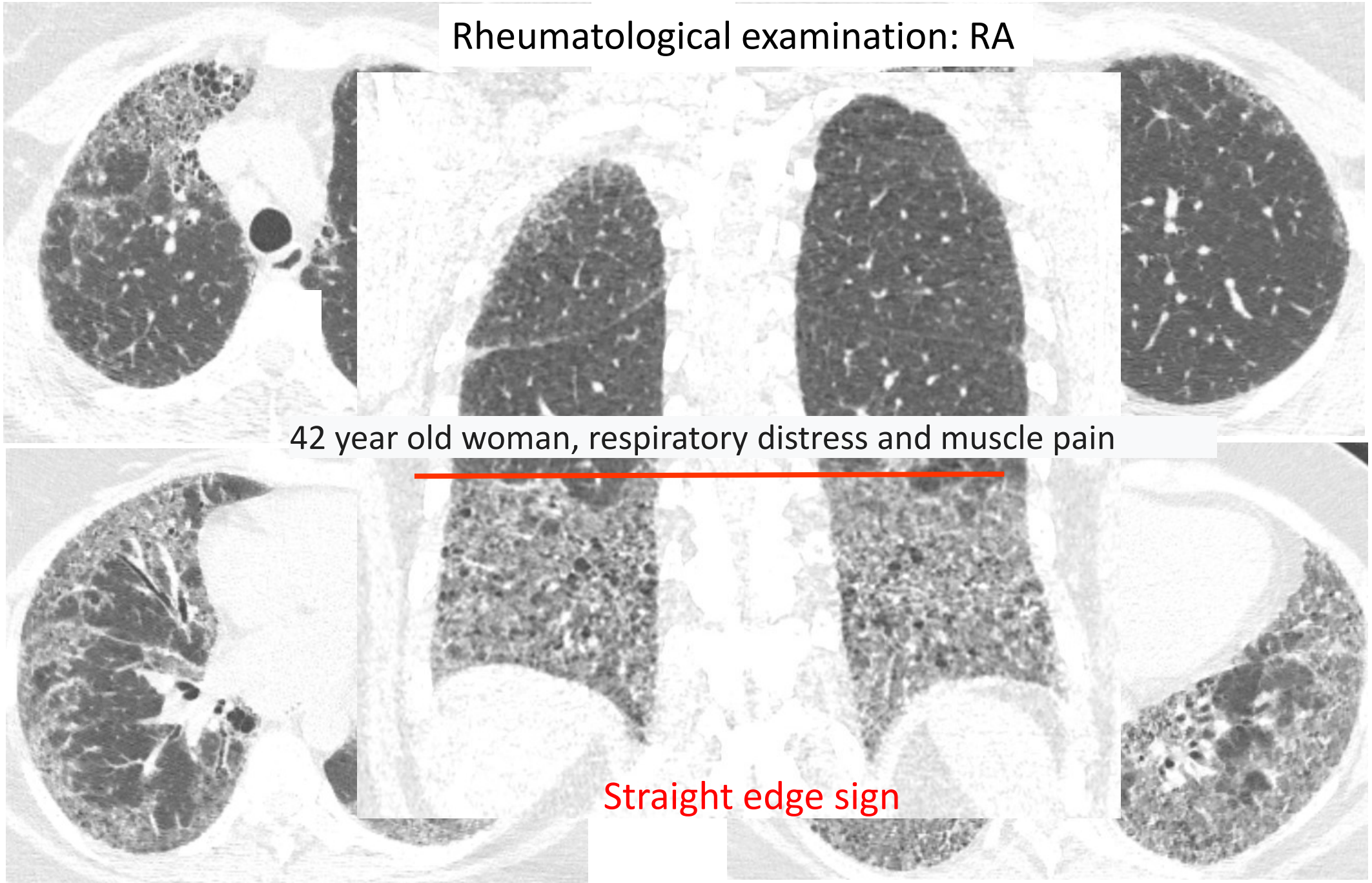






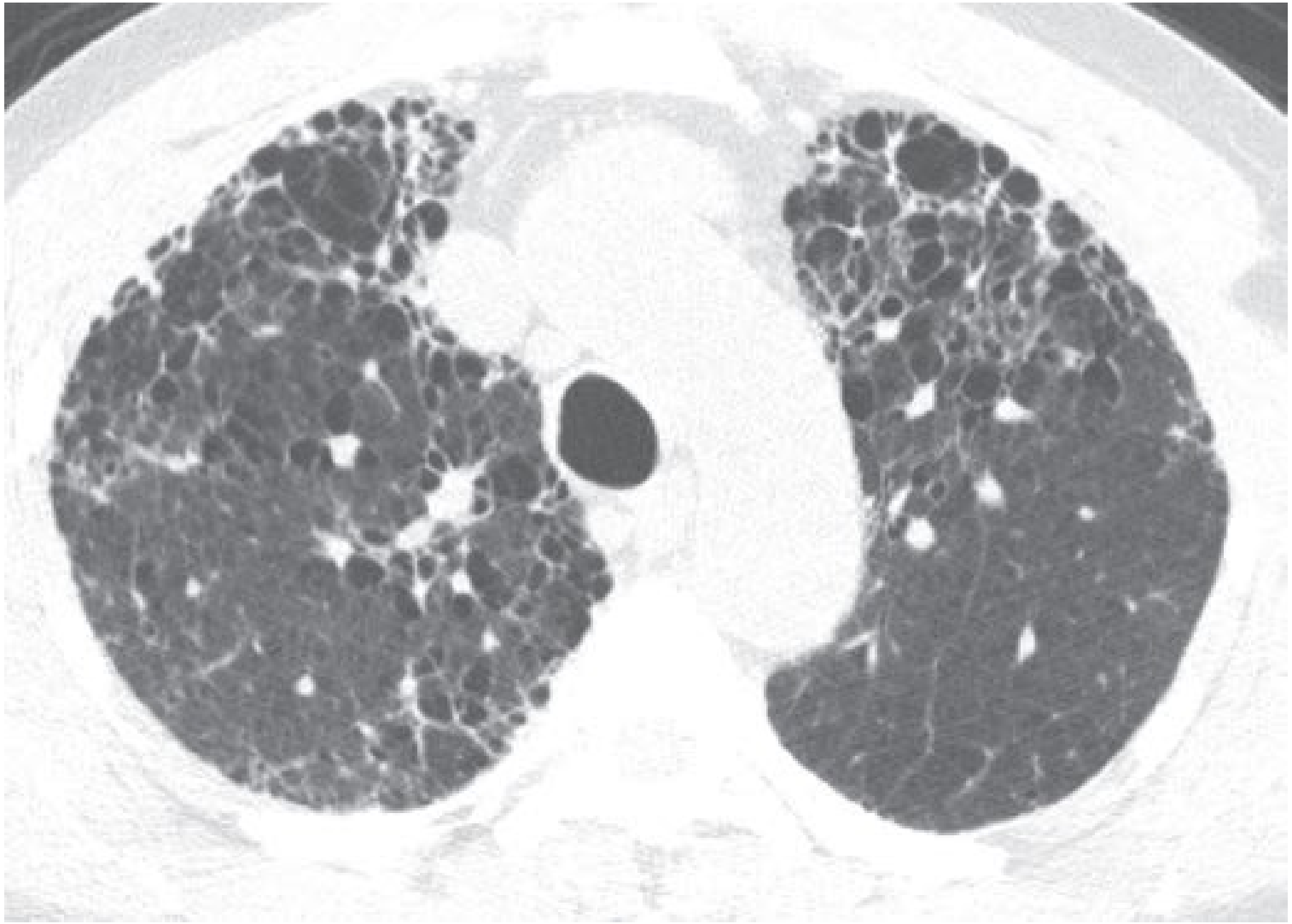
RITUXIMABA-INDUCED FIBROSIS

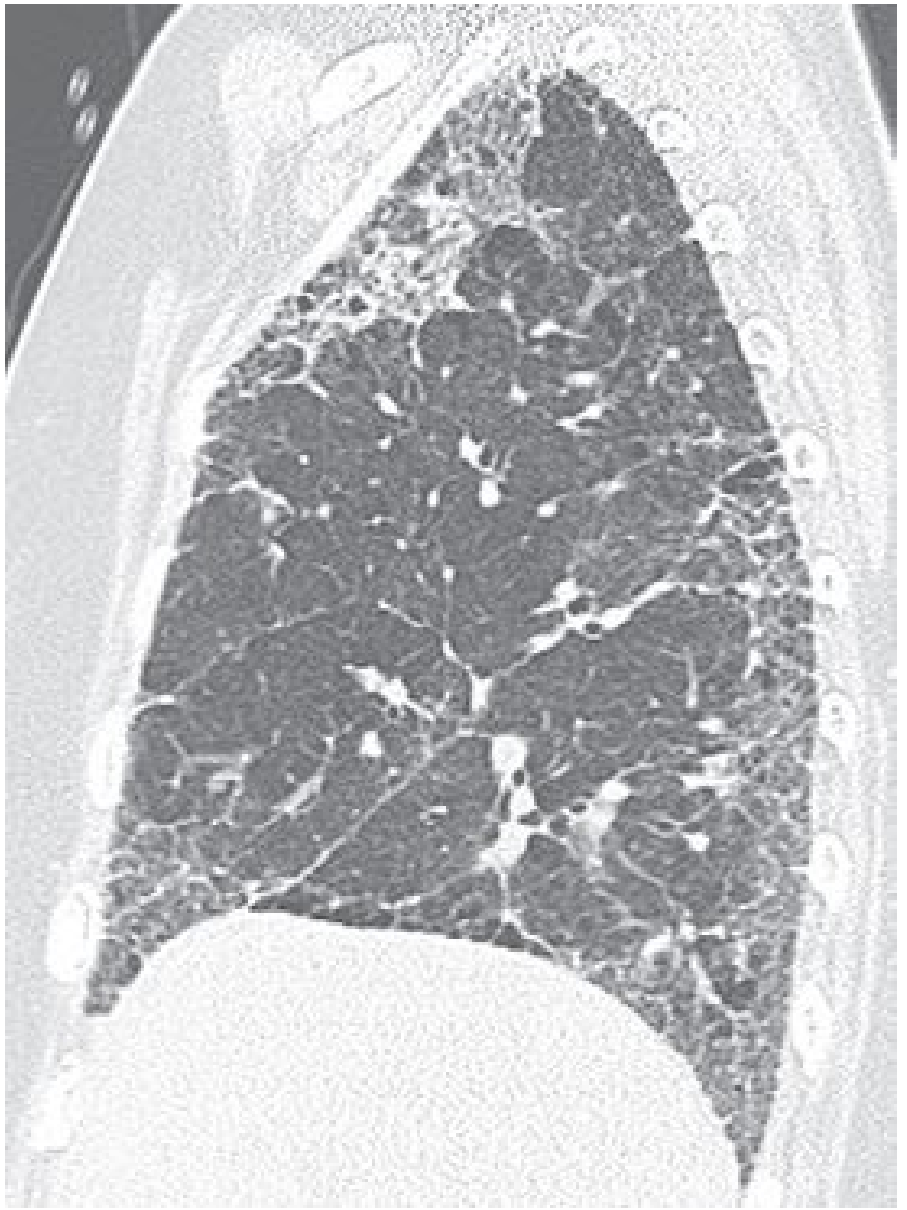
Rheumatological examination: RA



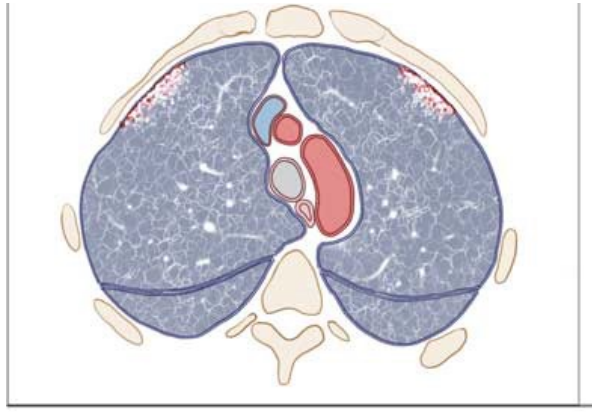
42 year old woman, respiratory distress and muscle pain

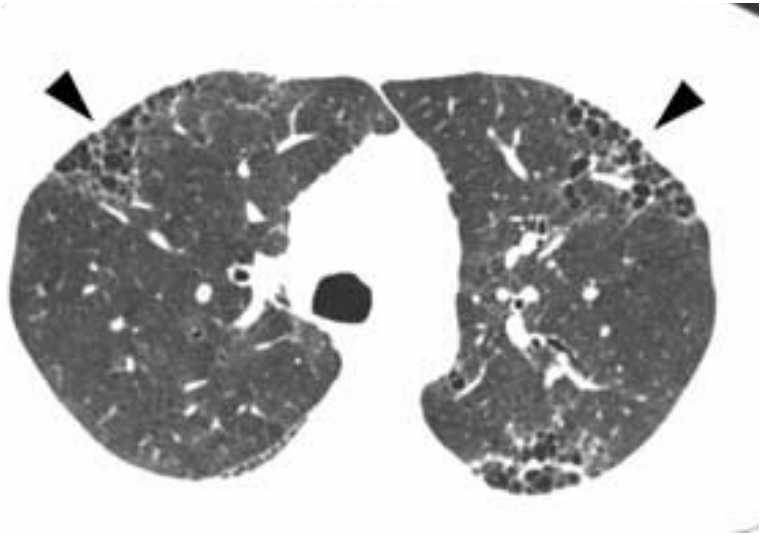
Straight edge sign

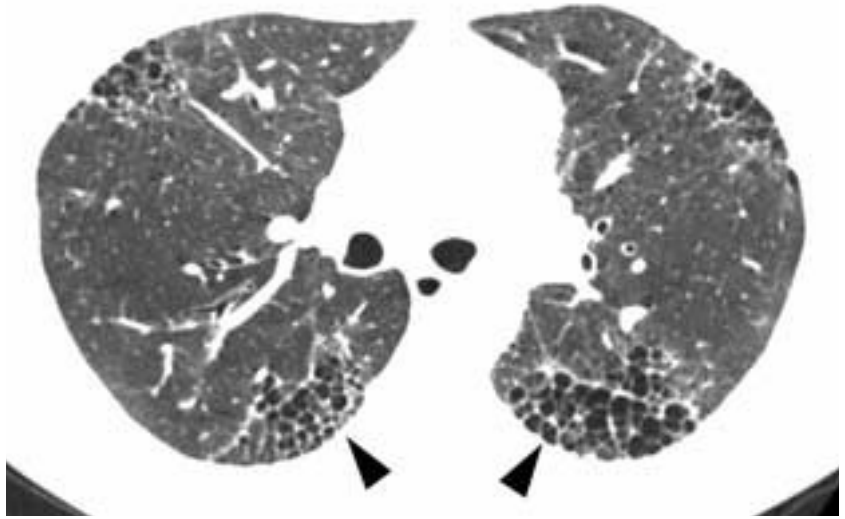




ANTERIOR UPPER LOBE SIGN

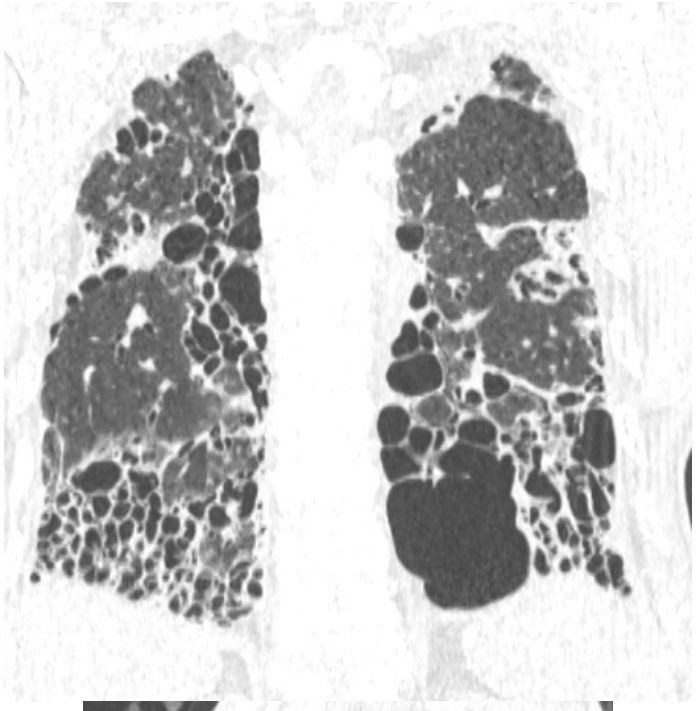






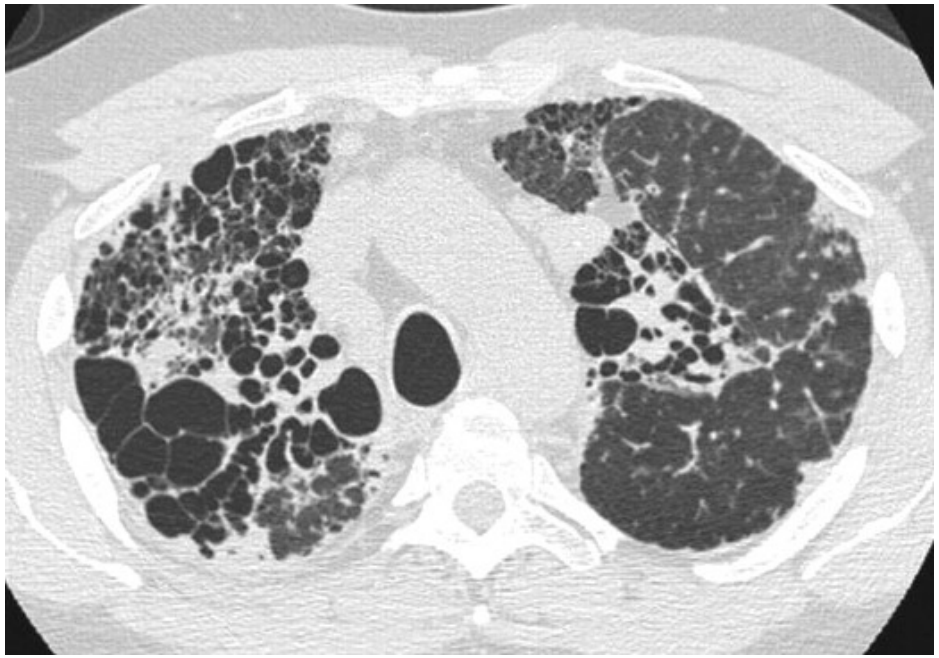
FOUR CORNERS SIGN - SCLERODERMA

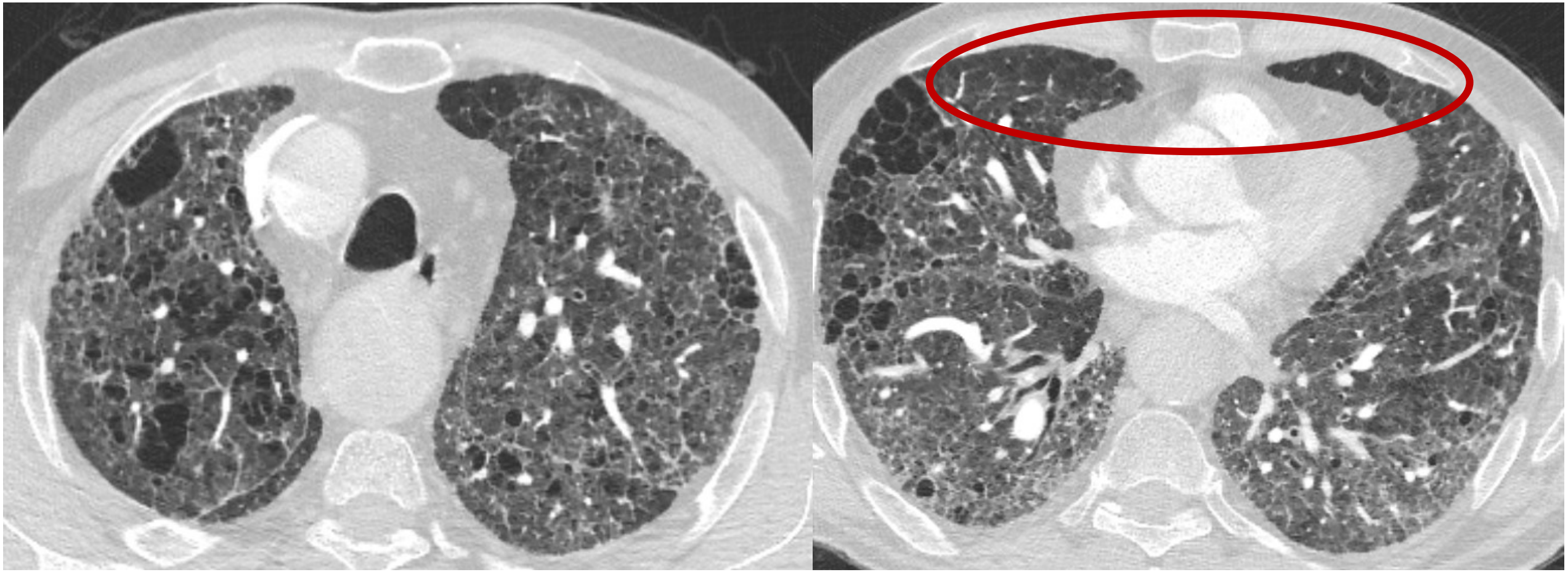
The Four Corners Sign A Specific Imaging Feature in Differentiating Systemic Sclerosis-related Interstitial Lung Disease From Idiopathic Pulmonary Fibrosis. Walkoff L et al J Thorac Imaging 2018 Jan 16.



Exuberant honeycombing-RA

SARCOIDOSIS





FIBROSIS DUE TO LANGERHANS CELL HISTIOCYTOSIS

THANKS TO EVERYONE WHO CONTRIBUTED
KATKISI OLAN HERKESE TEŞEKKÜRLER

მადლობა ყველას, ვინც წვლილი შეიტანა