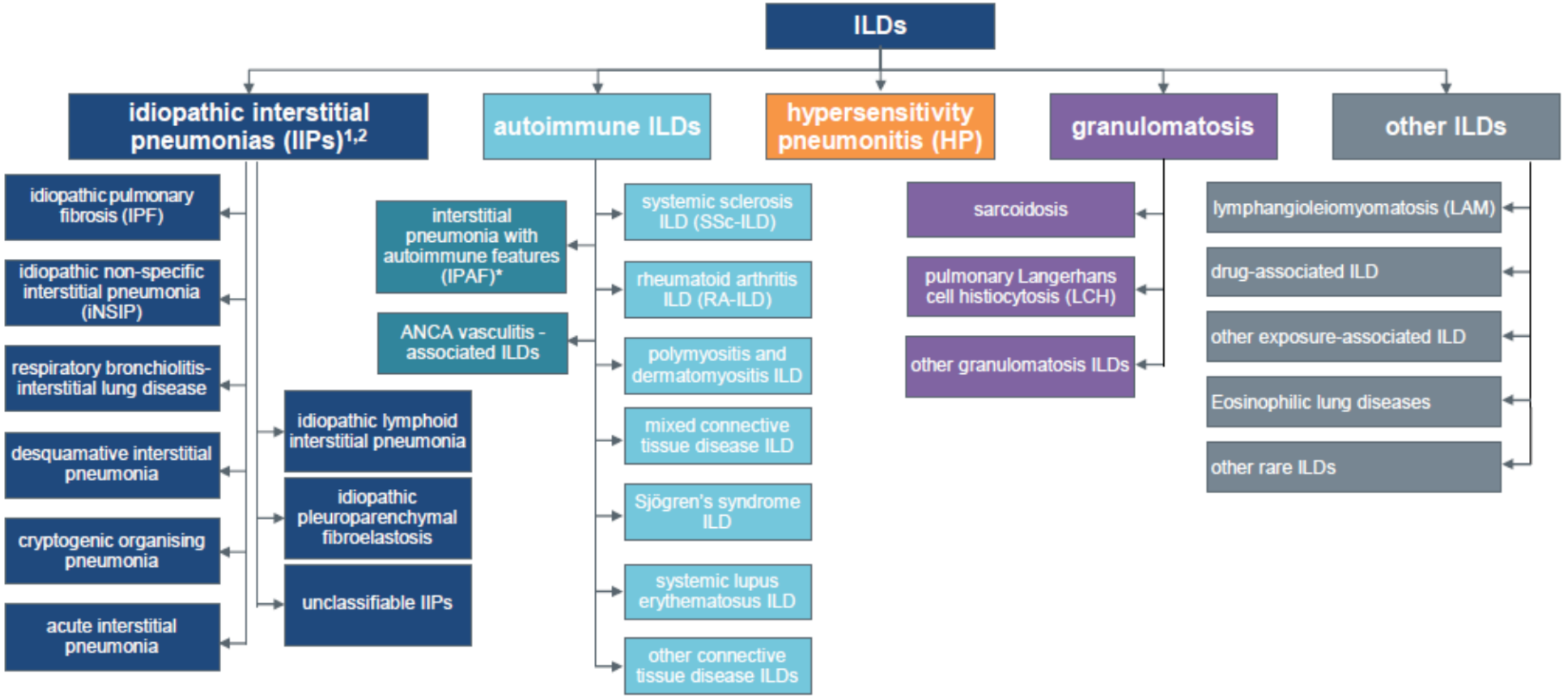
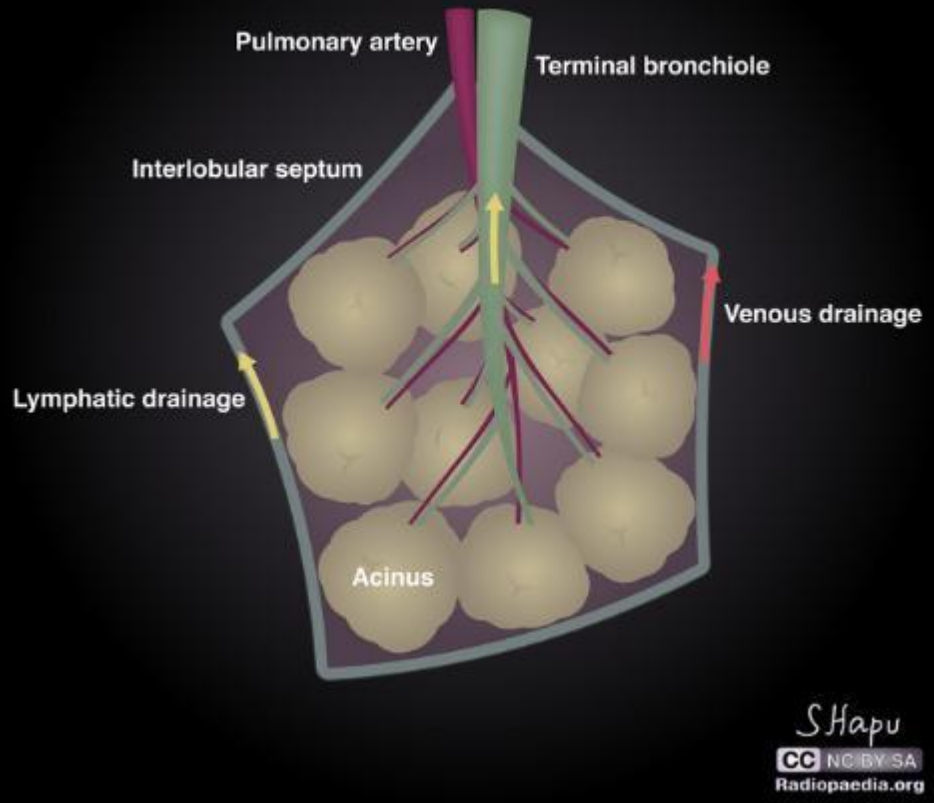
間質性肺炎影像判讀

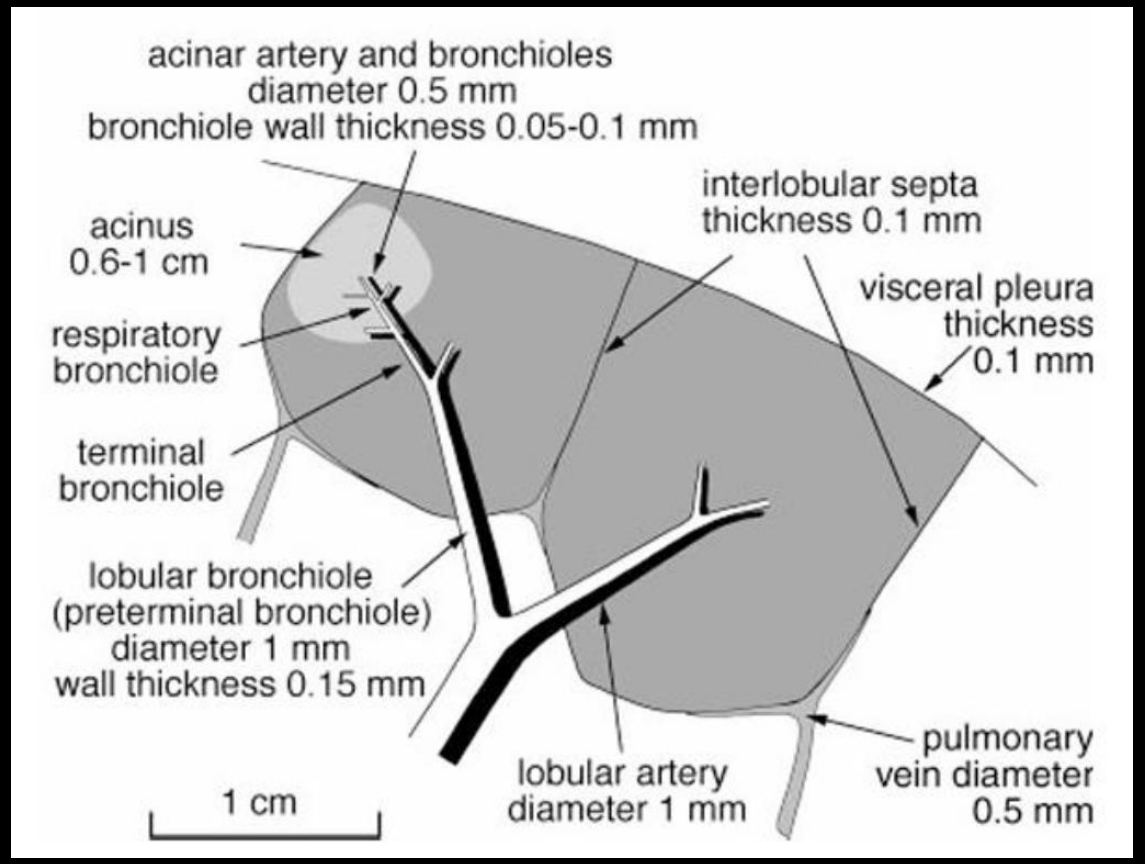
高雄長庚放射診斷科
廖建彰醫師
2026.8.1

ILDs - variety and heterogeneity



NORMAL ANATOMY: THE SECONDARY PULMONARY LOBULE AND ACINUS





- 3-24 acini
- 3-5 terminal bronchioles
- 1-2 cm in diameter
- Thin fibrous interlobular septum (0.1mm)

Common Chest CT finding

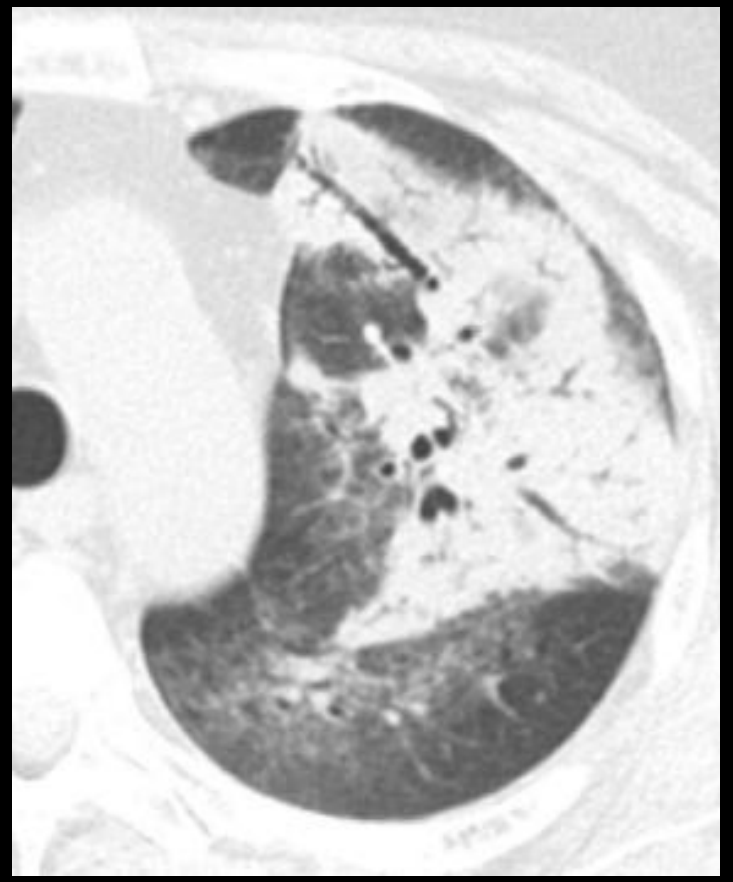
- Increased lung opacity
- Reticular opacities: Linear increasing lung opacity
- Nodular opacities
- Mosaic attenuation
- Bronchiectasis
- Cystic lesion
  - Honeycombing
  - Emphysematous/non-emphysematous cystic lesion

Increased lung opacity

Consolidation

Pathologic filling of alveoli (i.e., replacement of alveolar air) as the predominant abnormality.

1. Water (e.g., pulmonary edema)
2. Blood (e.g., pulmonary hemorrhage)
3. Pus (e.g., pneumonia)
4. Cells
5. Other substances (e.g., lipoprotein in alveolar proteinosis, lipid in lipoid pneumonia)



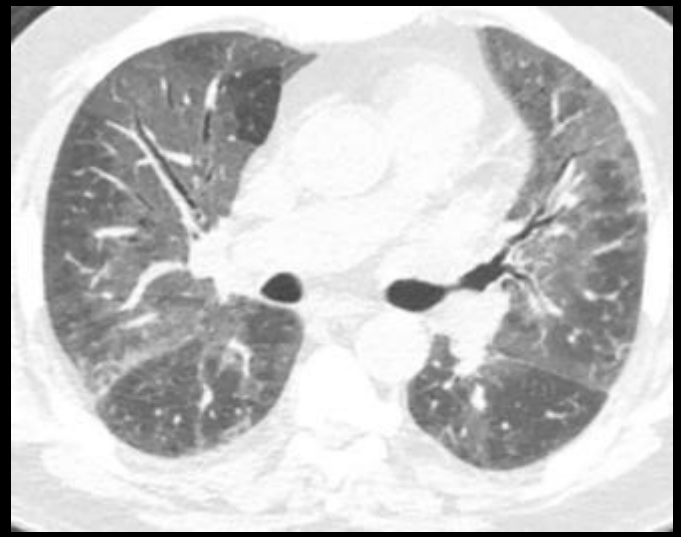
Radiology: Cardiothoracic Imaging Volume 3: Number 1—2021

TABLE 5-4 Differential Diagnosis of Consolidation

Diagnosis	Comments
Pneumonia (e.g., bacterial, mycobacterial, fungal, atypical)	Patchy, nodular, lobular, or diffuse, depending on the organism
AIP, ARDS	Patchy or diffuse
Pulmonary edema	Diffuse; GGO more common
Pulmonary hemorrhage	Patchy or diffuse; GGO more common
Acute eosinophilic pneumonia	Diffuse; GGO more common
Radiation pneumonitis	Extent usually corresponds to radiation ports
OP	Common; peripheral; can be mass-like; reversed halo or atoll sign in some
Chronic eosinophilic pneumonia	Patchy or nodular; peripheral; resembles OP
Churg-Strauss syndrome	Consolidation also present; nodular
Invasive mucinous adenocarcinoma	Diffuse, patchy, or nodular
Lymphoma	Diffuse, patchy, or nodular
NSIP	Patchy; subpleural; GGO more common
HP	Patchy; GGO more common
Lipoid pneumonia	Patchy or lobular; low-attenuation consolidation
Sarcoidosis	Patchy or mass-like; confluence of very small granulomas
Alveolar proteinosis	GGO more common

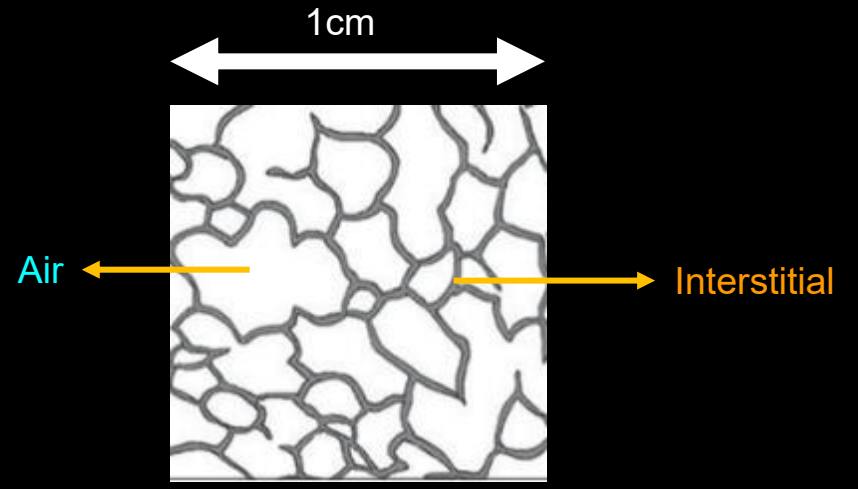
Webb, Müller and Naidich‘s High-Resolution CT of the Lung 6th Edition table 5-4

Ground glass opacity



Definition made by Fleischner Society.

- Hazy increased opacity of lung, with preservation of bronchial and vascular margins.



Most Normal Lung HU value = -850
-850= -1000 (Air HU) x Air% + 50 (Interstitial HU) x Interstitial%
Air% around 86%, Interstitial% around 14%

Ground glass opacities HU value= -500
-500= -1000 (Air HU) x Air% + 50 (Interstitial HU) x Interstitial%
Air% around 52%, Interstitial% around 48%

Air% ↓ Interstitial% ↑

Radiology: Volume 246: Number 3—March 2008
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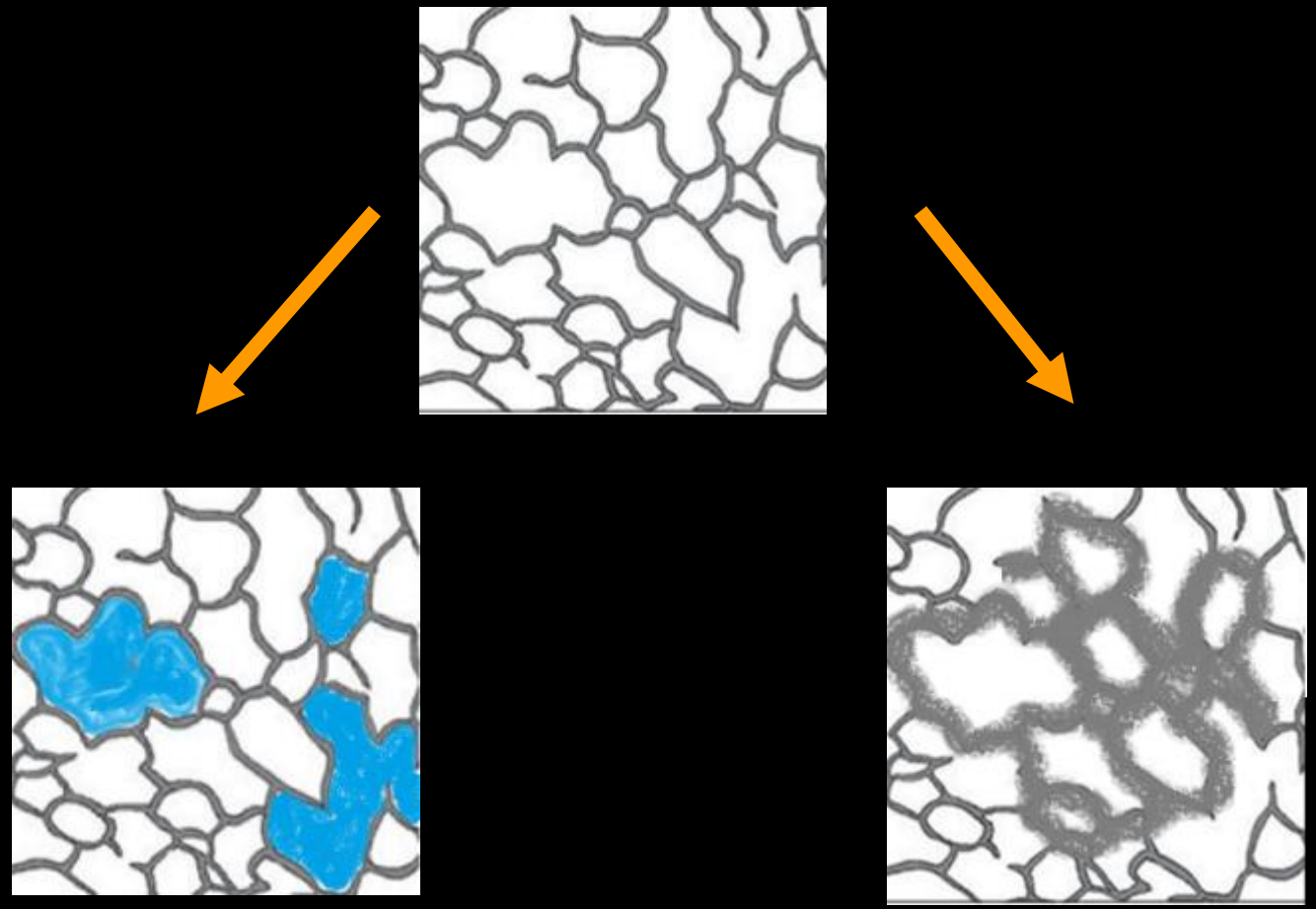
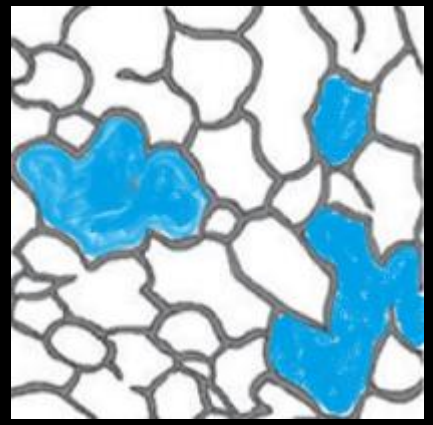
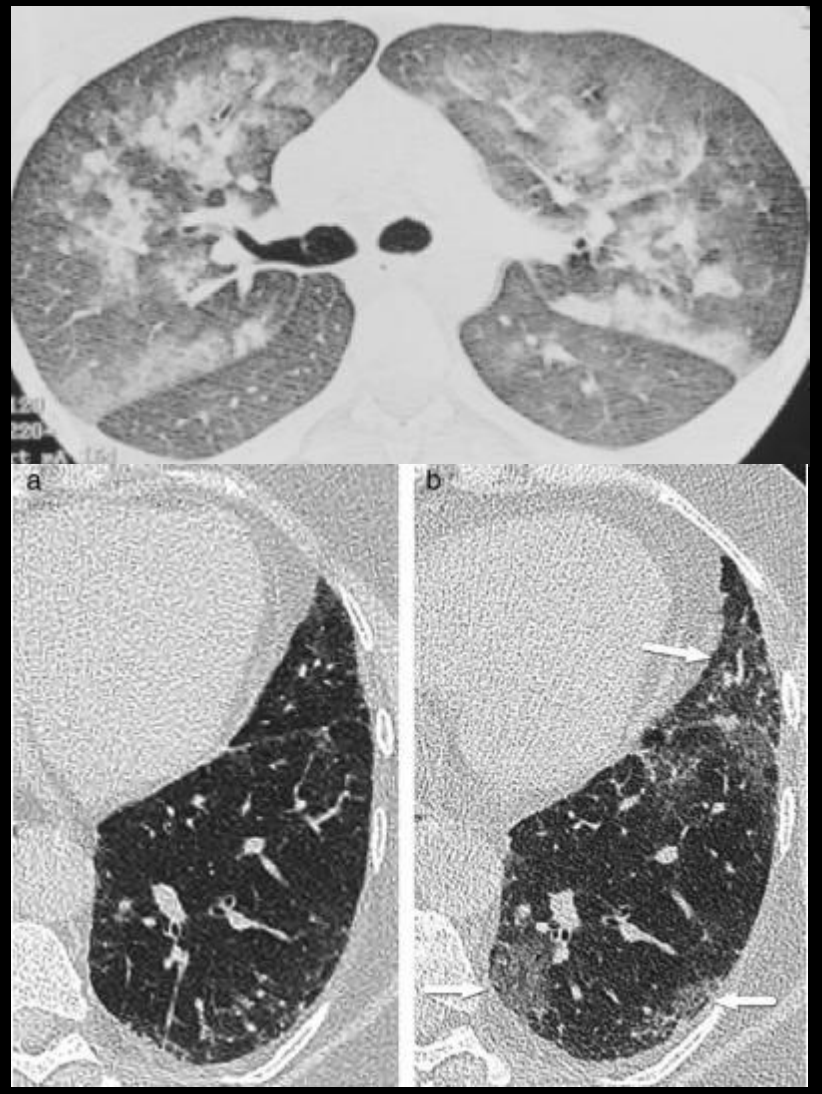
Ground glass opacity



Ground glass opacity

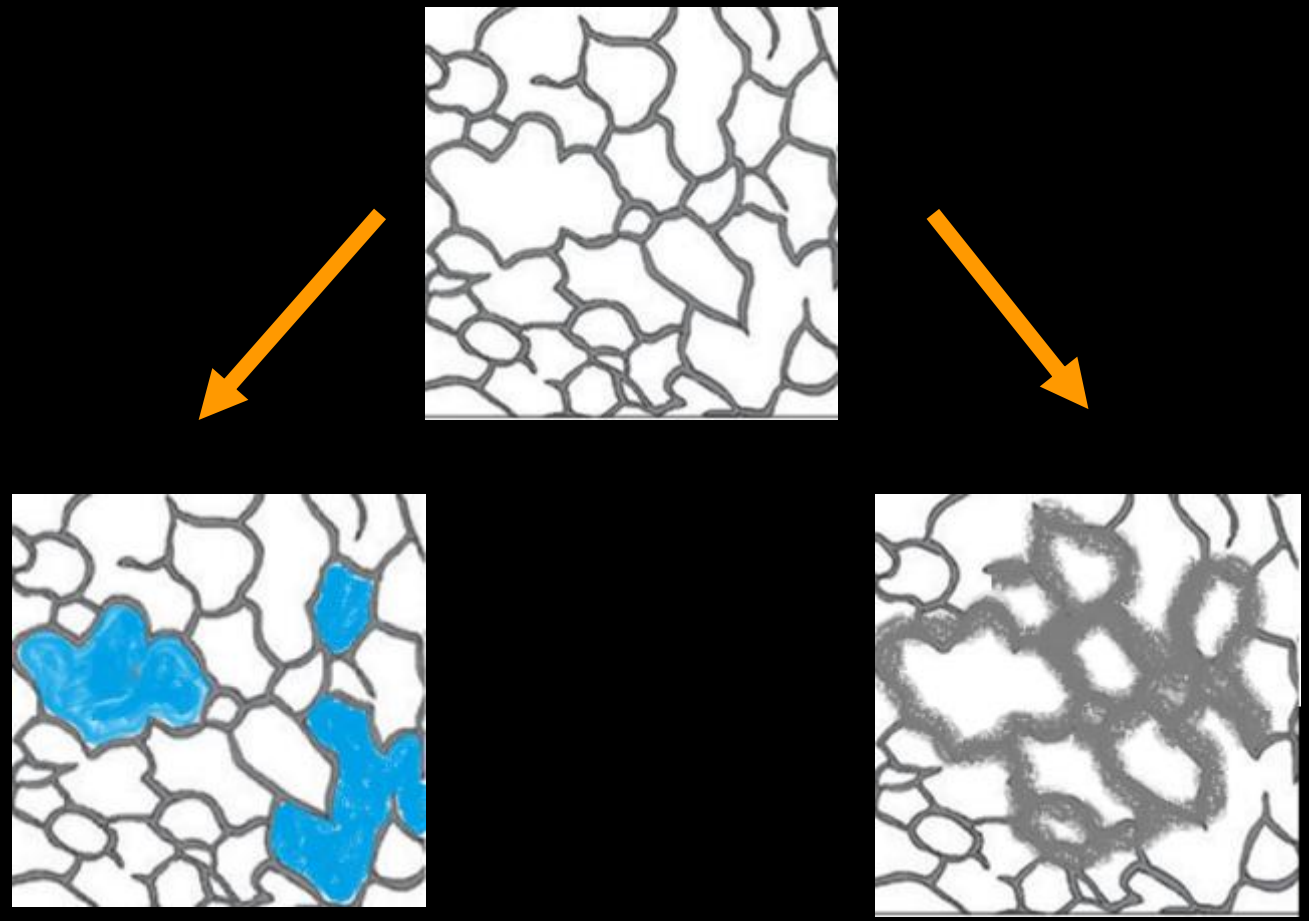




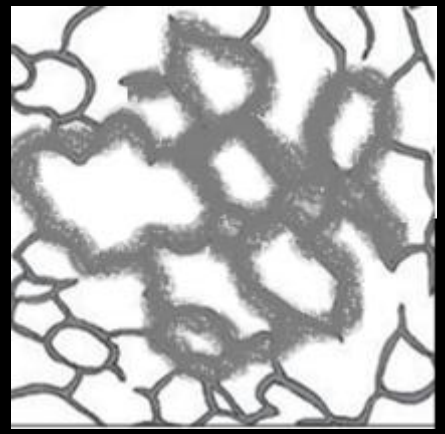
- Pulmonary edema
- **Inflammation**
  - Air space filled with water, cell, pus
- Acute exacerbation

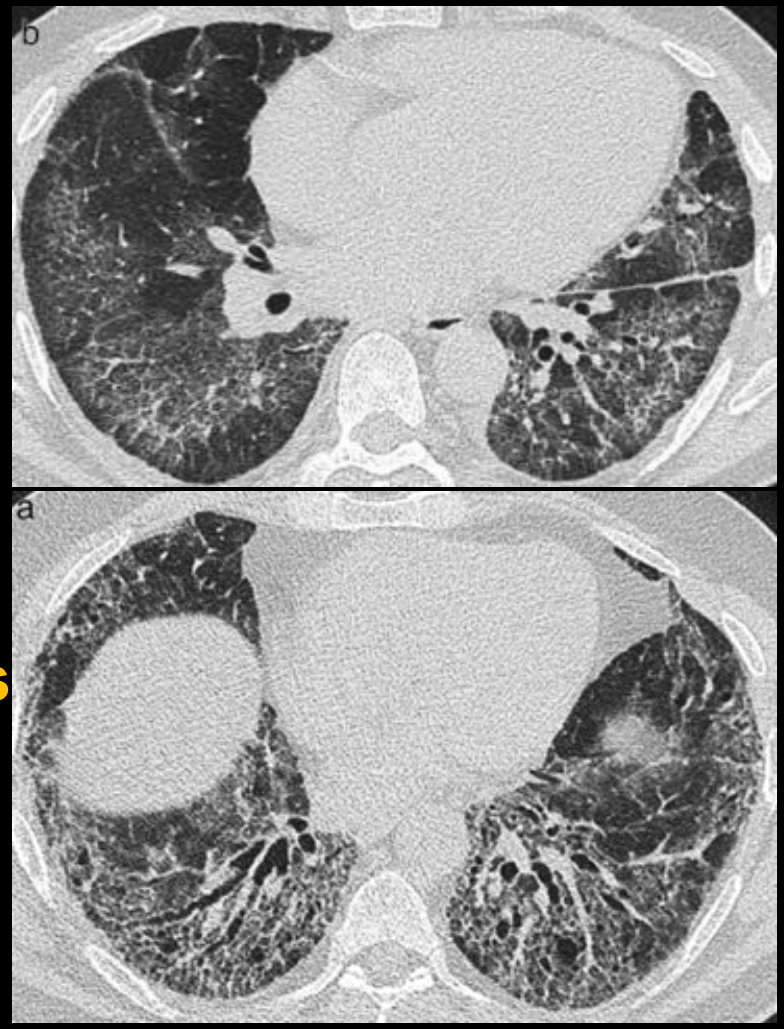
Respirology (2015) **20**, 859–872

Ground glass opacity



Ground glass opacity





- Interstitial **fibrosis**
- **Progression pulmonary fibrosis**

Respirology (2015) **20**, 859–872

TABLE 1 Causes of Isolated Diffuse Ground-Glass Opacity

Categories	Types of Diseases and Infections
Opportunistic infections	Pneumocystis pneumonia (PCP) Cytomegalovirus pneumonia (CMV) Herpes simplex virus pneumonia (HSV) Respiratory syncytial virus bronchiolitis Other
Chronic interstitial diseases	Hypersensitivity pneumonitis (HP) Desquamative interstitial pneumonia (DIP) Respiratory bronchiolitis interstitial lung disease (RBILD) Nonspecific interstitial pneumonia (NSIP) Acute interstitial pneumonia (AIP) Lymphocytic interstitial pneumonia (LIP) Sarcoidosis
Acute alveolar diseases	Pulmonary edema Heart disease Adult respiratory distress syndrome (ARDS) Other Diffuse alveolar hemorrhage
Other causes	Drug toxicity Pulmonary alveolar proteinosis (PAP) Bronchiolitis obliterans with organizing pneumonia (BOOP, COP) Bronchoalveolar carcinoma

Miller WT Jr & Shah RM. AJR Am J Roentgenol. 2005

Reticular opacities

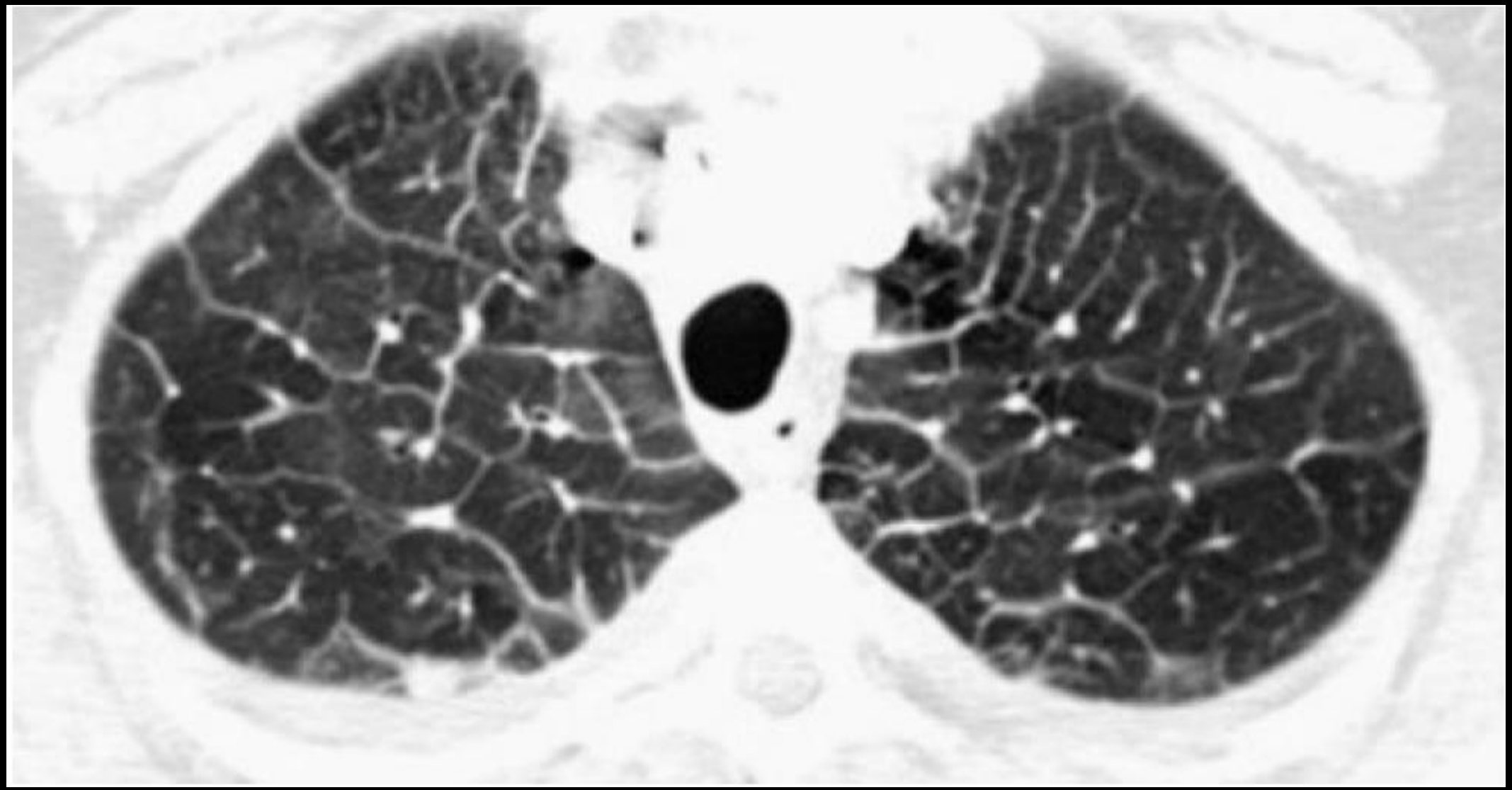
Reticular opacities

- Thickening of the interstitial fiber network of the lung by
  - –fluid
  - –fibrous tissue
  - –cellular infiltration, results in an increase in reticular lung opacities.

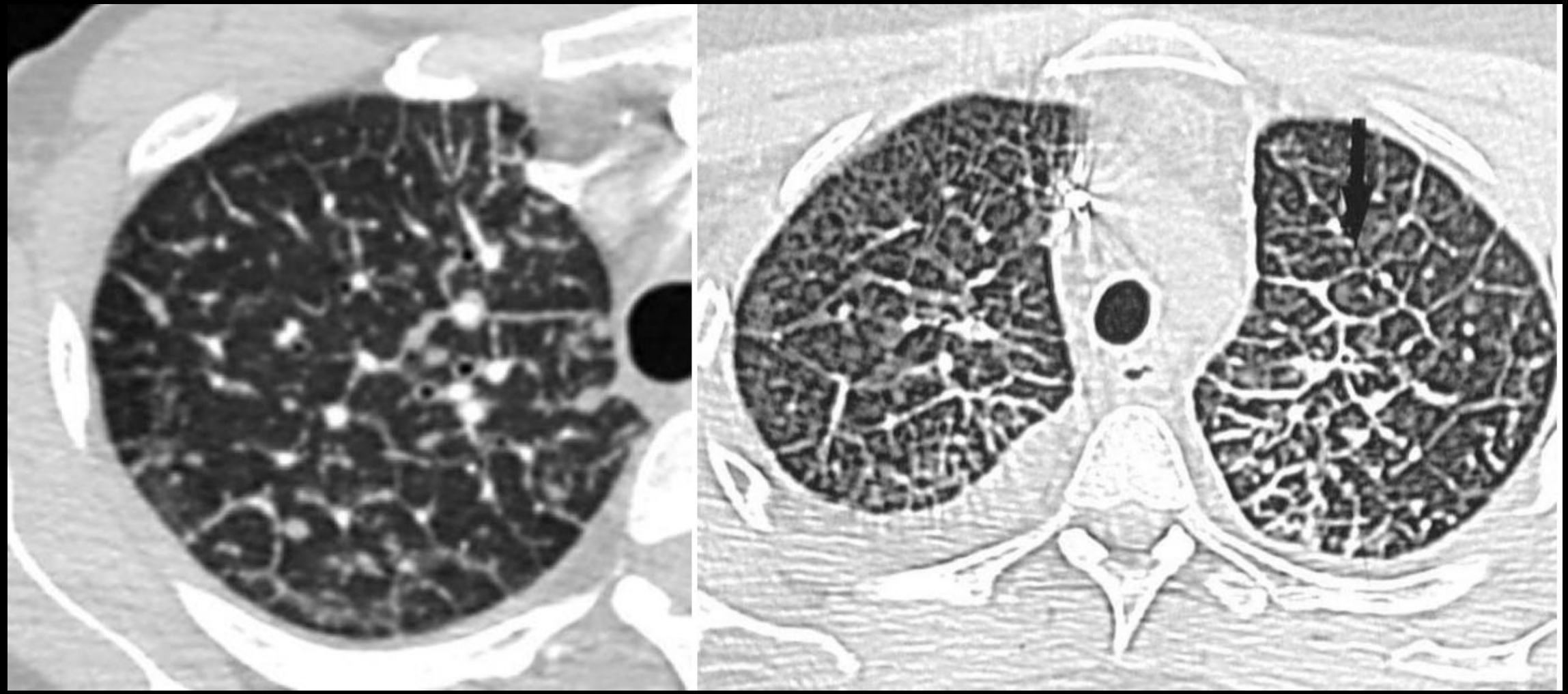
Interlobular septal thickening

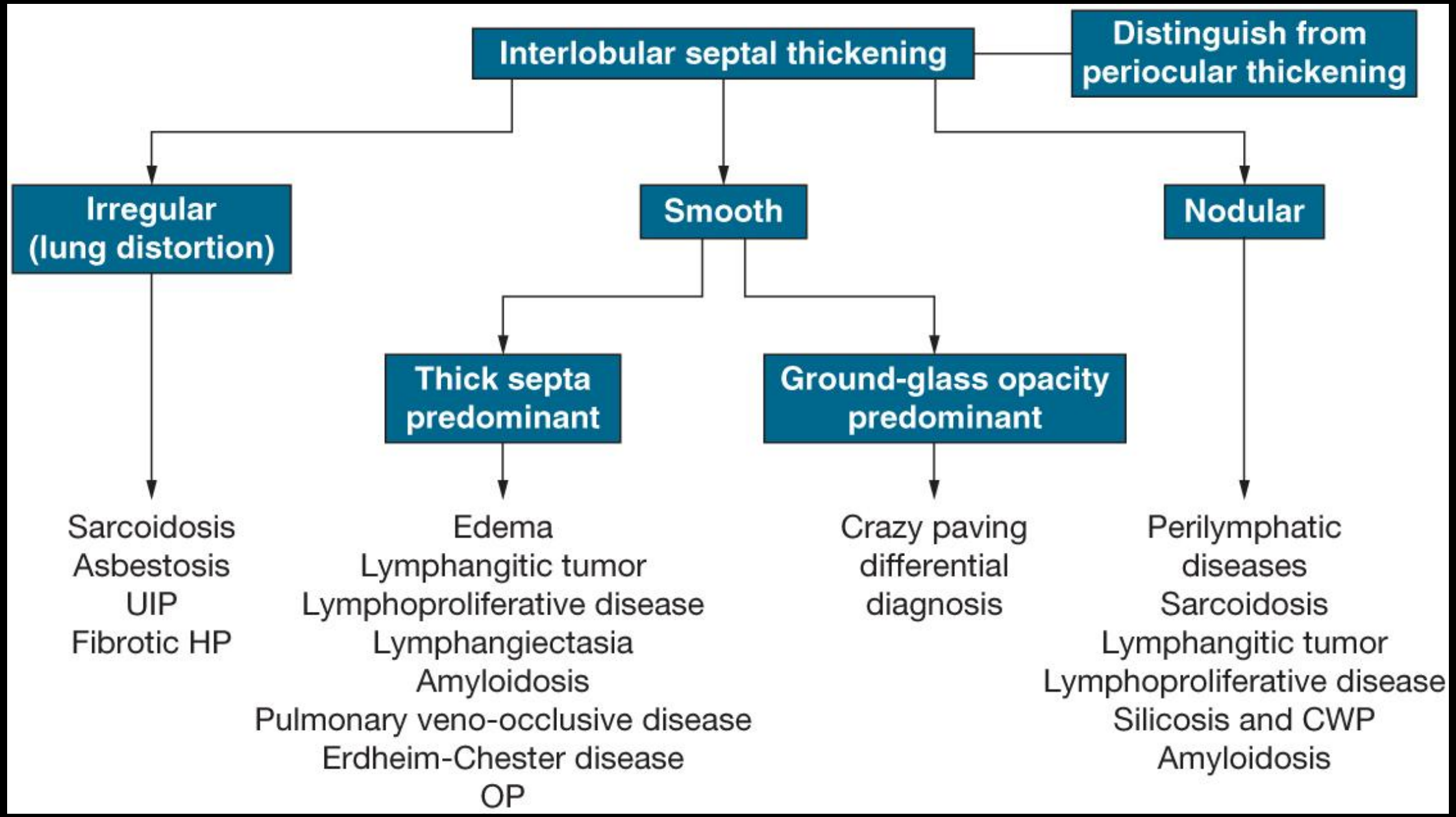
- Smooth septal thickening -- pulmonary edema, lymphangitic spread of tumor or, rarely, amyloidosis
- Nodular septal thickening -- sarcoidosis and lymphangitic spread of tumor.

Pulmonary edema



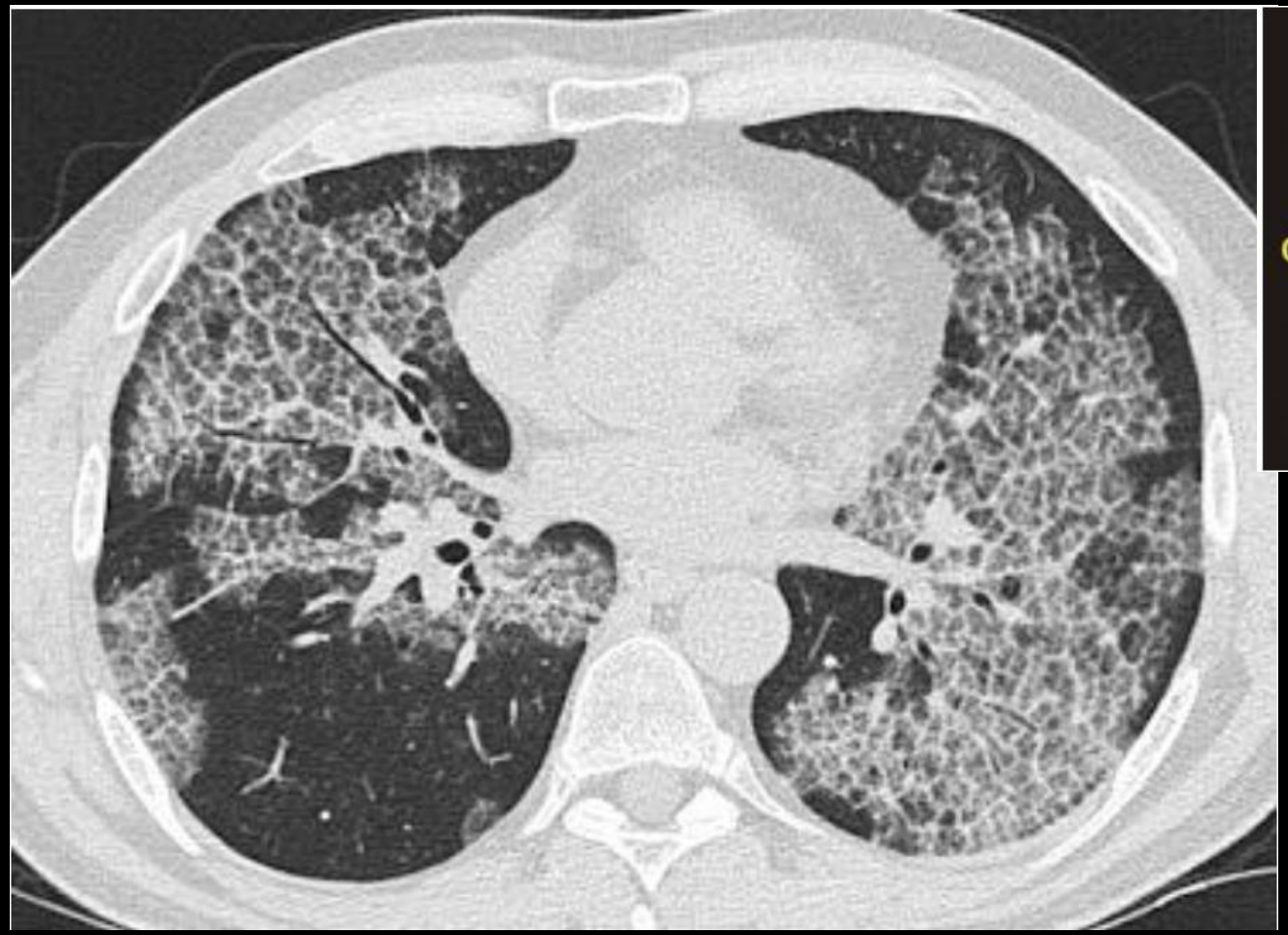
Perilymph carcinomatosis/Sarcoidosis

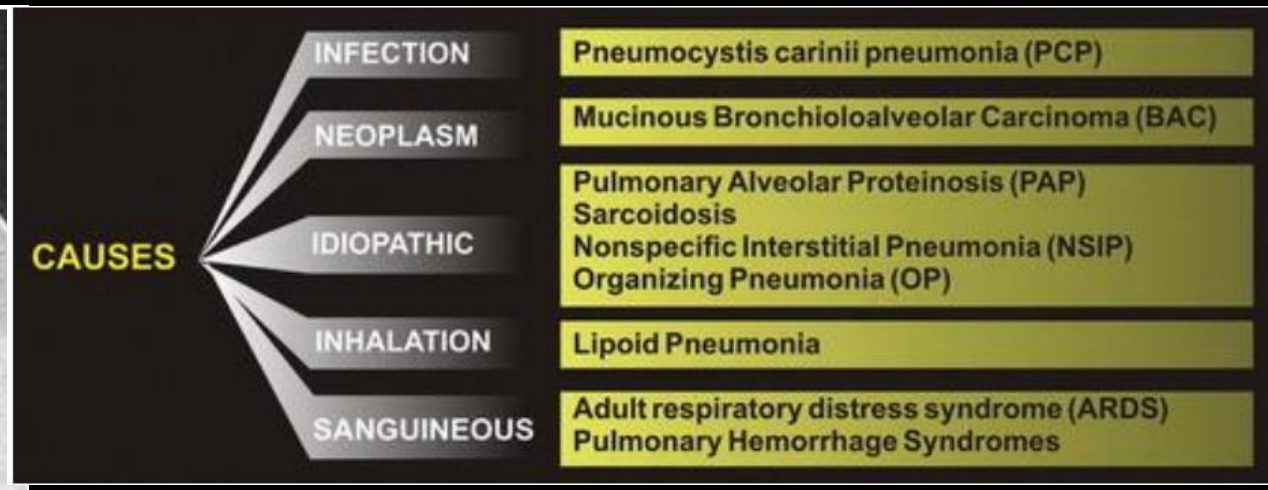




Webb, Müller and Naidich's High-Resolution CT of the Lung 6th Edition fig3-10

Crazy paving





Alveolar proteinosis

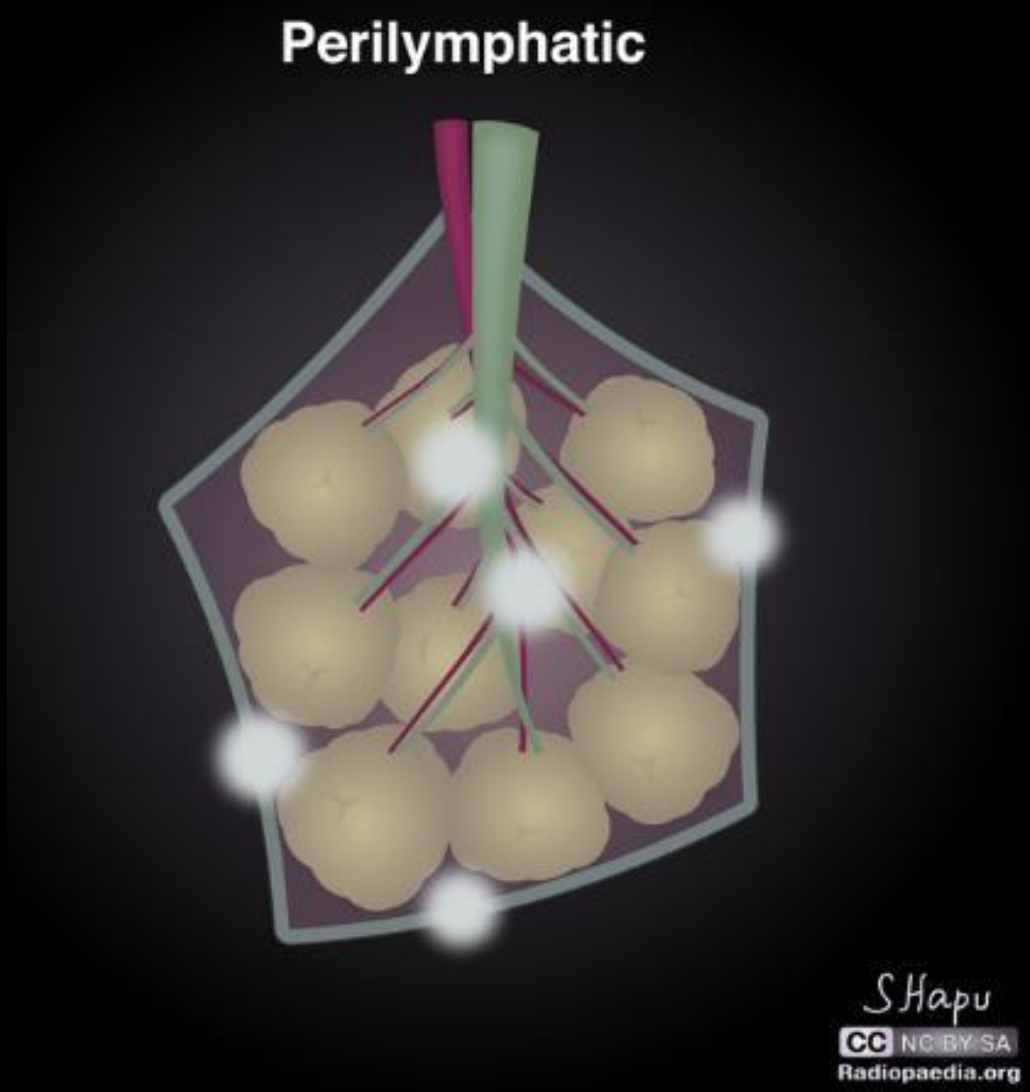
Nodular opacities

Nodules

- a small, dense spot on the lung, appearing as a white spot on a CT scan.
- Singal pulmonary nodule
  - Solid nodule
  - Subsolid nodule: pure ground glass nodule, part solid nodule
- Multiple Nodules can be classified as perilymphatic, random, or centrilobular in distribution on HRCT.

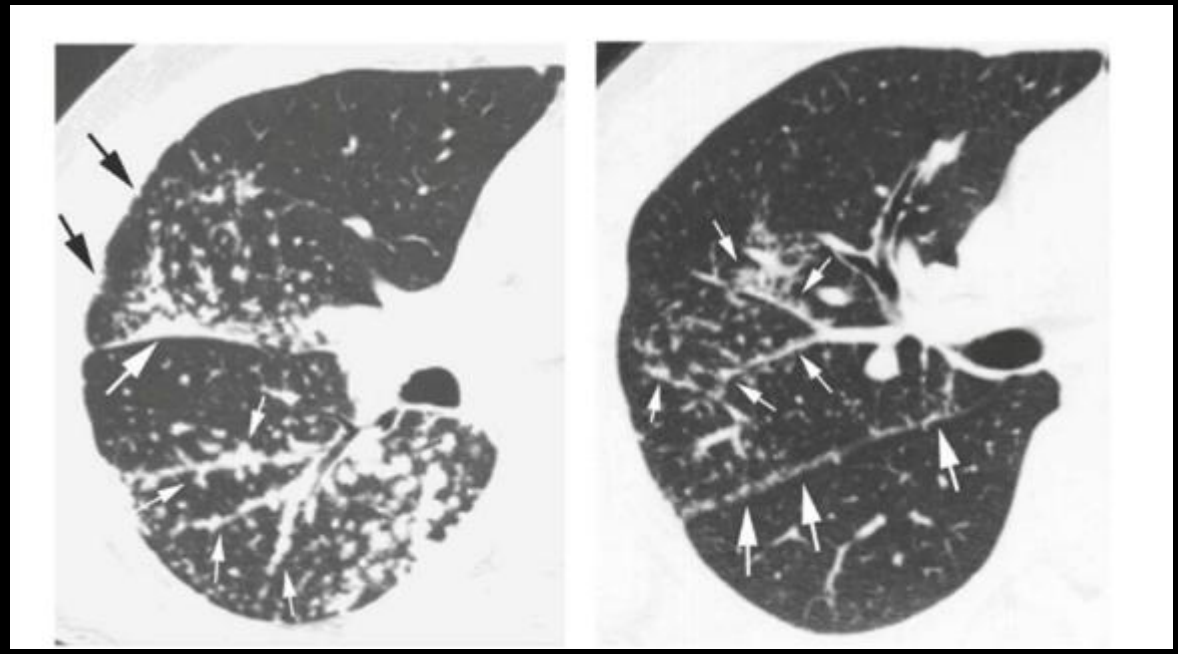
Perilymphatic

- Perilymphatic nodules occur in relation to lung lymphatics. They usually are well defined
- Involve regions
  - subpleural interstitium at the pleural surfaces and fissures
  - peribronchovascular interstitium in the parahilar lung
  - interlobular septa



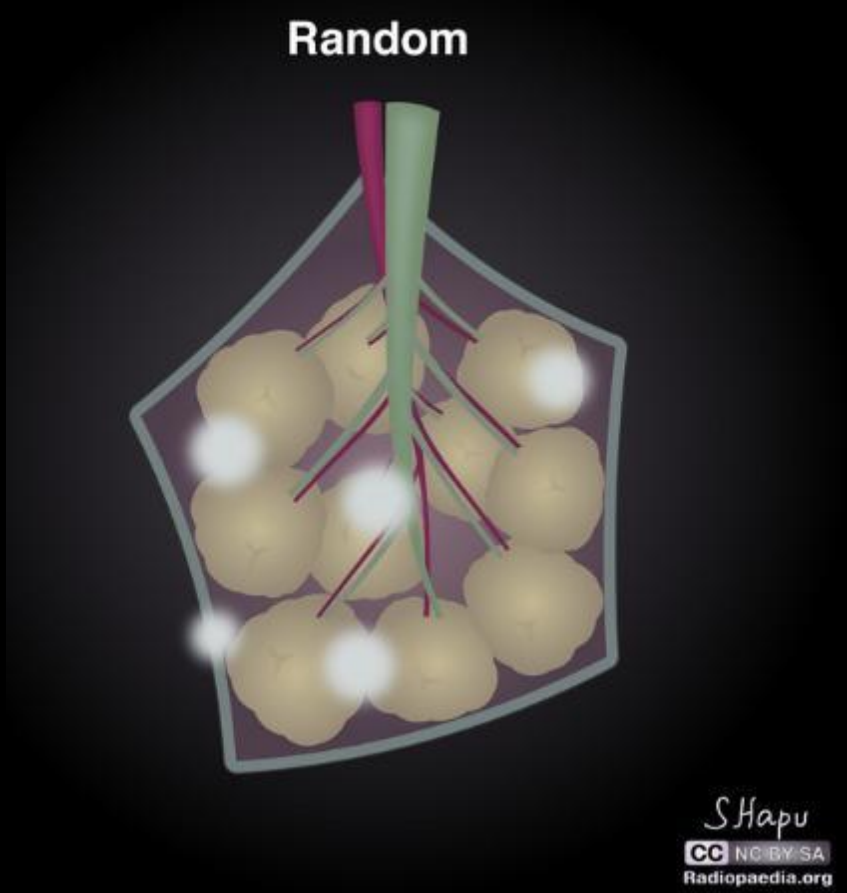
Perilymphatic nodules differential

- Sarcoidosis
- Lymphangitic spread of tumor
- Silicosis
- Lymphoid interstitial pneumonitis



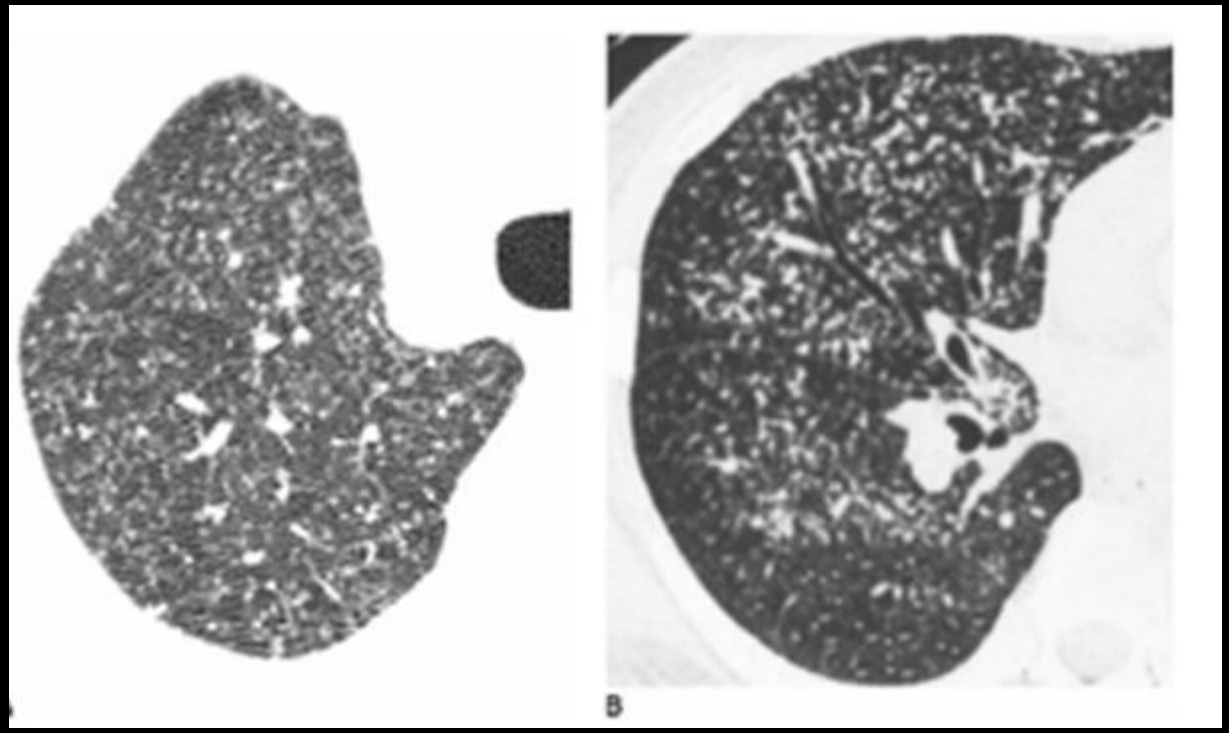
Random

- Random nodules are randomly distributed relative to structures of the secondary lobule and lung and appear diffuse and uniform in distribution
- Subpleural nodules often are seen. Nodules usually are well defined.



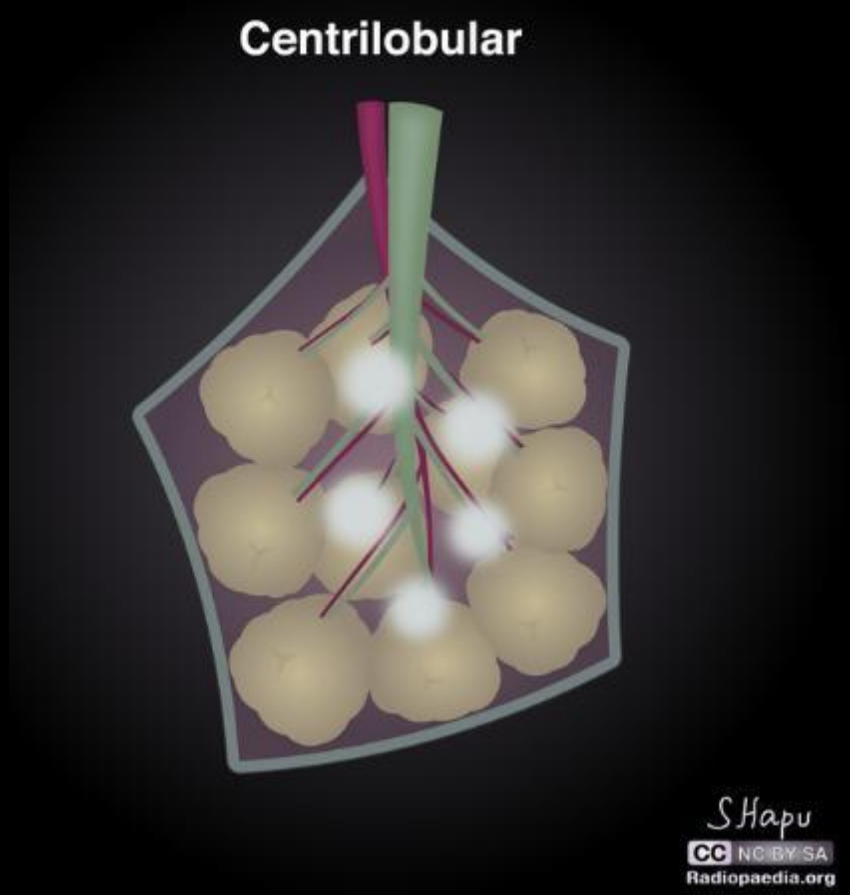
Random nodules differential diagnosis

- Miliary infection
  - TB
- Hematogenous metastasis
- Sarcoidosis



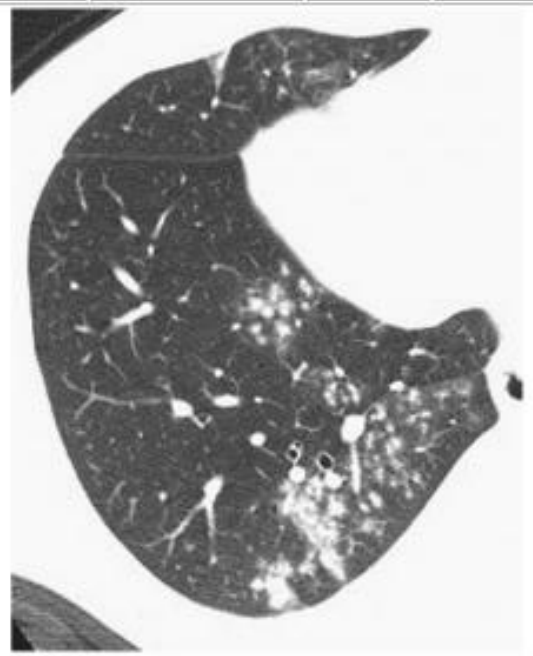
Centrilobular

- bronchiolar or peribronchiolar abnormalities or small vessels in a centrilobular location
- Most peripheral nodules often are centered 5 to 10 mm from the pleural surface and do not touch the pleura unless they are large
- Tree in bud pattern

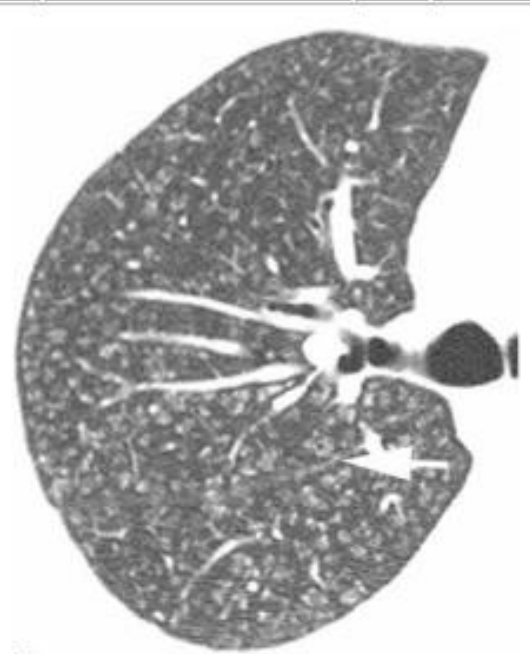


Centrilobular nodules differential diagnosis

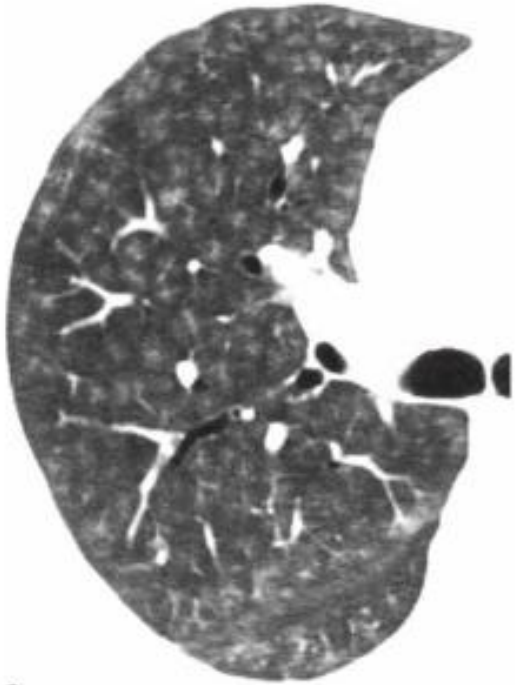
- Infectious bronchiolitis of any cause
  - Virus, bacteria, TB, mycobacteria, fungus
- Endobronchial spread of tumor
- Hypersensitivity pneumonitis
- Pulmonary edema or hemorrhage
- vasculitis



A



B

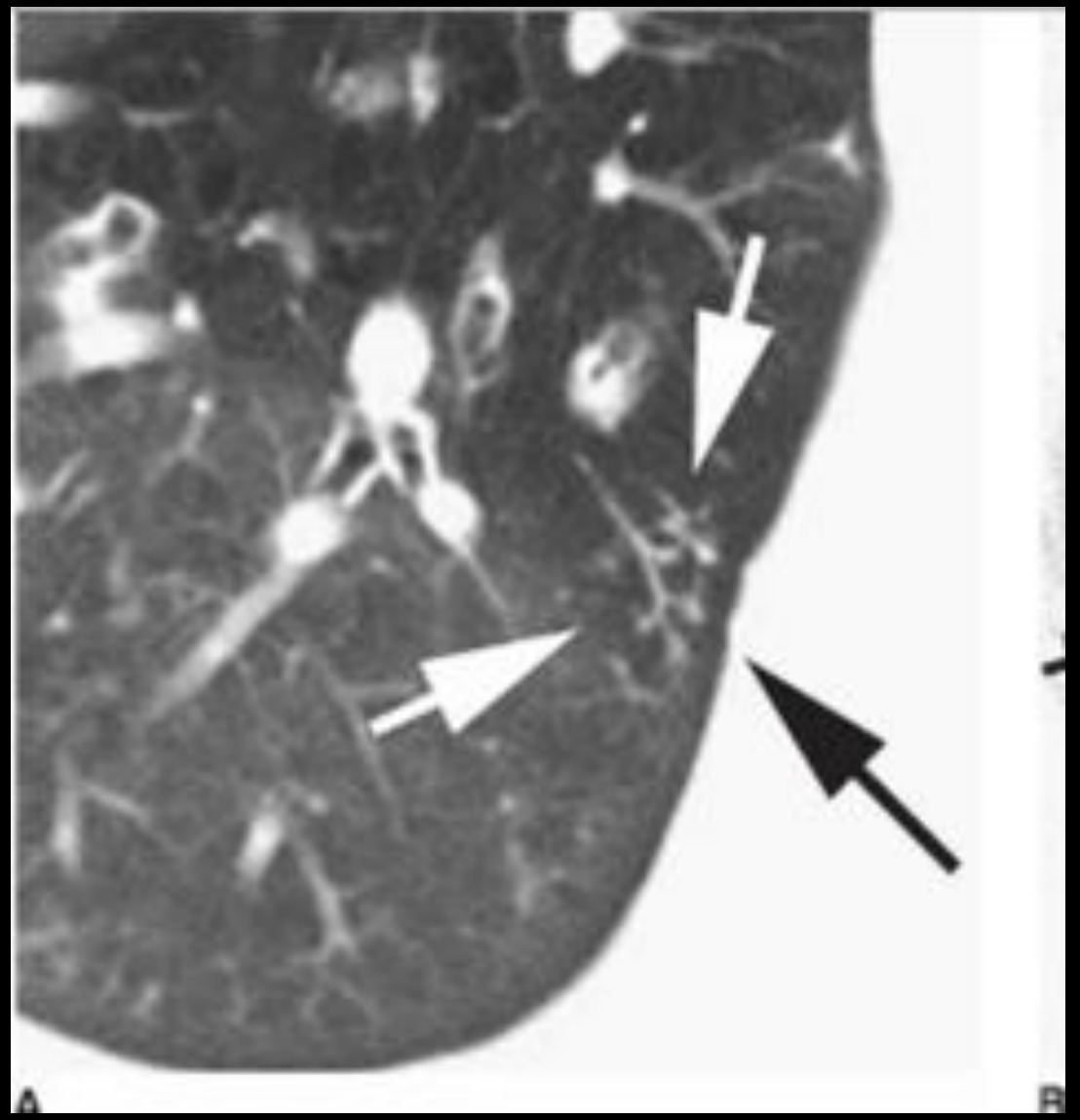


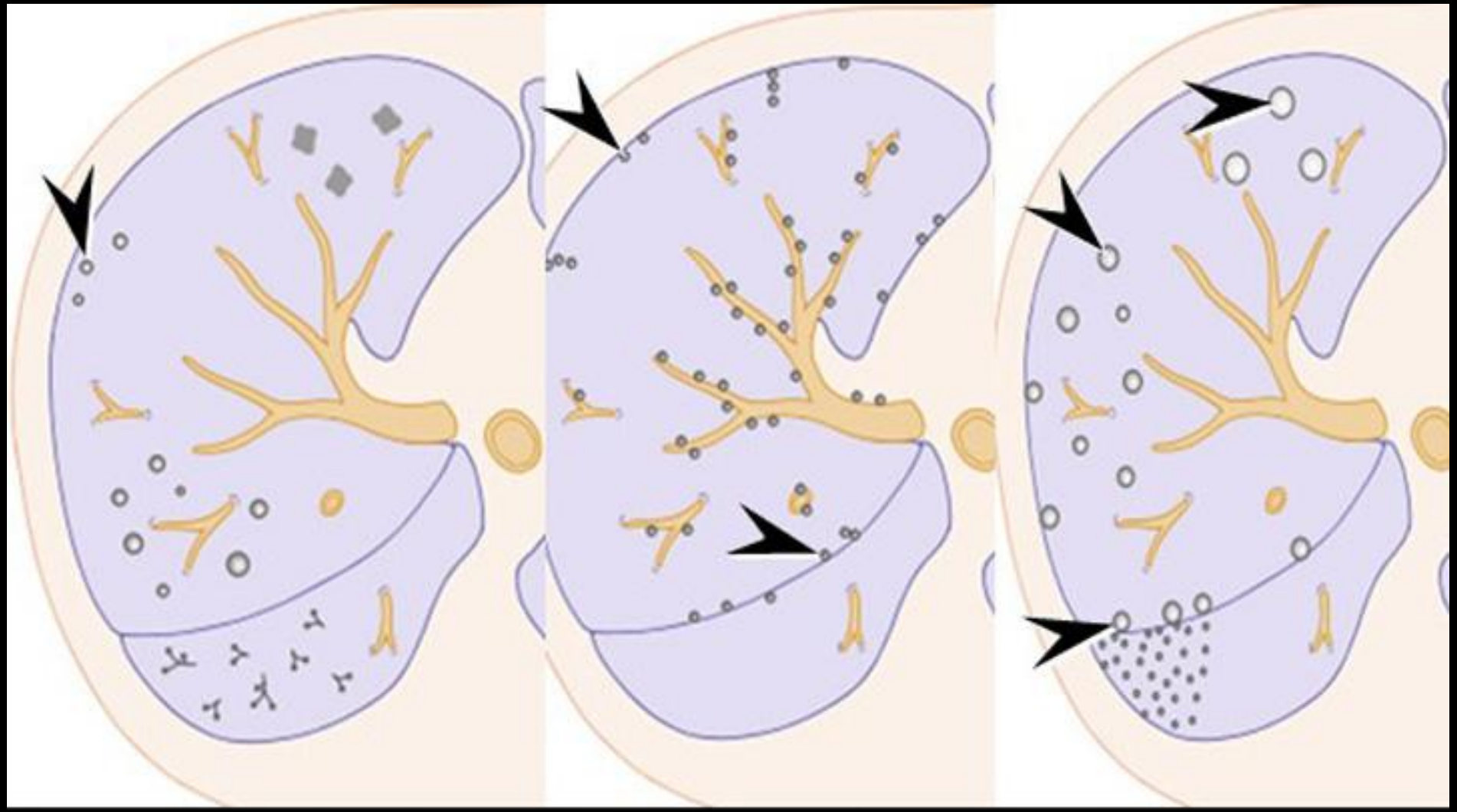
C

FIG. 10.27. Centrilobular nodules. **A:** Bacterial bronchopneumonia with patchy centrilobular nodules in the lower lobe. The most peripheral nodules are centered 5 to 10 mm from the pleural surface and spare the pleura. Small rosettes also are visible. **B:** Centrilobular nodules in hypersensitivity pneumonitis. Note that the nodules spare the fissure (*arrow*) and pleural surface. The nodules are diffuse and appear evenly spaced. **C:** Hypersensitivity pneumonitis with centrilobular nodules of ground-glass opacity.

Centrilobular Tree-in-bud Pattern

- dilatation and impaction of small centrilobular bronchioles (with mucus or pus), it confirms the presence of airway disease.





Centrilobular Perilymphatic Random

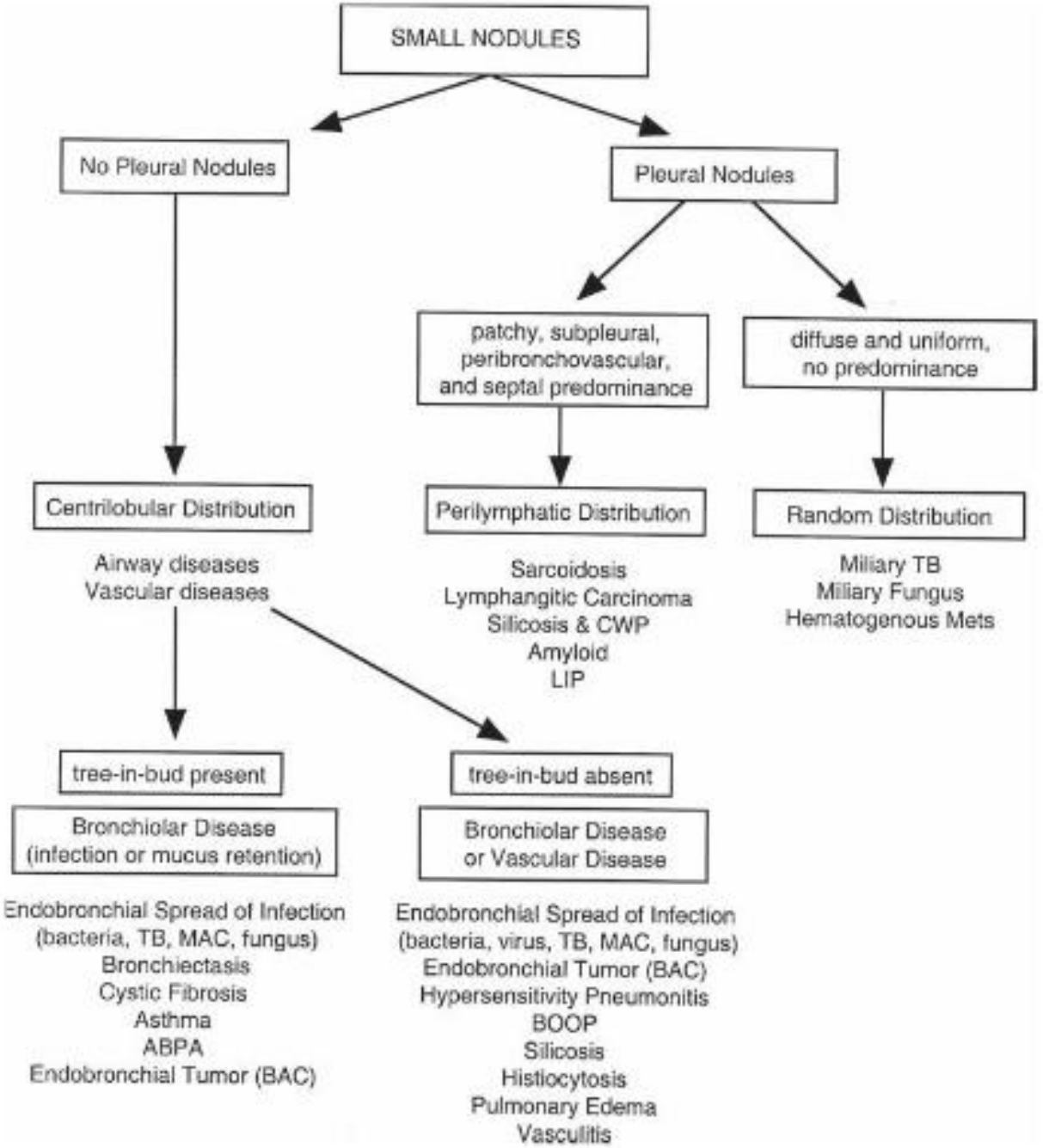


FIG. 10.29. Algorithm for classification and diagnosis of multiple small nodules.

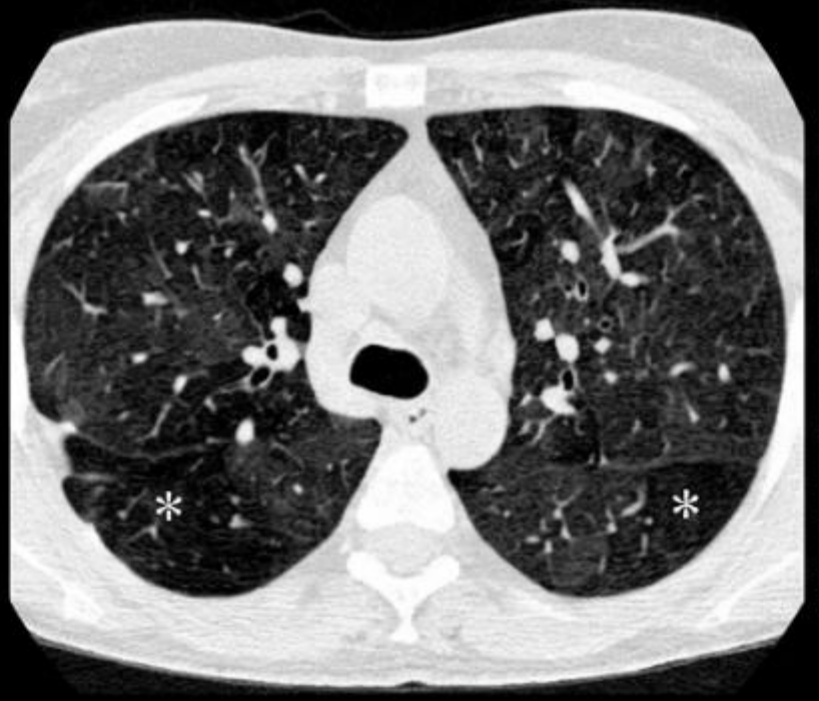
Heterogenous lung opacity
Mosaic pattern

Mosaic Attenuation on Thoracic CT

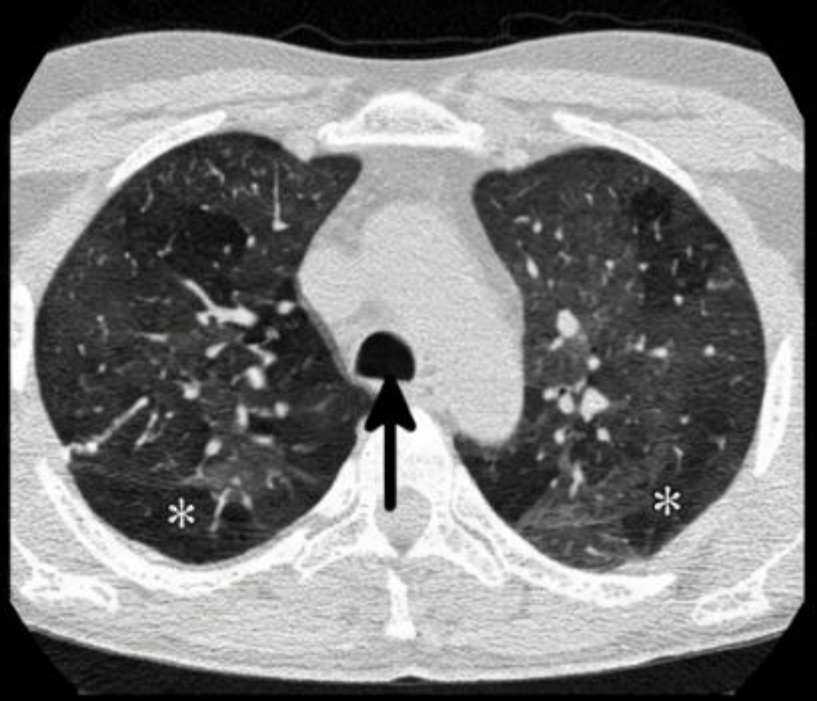
A commonly encountered CT pattern defined as heterogeneous areas of differing lung attenuation.

THE CLINICAL DILEMMA

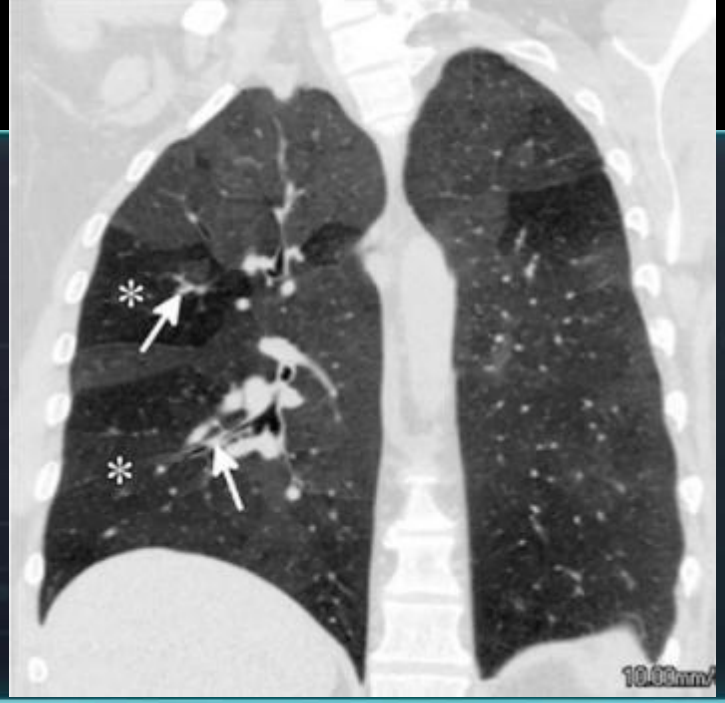
The radiologist's primary challenge is determining the location of the pathology. Is the **"lower-attenuation (dark)"** lung abnormal, or is the **"higher-attenuation (white)"** lung abnormal?



Inspiration: Geographic areas of decreased attenuation adjacent to normal lung. Notice the relative decrease in vascularity in the hypoattenuated regions.

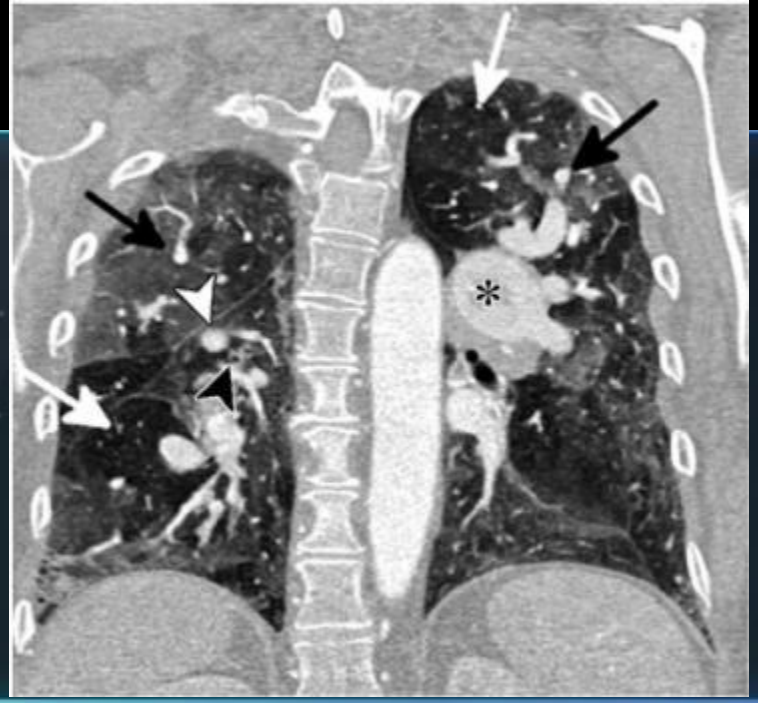


Expiration: Hypoattenuated areas remain dark (airtrapping), while normal lung increases in attenuation.



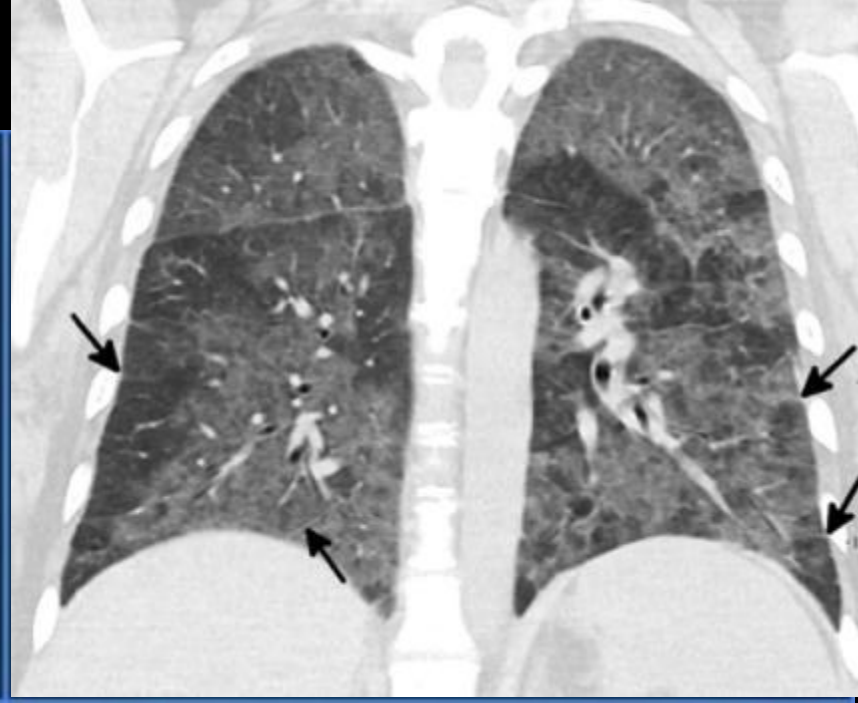
1. Small Airways Disease (SAD)

- **Rule:** Abnormal Tissue = **"DARK"** (Hypoattenuated)
- **Mechanism:** Bronchiolar obstruction causes collateral airflow limitation and hypoxic vasoconstriction.
- **Image Callout:** Asthma presentation. Well-defined areas of decreased attenuation with endobronchial mucus plugging in supplying airways.



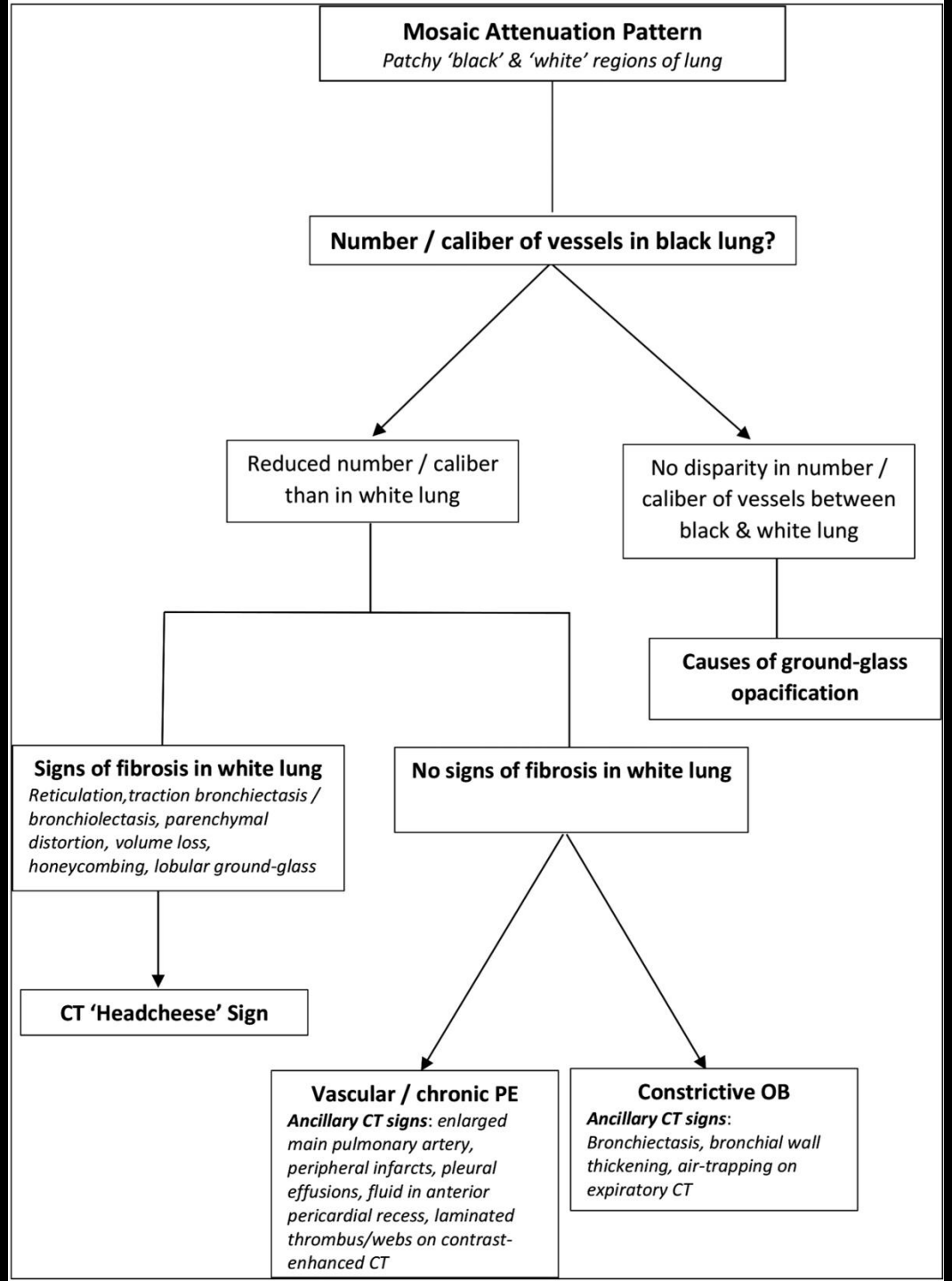
2. Pulmonary Vascular Disease (PVD)

- **Rule:** Abnormal Tissue = **"DARK"** (Hypoattenuated)
- **Mechanism:** Regional differences in lung perfusion due to vascular occlusion (e.g., CTEPH, PAH).
- **Image Callout:** CTEPH presentation. Hypoattenuation due to vascular occlusion adjacent to hyperattenuated (hyperperfused) lung. Note enlarged right lower lobe segmental pulmonary artery.



3. Ground-Glass Opacity (GGO)

- **Rule:** Abnormal Tissue = **"WHITE"** (Hyperattenuated)
- **Mechanism:** Alveolar/interstitial processes (e.g., hemorrhage, edema, infection).
- **Image Callout:** Diffuse Alveolar Hemorrhage. Normal airways and uniform vascularity, with interspersed diffuse ground-glass opacity and septal thickening.


Mosaic Attenuation Pattern
Patchy 'black' & 'white' regions of lung
Number / caliber of vessels in black lung?
Reduced number / caliber than in white lung
No disparity in number / caliber of vessels between black & white lung
Causes of ground-glass opacification
Signs of fibrosis in white lung
Reticulation,traction bronchiectasis / bronchiolectasis, parenchymal distortion, volume loss, honeycombing, lobular ground-glass
No signs of fibrosis in white lung
CT 'Headcheese' Sign
Vascular / chronic PE
Ancillary CT signs: enlarged main pulmonary artery, peripheral infarcts, pleural effusions, fluid in anterior pericardial recess, laminated thrombus/webs on contrast-enhanced CT
Constrictive OB
Ancillary CT signs: Bronchiectasis, bronchial wall thickening, air-trapping on expiratory CT

Bronchiectasis

Bronchiectasis

1. Primary Insult & Host Factors

Initial damage to ciliated epithelium and mucosal glands. Host factors (e.g., cystic fibrosis, ciliary dyskinesia, immune dysfunction) severely compromise the mucociliary clearance system.

2. Bacterial Colonization

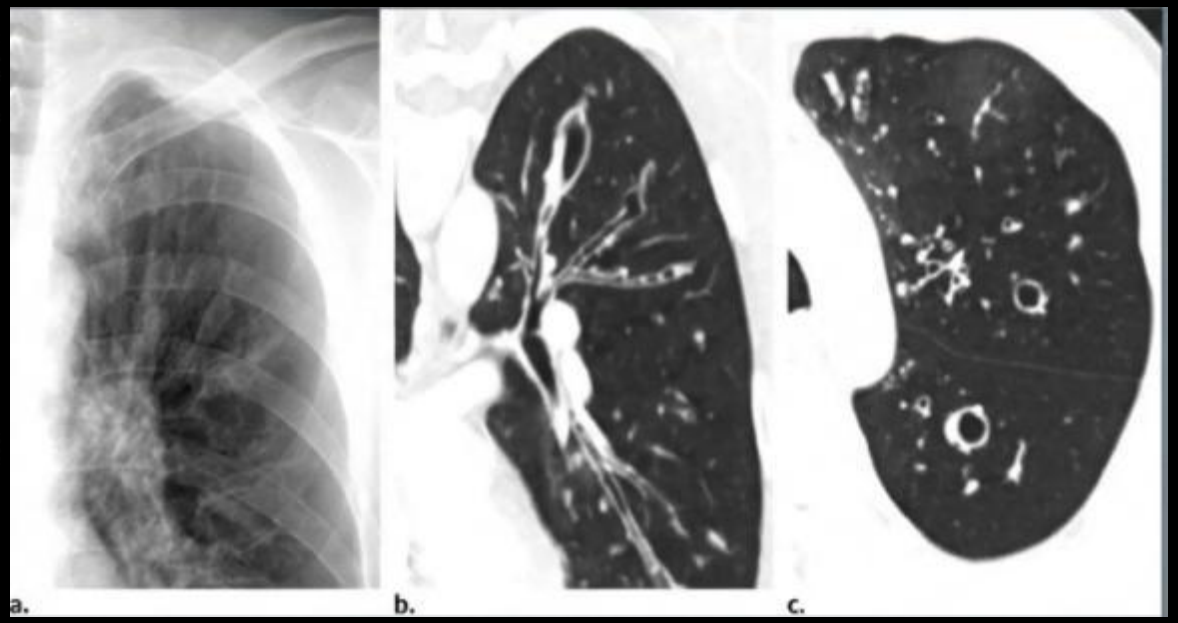
Impaired clearance drives the retention of mucus, drastically increasing the frequency and severity of pulmonary infections.

3. Deleterious Cytokine Cascade

Recurrent infections trigger chronic inflammation, recruiting and stimulating immune cells deep into the airway lumen.

4. Enzymatic Tissue Destruction

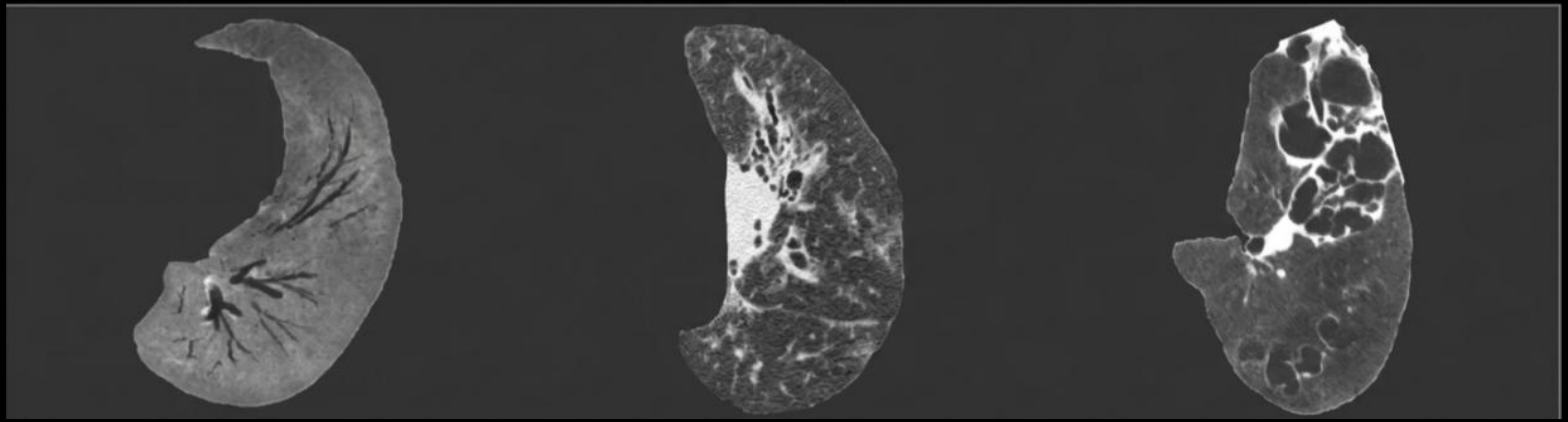
Neutrophils release massive amounts of elastases, proteases, and free radicals. This overwhelms local defenses, actively destroying epithelial elastin, smooth muscle, and ultimately the bronchial cartilage.



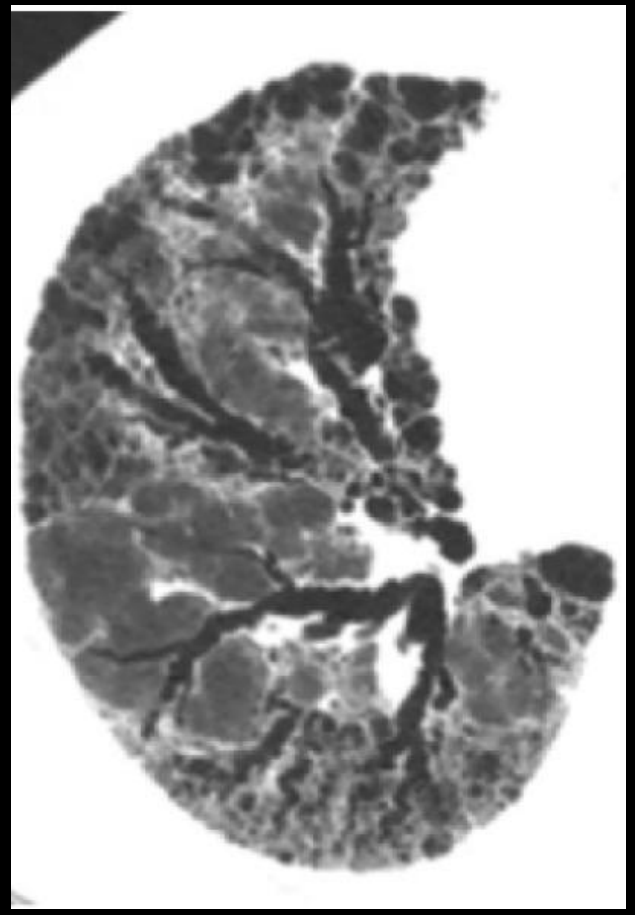
Morphologic Outcomes (Reid's Classification):

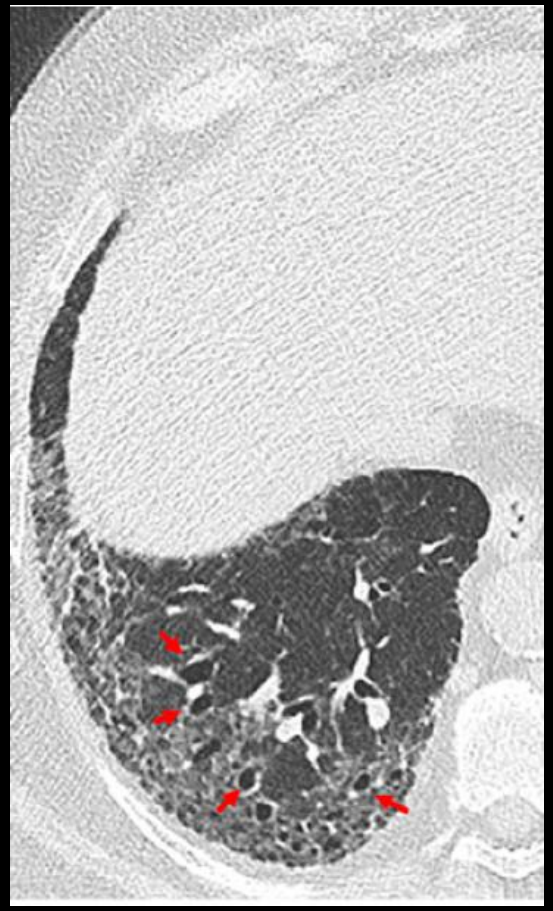
(a) Cylindrical: Smooth, uniform enlargement without tortuosity.

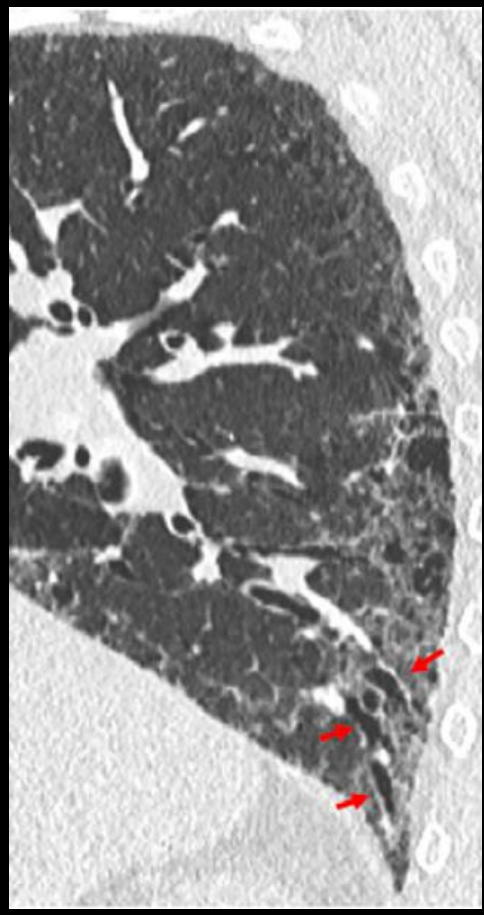
(b) Varicoid: Undulating contours; alternating dilation and narrowing (secondary to fibrotic traction). **(c) Cystic (Saccular):** Focal, pouch-like, ballooned destruction.



Traction bronchiectasis



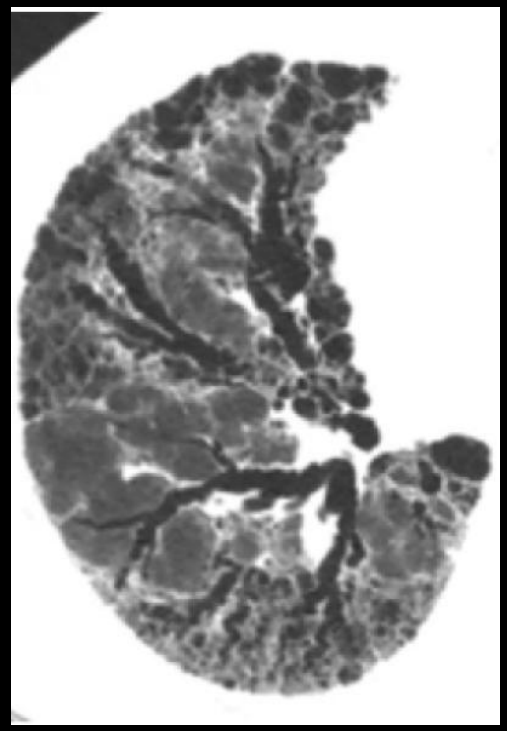




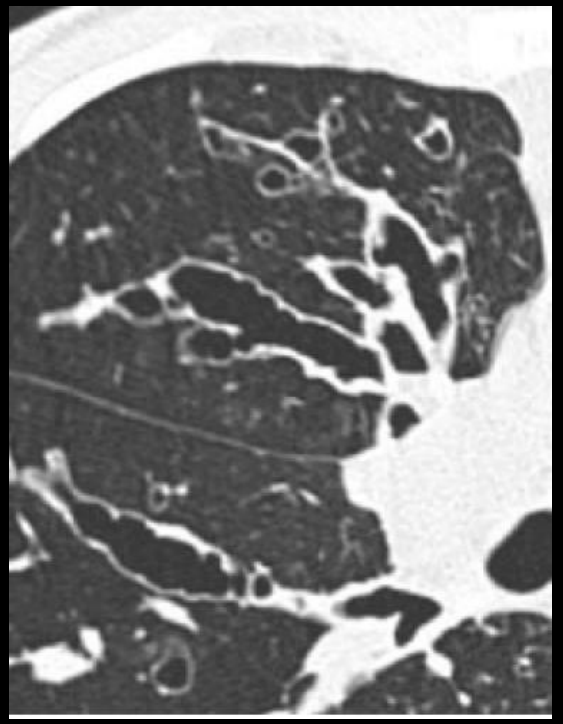
- Irregular bronchial and bronchiolar dilatation caused by surrounding retractile pulmonary fibrosis

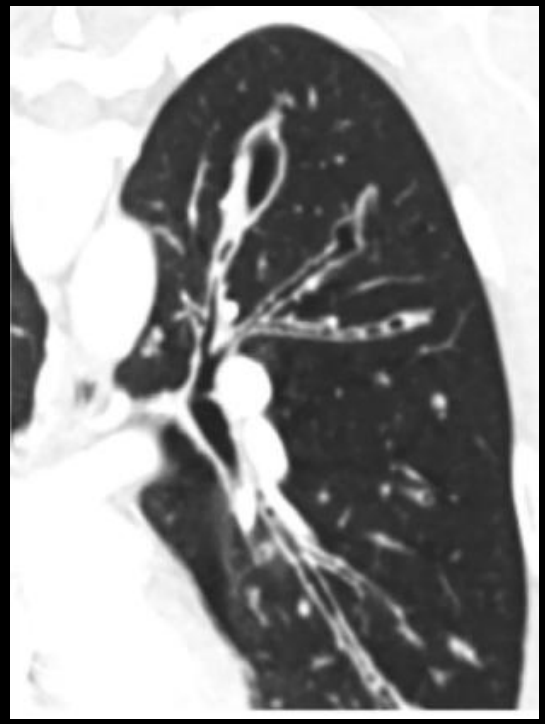
Radiology: Volume 246: Number 3—March 2008
RadioGraphics 2015; 35:1011–1030
American Journal of Respiratory and Critical Care Medicine Volume 205 Number 9 | May 1 2022

Traction bronchiectasis vs Bronchiectasis



- Irregular bronchial and bronchiolar dilatation caused by surrounding retractile pulmonary fibrosis



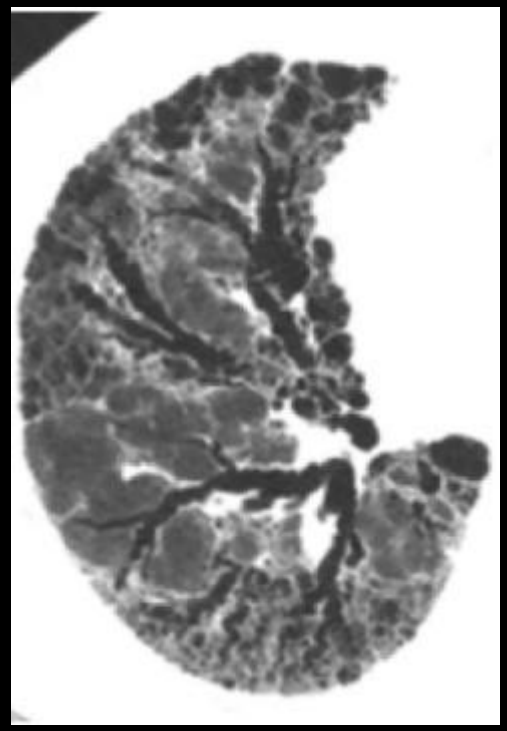


- Bronchiectasis is irreversible bronchial dilatation
  - from chronic infection
  - proximal airway obstruction
  - congenital bronchial abnormality

Radiology: Volume 246: Number 3—March 2008

RadioGraphics 2015; 35:1011–1030

Traction bronchiectasis vs Bronchiectasis



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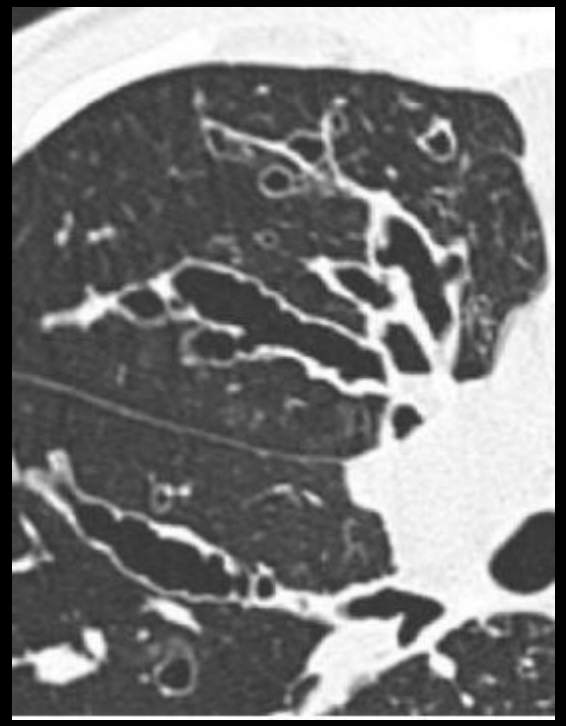

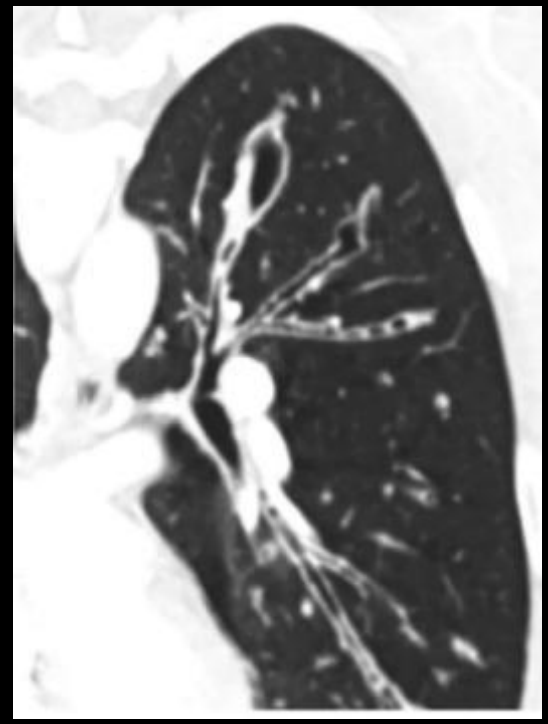

- Bronchiectasis is irreversible bronchial dilatation
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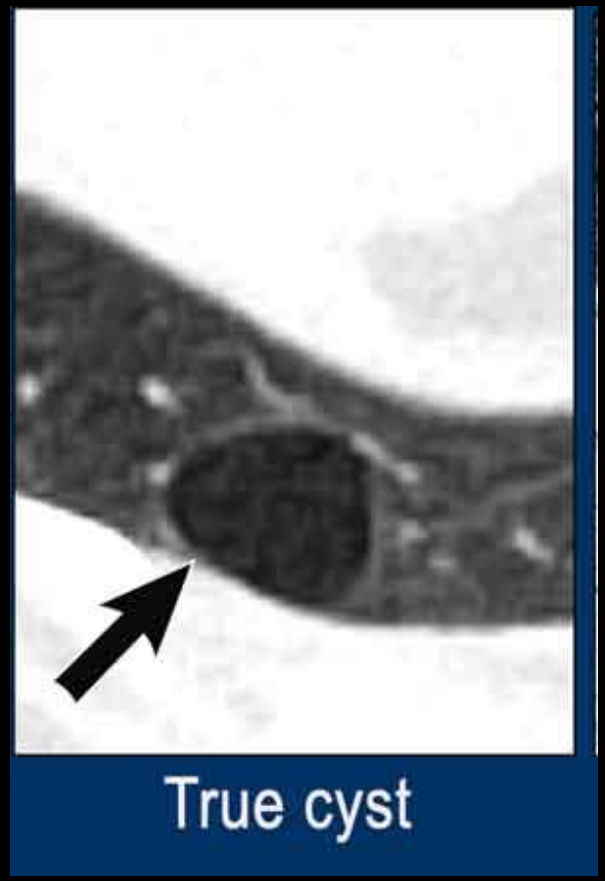
Radiology: Volume 246: Number 3—March 2008

RadioGraphics 2015; 35:1011–1030

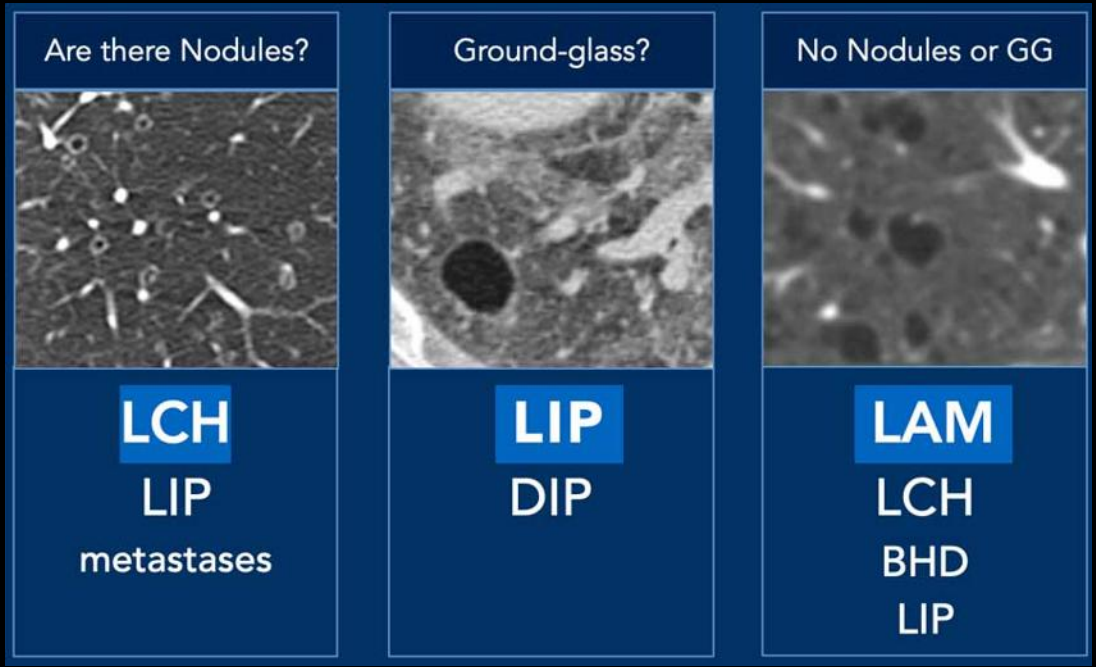
Cystic lung lesion

A round shape radiolucency area exhibiting well defined border adjacent to normal lung parenchyma, usually contain air.

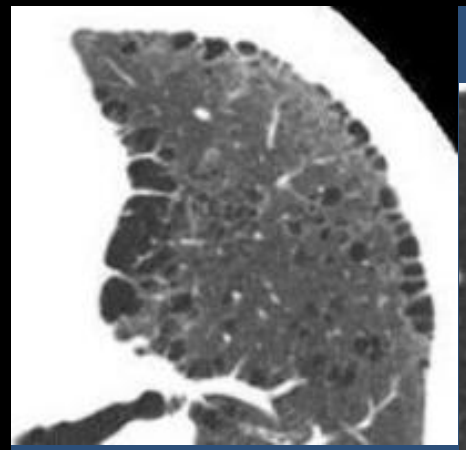


Lung cystic lesion

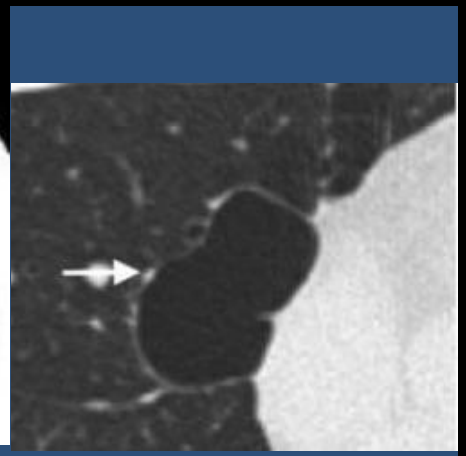
Intra-parenchyma



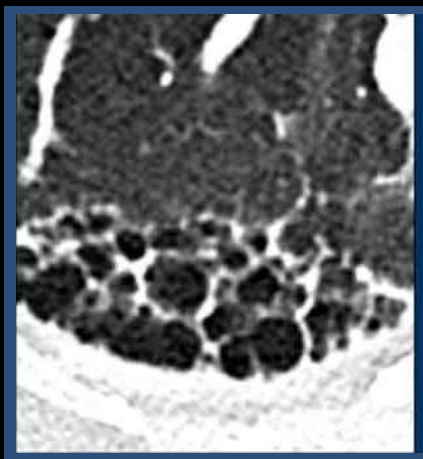
Subpleural



Paraseptal emphysema



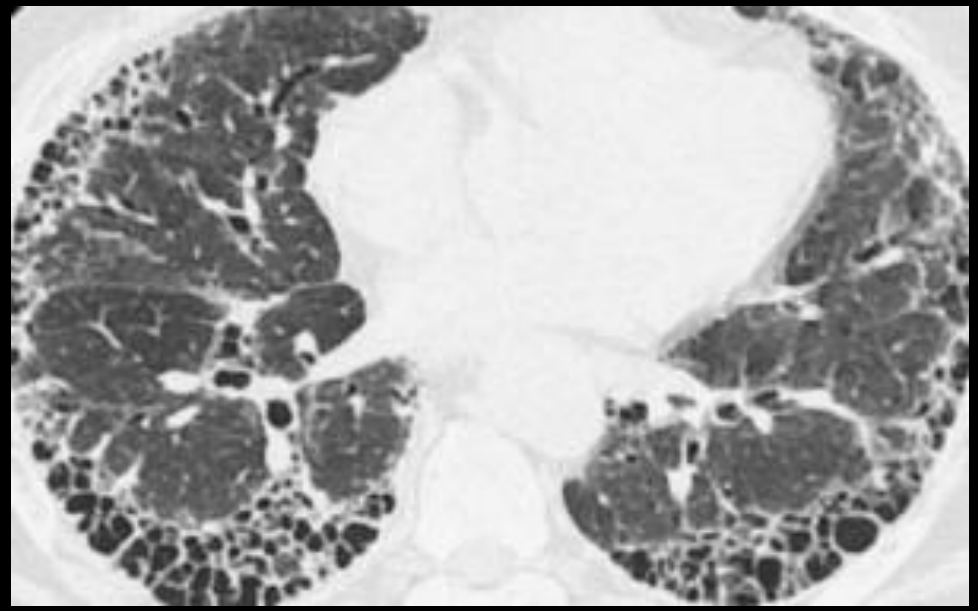
Bullae

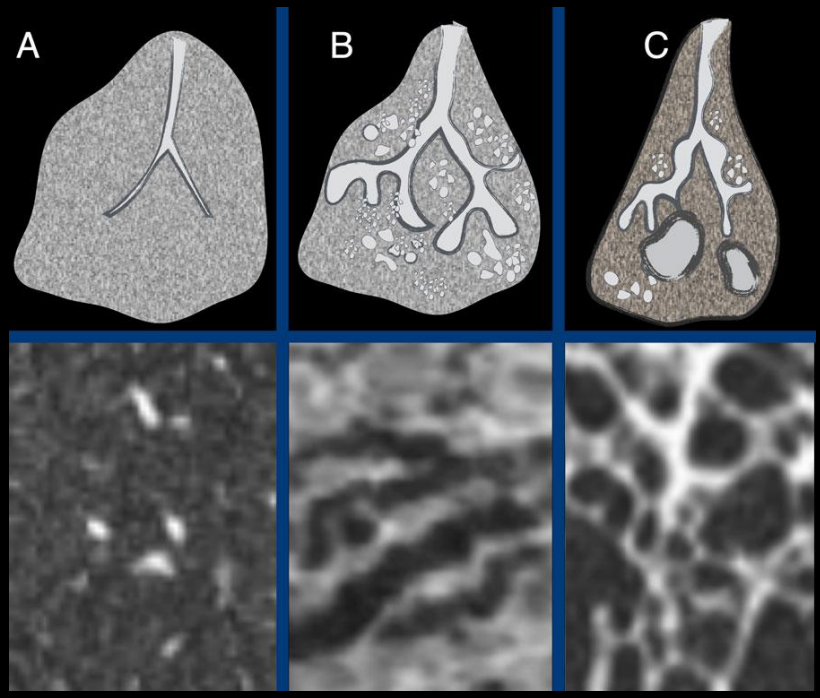


Honeycombing

- **LCH** - Langerhans Cell Histiocytosis is a multi-organ disease strongly associated with smoking.
- **LIP** - Lymphocytic Interstitial Pneumonia is associated with autoimmune diseases such as Sjogren, and also with HIV.
- **DIP** – Desquamative Interstitial Pneumonia is smoking related.
- **LAM** – Lymphangioleiomyomatosis is a genetic disorder mostly in women (in a sporadic form) or in the context of tuberous sclerosis complex
- **BHD** - Birt-Hogg-Dubé syndrome is a hereditary condition associated with skin tumors and an increased risk of RCC.

Honeycombing





Definition made by Fleischner Society.

- Clustered cystic air spaces
- Diameters on the order of **3–10 mm**, but occasionally as large as **2.5 cm**
- Well defined walls 1–3 mm in thickness
- Could be single layer or multiple layer

- Normal lung tissue (A)
- Distortion of the secondary lobule with traction bronchiolectasis (B)
- End stage cyst formation (C)
  - Fibrous or granulomatous process of alveoli and ducts, which causes the bronchioles to dilate or amputate.

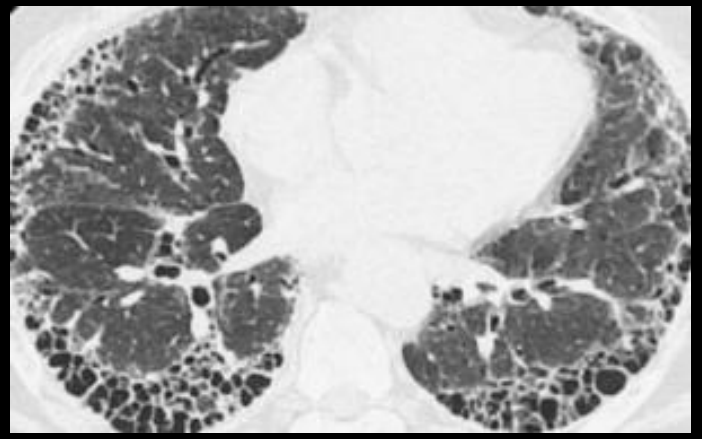
Radiology: Volume 246: Number 3—March 2008 *AJR* 2011; 196:773–782

https://radiologyassistant.nl/chest/hrct/fibrosis-of-the-lung-on-hrct-imaging

Pimentel JC. Tridimensional photographic reconstruction in a study of the pathogenesis of honeycomb lung. Thorax 1967; 22:444–452

Problems in identifying honeycombing

Emphysema



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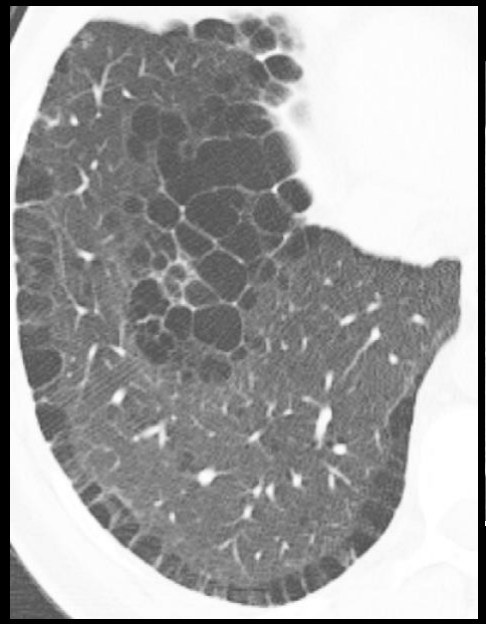
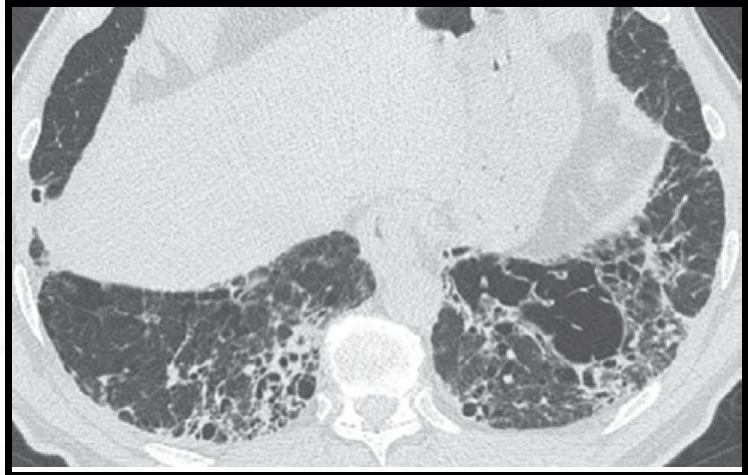


- Paraseptal emphysema
- No evident lung fibrosis
- Thin wall



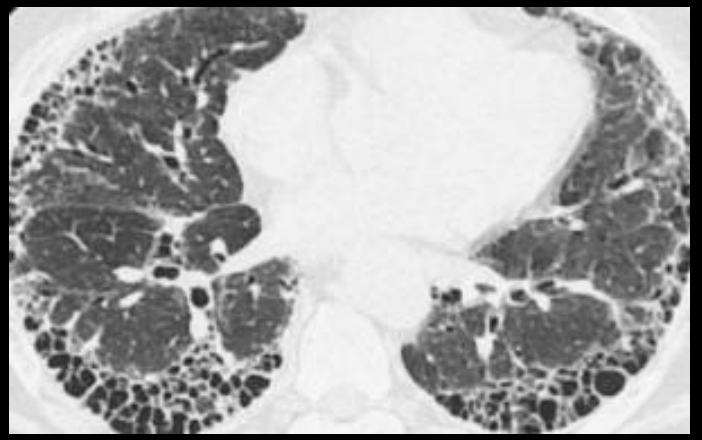
- CPFE, combined pulmonary fibrosis and emphysema
- Centrally placed emphysema expands as the surrounding fibrosis evolves.

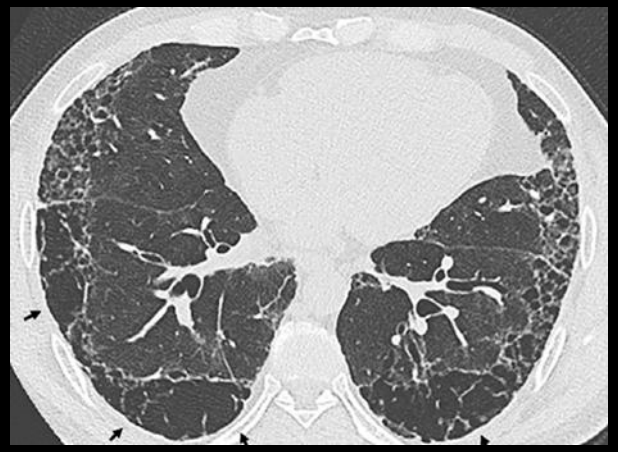
AJR 2011; 196:773–782

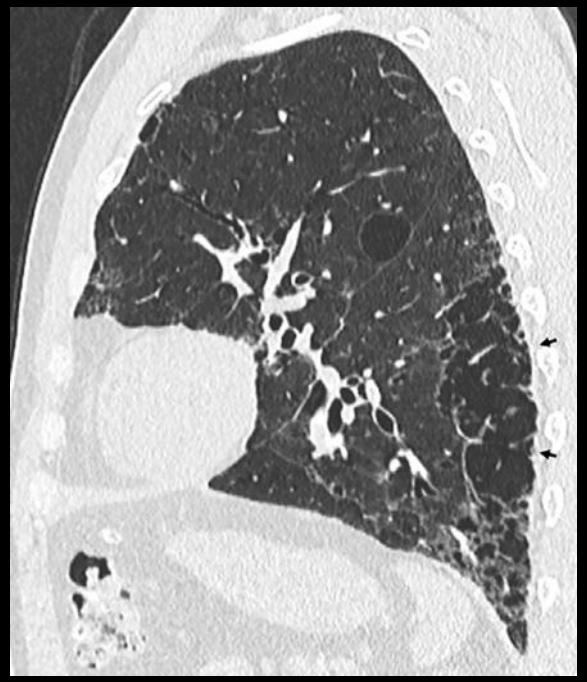
Radiology: Cardiothoracic Imaging Volume 3: Number 1—2021

Problems in identifying honeycombing

Airspace enlargement with fibrosis (AEF) or smoking-related interstitial fibrosis (SRIB)







Definition made by Fleischner Society.

- Clustered cystic air spaces
- Diameters on the order of **3–10 mm**, but occasionally as large as **2.5 cm**
- Well defined walls 1–3 mm in thickness

- AEF is not regarded as a distinct form of IPF
- Presence of fibrosis in the classic definition of emphysema.

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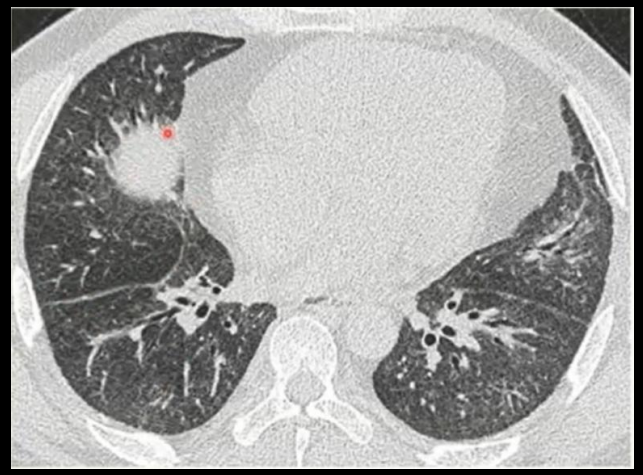
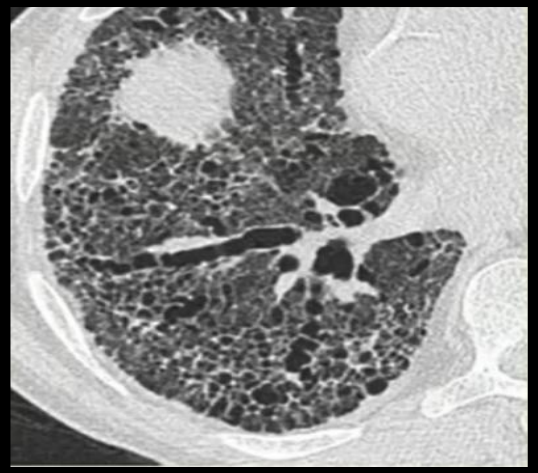
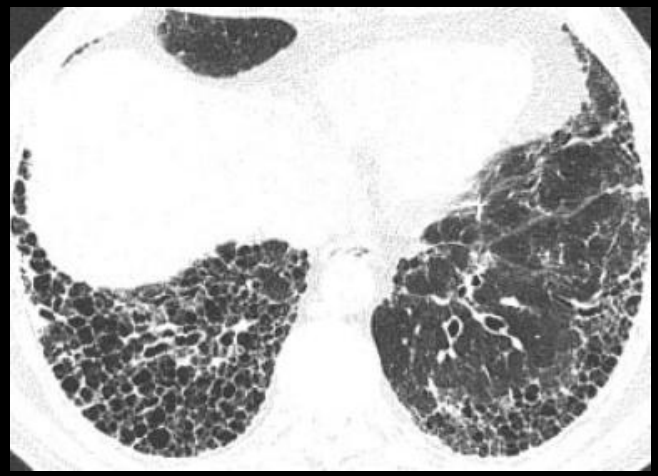
Typical CT finding of lung fibrosis/UIP/IPF



Volume loss

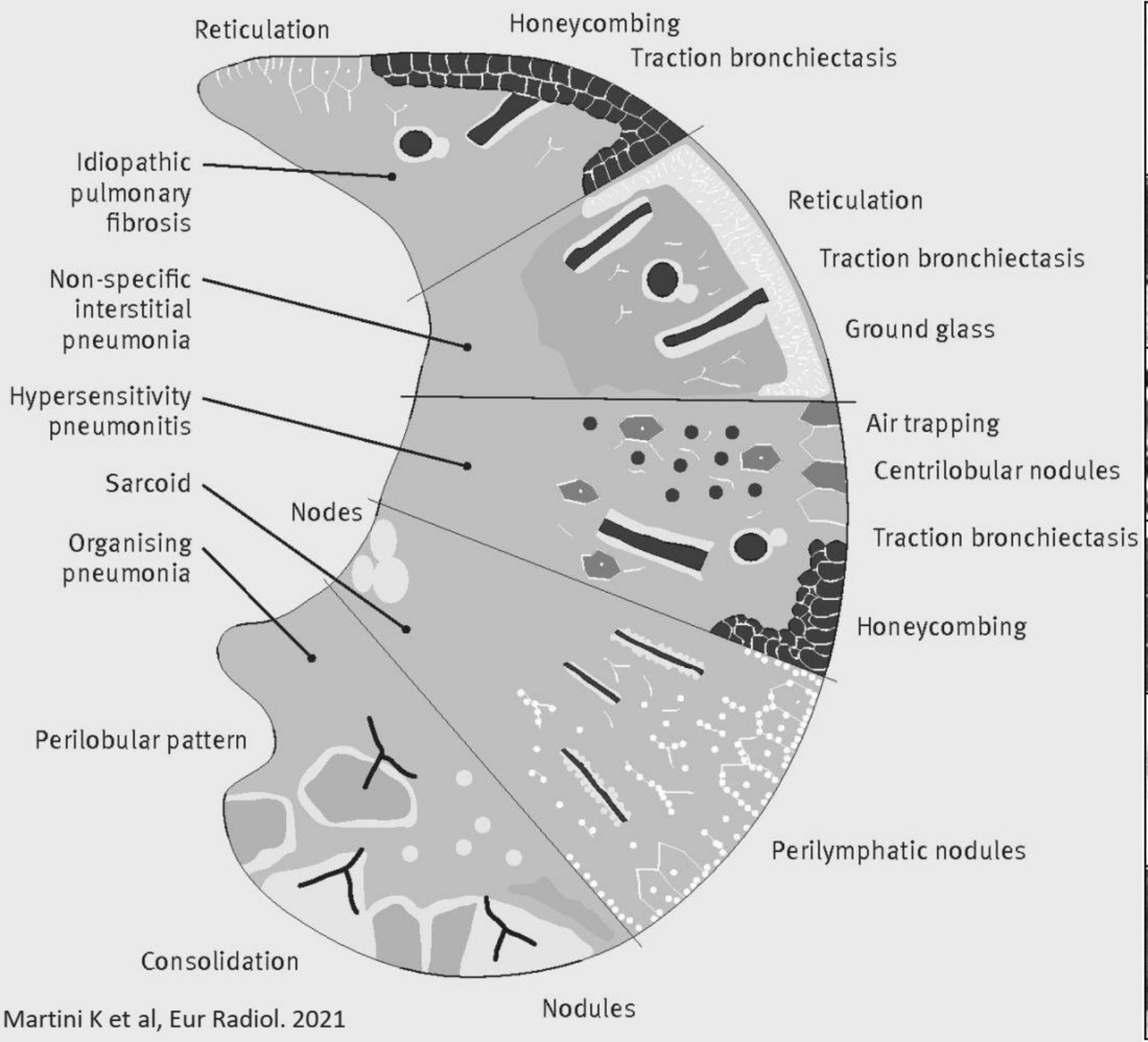


Traction bronchiectasis

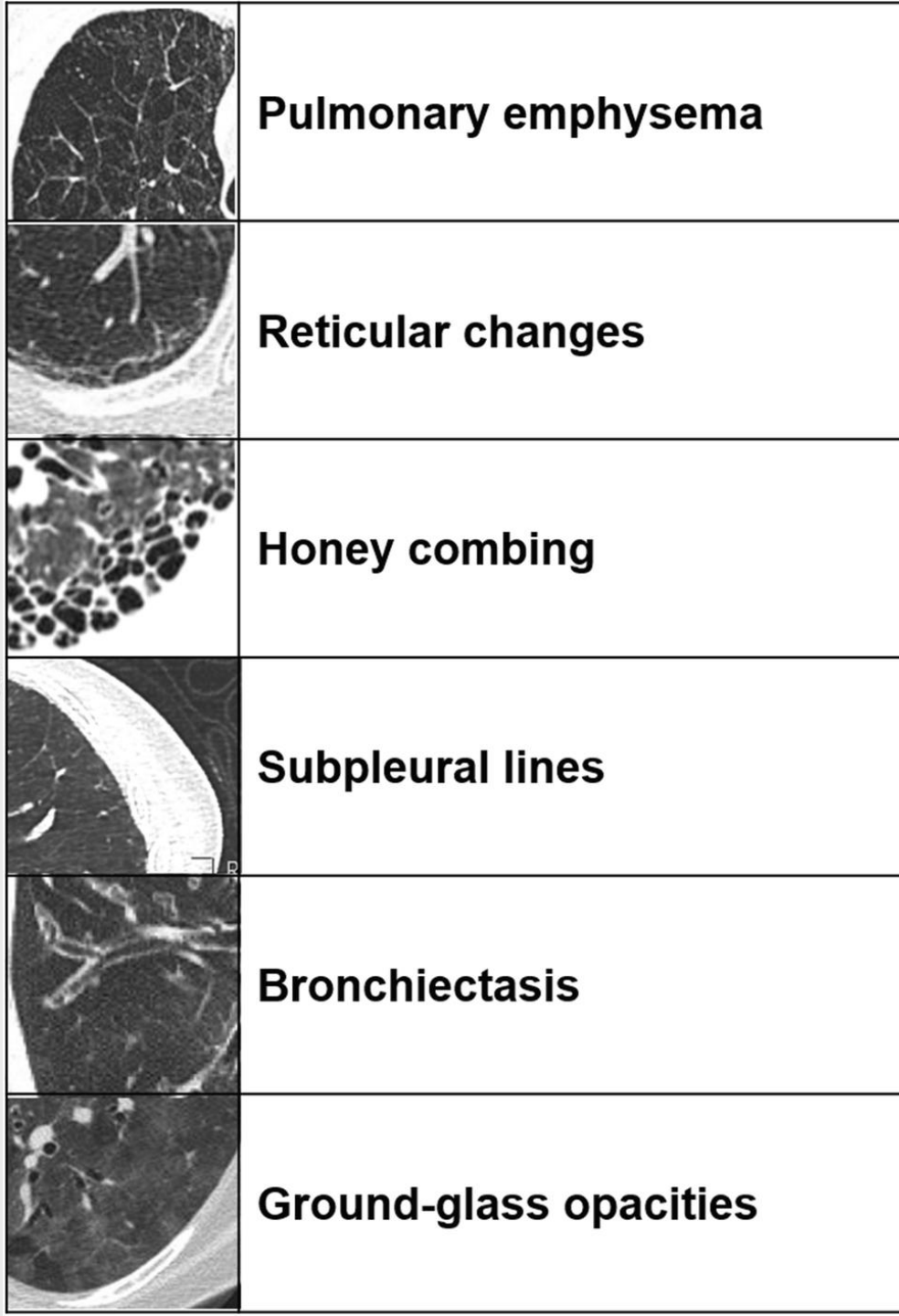


Honeycombing

Respirology (2015) **20**, 859–872



Martini K et al, Eur Radiol. 2021

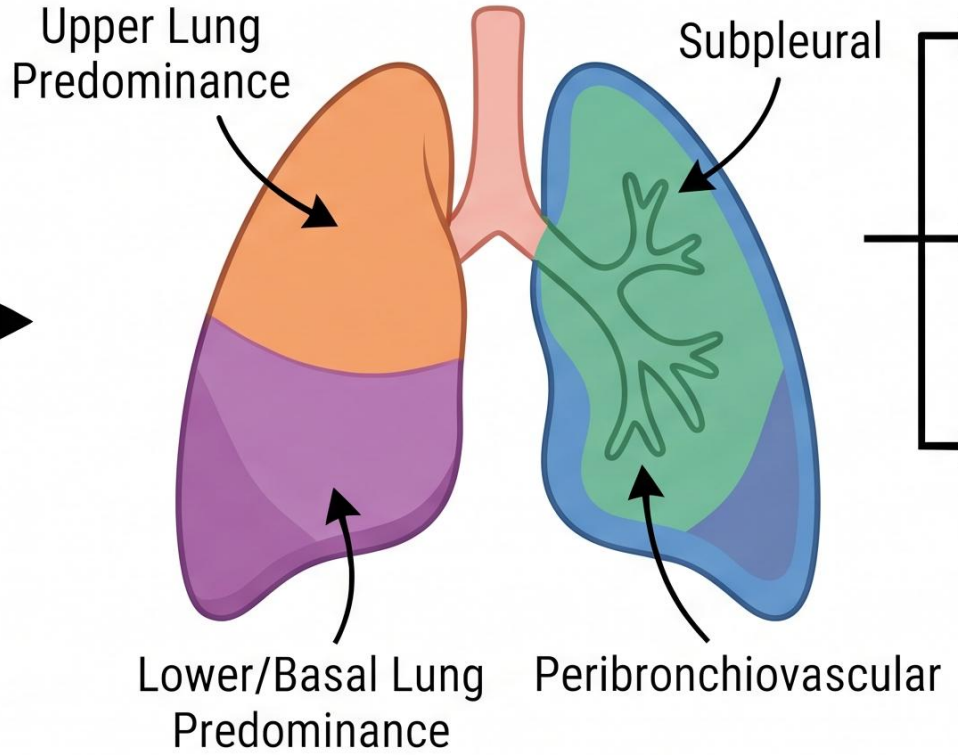


Framework for Diagnosing Interstitial Lung Diseases (ILD)

[Image Finding + Location] = Pattern

Image Findings

- Reticulation
- GGO (Ground-Glass Opacity)
- Honeycombing
- Traction Bronchiectasis



Key Diagnostic Patterns

- UIP (Usual Interstitial Pneumonia)
- NSIP (Non-Specific Interstitial Pneumonia)
- Indeterminate for UIP
- Alternative Pattern

Idiopathic interstitial pneumonitis pattern

Idiopathic pulmonary fibrosis (IPF)

IPF suspected*		Histopathology pattern†			
		UIP	Probable UIP	Indeterminate for UIP or biopsy not performed	Alternative diagnosis
HRCT pattern	UIP	IPF	IPF	IPF	Non-IPF dx
	Probable UIP	IPF	IPF	IPF (Likely)‡	Non-IPF dx
	Indeterminate	IPF	IPF (Likely)‡	Indeterminate§	Non-IPF dx
	Alternative diagnosis	IPF (Likely)‡	Indeterminate§	Non-IPF dx	Non-IPF dx

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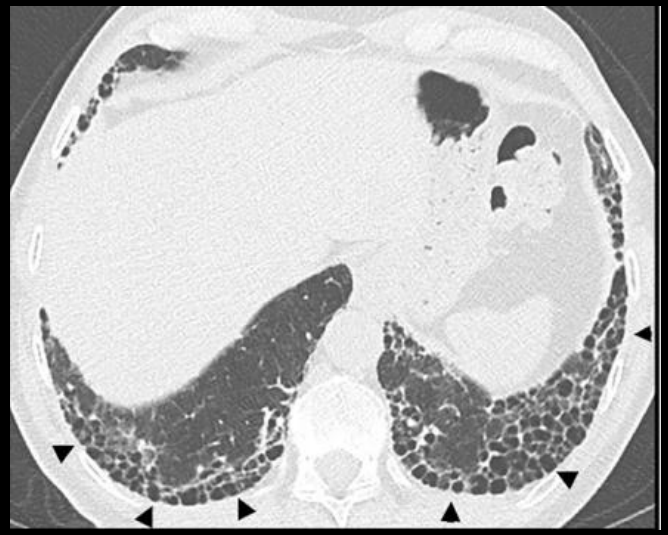
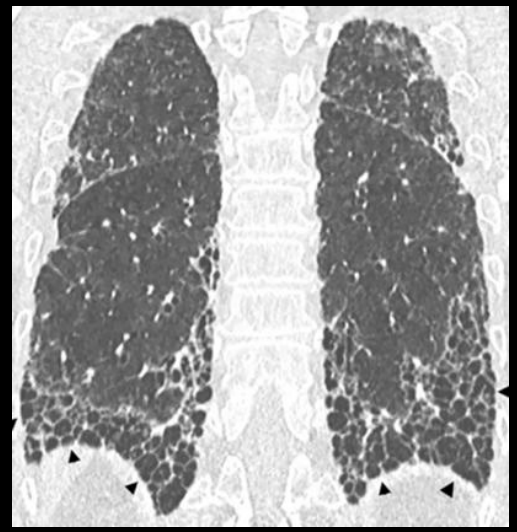
Usual Interstitial Pneumonitis ≠ IPF

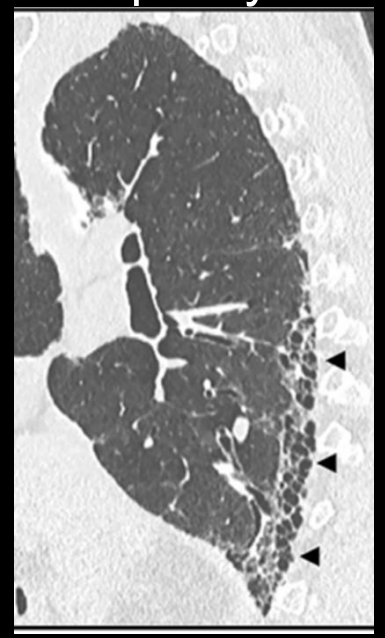
- IPF ➔ 不明原因的UIP
- Connective tissue disease associated UIP ➔ CTD-ILD
- Lung dominant connective tissue disease with UIP but do not meet the criteria for any form of CTD ➔ (血液或組織檢查覺得像, 但臨床上不完全符 合結締組織疾病的UIP)

UIP pattern

- Location
  - Subpleural; basal lung predominant
- Morphology
  - Reticulation, traction bronchiectasis/bronchiolectasis, honeycombing
- Absence of atypical features: Micronodules, sparing of lung bases, extensive air-trapping, consolidation, &/or ground-glass opacity







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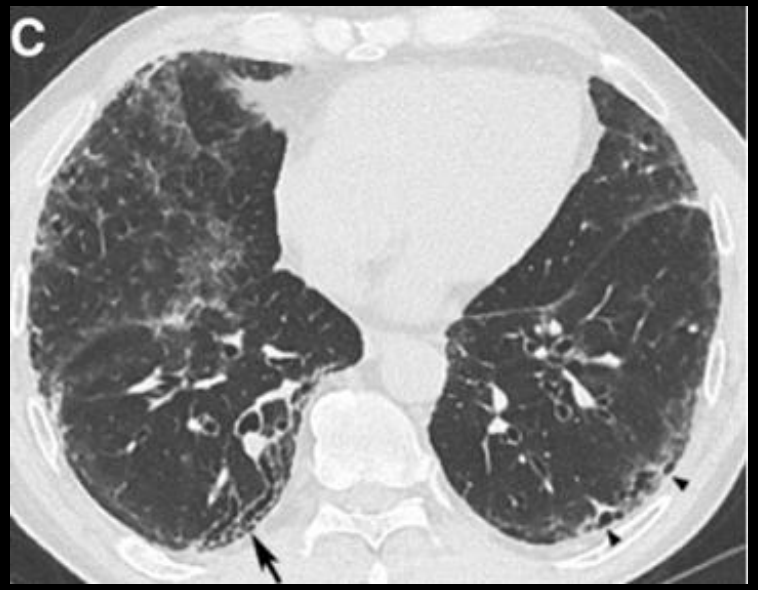
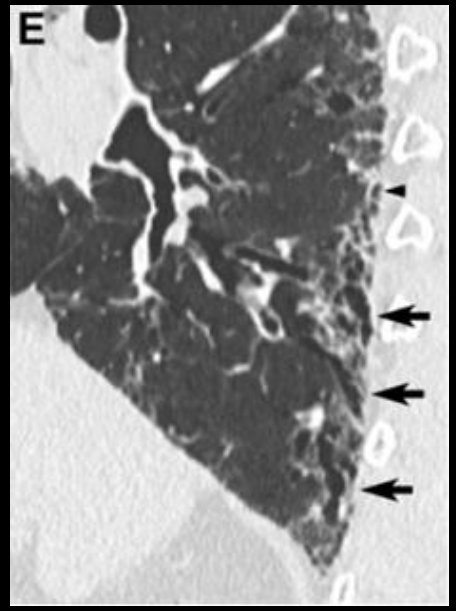
Probable UIP pattern

- Location
  - Subpleural; basal lung predominant
- Morphology
  - Reticulation, traction bronchiectasis/bronchiolectasis, ~~honeycombing~~
- Absence of atypical features: Micronodules, sparing of lung bases, extensive air-trapping, consolidation, &/or ground-glass opacity





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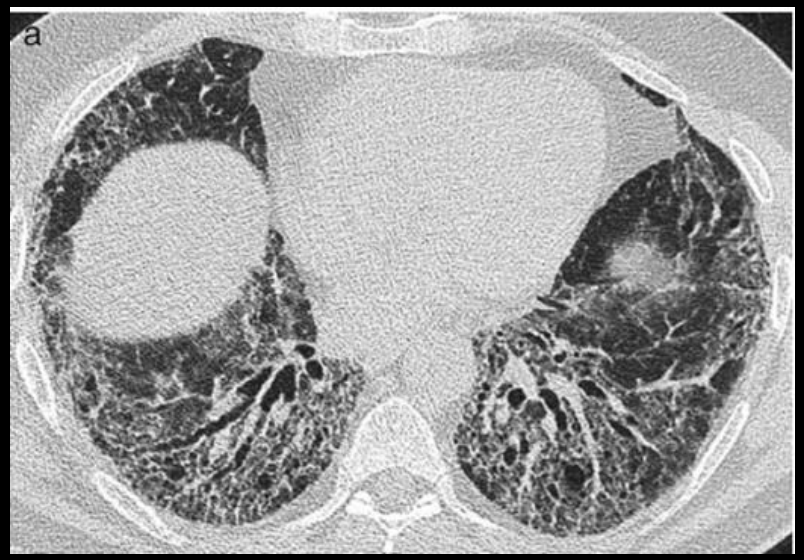
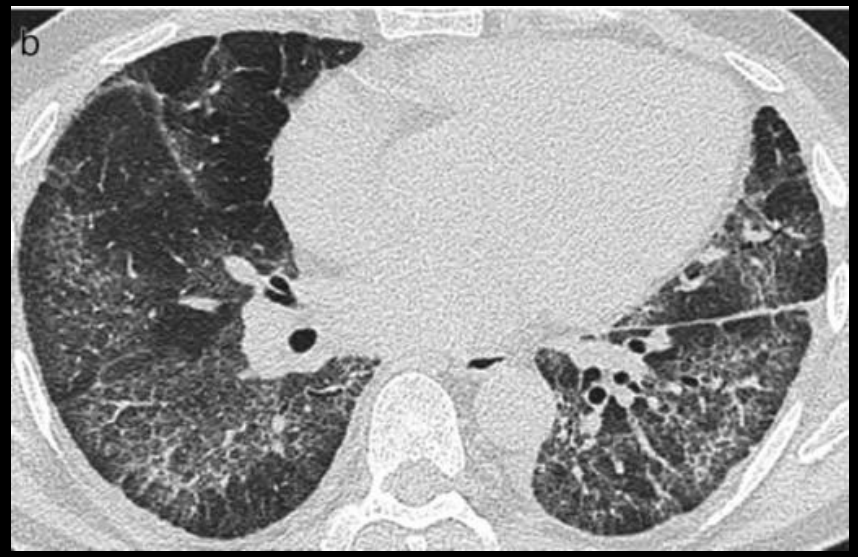
NSIP pattern

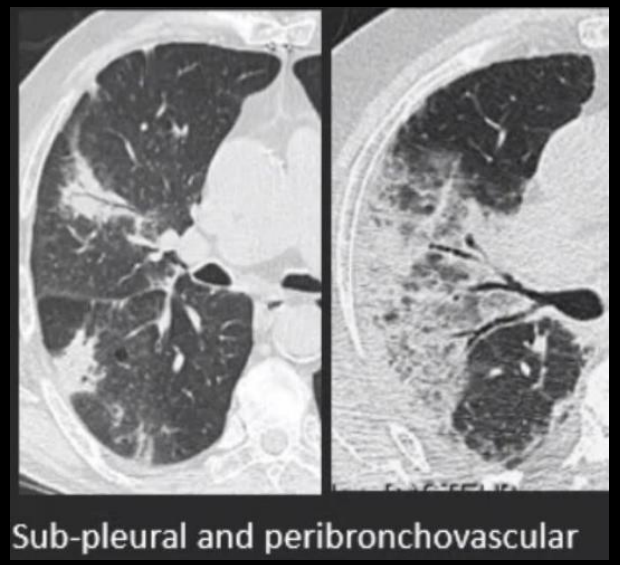
- Bilateral ground-glass and reticular opacities with traction bronchiectasis/bronchiolectasis
- Absent or sparse honeycombing
- Subpleural sparing ± peribronchovascular fibrosis
- Apicobasilar gradient (lower lobe predominant)

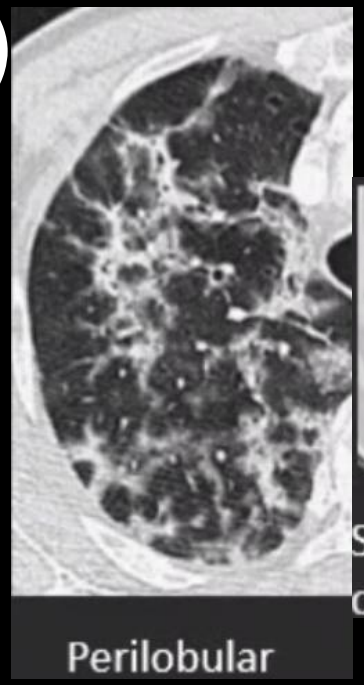


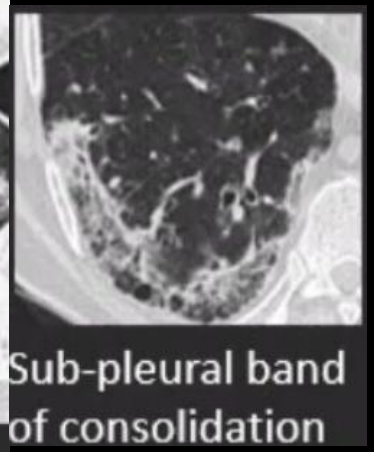


Organizing pneumonia (OP)

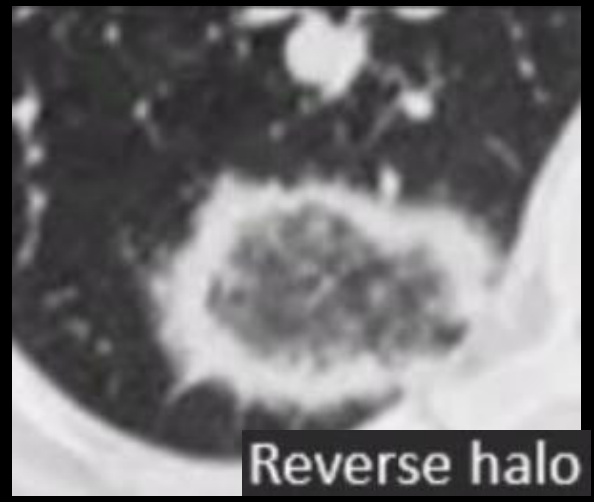
- Classic pattern (68-81%)
  - Bilateral peribronchovascular &/or subpleural consolidations
  - Mid-lower lung zone predominance
  - Consolidations may regress spontaneously
- Other patterns
  - Perilobular: Arcade-like or polygonal opacities
  - Focal: Single nodule or mass
  - Variable size, multiple nodules
  - Basal reticulation and architectural distortion with superimposed alveolar opacities
- Reversed halo sign (19%)
  - Ground-glass opacity surrounded by crescent or ring of parenchymal consolidation


Sub-pleural and peribronchovascular


Perilobular


Sub-pleural band of consolidation

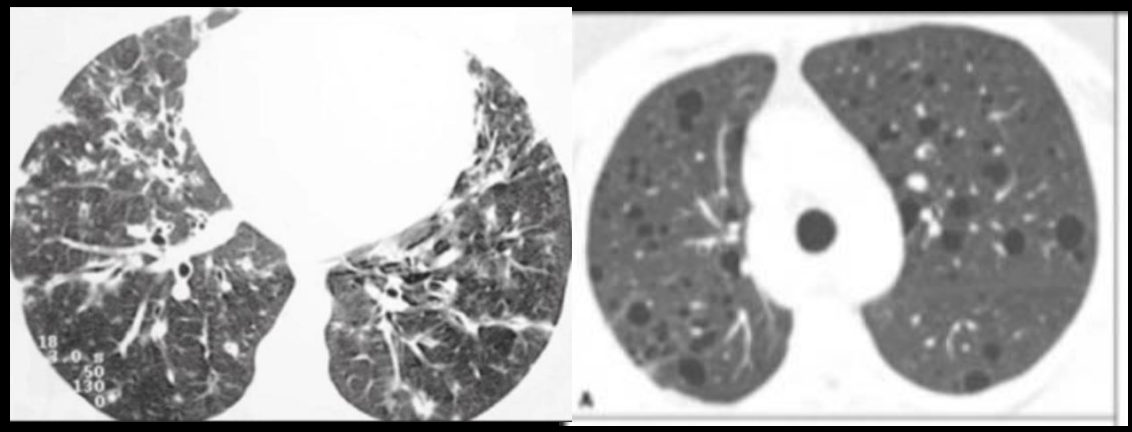

Nodules

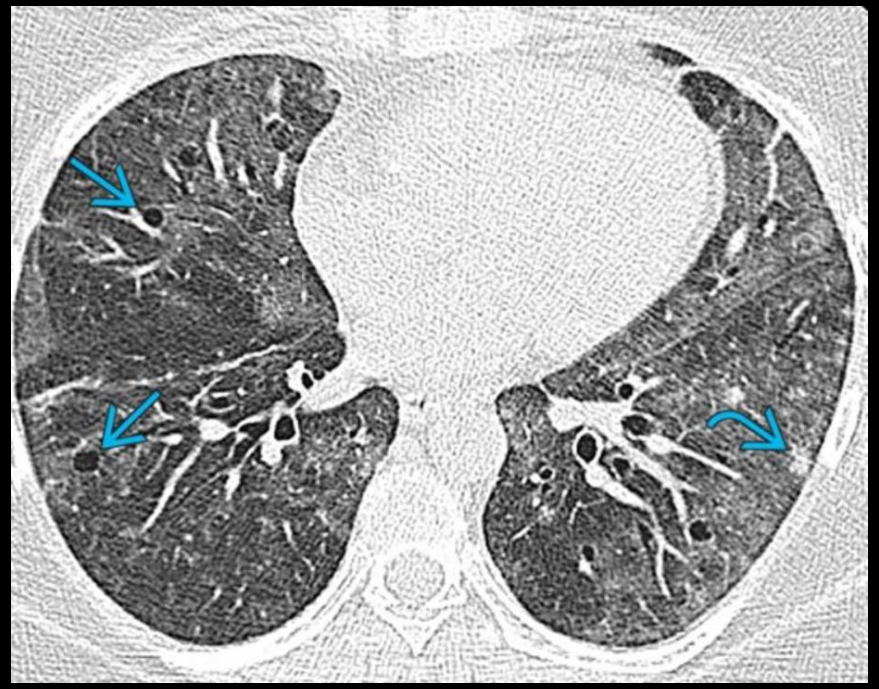

Reverse halo

Diagnostic and Interventional Imaging (2014) 95, 771—777

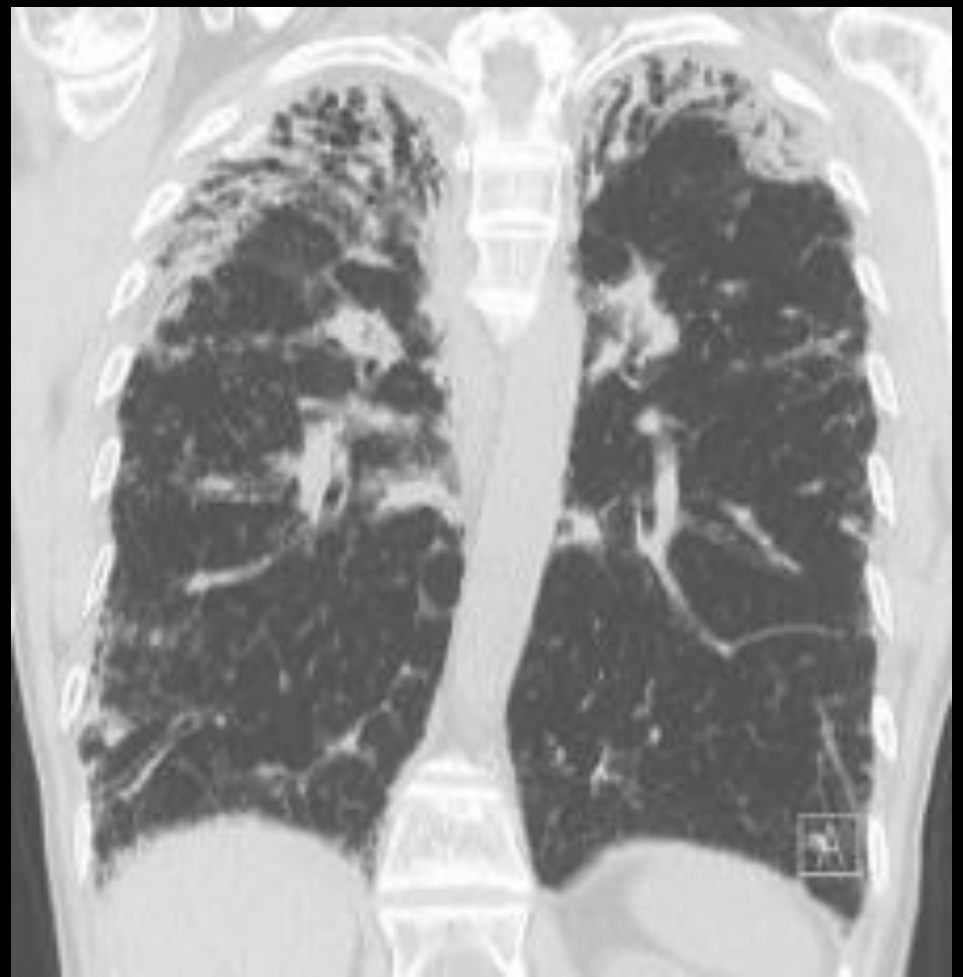
Lymphoid Interstitial Pneumonia (LIP)

- **Basilar** reticular/reticulonodular opacities
- Bilateral ground-glass opacities
- Poorly defined centrilobular nodules
- Small subpleural nodules (~ 85%)
- Bronchovascular bundle thickening (~ 85%)
- Mild interlobular septal thickening (~ 85%)
- **Thin-walled cysts (~ 70%)**
- Idiopathic (< 20%), **Sjögren syndrome (25%)**, infection, immunodeficiencies (e.g., common variable immunodeficiency)

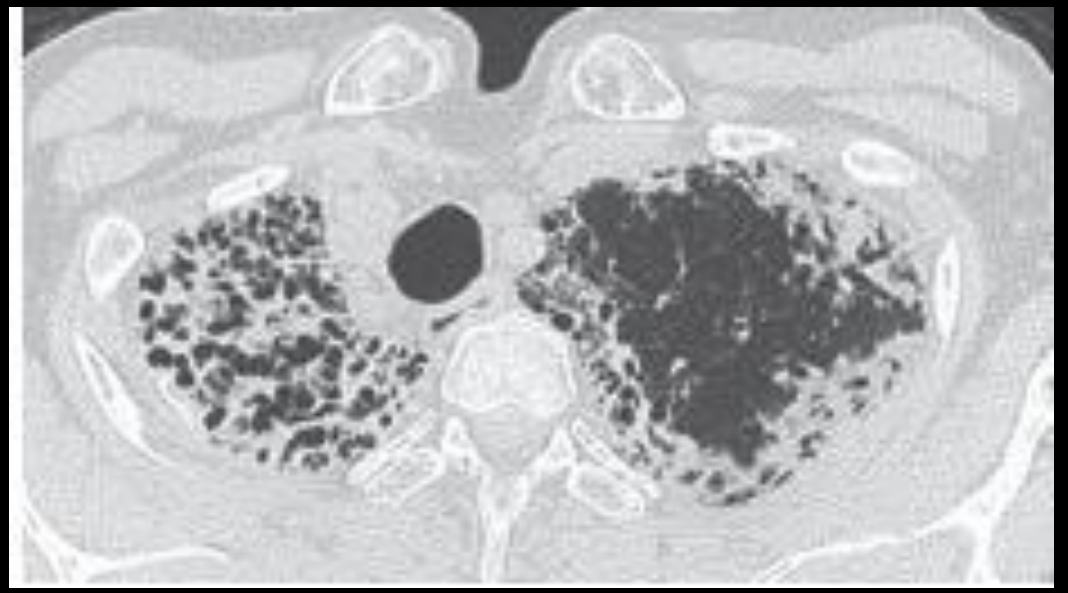




Pleuroparenchymal Fibroelastosis



- upper lobe-predominant pleural thickening and subpleural fibrosis and histologically by visceral pleural fibrosis and subpleural fibroelastosis



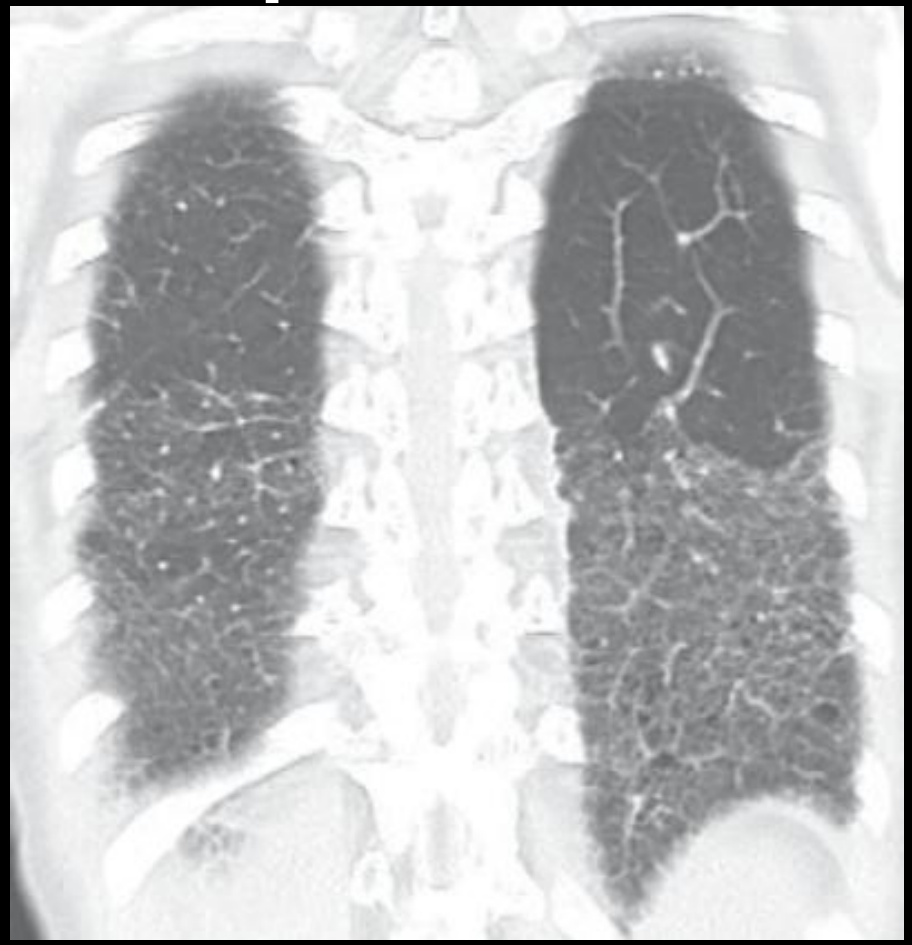
CTD-ILD or autoimmune related ILD

Relative Frequencies of Computed Tomography Imaging Patterns Among CTDs

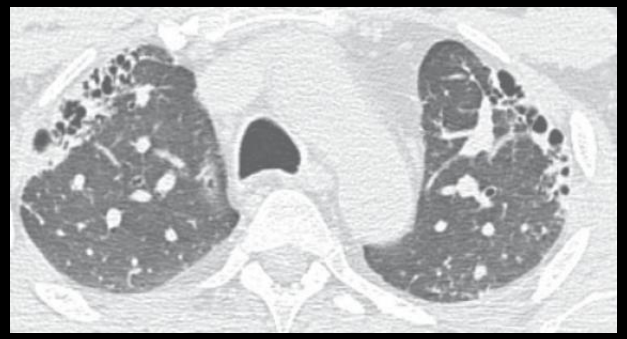
CTD	UIP	NSIP	OP	LIP	DAD	Hemorrhage	Airway
RA	+++	++	++	+	+	–	+++
SSc	+	+++	+	–	+	–	–
PM/DM	+	+++	+++	–	++	–	–
SjS	+	++	–	++	+	–	+
SLE	+	++	+	++	++	+++	–
MCTD	+	++	+	–	–	–	–

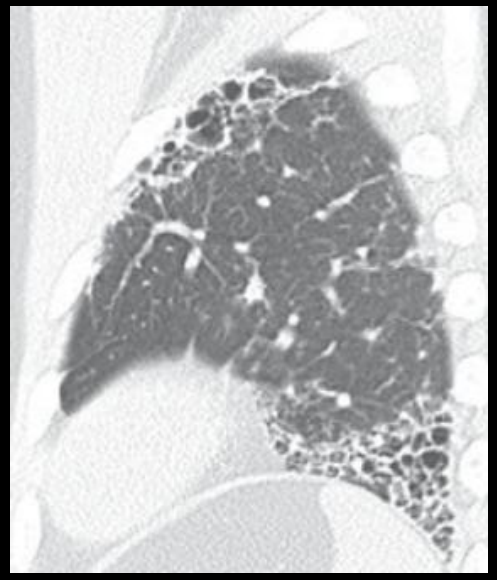
Mayo Clin Proc. 2019;94(2):309-325

UIP pattern in CTD-ILD

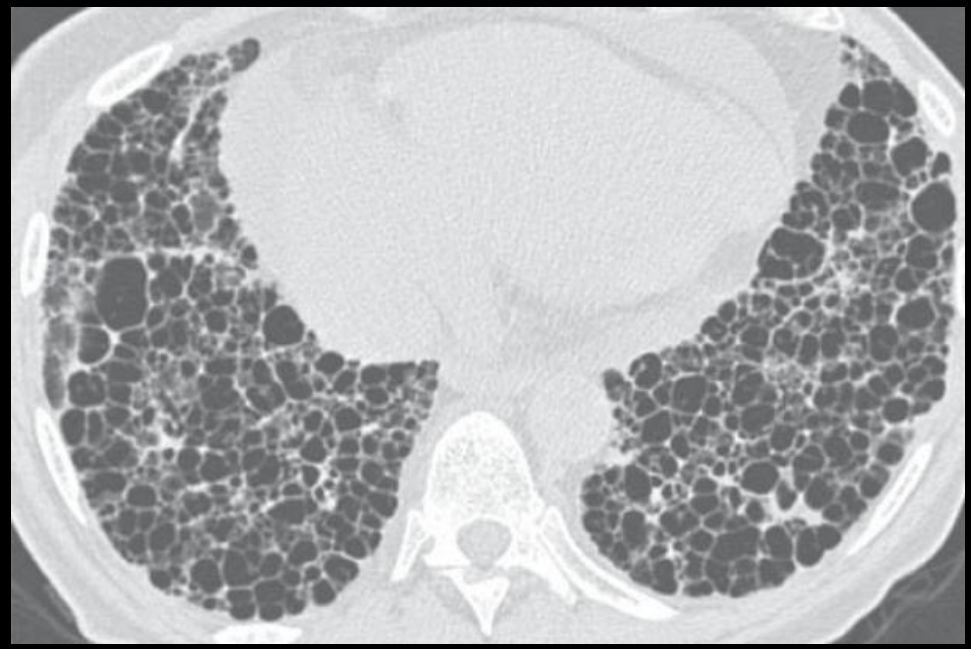


Straight edge sign





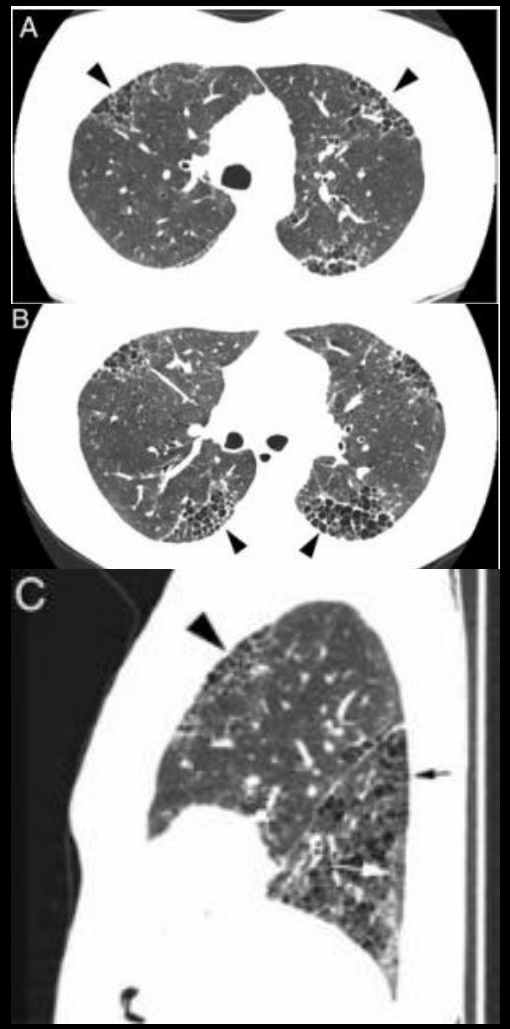
Anterior upper lobe sign

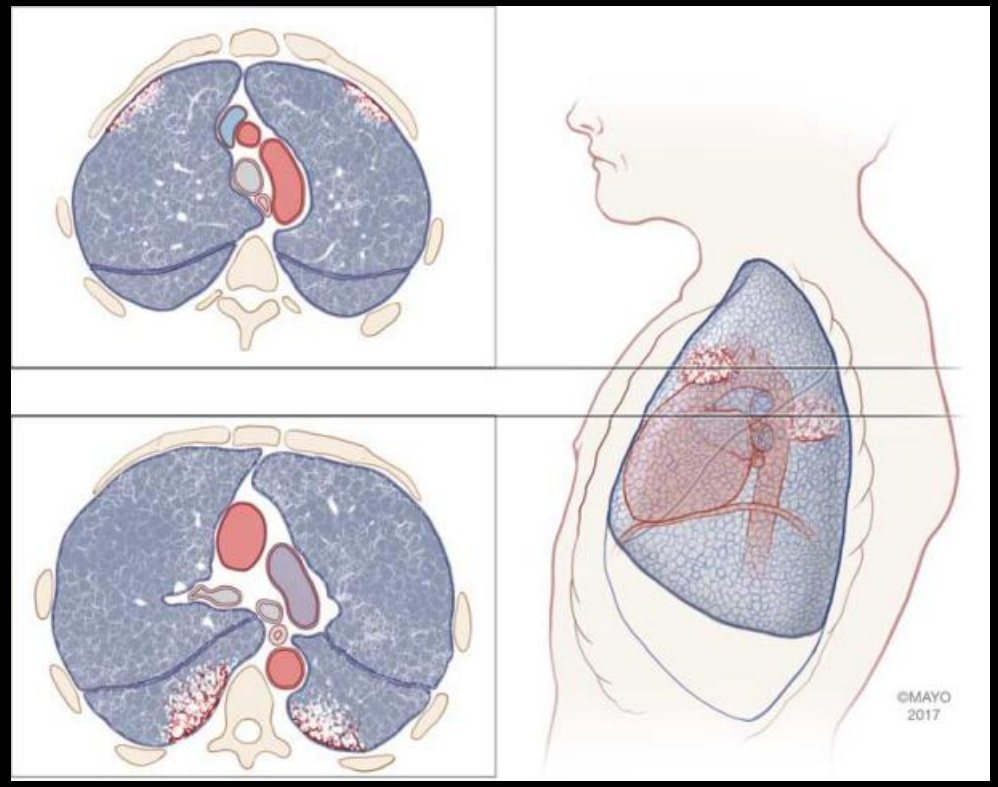


Exuberant honeycomb sign

Extensive honeycomb-like cyst formation within the lungs comprising greater than **70%** of the fibrotic portions of lung

The Four Corners Sign





A Specific Imaging Feature in Differentiating SSc-ILD from IPF

J Thorac Imaging. 2018 May;33(3):197-203.

Hypersensitivity pneumonitis (bronchiolocentric interstitial pneumonia, BIP pattern)

Hypersensitivity Pneumonitis (HP) – HRCT patterns

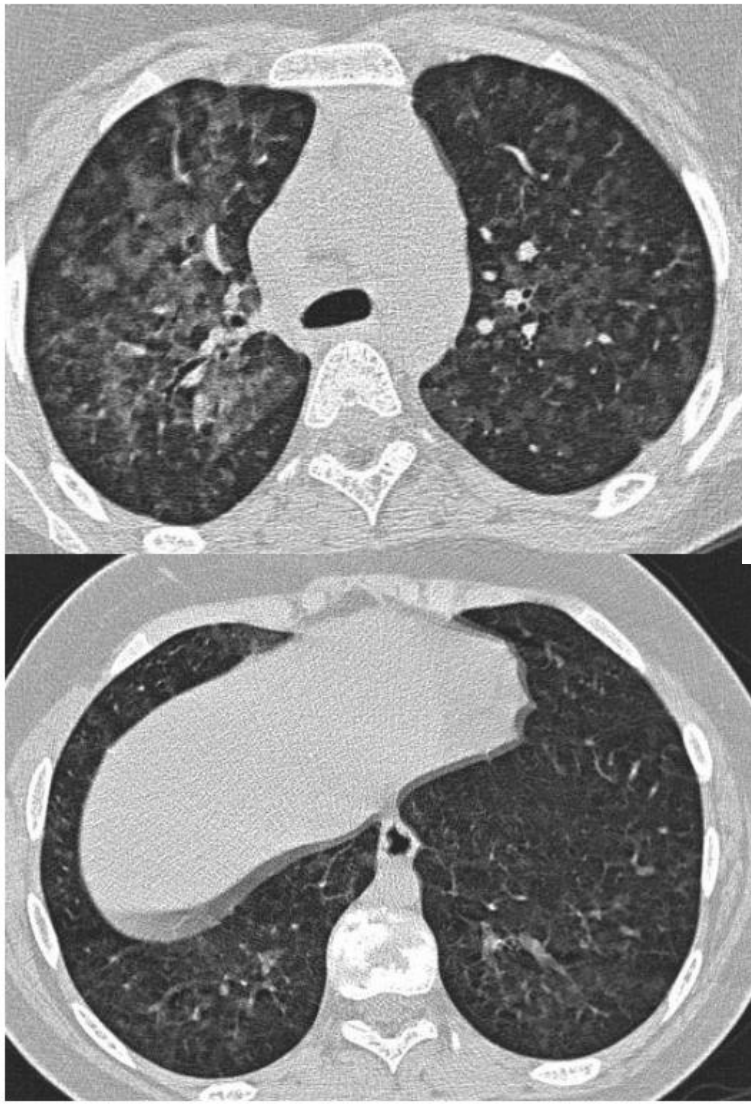
Non-fibrotic hypersensitivity pneumonitis Lung parenchyma abnormality +small airway disease

- **Typical**: at least one abnormality of the parenchyma and small airways
  - parenchyma: ground-glass opacity (GGO), mosaic attenuation
  - small airways: ill-defined centrilobular nodules, air trapping
  - diffuse distribution +/- basal sparing
- **Compatible**: non-specific changes reported in hypersensitivity pneumonitis
  - parenchyma: uniform and subtle GGOs, airspace consolidation, pulmonary cysts
  - diffuse distribution (although variant distributions of basal predominant or peribronchovascular)

Fibrotic hypersensitivity pneumonitis Lung parenchyma abnormality +small airway disease+ lung fibrosis

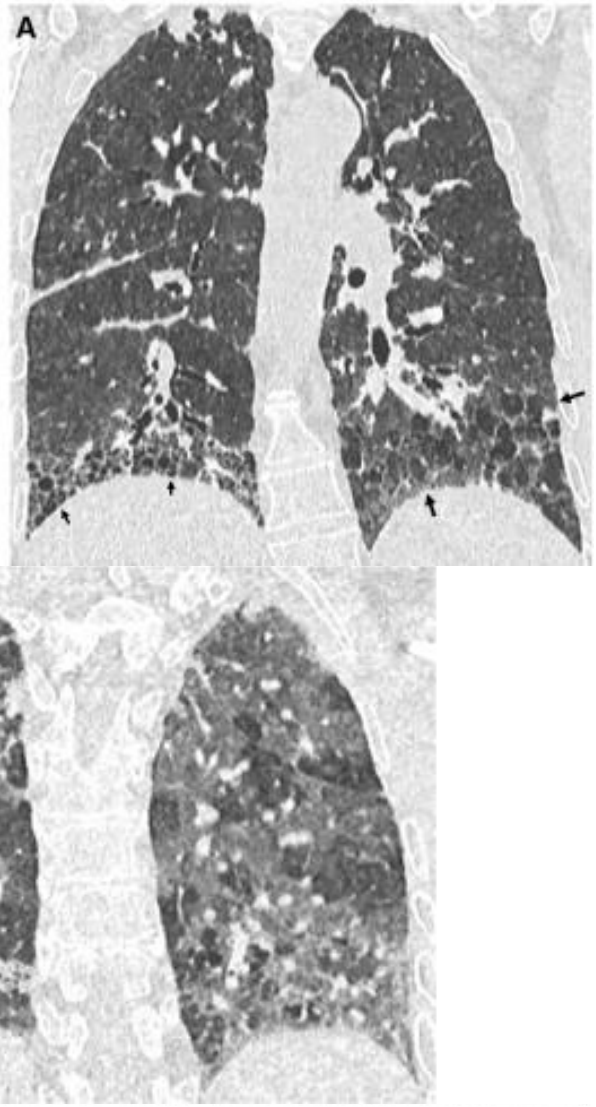
- **Three-density pattern - high specificity for fibrotic HP, Bilateral mosaic attenuation affecting 3 or more lobes**
- **Typical**
  - coarse reticulations with lung distortion +/- non-predominate traction bronchiectasis and honeycombing
  - distribution may be
    - Random, mid-zone predominant, relative lower zone sparing
  - small airways disease
    - ill-defined centrilobular nodules and/or GGOs
    - mosaic attenuation, three-density pattern (head cheese sign) and/or air trapping
- **Compatible**
- **Indeterminate**

Typical non-fibrotic hypersensitivity pneumonitis



Ground-glass opacity (GGO)
Mosaic attenuation

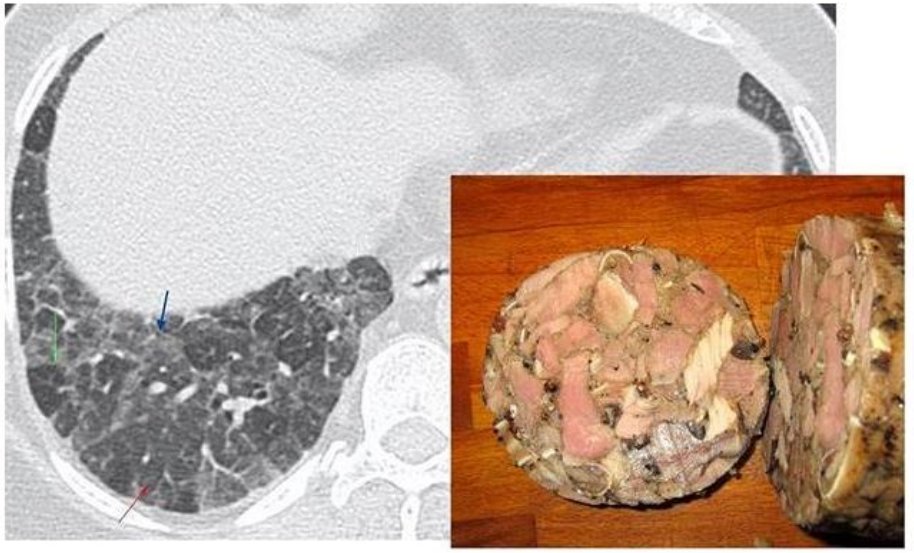
Typical fibrotic hypersensitivity pneumonitis



coarse reticulations with lung distortion
mid-zone predominant, relative lower zone sparing
mosaic attenuation

Head-Cheese sign

three-density pattern

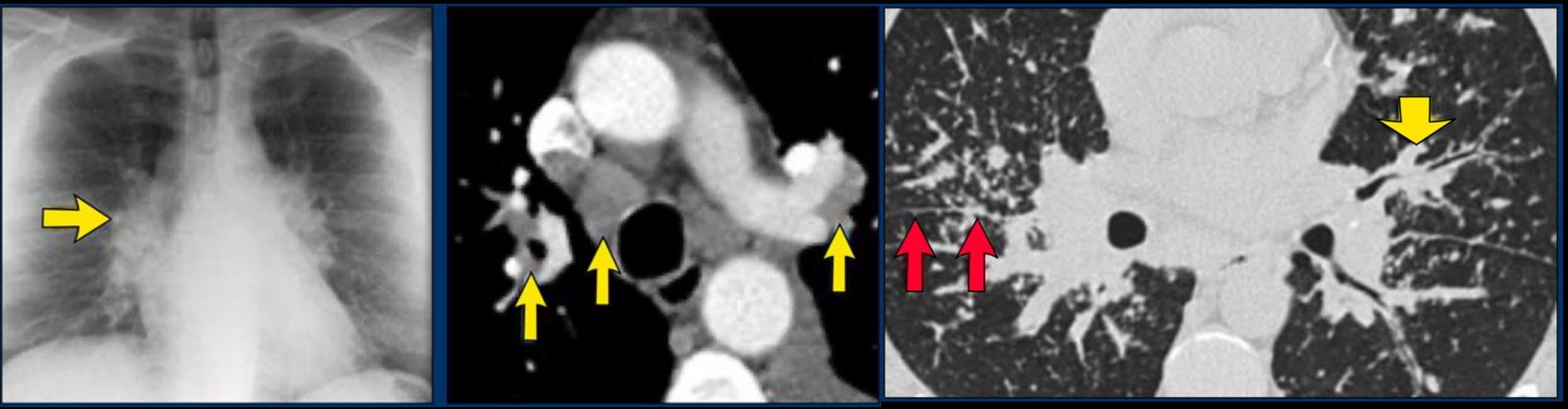


Disease	Key Imaging Differentiators
UIP	Prominent honeycombing, **subpleural fibrosis without sparing**, **heterogeneous distribution**, predominantly in **basal and posterior lungs**
HP	**Centrilobular nodules**, **mosaic attenuation**, **air trapping on expiratory imaging**, typically in the **mid to upper lungs**

Am J Respir Crit Care Med Vol 202, Iss 3, pp e36–e69, Aug 1, 2020

Granulomatosis

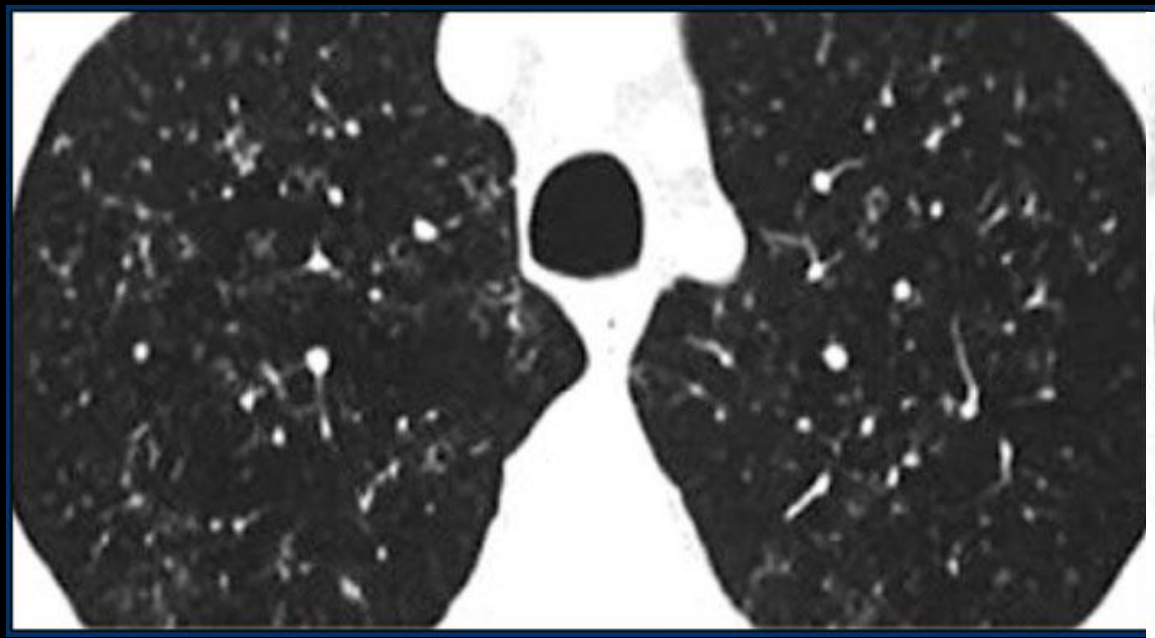
Sarcoidosis

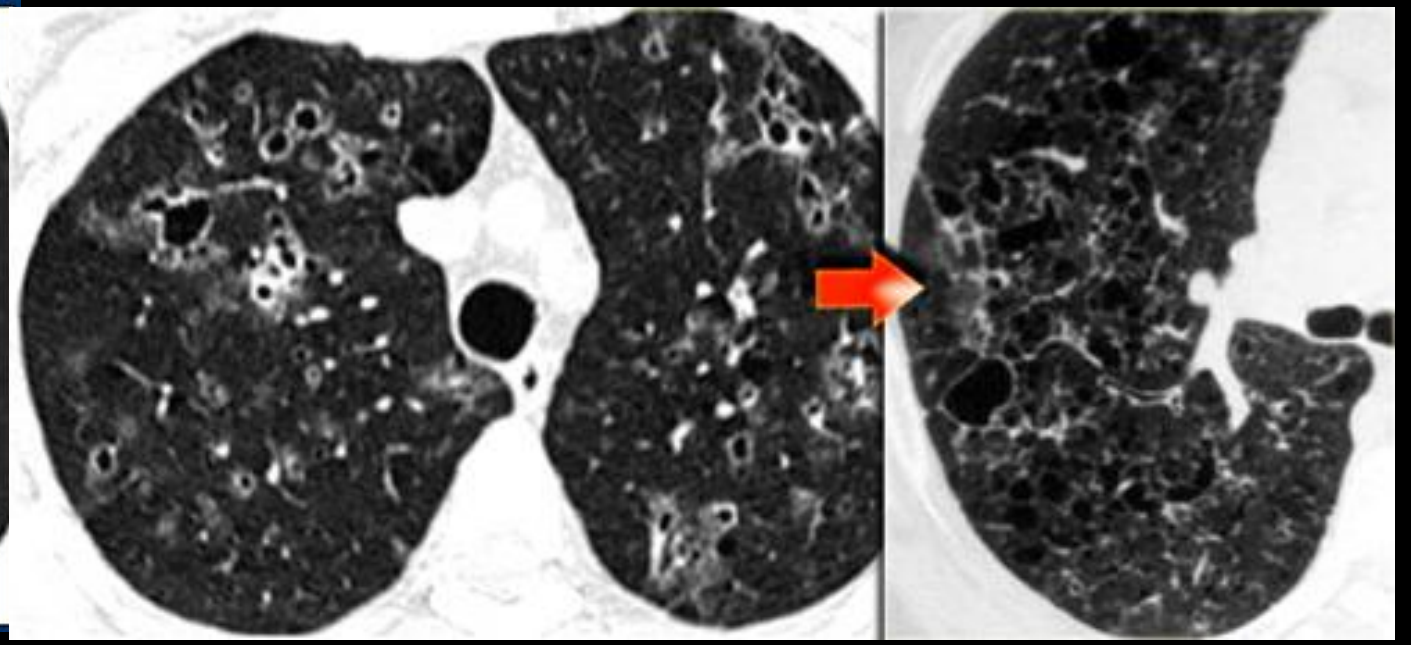


Common findings:

- Small nodules in a perilymphatic distribution (i.e. along subpleural surface and fissures, along interlobular septa and the peribronchovascular bundle).
- Upper and middle zone predominance.
- Lymphadenopathy in left hilus, right hilus and paratracheal (1-2-3 sign). Often with calcifications

Langerhans cell histiocytosis





HRCT findings in Langerhans cell histiocytosis:

•Early stage:

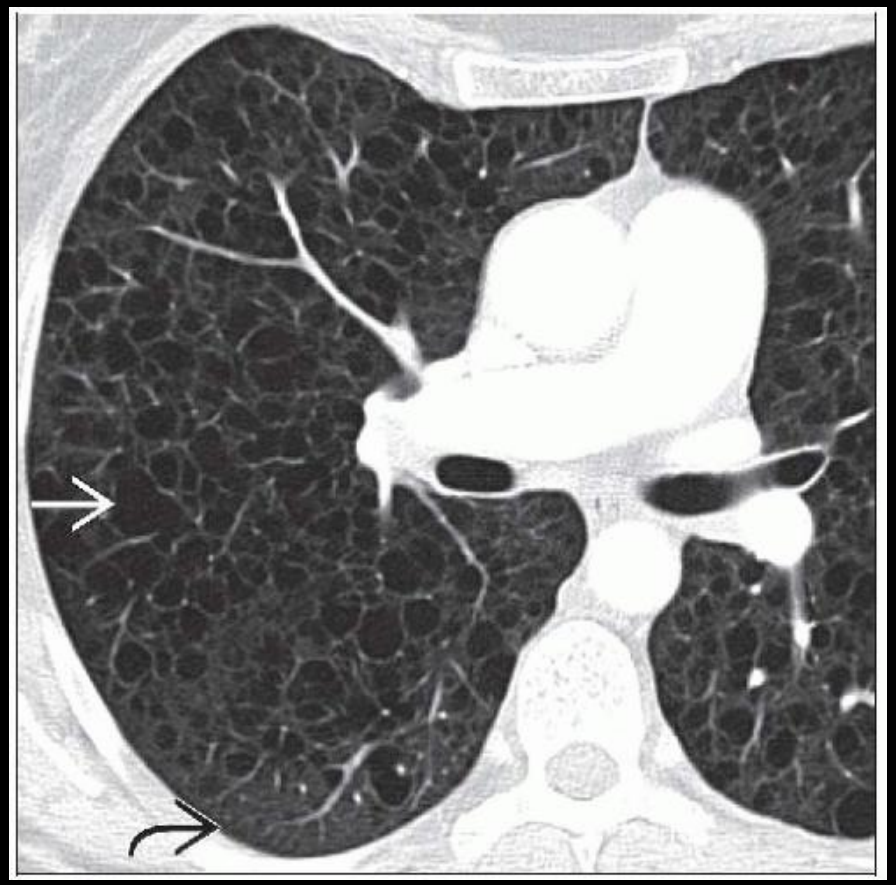
- Small irregular or stellate nodules in centrilobular location.

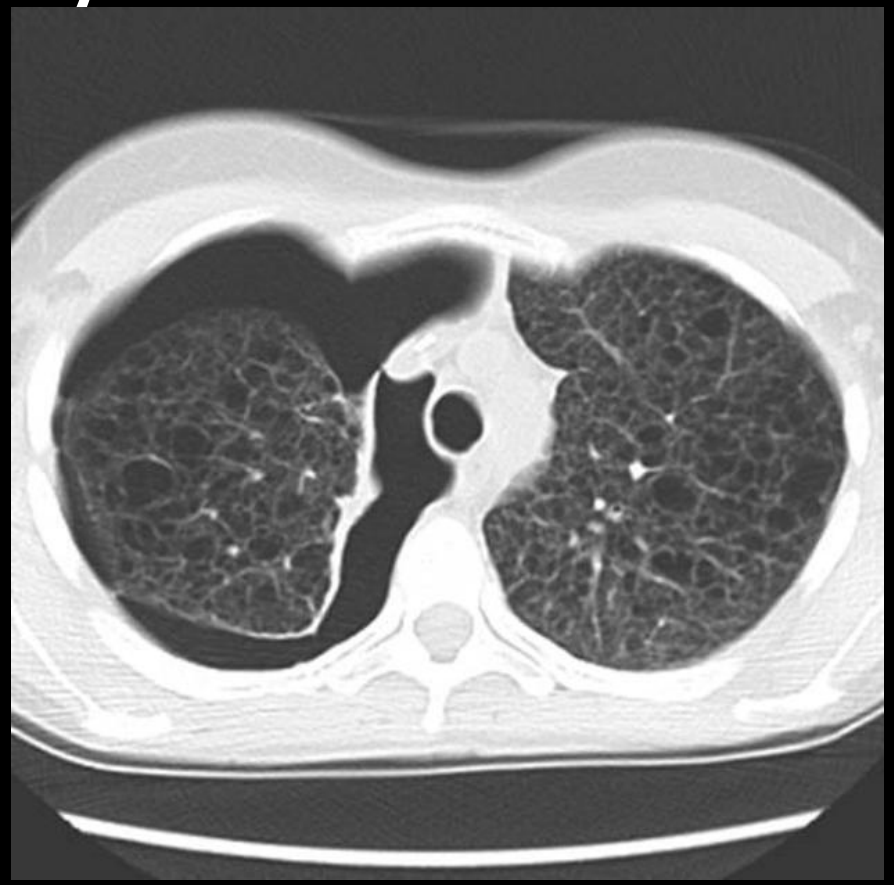
•Late stage (more commonly seen)

- Cystic airspaces Cysts have bizarre shapes, they may coalesce and than become larger.
- costophrenic and cardiophrenic angles
- Upper and mid lobe predominance.
- Recurrent pneumothorax.

Other ILD

Lymphangiomyomatosis





Key findings in Lymphangiomyomatosis:

- Numerous thin-walled cysts, surrounded by normal parenchyma.
- Cysts range from 2mm to 5cm in diameter, are round in shape and more or less uniform.
- Cysts are distributed diffusely throughout the lungs and upper and lower lobes are involved to a similar degree.
- Wall thickness of the cysts ranges from barely perceptible to 4 mm.
- Mediastinal or hilar adenopathy and pleural effusions (40%).
- Recurrent pneumothorax (40%).

Thank you

Reference and update data

Brief summary of CT patterns in ILDs

ILDs	Distribution	Key CT Findings	Common Zones	Other Clues
UIP	Peripheral, basal	Reticulation, honeycombing, traction bronchiectasis	Lower lobes	No GGO dominance; minimal nodules
NSIP	Diffuse or subpleural, basal	GGO, fine reticulation, volume loss	Lower lobes	Minimal or no honeycombing
COP	Patchy, peripheral or peribronchial	Consolidation, GGO	Random	Migratory pattern possible
RB-ILD	Upper lobes, centrilobular	Centrilobular nodules, GGO, bronchial wall thickening	Upper lobes	Strongly smoking-related
Sarcoidosis	Perilymphatic	Nodules along bronchovascular bundles, fissures, subpleural regions	Upper lobes	Hilar/mediastinal lymphadenopathy, galaxy sign
HP	Mid-lung predominance	Centrilobular nodules, GGO, mosaic attenuation, air trapping	Mid to upper zones	History of antigen exposure, "headcheese" sign
LAM	Diffuse	Multiple round, thin-walled cysts of uniform size	Diffuse	Women of childbearing age; no nodules
PLCH	Upper/mid-lung zones	Irregular cysts + nodules, bizarre-shaped cysts	Upper lobes	Strongly smoking-related, sparing of costophrenic angles

CT Finding	Differential Diagnosis	CT Finding	Differential Diagnosis
Interlobular (septal) lines	Interstitial edema, Lymphangitic carcinomatosis, Sarcoidosis, UIP	Irregular lung interfaces	Neurofibromatosis, Pneumatocele (emphysema), Pulmonary edema, UIP, Sarcoidosis
Intralobular lines	UIP, Alveolar proteinosis, Hypersensitivity pneumonitis (chronic)	Micronodules, random distribution	Miliary tuberculosis or histoplasmosis, Hematogenous metastases, Silicosis/CWP
'Thickened' fissures	Pulmonary edema, Sarcoidosis, Lymphangitic carcinomatosis	Micronodules, perilymphatic distribution	Sarcoidosis, Lymphangitic carcinomatosis, Silicosis/CWP
Peribronchovascular interstitial thickening	Pulmonary edema (smooth or nodular), Sarcoidosis, Lymphangitic carcinomatosis (smooth or nodular)	Ground glass opacities	UIP, Desquamative interstitial pneumonia, AIP, Hypersensitivity pneumonitis
Centrilobular nodules	Hypersensitivity pneumonitis, BOOP/COP, RB-ILD	Architectural distortion, Traction bronchiectasis	UIP, Sarcoidosis
Subpleural lines	Asbestosis, IPF	Conglomerate mass	Silicosis/CWP, Sarcoidosis, Silicosis
Parenchymal bands	UIP, Sarcoidosis	Consolidation	CWP, Radiation fibrosis, BOOP/COP, Sarcoidosis
Honeycombing	UIP, Hypersensitivity pneumonitis (chronic), Sarcoidosis		
Thin-walled cysts	EG, Lymphangioleiomyomatosis, Tuberous sclerosis		AIP, UIP

Finding	Differential diagnosis
Upper zone distribution	TB, Chronic fungal infection, Histoplasmosis, Coccidioidomycosis, Sarcoidosis, Eosinophilic granuloma, Silicosis, Ankylosing spondylitis, Hypersensitivity pneumonitis, Radiation fibrosis from treatment of head and neck malignancy
Lower zone distribution	IPF, Asbestosis, Rheumatoid lung, Scleroderma, Neurofibromatosis, Dermatomyositis, polymyositis, Chronic aspiration
Normal or increased lung volumes	Sarcoidosis, Eosinophilic granuloma, LAM, Tuberous sclerosis, Interstitial disease superimposed on emphysema
Honeycombing	IPF, Sarcoidosis, Eosinophilic granuloma, Rheumatoid lung, Scleroderma, Pneumoconiosis, Hypersensitivity pneumonitis, Chronic aspiration, Radiation fibrosis
Miliary nodules	Tuberculosis, Fungi (Histoplasmosis, Coccidioidomycosis, Cryptococcosis), Silicosis, Metastases, Thyroid carcinoma, Renal cell carcinoma Bronchogenic carcinoma Melanoma Choriocarcinoma, Sarcoidosis, Eosinophilic granuloma
Hilar/mediastinal lymph node enlargement	Sarcoidosis, Lymphangitic carcinomatosis, Lymphoma, Hematogenous metastases, Tuberculosis, Fungal infection, Silicosis
Pleural disease	Asbestosis (plaques), Lymphangitic carcinomatosis (effusion), Rheumatoid lung disease (effusion/thickening), Lymphangioleiomyomatosis (chylous effusion)
Abnormalities of soft tissues and bony thorax	Skin nodules (Neurofibromatosis), Subcutaneous calcifications Dermatomyositis Scleroderma, Erosion of distal clavicles, Rheumatoid lung Scleroderma, Rib lesions Ribbon ribs/erosion of inferior rib margins, Neurofibromatosis, Erosion of superior margins, Rheumatoid lung, Scleroderma, Kyphoscoliosis, Neurofibromatosis, Lytic bone lesions, Metastases, Eosinophilic granuloma

Interstitial Lung Disease Classification — 2025 ERS/ATS

Adapted from the 2025 ERS /ATS International Multidisciplinary Guideline

Interstitial patterns

- Usual Interstitial Pneumonia
- Nonspecific Interstitial Pneumonia (NSIP) Fibrotic and Non fibrotic
- Bronchiolocentric interstitial Pneumonia (BIP)
- Idiopathic Diffuse Alveolar Damage (DAD) – Replaces AIP
- Pleureparenchymal Fibroelastosis (PPFE)
- Lymphoid Interstitial Pneumonia (LIP)

Alveolar filling patterns

- **Organising Pneumonia (OP)** incl. Cryptogenic OP (COP)
- **Respiratory Bronchiolitis–Interstitial Lung Disease (RB-ILD)**
- **Alveolar Macrophage Pneumonia (AMP)** Replaces DIP
- **Rare alveolar filling disorders:**
  - **Acute Eosinophilic Pneumonia (AEP)**
  - **Chronic Eosinophilic Pneumonia (CEP)**
  - **Pulmonary Alveolar Proteinosis (PAP)**
  - **Lipoid Pneumonia (LP)**

Mixed patterns

- PPFE + UIP
- NSIP + OP
- CPFE (Combined Pullnonary Fibrosis and Emphysema)
- Granulomatous Organising Pneumonia
- GL–ILD (Granulornatous-Lymphocytic (Inerestitial Lung Disease)
- HP + PAP

Unclassifiable ILD

- **>50% confidence in diagnosis not reached despite MDT evaluation**

UPDATES IN MEDICINE

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Empowering Patient Care with Knowledge and Evidence