The Head Cheese Pattern Sign

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RAD 3030 Diagnostic Radiology

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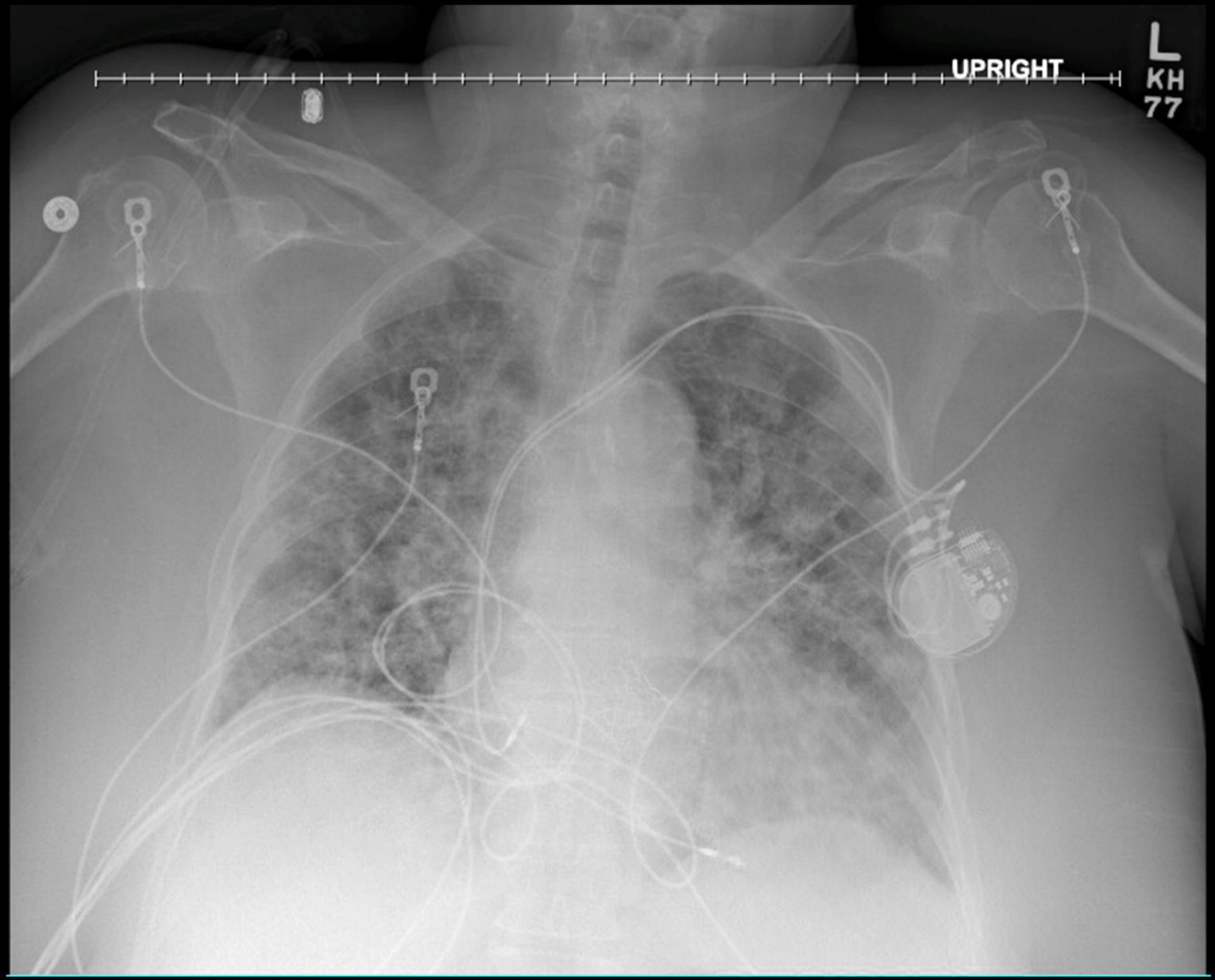
Clinical History

- 78 yo woman with a PMHx of valvular heart disease, HFpEF, and pulmonary fibrosis presenting with worsening, progressive shortness of breath requiring increased oxygen at home.
  - Aortic stenosis s/p TAVR complicated by CHB requiring AICD placement (2015)
  - Moderate to severe mitral stenosis (TTE from 10/2019)
  - CT chest suggestive of interstitial lung disease (10/2019)
  - Wheelchair bound, cannot walk far distances due to severe DOE and fatigue
  - SaO2 dropping to 80% with exertion
- Admitted for workup to distinguish cardiac vs pulmonary component of worsening dyspnea

Relevant Imaging

- CXR and CT Chest w/o contrast (10/2019) - comparison
- CXR and CT Chest w/o contrast (2/2020)
- CT Heart Eval w/ contrast for mitral valve measurements (2020)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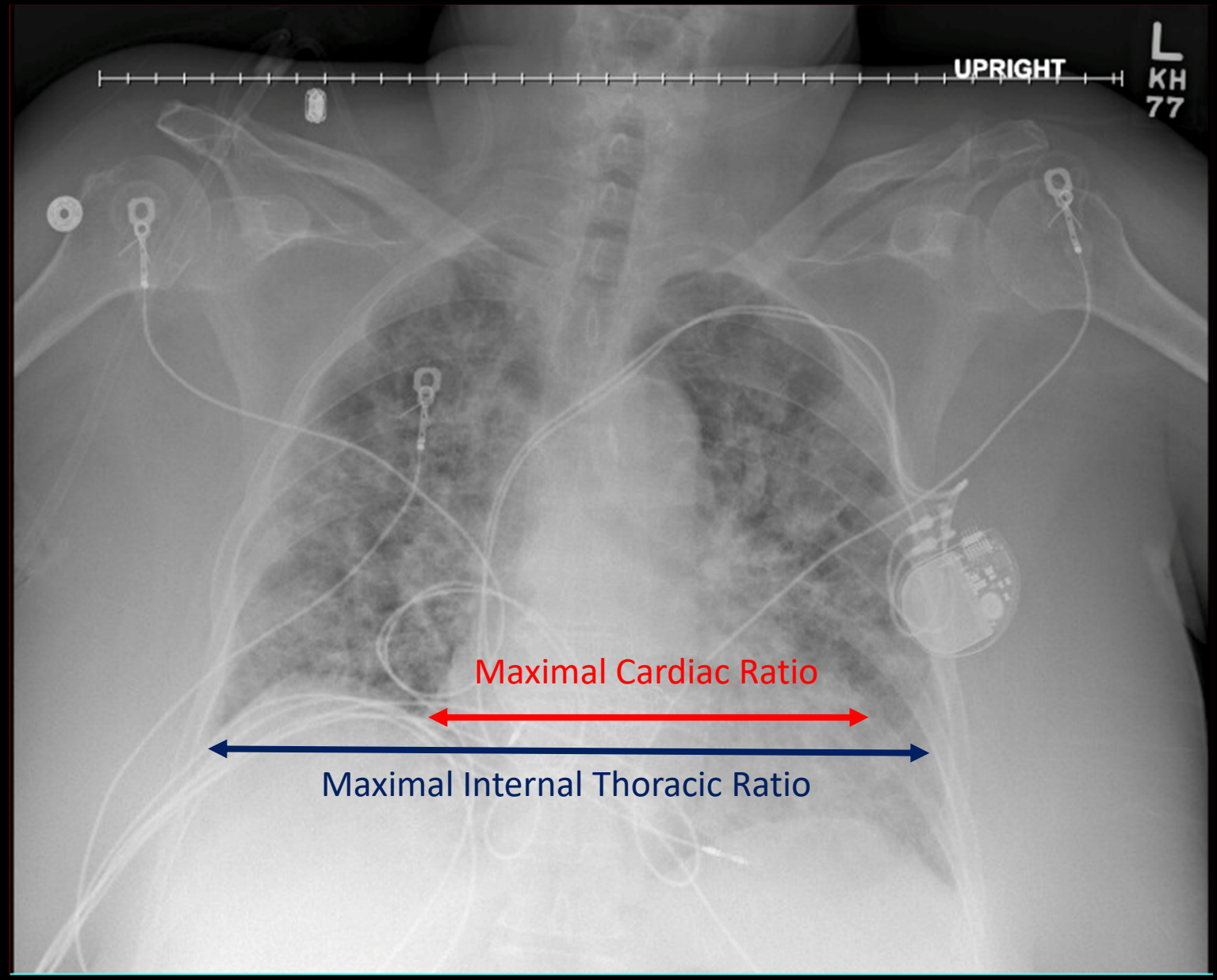
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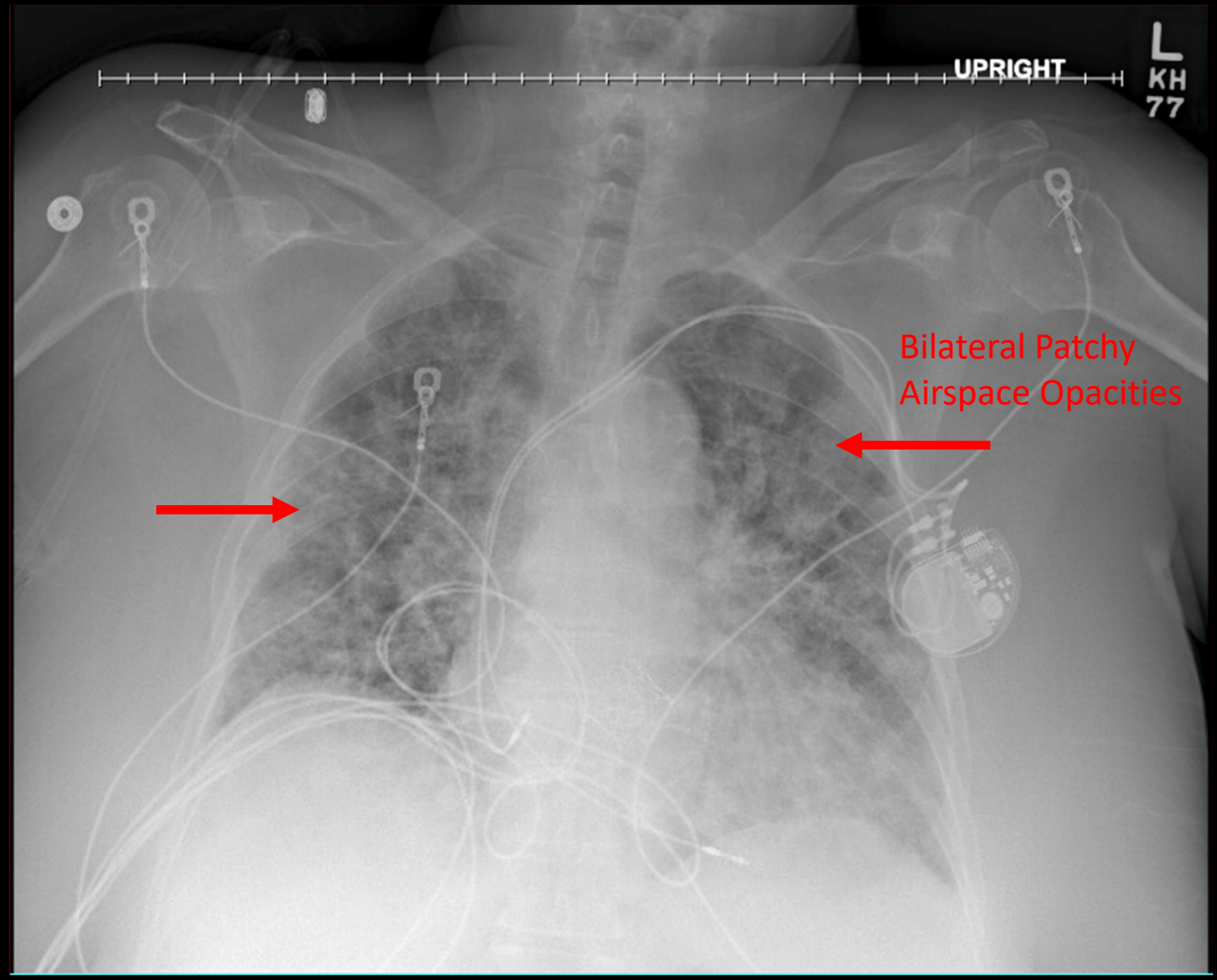
Maximal Cardiac Ratio
Maximal Internal Thoracic Ratio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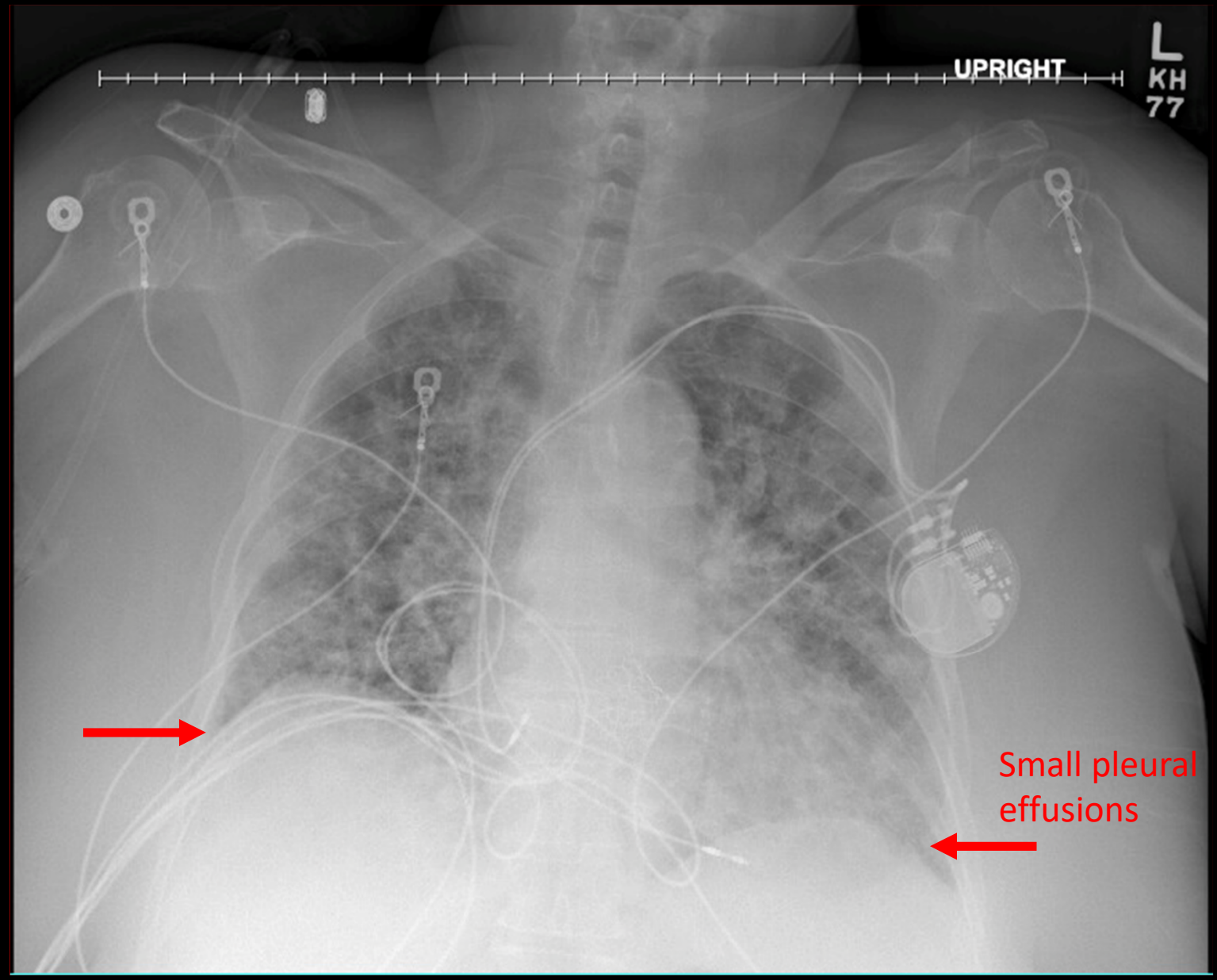
Bilateral Patchy
Airspace Opacities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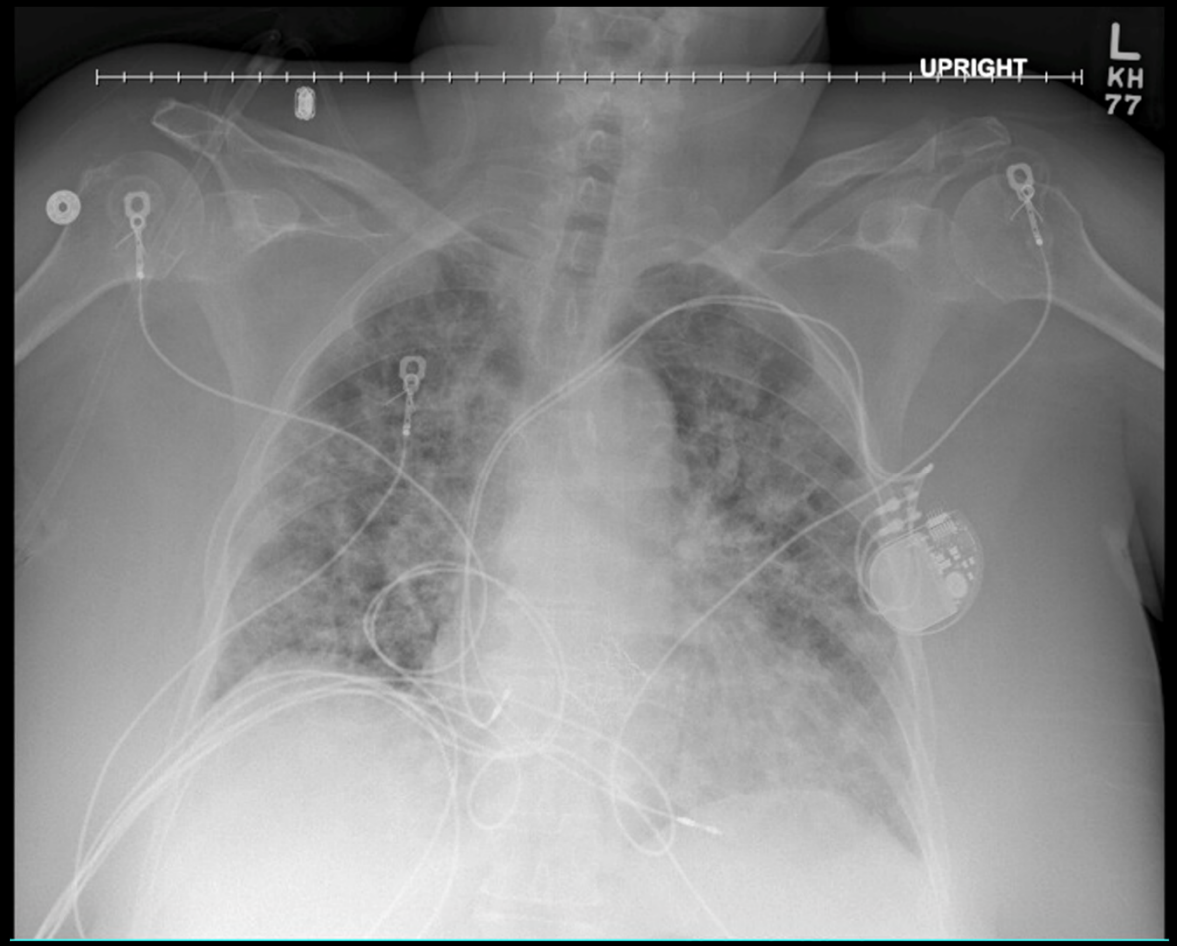
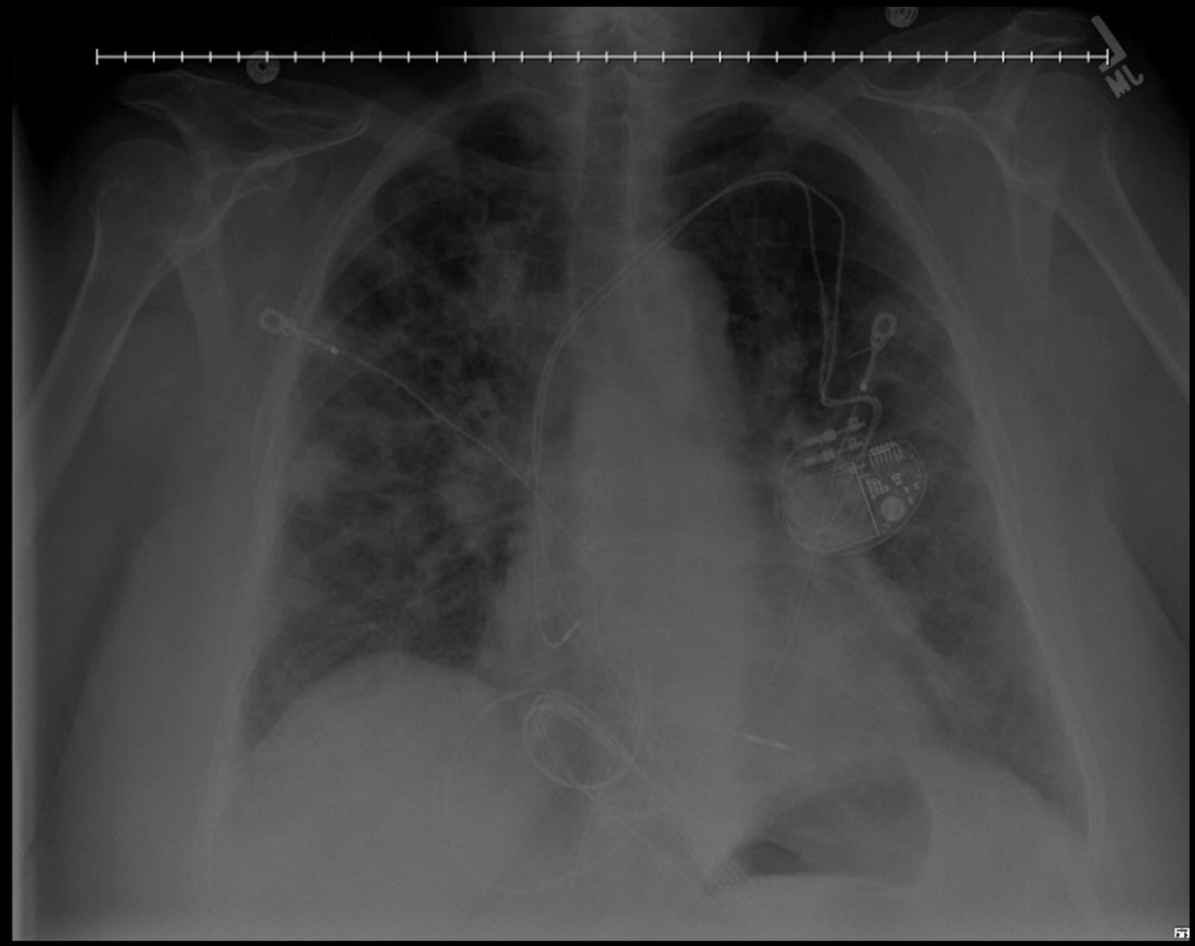
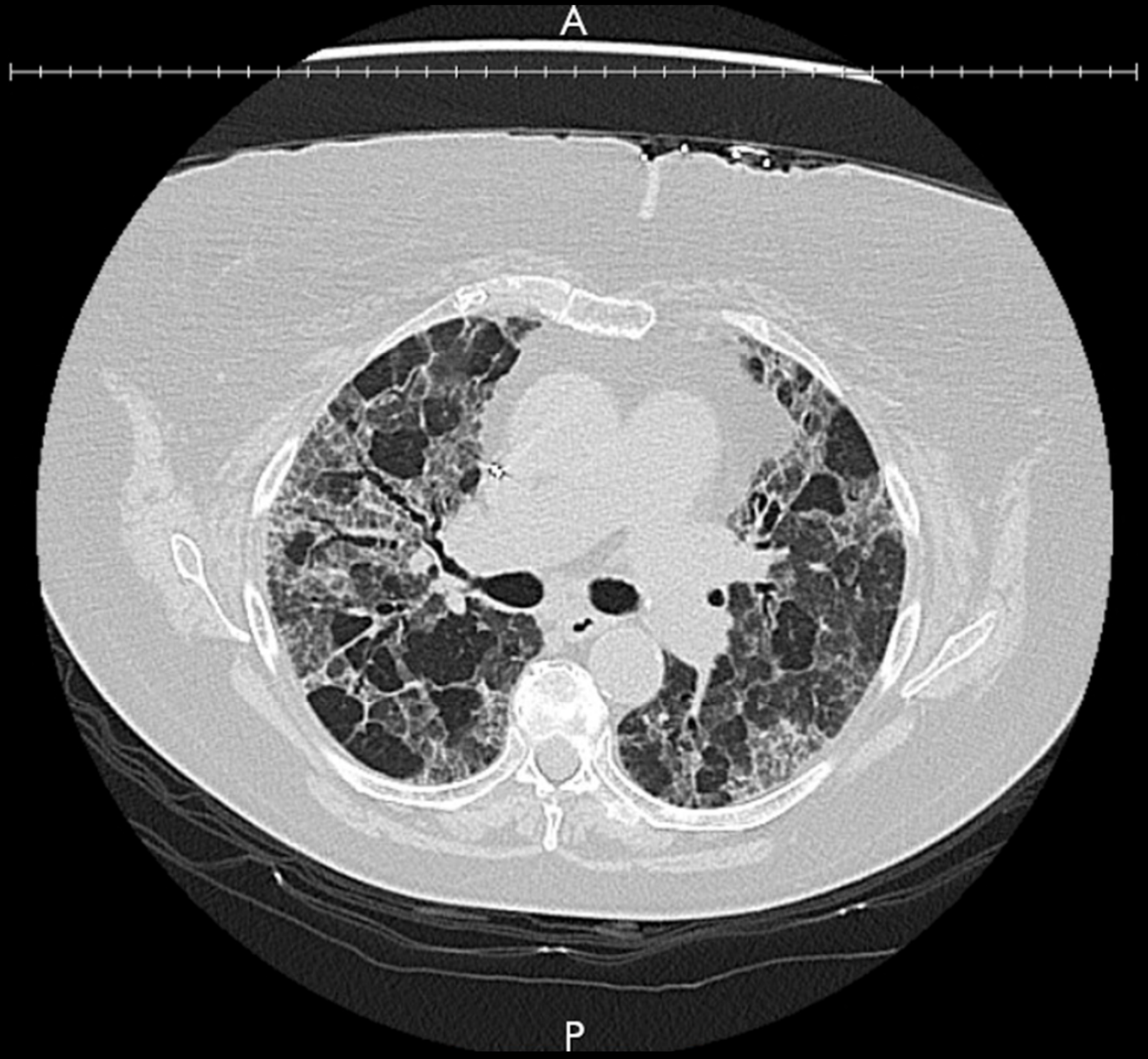
Small pleural effusions

02/2020



10/2019

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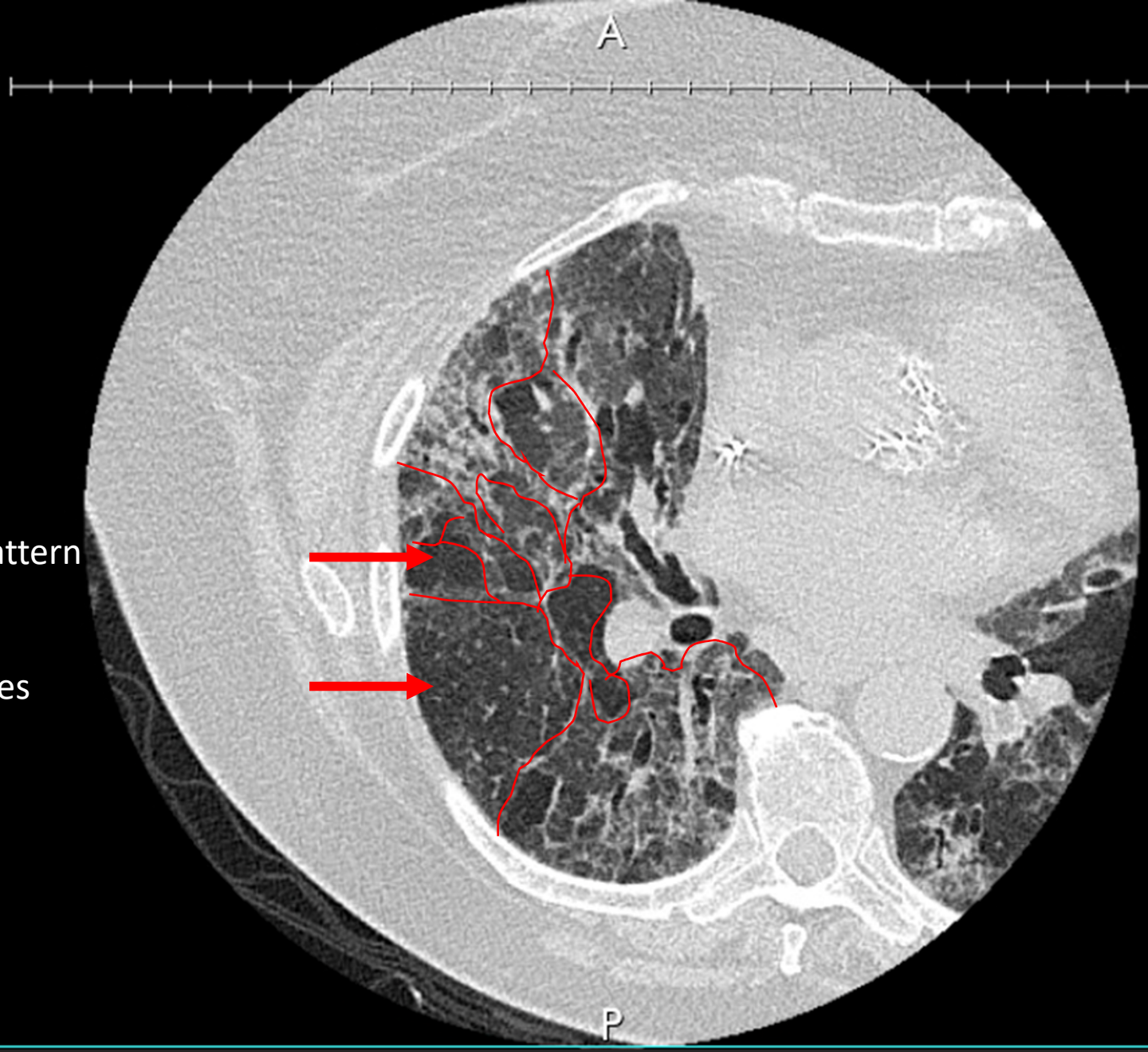
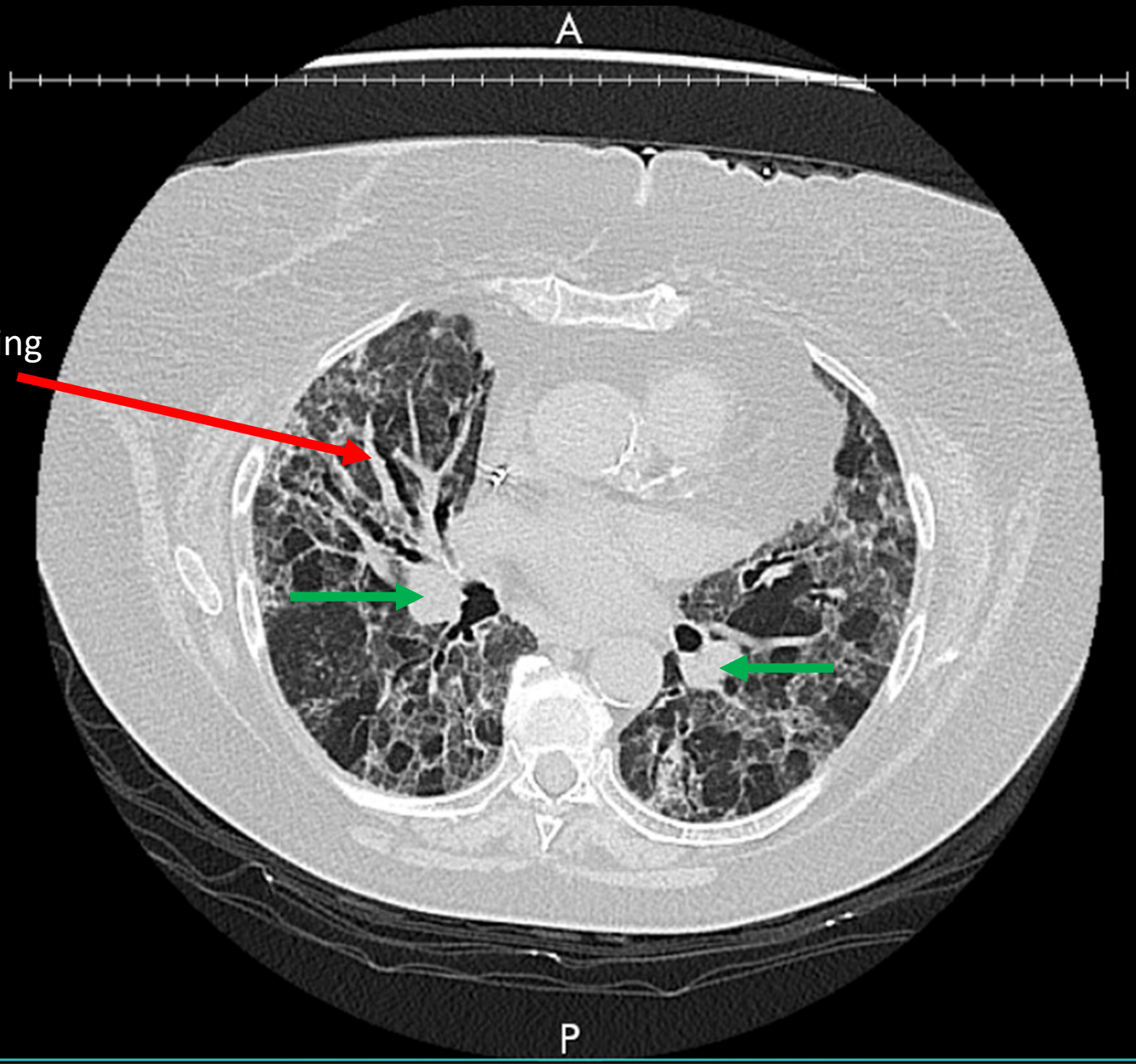
Mosaic Attenuation Pattern

Ground Glass Opacities

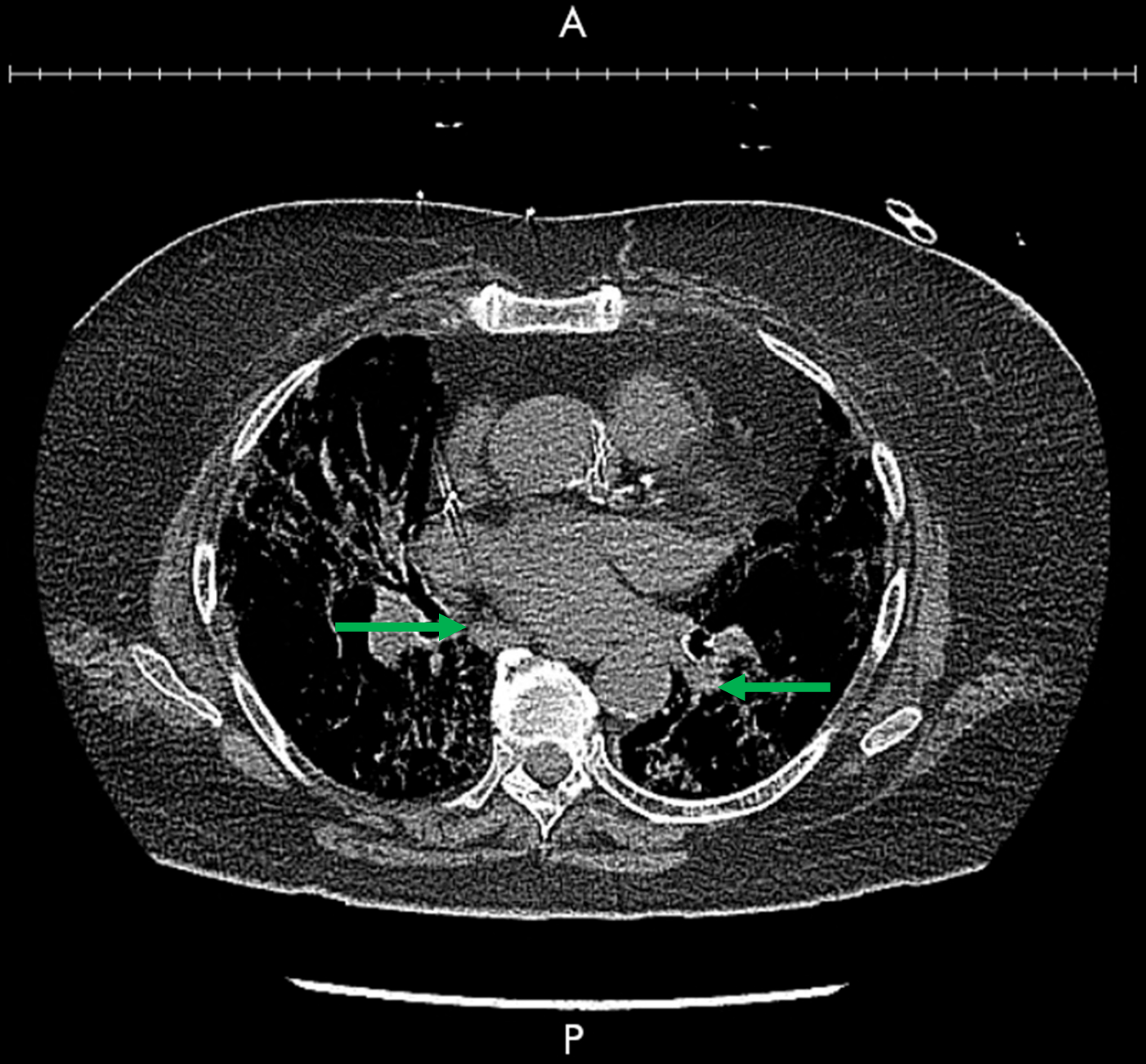


Air Trapping

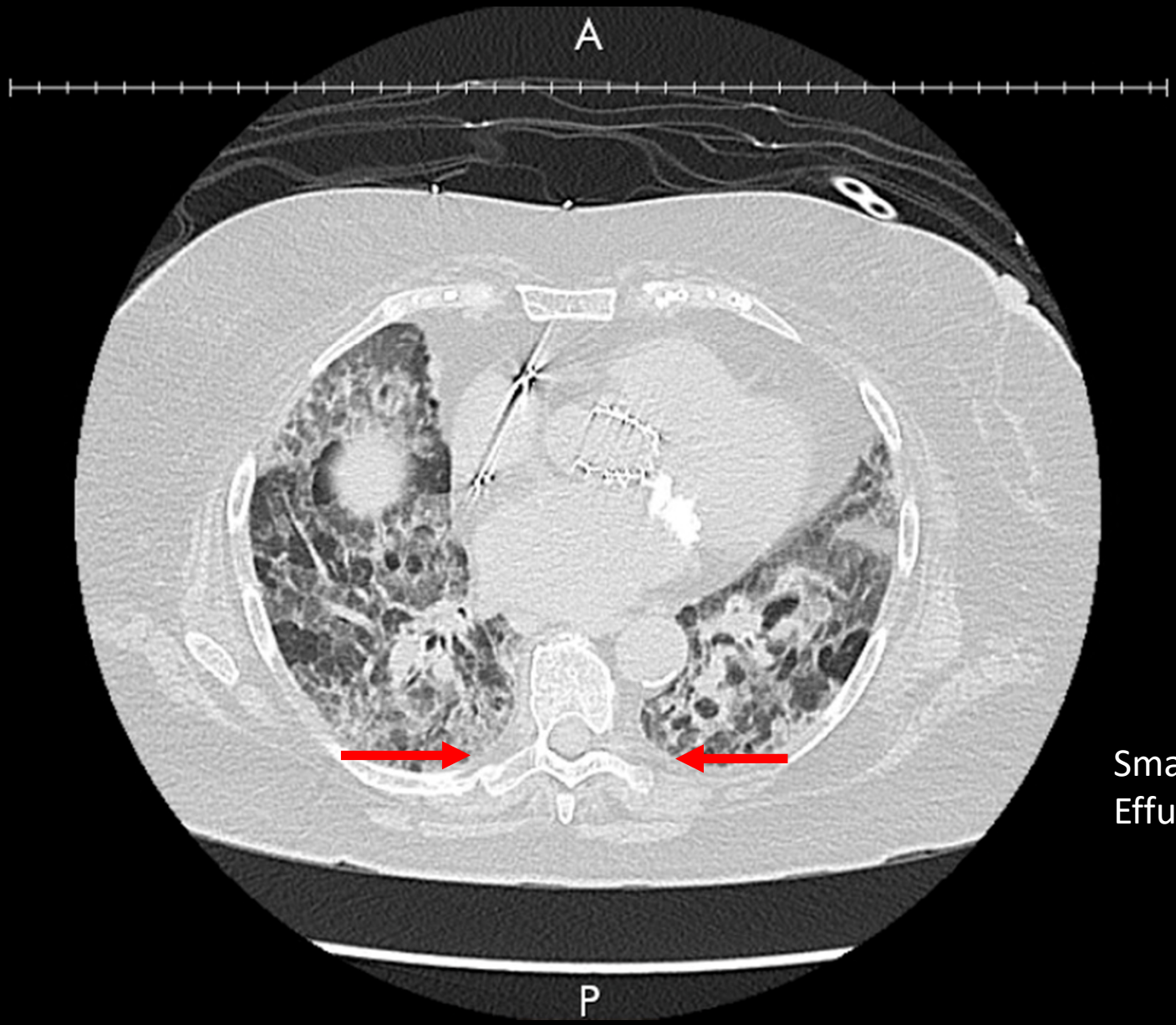


Septal Thickening

Enlarged Mediastinal Lymph Nodes

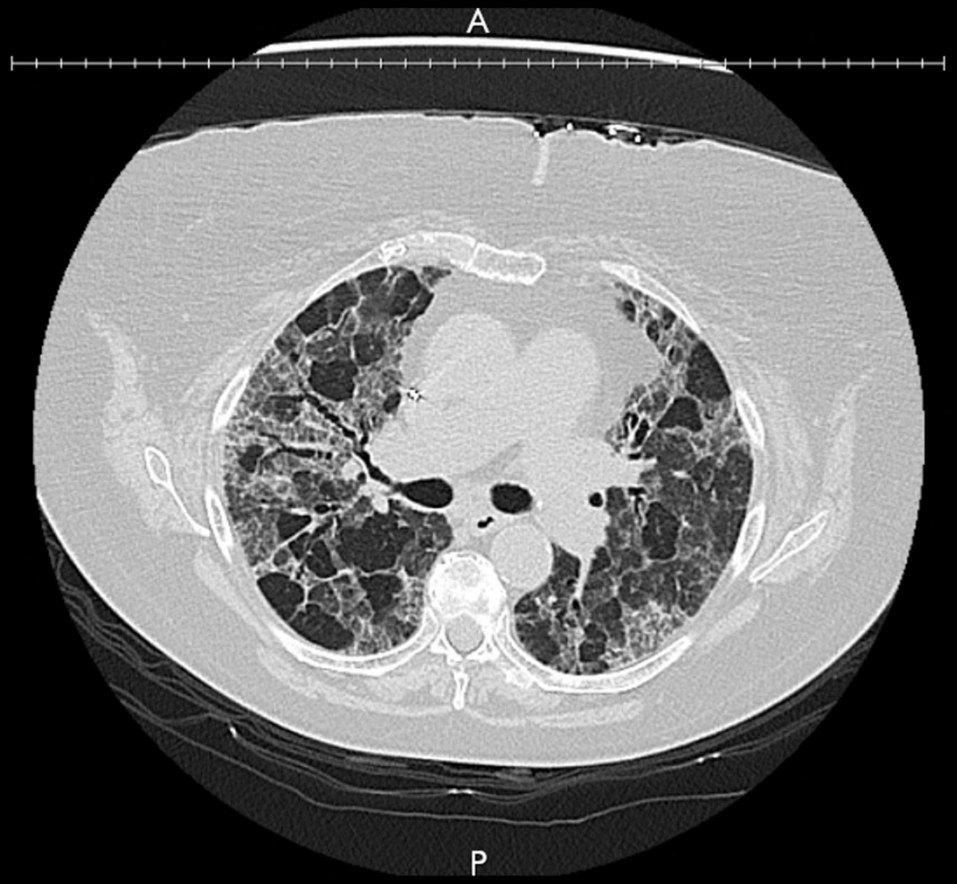


Enlarged Mediastinal Lymph Nodes

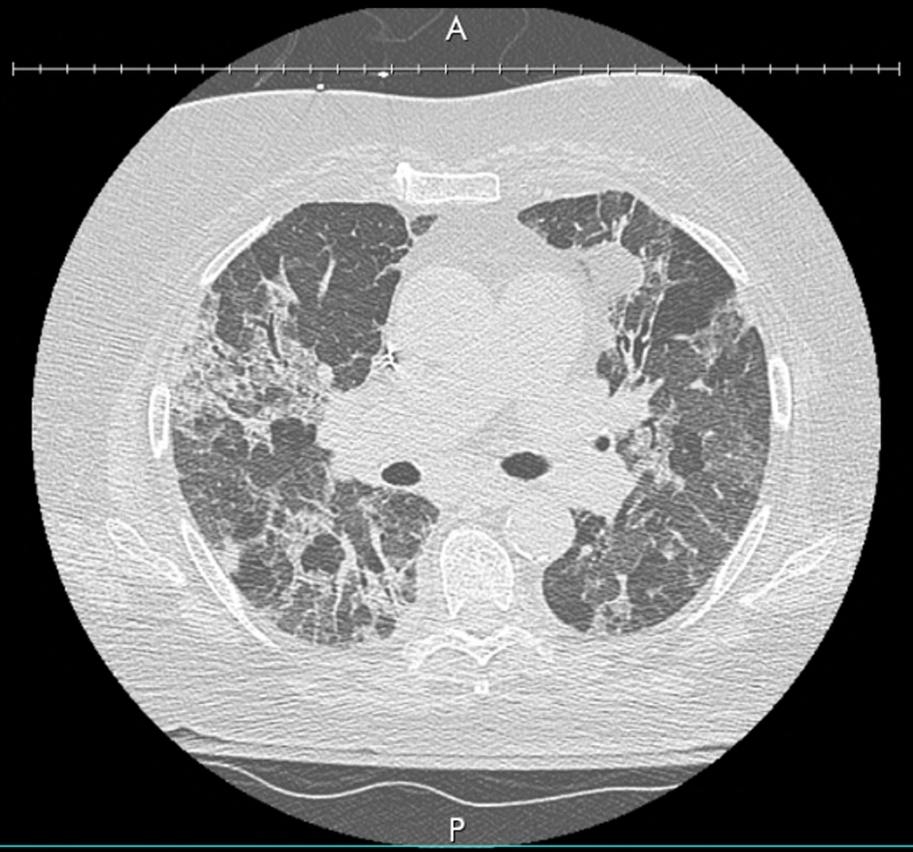


Small Bilateral Pleural Effusions

02/2020



10/2019



Key Imaging Findings

1. Multiple areas of mosaic attenuation, ground glass opacities, and normal lung tissue (**head cheese pattern**) seen in apical and basal bilateral lung fields with more accentuation identified in expiratory images.
2. Mild intra and interlobular septal thickening.
3. Multiple enlarged mediastinal lymph nodes and few scattered dense nodules bilaterally (stable compared to previous study)
4. Mild bilateral pleural thickening.
5. No honeycombing noted.

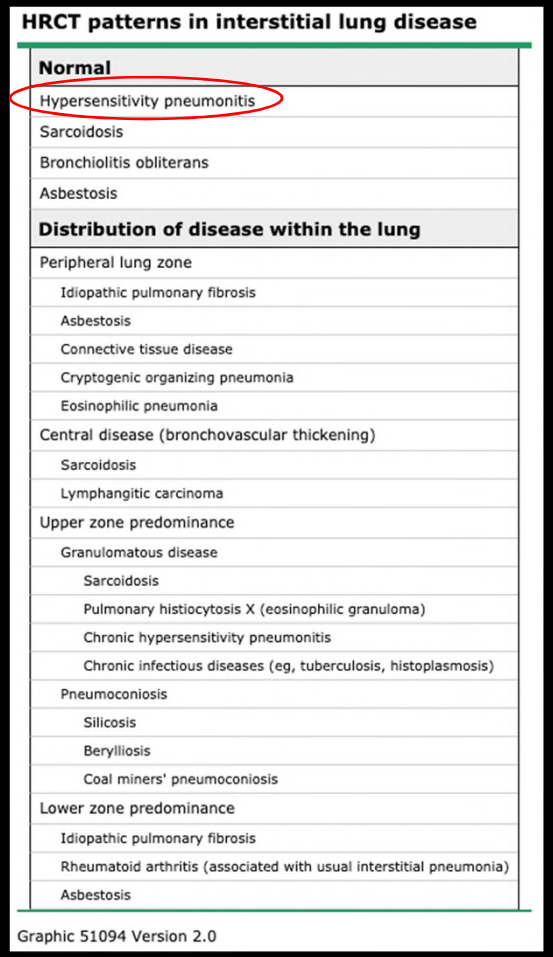
Other Diagnostic Work-Up

- TTE
  - EF 65-70%
  - Bio prosthetic AV functioning normally
  - Moderate MS, worsened since last TTE in 2016
- Pulmonary Function Testing
  - FVC 42%, FEV1 49%*, FEV1/FVC 115%*
  - Spirometry limited by patient's poor respiratory effort
- CT Heart Eval w/contrast
  - Thickened mitral valve with severe calcifications

Differential Diagnosis for Interstitial Lung Disease (ILD)

- Chronic hypersensitivity pneumonitis
- Idiopathic Pulmonary Fibrosis
- Non-specific interstitial Pneumonia
- Pulmonary Alveolar Proteinosis
- Sarcoidosis

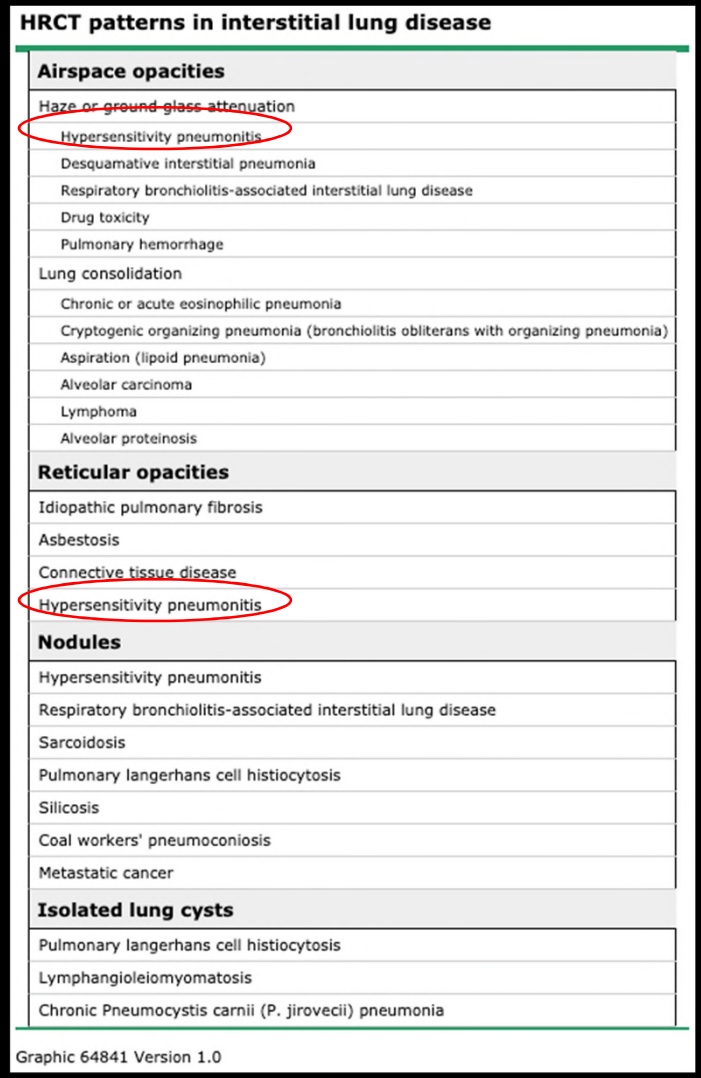
HRCT Patterns in ILD



HRCT patterns in interstitial lung disease

Normal
Hypersensitivity pneumonitis
Sarcoidosis
Bronchiolitis obliterans
Asbestosis
Distribution of disease within the lung
Peripheral lung zone
Idiopathic pulmonary fibrosis
Asbestosis
Connective tissue disease
Cryptogenic organizing pneumonia
Eosinophilic pneumonia
Central disease (bronchovascular thickening)
Sarcoidosis
Lymphangitic carcinoma
Upper zone predominance
Granulomatous disease
Sarcoidosis
Pulmonary histiocytosis X (eosinophilic granuloma)
Chronic hypersensitivity pneumonitis
Chronic infectious diseases (eg, tuberculosis, histoplasmosis)
Pneumoconiosis
Silicosis
Berylliosis
Coal miners' pneumoconiosis
Lower zone predominance
Idiopathic pulmonary fibrosis
Rheumatoid arthritis (associated with usual interstitial pneumonia)
Asbestosis

Graphic 51094 Version 2.0



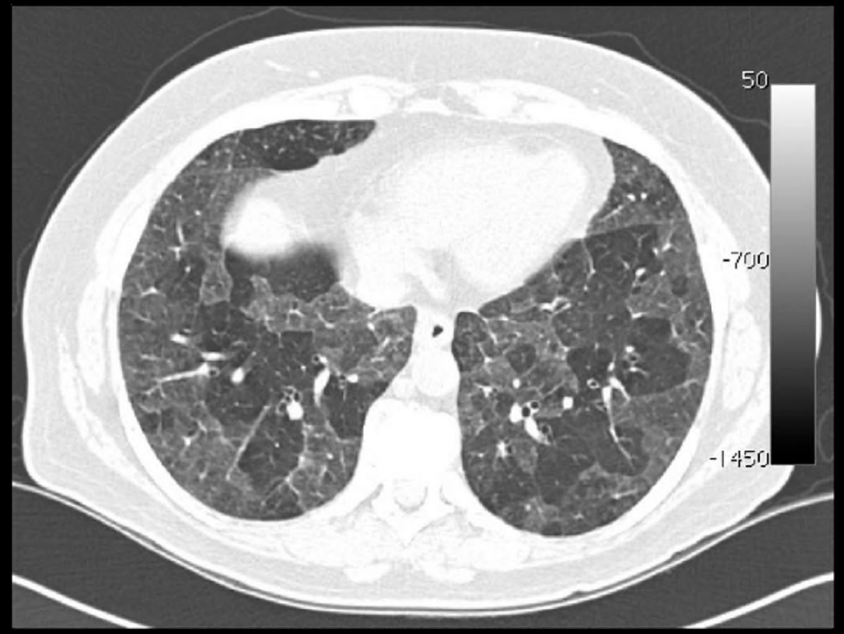
HRCT patterns in interstitial lung disease

Airspace opacities
Haze or ground glass attenuation
Hypersensitivity pneumonitis
Desquamative interstitial pneumonia
Respiratory bronchiolitis-associated interstitial lung disease
Drug toxicity
Pulmonary hemorrhage
Lung consolidation
Chronic or acute eosinophilic pneumonia
Cryptogenic organizing pneumonia (bronchiolitis obliterans with organizing pneumonia)
Aspiration (lipoid pneumonia)
Alveolar carcinoma
Lymphoma
Alveolar proteinosis
Reticular opacities
Idiopathic pulmonary fibrosis
Asbestosis
Connective tissue disease
Hypersensitivity pneumonitis
Nodules
Hypersensitivity pneumonitis
Respiratory bronchiolitis-associated interstitial lung disease
Sarcoidosis
Pulmonary langerhans cell histiocytosis
Silicosis
Coal workers' pneumoconiosis
Metastatic cancer
Isolated lung cysts
Pulmonary langerhans cell histiocytosis
Lymphangioleiomyomatosis
Chronic Pneumocystis carnii (P. jirovecii) pneumonia

Graphic 64841 Version 1.0

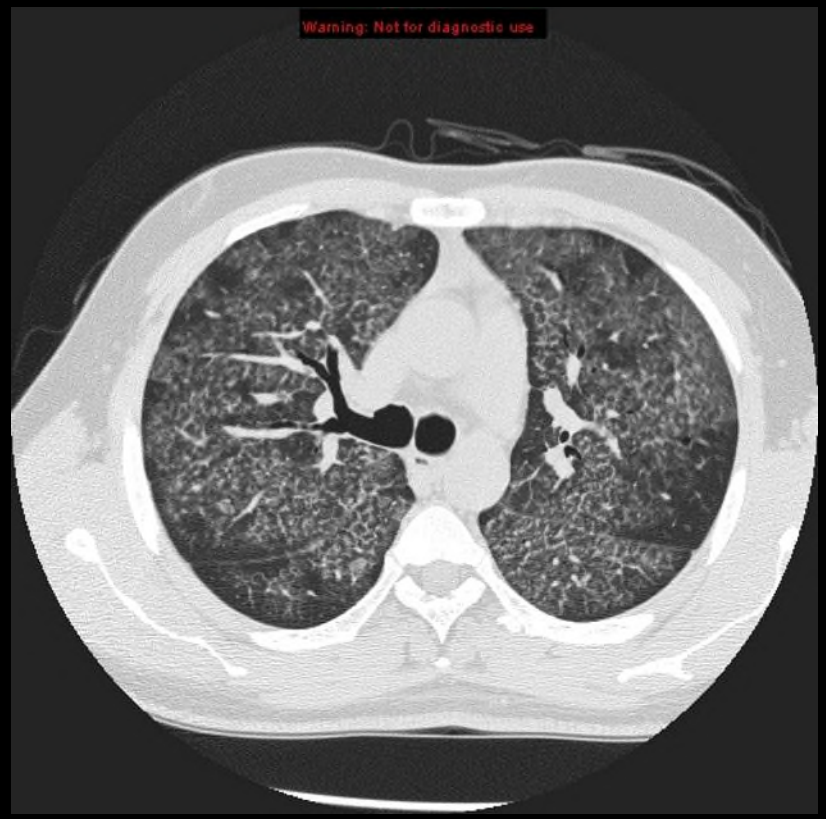
Head Cheese Sign

- Refers to a juxtaposition of regions with three (or sometimes more) different densities/regions of different attenuation within the lungs:
  - ground glass opacities (high attenuation)
  - mosaic attenuation pattern (low attenuation)
    - Usually secondary to air trapping, therefore more notable on expiratory images
  - normal lung tissue (normal attenuation)
- Indicative of a mixed infiltrative (ground glass opacity) and obstructive (mosaic attenuation) disease process



Other Specific HRCT Imaging Patterns in ILD

Crazy Paving



Galaxy Sign

ACR Appropriateness Criteria

Variant 1: **Chronic dyspnea. Unclear etiology. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☢
CT chest without IV contrast	May Be Appropriate (Disagreement)	☢☢☢
CT chest with IV contrast	May Be Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	O
MRI chest without IV contrast	Usually Not Appropriate	O
US chest	Usually Not Appropriate	O

ACR Appropriateness Criteria

Variant 3: **Dyspnea due to suspected valvular heart disease. Ischemia excluded.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		☢
US echocardiography transthoracic resting	9		O
US echocardiography transesophageal	8		O
MRI heart function and morphology without and with IV contrast	8		O
MRI heart function and morphology without IV contrast	7		O
CT heart function and morphology with IV contrast	6	This procedure can sometimes be used to assess valve disease. It may be appropriate for some clinical scenarios.	☢☢☢☢
US echocardiography transthoracic stress	4		O
CTA coronary arteries with IV contrast	3		☢☢☢
SPECT or SPECT/CT MPI rest and stress	2		☢☢☢☢

ACR Appropriateness Criteria

Variant 4: **Chronic dyspnea. Suspected interstitial lung disease. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
CT chest without IV contrast	Usually Appropriate	☢☢☢
Radiography chest	Usually Appropriate	☢
CT chest with IV contrast	May Be Appropriate (Disagreement)	☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	O
MRI chest without IV contrast	Usually Not Appropriate	O
US chest	Usually Not Appropriate	O
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Cost of Imaging

- Chest Xray (1 view)
  - $246 x 6 = $1,476
- CT Heart eval w/con
  - $2,852
- CT Chest w/o contrast
  - $1,364

Total Imaging Costs = $5,692

- Interstitial Lung Disease Inpatient Work-Up – cost to the patient
  - Insured $813
  - Uninsured $36,899

Take Home Points

- The diagnostic approach to interstitial lung disease relies on high-resolution computed tomography (HRCT) of the chest. Certain HRCT findings help to narrow the differential diagnosis of ILD.
- The head cheese sign refers to a juxtaposition of regions with ground glass opacities, mosaic attenuation pattern, and normal lung tissue. This sign is highly specific for hypersensitivity pneumonitis, although it can also be seen in other mixed infiltrative and obstructive processes.
- Several other metaphoric chest CT scan signs have been described linking abnormal imaging patterns to lung diseases. Some of these are specific to a disease, whereas others help narrow the differential diagnosis.

References

- Raju, Shine et al. “Chest CT Signs in Pulmonary Disease: A Pictorial Review.” *Chest* 151.6 (2017): 1356–1374. Web.
- UpToDate, “Approach to the adult with interstitial lung disease: Diagnostic testing”
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- https://radiopaedia.org/articles/head-cheese-sign-lungs?lang=us
- https://radiopaedia.org/articles/interstitial-lung-disease?lang=us


Questions?