

AMSER Case of the Month

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65-year-old man with worsening dyspnea on exertion

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Patient Presentation

- 65-year-old man with transthyretin amyloid cardiomyopathy was transferred to the cardiac care unit from an outside hospital with 3 weeks of worsening dyspnea on exertion and orthopnea
- Past medical history:
 - Transthyretin amyloid cardiomyopathy (2018)
 - Interstitial lung disease per outside hospital records
- Social history: denies tobacco/alcohol/drugs
- Family history: son and brother with cardiomyopathies

Pertinent Labs

- PE: Neck – JVP to ear; Cardiac – irregularly irregular rhythm, distant heart sounds; Lungs – wheezes on inspiration and expiration; Extremities – warm, 2+ pulses, 1+ edema
- Vitals: T 36.0 °C HR 87 /min BP 84/70 mmHg RR 25/min Oxygen Sat 99%
- Labs:
 - WBC 13.10
 - BNP 3,500 (baseline 700)
 - Troponin 0.2
- Transthoracic Echo:
 - LVEF: 10-15%
 - Dilated four chambers
 - Moderate to severe mitral regurgitation, posteriorly directed eccentric jet
 - Mild aortic, tricuspid and pulmonic regurgitation

What Imaging Should We Order?

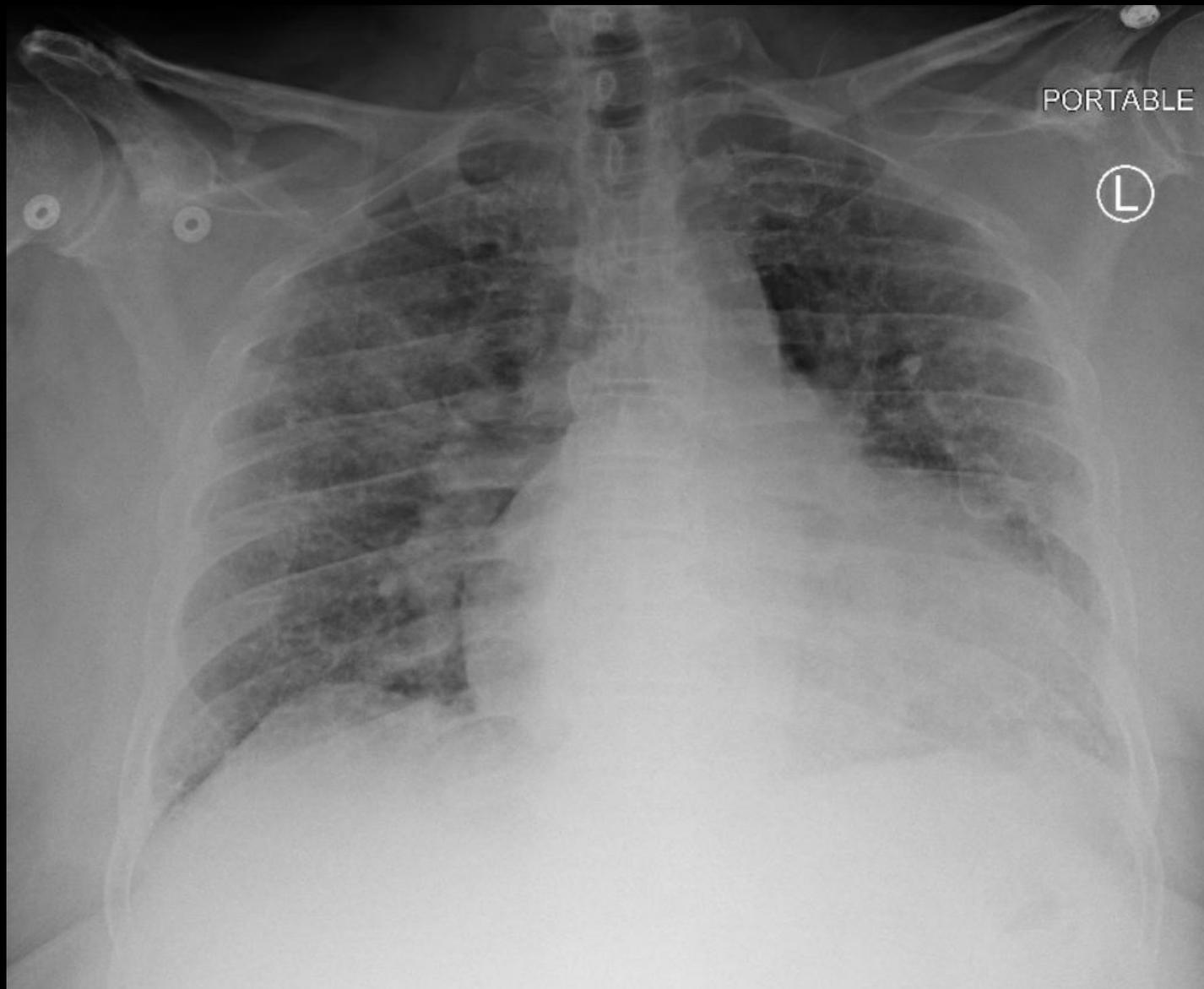
ACR Appropriateness Criteria for Dyspnea with Suspected Cardiac Origin

Variant 2: Dyspnea due to suspected nonischemic heart failure. Ischemia excluded.

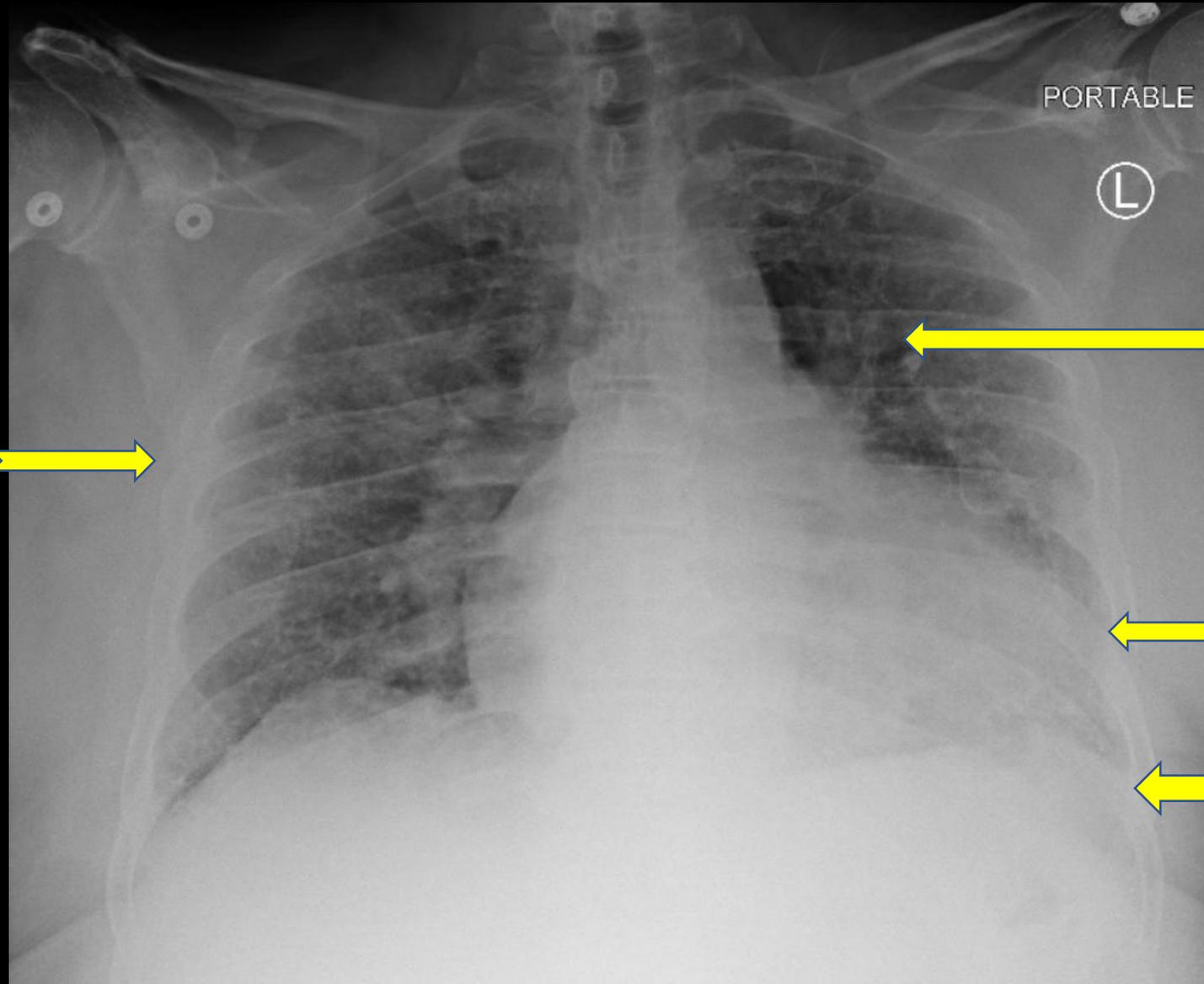
Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		⊗
US echocardiography transthoracic resting	9		○
MRI heart function and morphology without and with IV contrast	9		○
MRI heart function and morphology without IV contrast	8		○
US echocardiography transesophageal	5		○
CT heart function and morphology with IV contrast	5		⊗ ⊗ ⊗ ⊗
US echocardiography transthoracic stress	3		○
Tc-99m SPECT MPI rest and stress	3		⊗ ⊗ ⊗ ⊗
Rb-82 PET heart stress	3		⊗ ⊗ ⊗
MRI heart with function and inotropic stress without and with IV contrast	3		○

This imaging modality was ordered by the physician

Findings (unlabeled)



Findings (labeled)



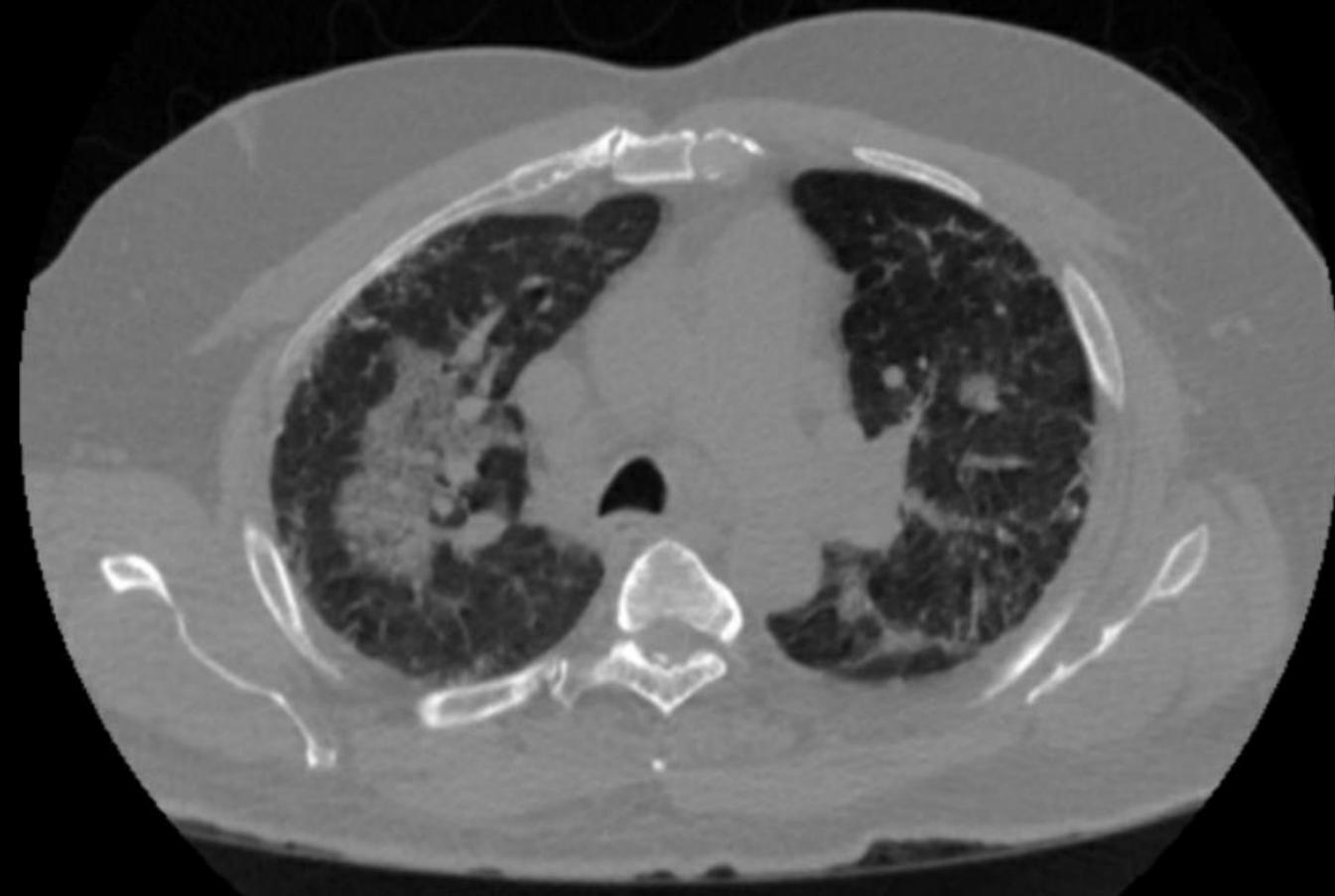
Bilateral bronchioloalveolar opacification

Pulmonary venous cephalization (Stag's antler sign)

Moderate cardiomegaly

Trace pleural effusion

Findings (unlabeled)



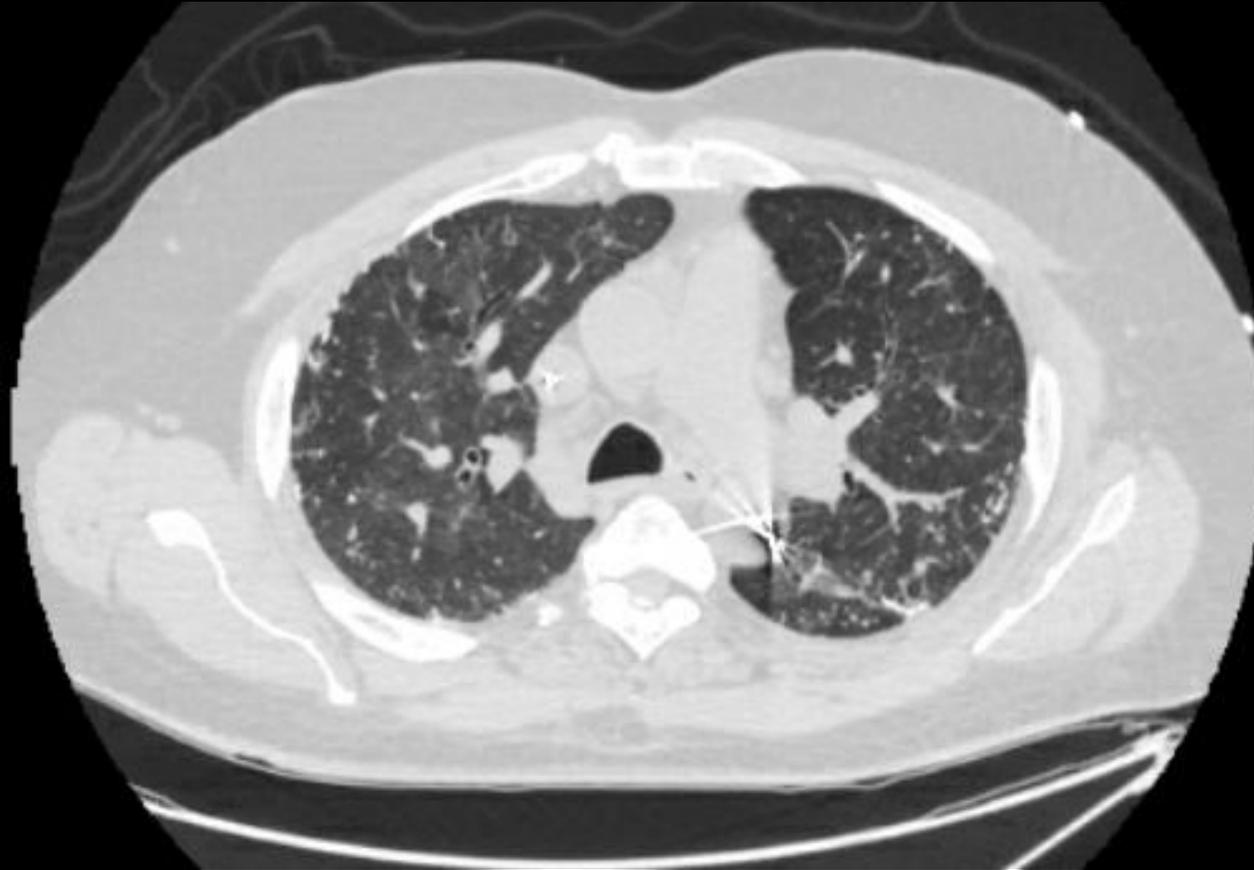
Findings (labeled)

Ground-glass opacity in right upper lobe



Final Diagnosis:

Unilateral pulmonary edema secondary to mitral regurgitation



Repeat CT following diuresis 2 weeks later

Differential Diagnoses:

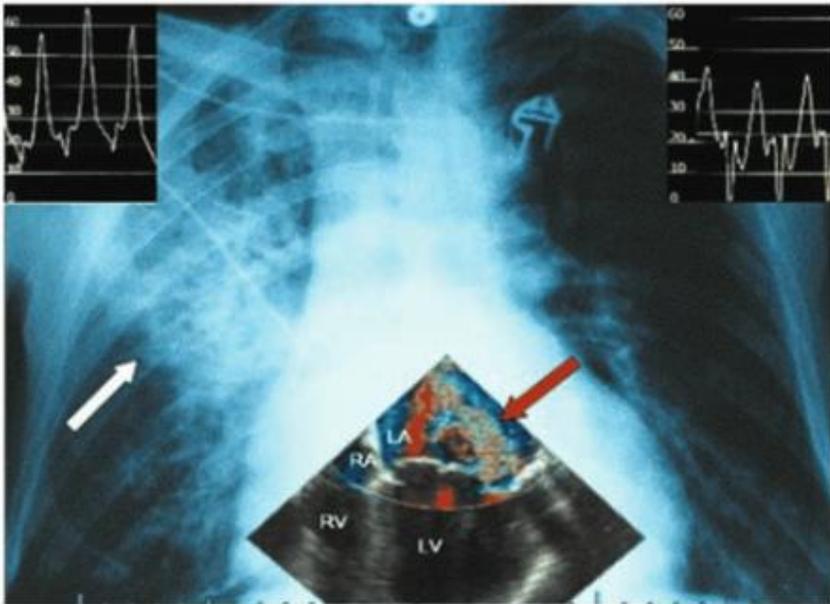
- Infectious process
 - Organizing pneumonia
- Chronic interstitial diseases
 - UIP (usual interstitial pneumonia)
 - NSIP (nonspecific interstitial pneumonia)
 - Sarcoidosis
- Acute alveolar diseases
 - Pulmonary edema
 - Hypersensitivity pneumonitis
 - ARDS

Unilateral Pulmonary Edema (UPE)

- Cardiogenic pulmonary edema on chest radiograph:
 - Up to 20% of patients may have normal CXR
 - Mild pulmonary vascular redistribution
 - Bilateral perihilar alveolar edema
 - Cardiomegaly and bilateral interstitial markings in severe cases
- In 2% of cases, unilateral pulmonary edema is present and is caused by eccentric mitral regurgitation (MR)
 - Predilection for the right upper lobe
 - Related to lateralized direction of MR: posterior leaflet prolapse is more likely to be associated with right-sided UPE
 - Associated with delay in initiation of appropriate treatment
 - Independent increased risk of mortality

Pathophysiology of UPE

Figure 1 Chest radiograph showing right upper lobe unilateral pulmonary edema (white arrow)



Transoesophageal echocardiography: mitral valve regurgitant jet directed toward the right upper pulmonary vein (red arrow). LA, left atrium, LV, left ventricle, RA, right atrium, RV, right ventricle. Right heart catheterization: left PCWP tracing with V wave of 40 mmHg (right upper corner) vs. V wave of 60 mmHg in the right PCWP tracing (left upper corner). With permission from [10].

- The anatomy of the pulmonary veins in relation to the mitral valve may explain the predilection for the right upper lobe
 - Eccentric regurgitant jet (often posteriorly)
- Positioning of the patient
- Left-sided cardiac enlargement can physically impede blood flow in left pulmonary artery
- Differences in lymphatic draining capacity of the right and left lung

References:

1. Vogel-Claussen, J, Elshafee ASM, Kirsch J et al. ACR Appropriateness Criteria® Dyspnea-Suspected Cardiac Origin. Available at <https://acsearch.acr.org/docs/69407/Narrative/>. American College of Radiology. Apr 21, 2019.
2. Meyer, TE. Approach to acute decompensated heart failure in adults. In: UpToDate, Post, TW (Ed), UpToDate, Waltham, MA, 2019.
3. Attias D, Mansencal N, Auvert B et al. Prevalence, characteristics, and outcomes of patients presenting with cardiogenic unilateral pulmonary edema. *Circulation*. 2010 Sep; 122(11):1109-15.
4. Myriantefs, P, Markou N, Gregorakos L. Rare roentgenologic manifestations of pulmonary edema. *Curr Opin Crit Care*. 2011; 17:449-53
5. Schnyder PA, Sarraj AM, Duvoisin BE et al. Pulmonary Edema Associated with Mitral Regurgitation: Prevalence of Predominant Involvement of the Right Upper Lobe. *American Journal of Roentgenology*. 1993; 161(1):33-36.