

A large, stylized oak leaf graphic in a dark blue color, positioned on the left side of the slide, partially overlapping the text.

Case Presentation: 59 Year Old African-American Woman with Increasing Dyspnea

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History of Present Illness

- 59-year-old African-American woman with a history of HFrEF, CKD, hypertension, pre diabetes, and multiple pulmonary nodules presented complaining of increasing lower extremity edema for the last few days.
- She also reported increased shortness of breath when she walks up the stairs. She did not notice any changes shortness of breath when she lies flat. She denies any cough/wheeze, fever/chill, night-time waking/apnea. She denied anosmia or COVID exposure. Denies URI symptoms. Denied chest pain, nausea and vomiting.

Additional History

- ROS positive for shortness of breath and polyuria
- PMH of Nonischemic Nonvalvular Cardiomyopathy, EF <20%, moderate pericardial effusion
- History of ascites and right pleural effusion attributed to CHF in 2019
- PET in 2019 demonstrated nonspecific enlarged mediastinal lymph nodes with mildly increased FDG activity, patient failed to follow up
 - Pleural fluid cytology in 2019 was negative for malignancy
- History of HTN, HLD, CKD Stage 3b
- No prior surgical history
- Patient has never smoked, denies heavy alcohol use

Physical Examination

181/97 80 98.1F 20 92%; Weight 63.7kg, BMI 24.3 kg/m²

Pertinent Findings:

Gen: Alert in no acute distress, appears older than stated age, thin, cachectic

Neck: Supple, trachea midline, JVD 10 to 11cm

HEENT: Oral mucosa moist

CV: Regular rate and rhythm, S3 present, no murmur, 2+ lower extremity edema up to her groin in L>R, pitting edema in her abdomen

Resp: Dullness to percussion $\frac{3}{4}$ of way up R posterior chest, Diminished breath sounds on right, L basilar fine crackles to midlung, no wheeze

GI: Soft, Nontender, Normal bowel sounds, liver edge 3 cm from the rib cage and smooth, 10cm of shifting dullness

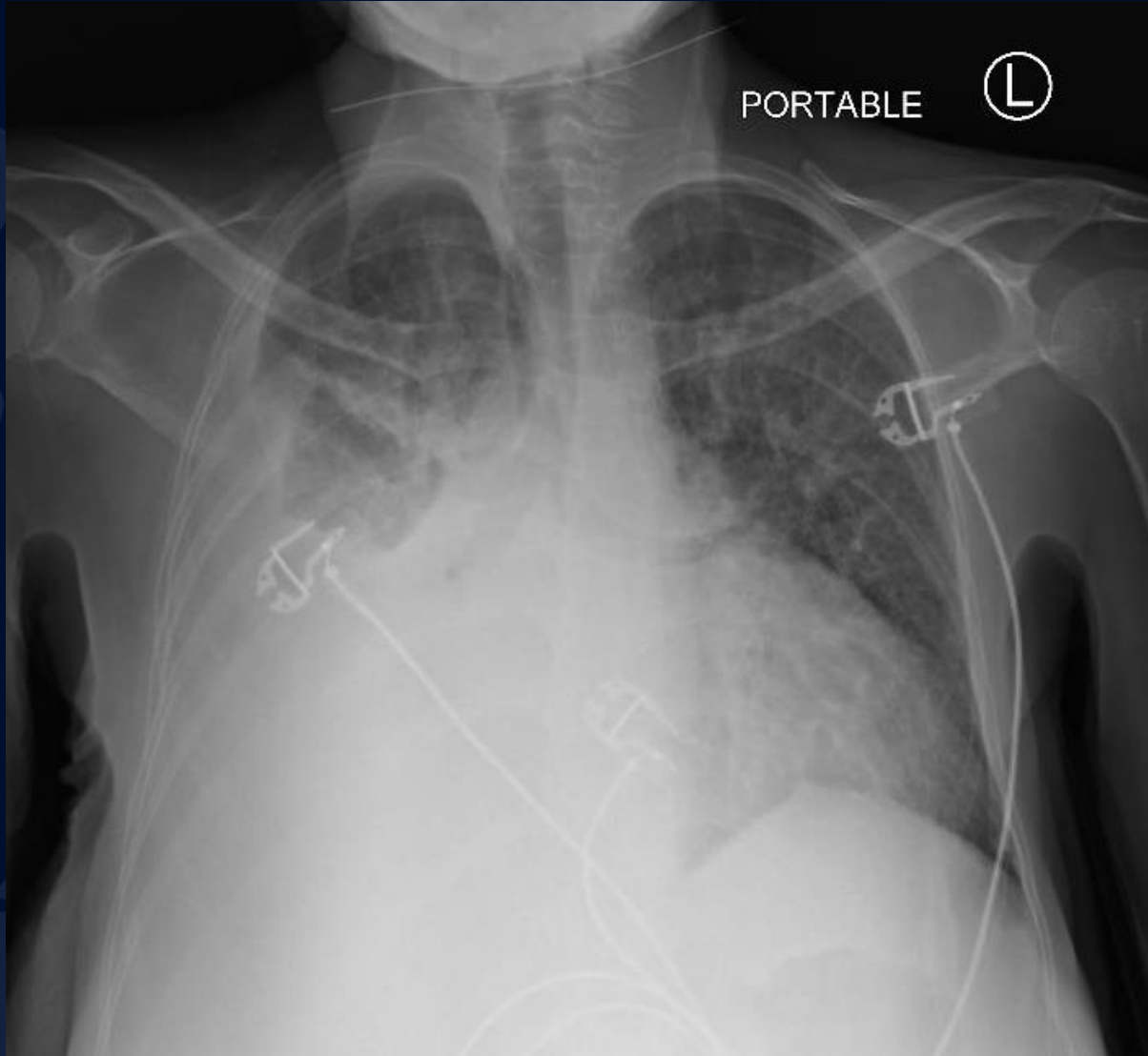
Lymphatics: No cervical/axillary lymphadenopathy.

Labs

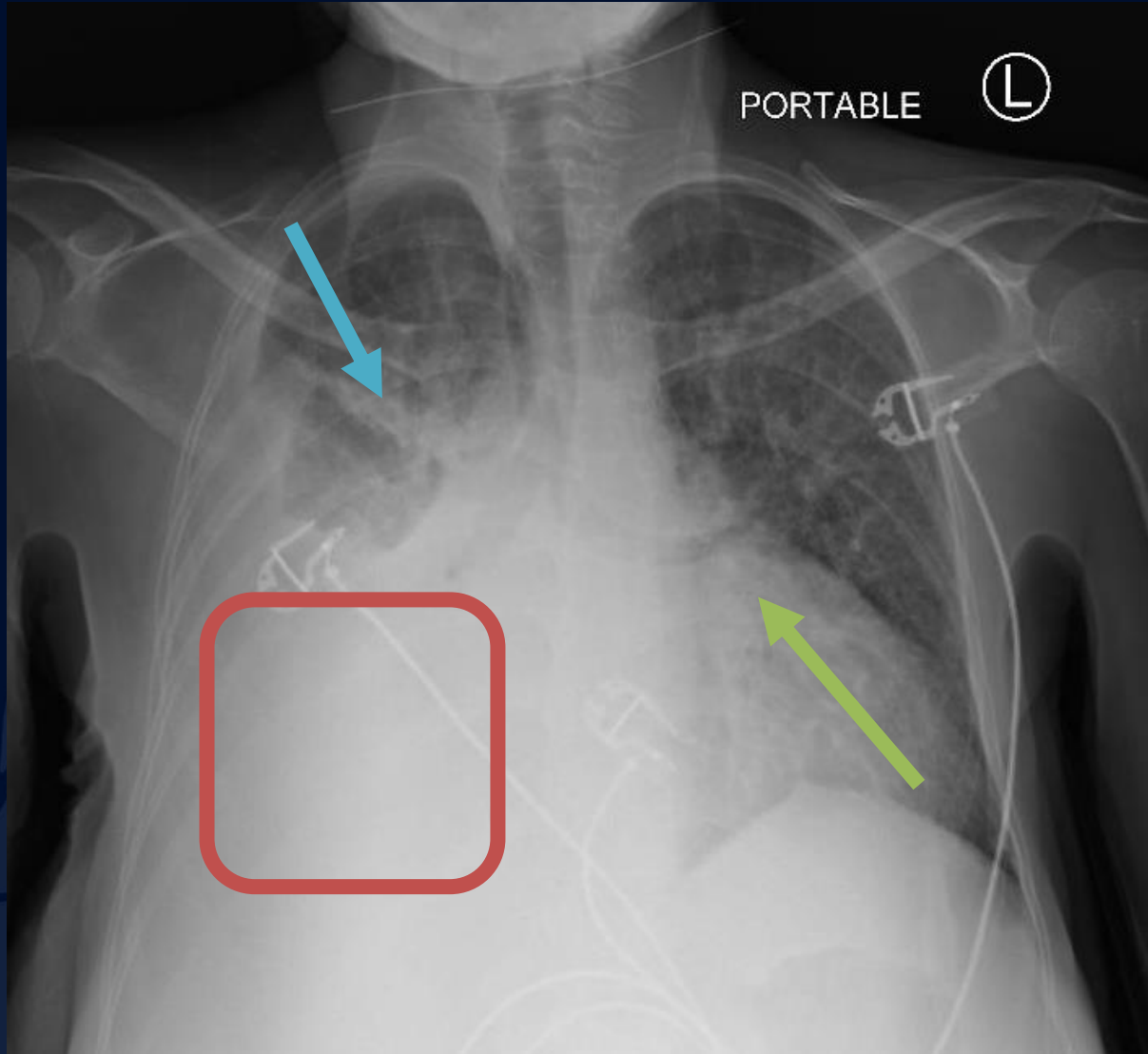
- WBC: 4.1 thous/mm³
- Hb/Hct: 13.9/43.6
- Plat: 143 thous/mm³
- PT: 14.9 s
- INR: 1.2
- Na 139 mmol/L
- K 4.5 mmol/L
- Cl 98 mmol/L
- HCO₃ 34 mmol/L
- BUN 27 mg/dL
- Cr 1.17 mg/dL
- Pro 8.4 g/dL
- Alb 4.0 g/dL
- Lac 1.0 mmol/L

- Trop <0.012 ng/mL
- NT-proBNP 10,600 pg/mL
- D-Dimer 659 ng/mL
- Procal 0.08 ng/mL

AP Portable Chest Radiograph



AP Portable Chest Radiograph



IMPRESSION: Large **right pleural effusion** with **pulmonary vascular congestion** likely secondary congestive heart failure. Probable **right perihilar atelectasis**.

Thoracentesis

Right-sided thoracentesis yielded 1500 mL of clear yellow pleural effusion

Fluid Analysis Results:

- Pleural Protein 4.8 g/dL
- Pleural LDH 244 IU/L
- Serum LDH 498 IU/L (ULN 618)
- Serum Protein 8.4 g/dL

Pleural Fluid Evaluation

Transudate vs. Exudate: The Age Old Question

Light's Criteria

	Transudate	Exudate	This Patient
Pleural: Serum Protein	< 0.5	≥ 0.5	0.57
Pleural: Serum LDH	< 0.6	≥ 0.6	0.49
Pleural fluid LDH	< 2/3 ULN	>2/3 ULN	498 (> 412)
Potential Etiologies	<ul style="list-style-type: none">• Heart failure• Cirrhosis• Nephrotic syndrome• Pulmonary embolism	<ul style="list-style-type: none">• Malignancy• Pneumonia• Tuberculosis• Esophageal rupture• Chylothorax• Hemothorax	

Additional Fluid Analysis

Special Tests	Role	Cutoff	This Patient
Albumin	Equivocal Exudative Effusions	Serum Alb – Pleural Alb <1.2g/dL	4.0 – 2.1 = 1.9
Culture	Complicated Parapneumonic Effusion vs Empyema		N/A
Cytology	Malignant Effusion		Negative
Amylase	Pancreatitis, Pancreaticopleural fistula, Malignant, Esophageal Rupture	> Serum ULN (~220)	36
Cholesterol	Exudative Effusions (Cholesterol Effusion)	>45 mg/dL (>250 mg/dL)	51
Triglycerides	Chylothorax	>110 mg/dL	N/A
Hematocrit	Hemothorax	Pleural Hct / Blood Hct ≥0.5	N/A
Adenosine Deaminase	TB, Malignant, PE, Empyema	>40 IU/L	N/A
NT-proBNP	CHF if Exudative	>1500 pg/mL	10,600
Creatinine	Urinorhax	Pleural Cr / Serum Cr ≥1	N/A
Tumor Markers: CEA, CA15.3, CA549, HER2/Neu, CYFRA 12.1, CA125, telomerase			N/A

Differential Diagnosis

- (1) Heart failure (Transudative Pleural Effusion)

For:

- CXR revealing prominent pulmonary vasculature
- Largely elevated proBNP
- Meets clinical picture (anasarca, progressive dyspnea, reduced ejection fraction)

Against:

- Effusion is predominantly unilateral
- Equivocal pleural fluid analysis for Light's Criteria

- (2) Malignancy (Exudative Pleural Effusion)

For:

- CXR revealing large unilateral pleural effusion with right perihilar atelectasis
- Previous PET in 2019 showed enlarged mediastinal lymph nodes
- Pleural:serum protein, pleural:serum LDH, pleural cholesterol in exudative range

Against:

- Pleural cytology negative for malignancy
- Albumin, protein not in support of exudative process
- Does not meet clinical picture (no weight loss, fatigue, hemoptysis)

- (3) Pneumonia (Exudative Pleural Effusion)

For:

- CXR revealing R middle lobe radio density
- Pleural:serum protein, pleural:serum LDH, pleural cholesterol in exudative range

Against:

- Albumin, protein not in support of exudative process
- Does not meet clinical picture (no fever, cough, leukocytosis)

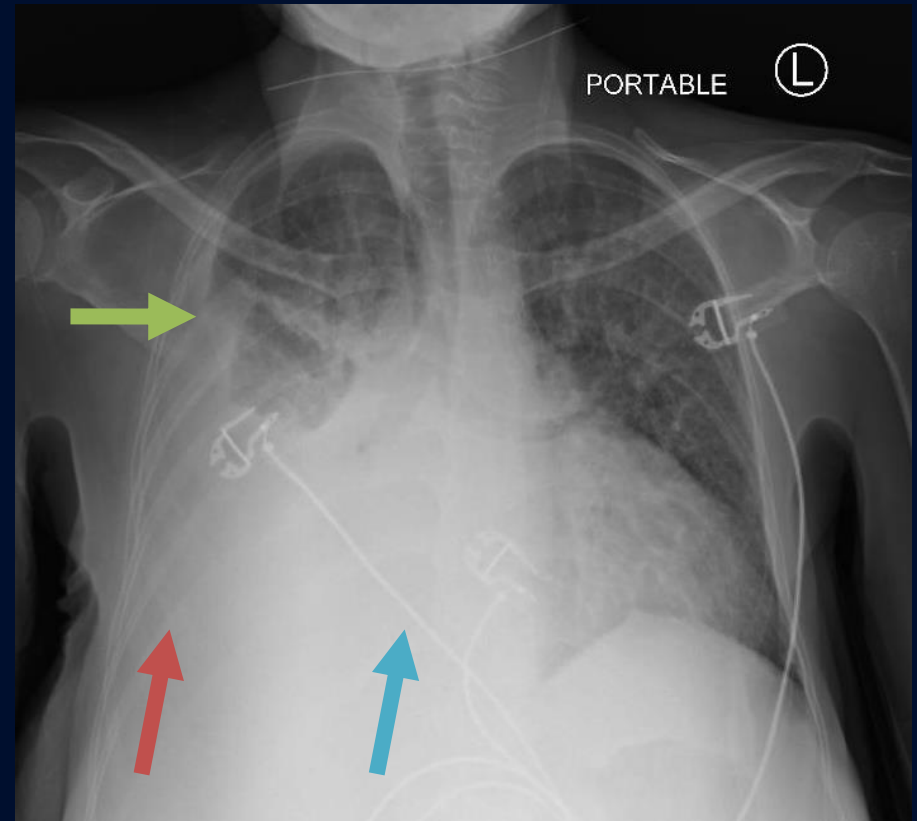
A large, stylized oak leaf graphic in a dark blue color, positioned on the left side of the slide. The leaf has a prominent central vein and several smaller veins branching off, with a scalloped edge.

Diagnosis?

Diagnosis: Pleural Effusion Secondary to Congestive Heart Failure

PA and AP Chest radiographic features of pleural effusion can include:

- Blunting of the costophrenic angle
- Blunting of the cardiophrenic angle
- Fluid within the horizontal or oblique fissures
- Meniscus
- Contralateral Mediastinal shift (in case of large effusions)



Diagnosis: Pleural Effusion Secondary to Congestive Heart Failure

- In heart failure, pleural effusion results from increased interstitial fluid in the lung due to **elevated pulmonary capillary pressure** due to elevated left sided filling pressures
- More than 80% of patients with pleural effusions caused by congestive heart failure have bilateral pleural effusions, and thus **thoracentesis** is indicated if there is **unilateral** pleural effusion in this setting
- Of unilateral pleural effusions in CHF, most do occur on **the right side**
- While Light's criteria is often used to distinguish pleura effusions as exudative versus transudative, the criteria have **lower specificity** in identifying exudative effusions (next slide)
- An estimated **25%** of pleural effusions secondary to CHF *actually* fall into the exudative range on biochemical analysis
- The measurement of **pleural fluid NT-proBNP** is the best way to identify pleural effusions that meet the exudative criteria of Light but are due to HF

Diagnosis: Pleural Effusion Secondary to Congestive Heart Failure

TABLE 3. SENSITIVITY OF TESTS TO DISTINGUISH EXUDATIVE FROM TRANSUDATIVE EFFUSIONS.*

TEST	SENSITIVITY FOR EXUDATE	SPECIFICITY FOR EXUDATE
	%	
Light's criteria (one or more of the following three)	98	83
Ratio of pleural-fluid protein level to serum protein level >0.5	86	84
Ratio of pleural-fluid LDH level to serum LDH level >0.6	90	82
Pleural-fluid LDH level >two thirds the upper limit of normal for serum LDH level	82	89
Pleural-fluid cholesterol level >60 mg/dl (1.55 mmol/liter)	54	92
Pleural-fluid cholesterol level >43 mg/dl (1.10 mmol/liter)	75	80
Ratio of pleural-fluid cholesterol level to serum cholesterol level >0.3	89	81
Serum albumin level - pleural-fluid albumin level \leq 1.2 g/dl	87	92

*LDH denotes lactate dehydrogenase.

Light RW. Clinical practice. Pleural effusion. N Engl J Med. 2002 Jun 20;346(25):1971-7. doi: 10.1056/NEJMcp010731. PMID: 12075059.

Resources

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