

Pleural Effusions

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Disclosures

- None

Objectives

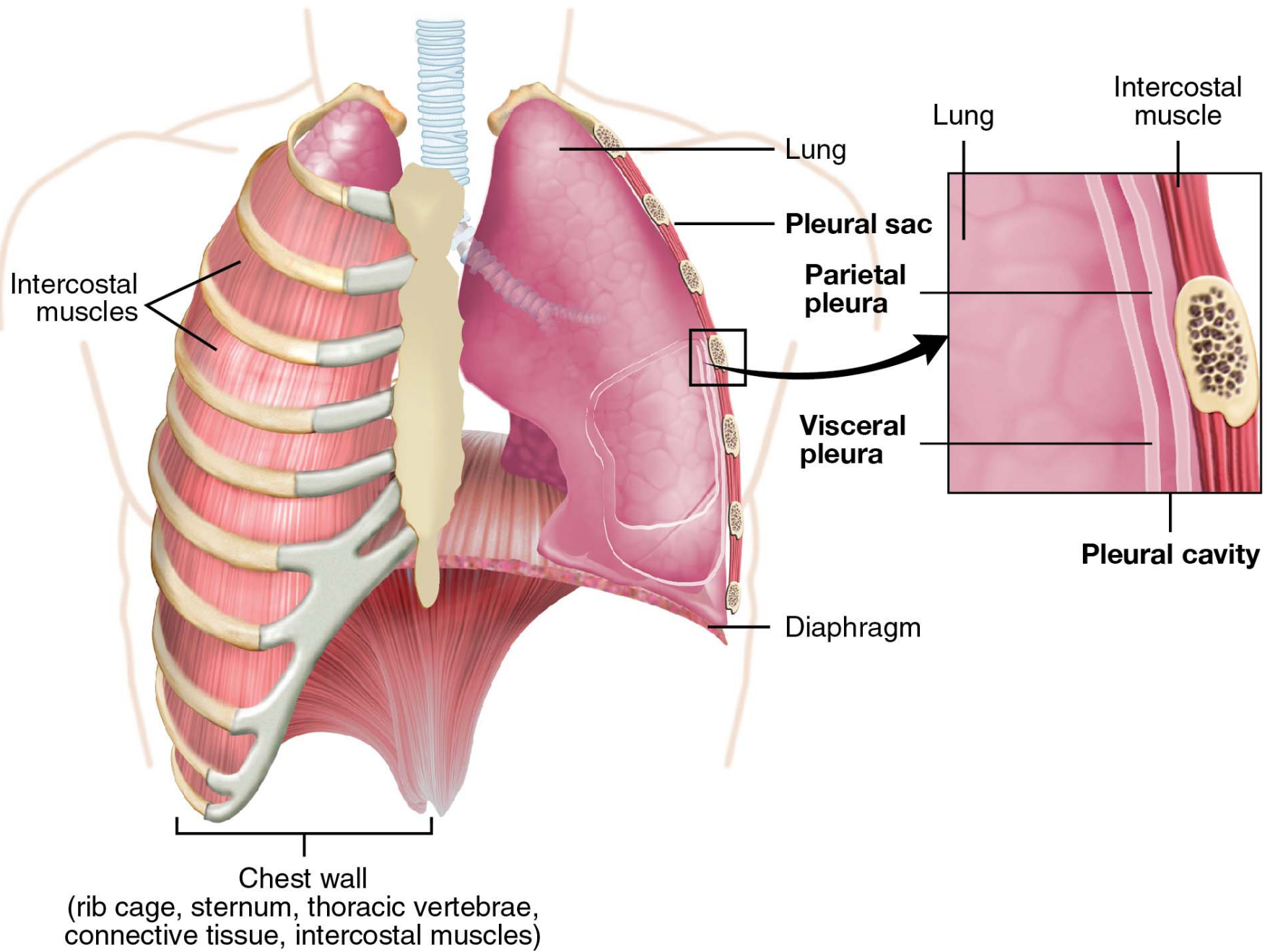
- Understand the presentation of a pleural effusion
- How to diagnose and treat
- Differentiate exudates from transudates, and know the differentials for each
- Know when to place a chest tube and ask for help

Board Review

- An 81yo man is evaluated in follow-up after a recent hospitalization. He was admitted 2 weeks ago for pneumonia and was discharged 12 days ago with 10d of abx. Still has low-grade fever, fatigue, dyspnea. PE reveals temp 38.4 celsius, BP 120/65 mmHg, HR 80, RR 28/min, BMI 21. SpO2 90% on RA. Pulm exam reveals decreased breath sounds, dullness to percussion, and decreased fremitus over the the right lung base. CXR reveals moderate right pleural effusion. US reveals moderate echogenic pleural effusion w/ loculations. Thora reveals WBC 22k, Glucose 40, LDH 1256, pH 7.1, negative gram stain.
- What is the most appropriate next step?
 - A. Begin ceftriaxone and azithromycin
 - B. Insert a large-bore pleural drain and start levofloxacin
 - C. Insert a small-bore pleural drain and begin piperacillin-tazonbactam
 - D. Repeat CXR in two weeks

Etiology and Pathogenesis

- 0.1ml/kg of fluid is normal
- 1.5 million patients/year
- Changes in oncotic and hydrostatic pressures or in membrane permeability determine properties of the effusion
 - Transudate vs Exhudate



Differential Diagnoses

- Transudates
 - Heart Failure (33%)
 - PE (10%)
 - Cirrhosis (3%)
 - SVC Syndrome
 - Nephrotic Syndrome
 - Urinothorax
- Exhudates
 - Pneumonia (20%)
 - Malignancy (13%)
 - PE (10%)
 - Viral Disease (7%)
 - CABG (4%)
 - Pericarditis
 - Pancreatitis
 - Esophogeal rupture
 - Chylothorax
 - RA
 - Meds
 - Mesothelioma

Case 1

- A 75yo veteran w/ PMH of afib on anticoagulation, CAD w/ ischemic cardiomyopathy complicated by recurrent pleural effusions, COPD, and tobacco abuse disorder, presents c/o worsening shortness of breath. How should this patient be evaluated?

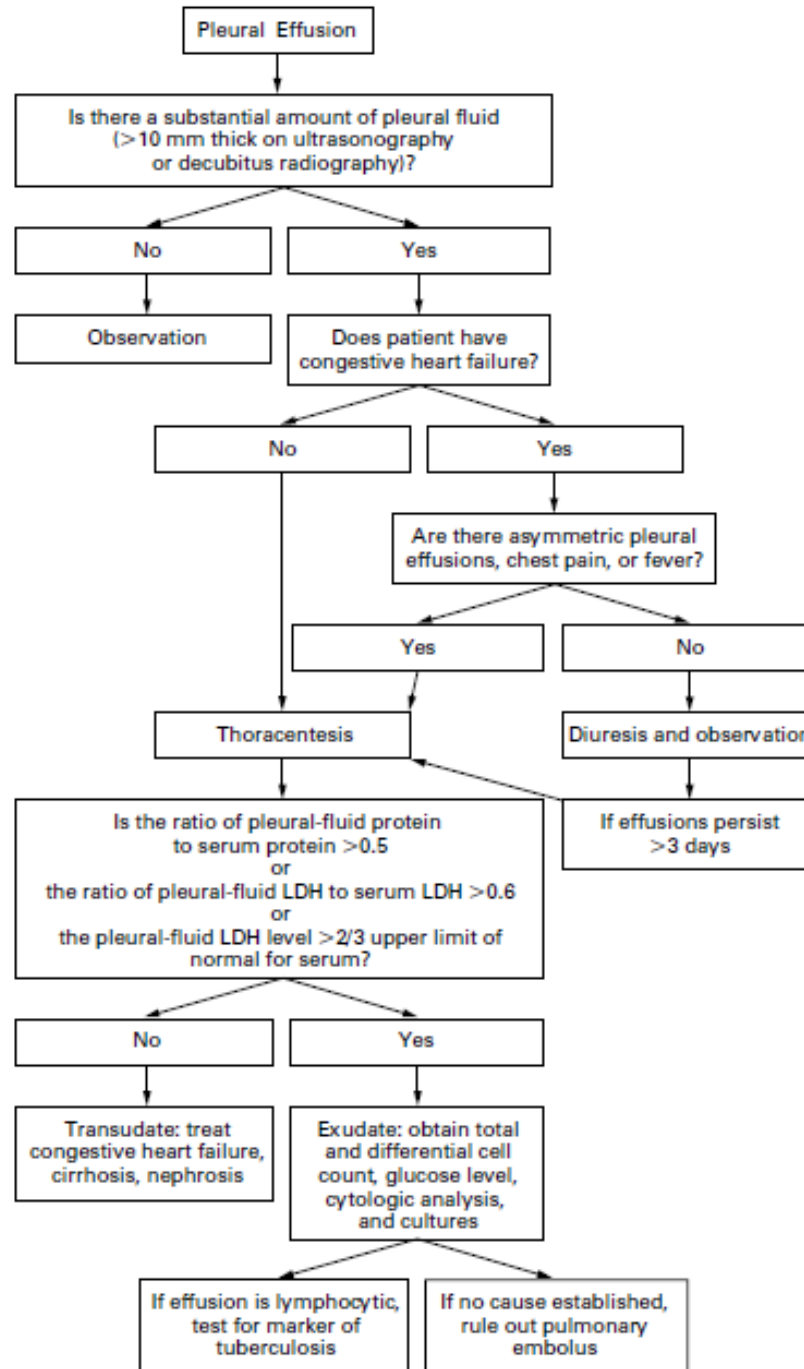
Initial Evaluation

- ROS otherwise negative
- Breath sounds diminished, dullness to percussion in bilateral lung bases w/o fremitus
- JVD, symmetric peripheral edema, and an S3 gallop
- Initially hypoxemic, resolved w/ 2L NC

Labs and Imaging

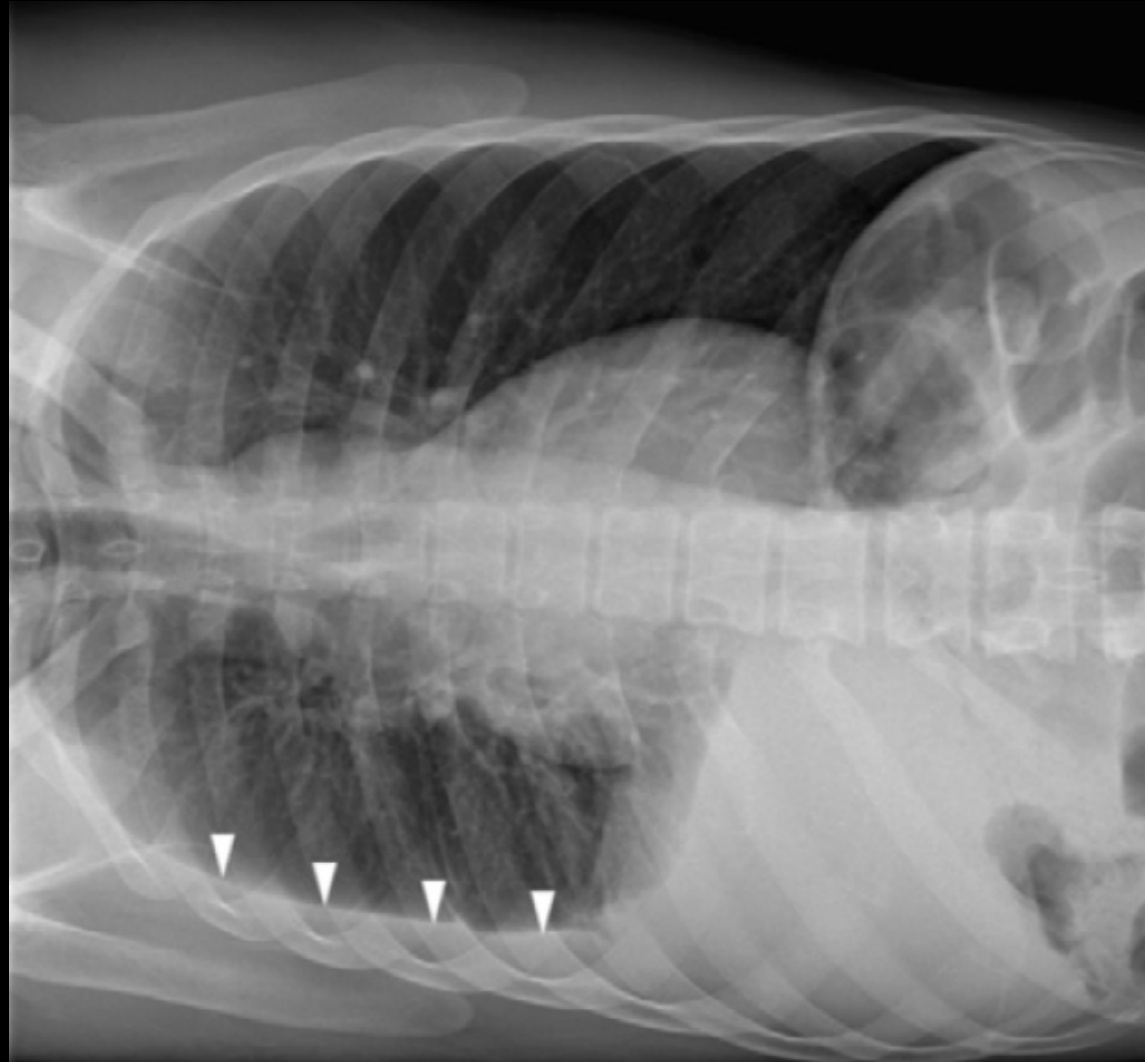
- EKG w/ rate-controlled afib, some LVH
- Troponins are negative
- CBC w/ diff is normal, CMP w/ mild hyponatremia, ntBNP 2348
- INR 1.9
- PA/Lat CXR obtained





Light, R. Pleural Effusion. New England Journal of Medicine. 2002. 346;25: 1971 – 1977

3 days later



Thoracentesis!

- OK on patients with mild coagulopathies
- Contraindications
 - Unstable patient
 - Infection overlying site
 - Severe coagulopathy
- Complications
 - PTX (0.6 – 6%)
 - Bleeding (0.05 – 1%)
 - REPE (0 – 16%)



Pleural Fluid Analysis

- Cell Count and Differential
- Gram Stain
- Aerobic/Anaerobic Cultures
- Cytology
- LDH, Protein, Albumin, Cholesterol
- pH and glucose
- Others
 - AFB, ADA, MTB Cx
 - Amylase
 - Hct
 - Triglycerides or cholesterol

Normal Pleural Fluid Studies

- Glucose similar to serum
- pH 7.60
- LDH less than 0.45 ULN
- Chol less than 60mg/dL

Normal Cell Count	
TNC	125
RBC	38
PMN	1
Mesos	1
Macros	75
Lymphs	23
Eos	0

Gross Appearance

- Pus is diagnostic for an empyema
- Turbidity is due to cellular debris or chyle
- Bloody effusion is more likely to be Cancer, PE, trauma, or pna

Light's Criteria

- Pleural Fluid Protein/Serum Protein ratio > 0.5
- Pleural Fluid LDH/Serum LDH ratio > 0.6
- Pleural Fluid LDH $> 2/3$ ULN serum LDH

Not Light's Criteria

- Two-Test Rule
 - Pleural cholesterol $> 45\text{mg/dL}$
 - Pleural Fluid LDH $> 0.45\text{ ULN}$
- Three-Test Rule
 - Pleural Fluid Protein $> 2.9\text{ g/dL}$
 - Pleural cholesterol $> 45\text{mg/dL}$
 - Pleural Fluid LDH $> 0.45\text{ ULN}$

Case 1a

Protein	3.1
LDH	53
Chol	38
Albumin	1.6
sProtein	6.0
sAlbumin	2.9
sLDH	114
pH	7.50
Glucose	112

Gross	Yellow
TNC	125
RBC	38
PMN	1
Lymphs	20
Monos	39
Other	40

Serum Albumin – Pleural Albumin

- Similar to SAAG
- gradients > 1.2 g/dL suggest transudate
- In Case 1a, gradient is 1.3 suggesting a transudative effusion

Case 1b

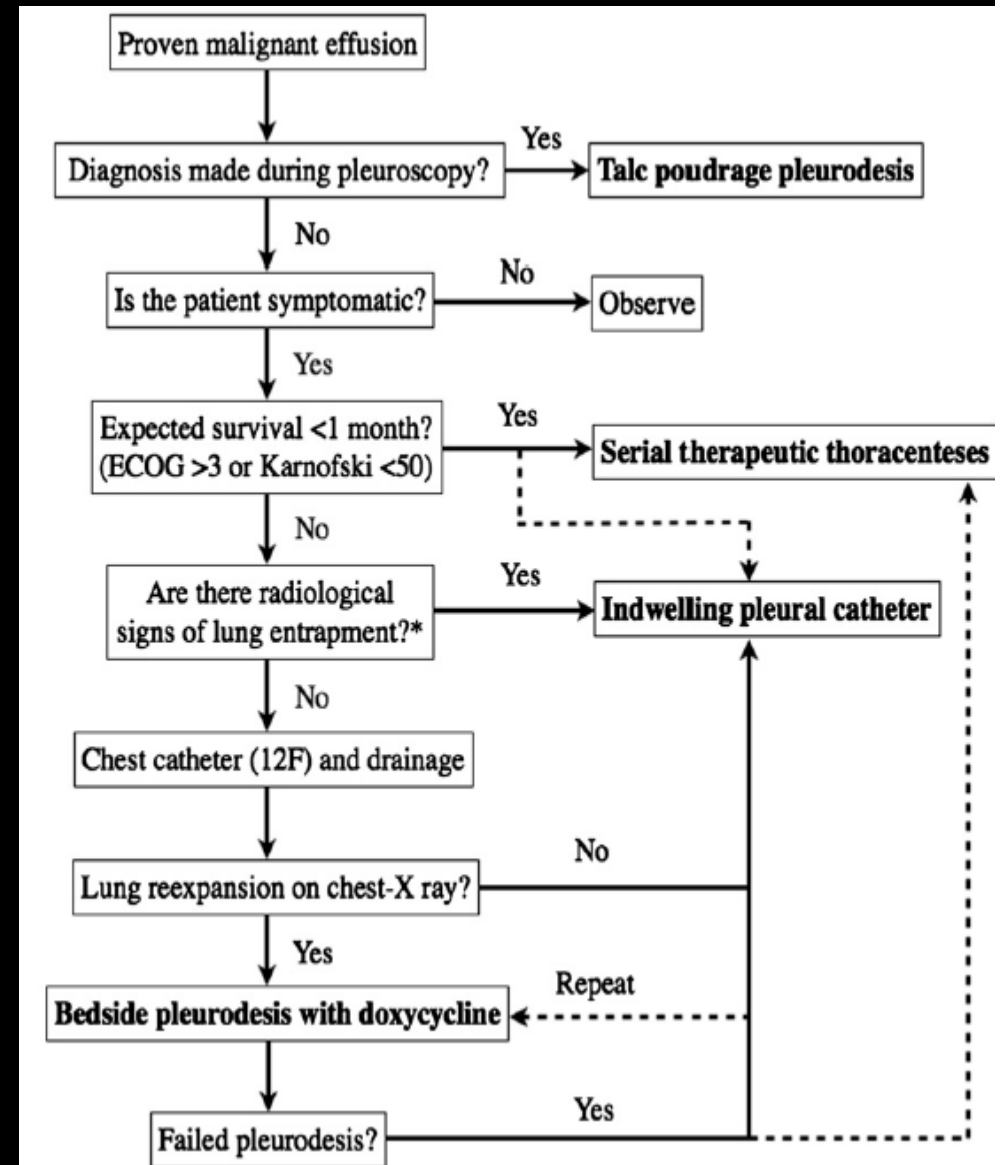
Protein	3.7	Gross	Turbid
LDH	153	TNC	125
Chol	58	RBC	38
sProtein	6.3	PMN	1
sLDH	220	Lymphs	67
pH	7.48	Monos	13
Glucose	112	Other	9

Lymphocytic Pleural Effusions

- Malignancy, Malignancy, Malignancy
- TB, lymphoma, sarcoidosis, RA, yellow nail syndrome, chylothorax
- Thoracentesis is very specific, somewhat sensitive
 - Overall sensitivity 60%
 - 65% on first tap, 27% on the second, and 5% on the third

Malignant Pleural Effusion

- Lung (37%)
- Breast (17%)
- Unknown site (10%)
- Lymphoma (9%)
- Gastrointestinal (8%)
- Ovary (7%)
- Mesothelioma (3%)



Case 2

- A 75yo veteran w/ PMH of afib on anticoagulation, CAD w/ ischemic cardiomyopathy complicated by recurrent pleural effusions, COPD, and tobacco abuse disorder, presents c/o worsening shortness of breath and pleuritic right sided chest pain. How should this patient be evaluated?

Initial Evaluation

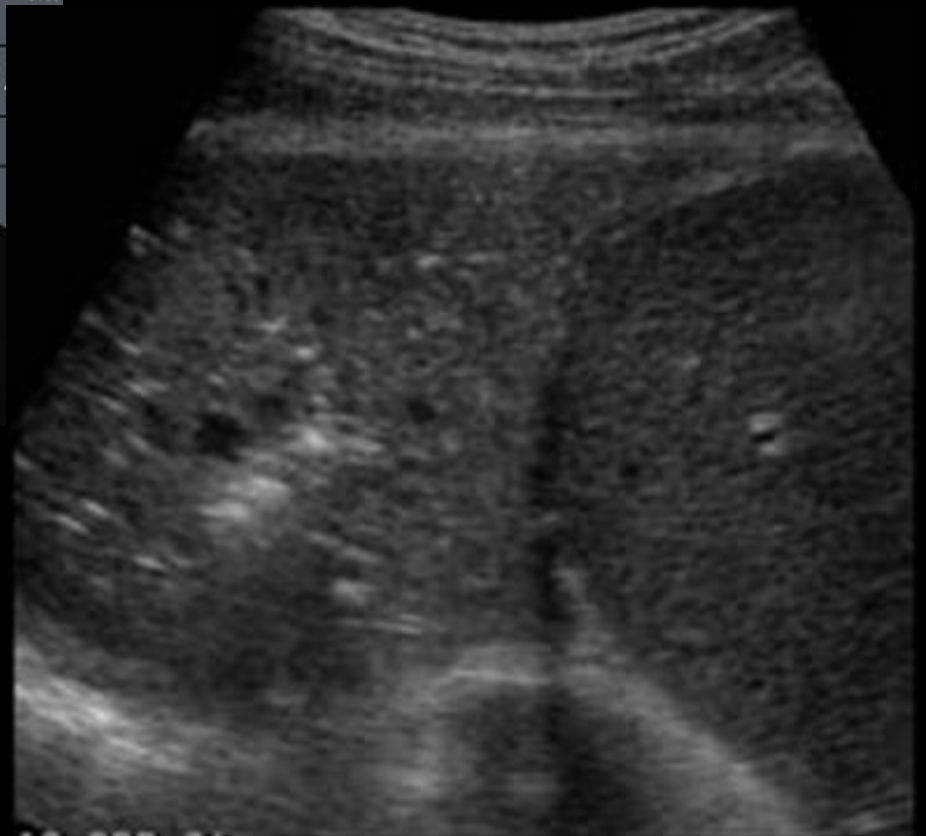
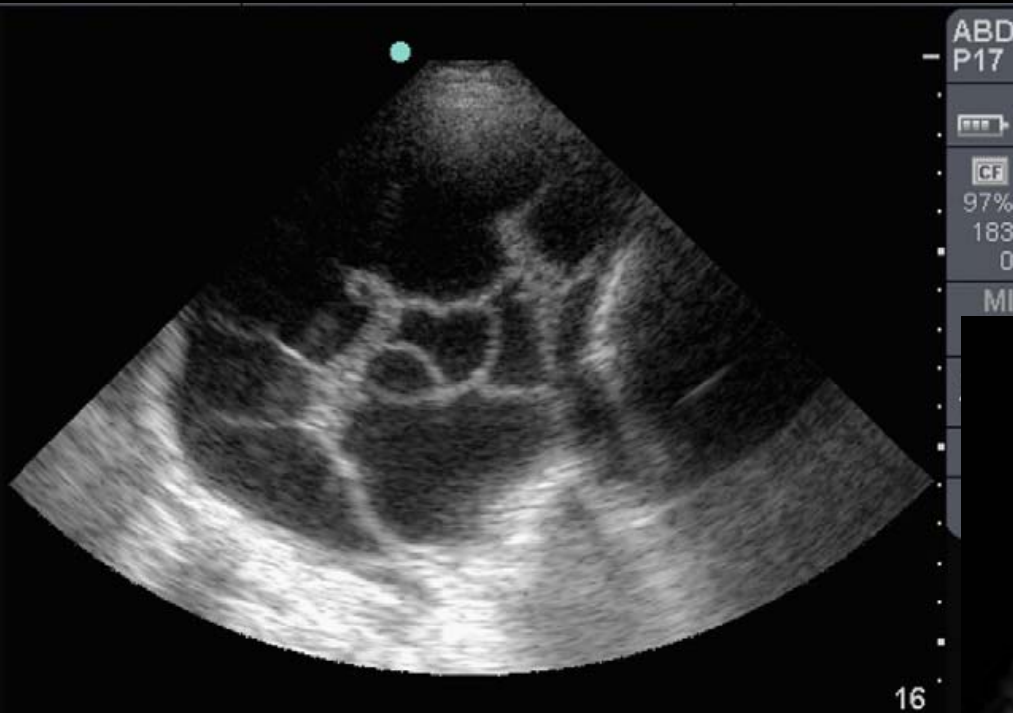
- ROS reveals fever, chills, cough productive of cloudy sputum flecked with blood
- Breath sounds diminished, dullness to percussion in bilateral lung bases, decreased fremitus
- JVD, S3 gallop, and edema
- Initially hypoxemic, resolved w/ 2L NC

Labs and Imaging

- EKG w/ afib w/ RVR, some LVH
- Troponins are negative
- CBC w/ diff reveals neutrophilia, CMP w/ mild hyponatremia, ntBNP 2289
- INR 1.9
- PA/Lat CXR obtained



Thoracentesis, the sequel!



Protein	3.7	Gross	Cloudy
LDH	1253	TNC	52532
Chol	58	RBC	3834
sProtein	6.3	PMN	91
sLDH	220	Lymphs	3
pH	7.03	Monos	1
Glucose	42	Other	5

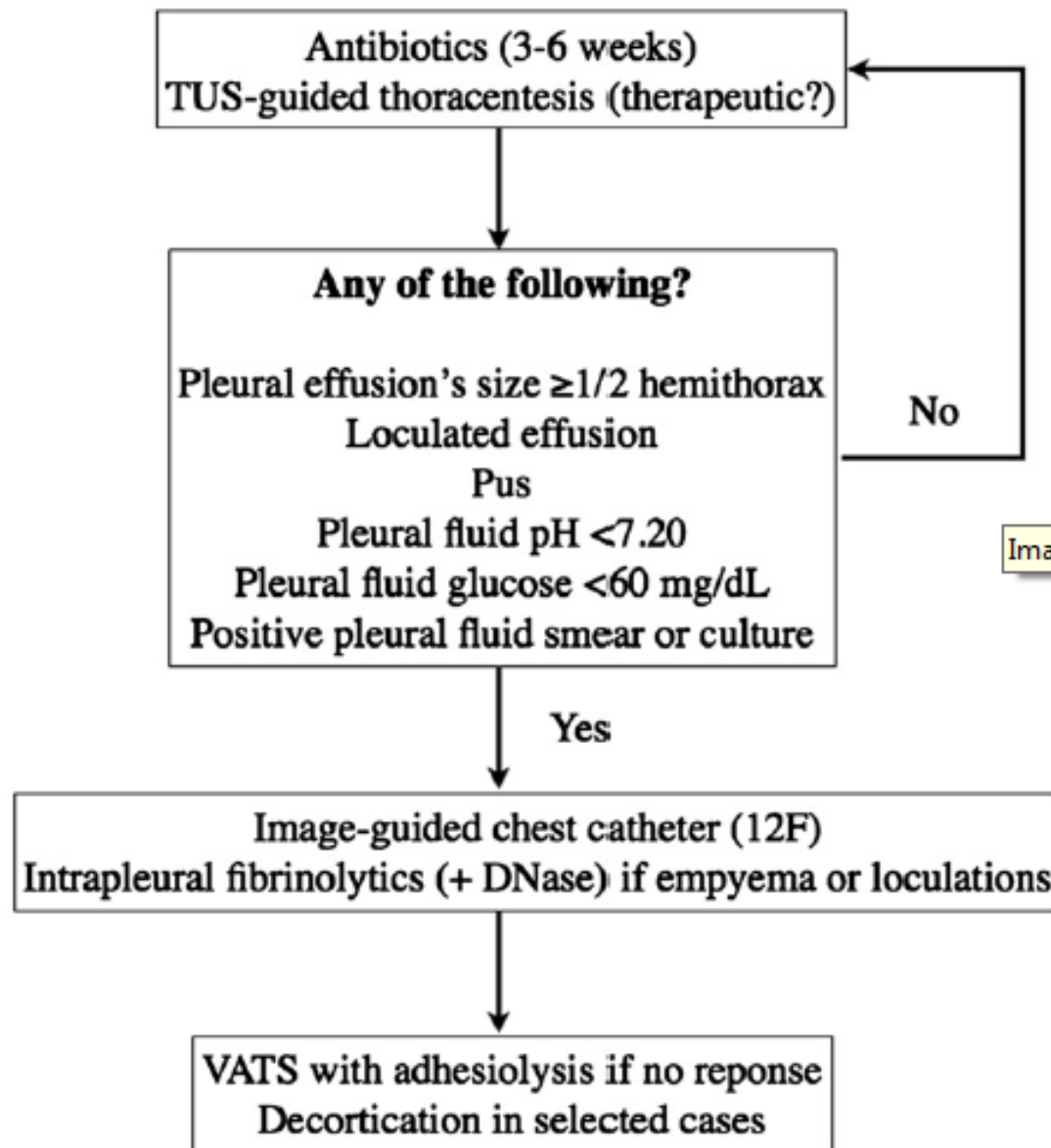


Image of Fig. 15



Others

- Rheumatoid pleurisy
 - Low glucose and pH
 - “Tadpole-like” macrophages
- Lupus pleurisy
 - Negative or low titer ANA r/o ds
- PE
 - Undiagnosed exudates
- Chylothorax
 - Opal or milky fluid
- TB
 - ADA has very high NPV
 - Lymphocytic effusion with low mesothelial cells
- Pancreatitis
 - Amylase
- Esophageal rupture
 - Very low pH

References

- Saguil et al. Diagnostic Approach to Pleural Effusion. *American Academy of Family Practitioners*. 2014. 90(2): 99 – 104
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- Hibbert et al. Safety of US-Guided Thoracentesis in patients with abnormal preprocedural coagulation parameters. *Chest*. 2013. 144(2): 456 – 463
- Porcel JM and Light RW. Pleural Effusions. *Disease-a-month*. 2013. 59: 29 – 57.

Questions?