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
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 pipercillin-tazobactam
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
Intercostal muscles

Lung

Pleural sac

Parietal pleura

Visceral pleura

Diaphragm

Chest wall
(rib cage, sternum, thoracic vertebrae, connective tissue, intercostal muscles)

Intercostal muscle

Pleural cavity

Lung
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
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

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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 > 45mg/dL
  – Pleural Fluid LDH > 0.45 ULN

• Three-Test Rule
  – Pleural Fluid Protein > 2.9 g/dL
  – Pleural cholesterol > 45mg/dL
  – Pleural Fluid LDH > 0.45 ULN
## Case 1a

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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

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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!
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<td>Other</td>
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Antibiotics (3-6 weeks)
TUS-guided thoracentesis (therapeutic?)

Any of the following?
- Pleural effusion’s size $\geq 1/2$ hemithorax
- Loculated effusion
- Pus
- Pleural fluid pH $< 7.20$
- Pleural fluid glucose $< 60$ mg/dL
- Positive pleural fluid smear or culture

No

Yes

Image-guided chest catheter (12F)
Intrapleural fibrinolytics (+ DNase) if empyema or loculations

VATS with adhesiolysis if no response
Decortication in selected cases
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

Questions?