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Pleural Effusion

★ Objectives:

1-Focus on Clinical presentation and examination.

2-Focus on Initial test (CXR then Thoracocentesis).

3- What could be the causes of pleural effusion in terms of: CHF, SLE, Empyema and Parapneumonic effusion.

4- You need to know the Light's criteria and based on it you classify patients into transudative and exudative.

★ Resources Used in This lecture:

Slides, Davidson's, Kumar, Step-up, Master the boards, Kaplan and Class notes

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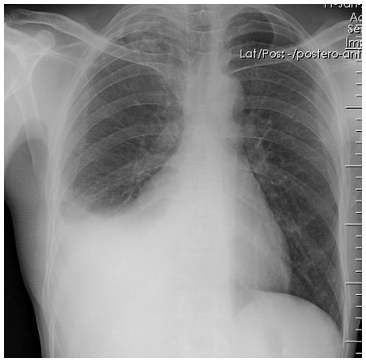
What is Pleura? Serous fluid that allows for the parietal pleura (outer lining) and visceral pleura (inner lining) to glide[1] over each other without separation.

- Contains about 5-15 ml of fluid at one time.
- Fluid is produced by parietal pleura ⇒ absorbed by visceral pleura ⇒ Drained into lymphatics ⇒ To blood.
- About 100-200 ml of fluid circulates through the pleural space in 24h.



Pleural effusion: is an excessive accumulation of serous fluid in the pleural space. It can be detected by plain chest x-ray when there is more than *300 ml* present. The primary cause of a pleural effusion is simply an imbalance between the fluid production and fluid removal in the pleural space.

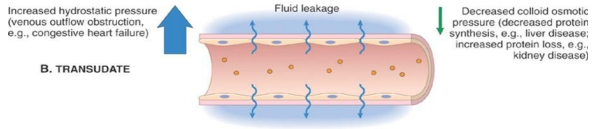
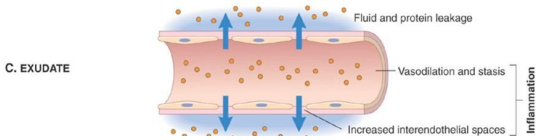
Generally, by one of the following mechanisms:

1- Increased drainage of fluid *into* pleural space.

2- Increased production of fluid by cells in the pleural space.

3- Decreased drainage of fluid *from* the pleural space.

★ Types: Video

	Transudative pleural effusion	Exudative pleural effusion
Due to..	1. Increased hydrostatic pressure: elevated capillary pressure in visceral or parenteral pleura (CHF) 2. Decreased plasma oncotic pressure (hypoalbuminemia → nephrotic syndrome.)	1. Increased **permeability** of the pleural surfaces. 2. Decreased lymphatic flow from the pleural space because of damage of pleural membranes or vasculature.
		

[1] زحلقة

★ Causes:

Transudative pleural effusion Think BIG ORGANS!	Exudative pleural effusion
HEART: Congestive Heart Failure (CHF) left-sided heart failure → increase in the hydrostatic pressure of the lung vasculature → leakage of fluid only in the pleural space → transudative pleural effusion.	**Infection:** 1. Bacterial pneumonia "parapneumonic pleural effusion". 2. Tuberculosis (TB)
RENAL: Nephrotic Syndrome Hypoalbuminemia ⇒ Decreased plasma oncotic pressure.	
LIVER: Chronic Liver disease (ex: Cirrhosis with ascites) movement of ascitic fluid from the peritoneal cavity into the pleural space through diaphragmatic defects[2].	**Inflammatory:** -Collagen Vascular Disease: (SLE, Rheumatoid Arthritis) -Pancreatitis
THYROID: Hypothyroidism	**Drugs:** Hydralazine, Cimetidine, Methotrexate (very common)
Hypoalbuminemia Decreased plasma oncotic pressure. Hypoalbuminemia can be caused by various conditions, including nephrotic syndrome, hepatic cirrhosis, heart failure, and malnutrition	**Malignancy & Metastatic disease:** #1 : Lung Malignancy. (36%) **Metastatic:** Lymphoma (10%) **In Females:** Breast Cancer. (25%) **In Male:** adrenal (NOT PROSTATE). **USMLE Question: Where's the most common site for pleural metastasis in male? Ans: adrenal*
Atelectasis (Lung Collapse)	**Idiopathic**
Pulmonary Embolism	
Ovarian fibroma causes right-sided pleural effusion (Meigs' Syndrome)	Pulmonary Embolism (more common)
Peritoneal dialysis	Viral Infection

- **Collectively the most common *causes* of pleural effusion are:**

1. CHF most common cause
2. Pneumonia (bacterial)
3. Malignancies
4. Pulmonary embolism
5. Viral diseases
6. Cirrhosis with ascites

[2] Alonso, Jose Castellote. "Pleural effusion in liver disease." Seminars in respiratory and critical care medicine. Vol. 31. No. 06. © Thieme Medical Publishers, 2010.

★ Clinical Features:

Symptoms: Often asymptomatic.

1. Symptoms of pleural effusion:
    a. Pleuritic chest pain, cough "pain in lungs", dyspnea on exertion.
2. Symptoms of the underlying cause:
    a. Peripheral edema, orthopnea, paroxysmal nocturnal dyspnea.

Signs:

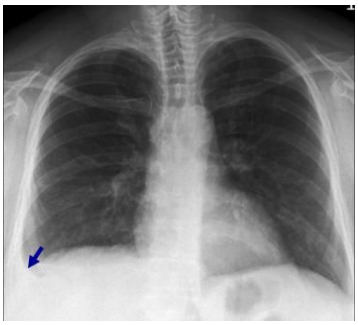
- Asymmetrical chest wall movement → reduced in affected side.
- Trachea will shift away from the affected side.
- Reduced vocal resonance/tactile fremitus.
- Percussion: stony dullness.
- Auscultation: absent/decreased vesicular breath sounds.
- Palpation of apex beat → if the effusion was on the left side apex beat will be shifted.
- Mediastinum shifted away.

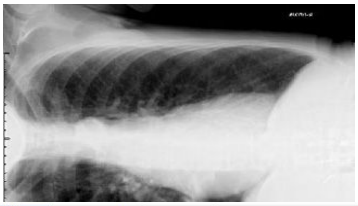
★ Diagnosis: How to diagnose pleural effusion?

1- History & 2- Physical examination → gives 85% of diagnosis.

3- Chest x-ray: Initial diagnostic test for pleural effusion.

- Postero-anterior and lateral look for: blunting of costophrenic angle. About 250 mL of pleural fluid must accumulate before an effusion can be detected.
- Lateral decubitus films (patient lying on one side) are more reliable for detecting small pleural effusions, with the new technology even (10 ml) of fluid is detected.





4-Ultrasound:

What are the advantages of ultrasound? More sensitive and specific and it can detect minimal fluid.

- It will help you to *rule out* others like pneumothorax and fluid collection.

5- CT scan: (when there is malignant suspicion).

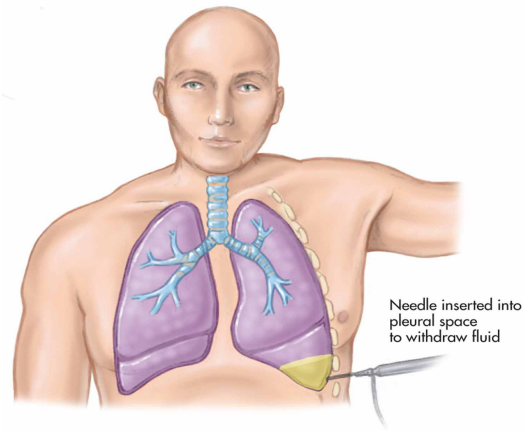
More reliable than CXR for detecting effusions.

What's the indication for CT in pleural effusion?

- For additional information about parenchymal lung or mediastinum like more consolidation or masses.

6- Thoracocentesis: It's aspiration of fluid.

Provides **diagnosis** in 75% of patients and **therapeutic** as it provides relief for large effusions.



***After you get the fluid send fluid for CBC, protein, LDH, glucose, gram stain, and cytology. THE 5 C's**

1. **Cytology**: to tell you if there's malignancy or not.
2. **Culture**: for diagnosis of
    a. Parapneumonic effusion
    b. Empyema
    c. TB
3. **Cell count**:
    a. **Neutrophils** → Parapneumonic and Empyema
    b. **Lymphocytes** → Malignancy, TB, Connective tissue disease.
    c. **Eosinophils** → Lymphatic obstruction, Fungal Infection, Drugs (FYI).
4. **Color:**
    a. **Red** :

Blood (Hemorrhagic effusion): Malignancy, TB, Connective tissue disease.

    b. **White**:

Lymphatic obstruction: Lymphoma, Thoracic duct injury, Chylothorax.

    c. **Turbid**[3]

Pneumonia (Parapneumonic effusion)

    d. **Yellow** "most common color"

Any of the mentioned causes above can cause yellow, but the most common cause is **CHF → because of proteins.**

[3] كأنه طبشير مخلوط مع مويه

e. **Black.**

f. **Purulent (white mixed with greenish color)** → Pus → Empyema.

What's Empyema? Pus within the pleural space.

Empyema : Complicated parapneumonic effusion, which means the pleural effusion is infected.	
Causes	1. Exudative Pleural effusions. 2. Complication of bacterial pneumonia.
Clinical features	• Clinical features of the underlying disease (pneumonia most common).
Diagnosis	• CXR and CT scan of Chest.
Treatment	1. Drainage and antibiotic therapy. 2. Recurrence is common → repeated drainage. 3. If severe and persistent → rib resection and open drainage.

5. Chemistry: For certain test to minimize your DDX.

g. **PH** → low in empyema.

h. **Glucose** → low in infections and malignancies.

i. **Proteins**.

In chemistry you need to know 2 important things to get Light's criteria:**LDH** and **Protein**.

Light's Criteria: "Determination of transudate versus exudate source of pleural effusion"

There are 3 items, you need 1 and the third one kick it out because it's the Same as the second one.

1. Protein in pleural effusion / Protein in serum **> 0.5**
2. LHD in pleural effusion / LHD in serum **> 0.6**
3. LDH > two-thirds the upper limit of normal serum LDH.

- ***Exudative effusion*** **meet at least one of the previous criterias.**
- ***Transudative*** **have none of these!**

★ **SUMMARY:**

Cause	Appearance of fluid	Type of fluid	Predominant cells
Tb	Serous	Exudate	Lymphocytes
Malignancy	Serous +/- blood-stained	Exudate	Serosal cells and lymphocytes
Cardiac Failure	Serous	Transudate	Few serosal cells
Pulmonary Infarction	Serous or blood stained	Exudate mainly	RBC's, eosinophils
Obstruction of thoracic duct	Milky	Chyle	None

★ **Treatment (treat underlying cause):**

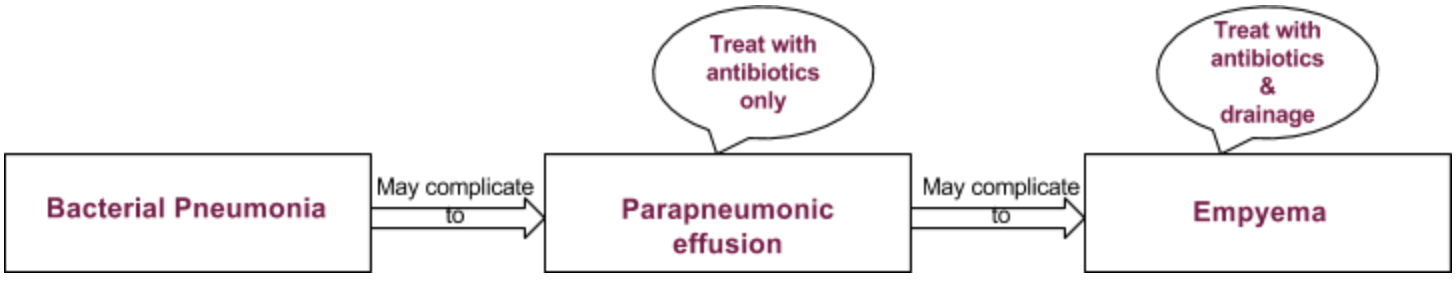
1- Transudative effusion:

- *Diuretics* and sodium restriction.
- Therapeutic thoracentesis (in massive effusion).

2- Exudative effusion: treat underlying cause.

3- Parapneumonic effusions (pleural effusion in the presence of pneumonia)

- Uncomplicated: antibiotics alone.
- Complicated or empyema:
  - Chest tube drainage and antibiotics.
  - Intrapleural injection of thrombolytic agents (streptokinase or urokinase); may accelerate the drainage.
  - Surgical lysis of adhesions may be required.



MCQs

1. A patient came presented with SOB, pleuritic chest pain, cough, joints pain, malar rash, oral ulcer and hair loss. What is the cause of the pleural effusion?

A. Pneumonia
B. CHF
C. SLE

2. A patient presented with SOB, pleuritic chest pain, cough, orthopnea, palpitation and lower limb swelling. What is the cause of the pleural effusion?

A. Pneumonia
B. CHF
C. SLE

3. A lady came in with SOB, Pleuritic Chest pain. On examination you found stony dullness, trachea shifted to the right side and CXR showed fluid in the pleural space of the left lung. What is the diagnosis?

A. Lung mass.
B. Pneumonia.
C. Pneumothorax.
D. Pleural effusion.

4. A 36 years old lady presented with fever, cough, yellowish sputum she went to Salamatic Hospital they gave her antibiotics for 3 days but no improvement, she came after 6 days with pleuritic chest pain, SOB on examination classical signs of pleural effusion, the CXR done for her showed right sided pleural effusion, thoracentesis is done and showed pus. What's the most likely diagnosis?

A. Pneumonia.
B. Viral pneumonia.
C. Heart Failure.
D. SLE.
E. Empyema.

Answers: 1.C, 2.B, 3.D, 4.E