Pleural Effusion

Objectives:

- Describe the pathophysiology of a pleural effusion
- Describe the main causes of a pleural effusion
- Differentiate among the manifestations of fluid collections
- Describe the signs and symptoms of a pleural effusion
- Explain diagnostic methods
- Describe the various treatment options

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Resources: 436 Slides, 435 team, Davidson, Kumar, Step up to medicine

- Editing File
- Feedback
**Definition:**

- **Pleura:**
  - Serous fluid [5-15 ml] that allows for the *parietal pleura* (*outer lining*) and *visceral pleura* (*inner lining*) to glide over each other *without* separation.
  - Produced by the *parietal Pleura*, absorbed and drained by *visceral Pleura*
  - 100-200ml of fluid circulates through the pleural space within a 24-hour period
  - Function: Pleural fluid helps in lubrication and prevents atelectasis\(^1\).
  - \(\geq 250\) ml of pleural fluid is pathological (below it is acceptable).
  - Patients with pleural effusion will present with: Chest pain and SOB.
  - What are the physical signs of pleural effusion?
    1. Dullness on percussion.
    2. Shifted trachea to the other side.
    3. Asymmetrical chest expansion.
    4. Decreased tactile fremitus.

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**Pleural Effusion**

**Pleural Effusion:**

Pleural effusion is an excessive accumulation of *serous fluid* within the *pleural space*, which can be detected on PA X-ray when \(\geq 300\) ml of fluid is present and *clinically* when \(\geq 500\) ml is present.

It is most commonly a unilateral effusion.

- **The accumulation of:**
  - frank\(^2\) pus is termed *empyema*.
  - blood is *haemothorax*.
  - chyle\(^3\) is a *chylothorax*\(^4\).

- **This accumulation can be caused by one of the following mechanisms:**
  - Increased production of fluid by cells in the pleural space.
  - Increased drainage of fluid into pleural space.
  - Decreased drainage fluid from the pleural space.

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\(^1\) the collapse or closure of a lung resulting in reduced or absent gas exchange

\(^2\) unmistakable; obvious

\(^3\) A milky fluid containing fat droplets which drains from the lacteals of the small intestine into the lymphatic system during digestion.

\(^4\) It results from lymph formed in the digestive system called chyle accumulating in the pleural cavity due to either disruption or obstruction of the thoracic duct.
### Pleural Effusion types:

<table>
<thead>
<tr>
<th>Transudative pleural effusion</th>
<th>Exudative pleural effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathophysiology (don’t bother about it, just know that there are different mechanisms for pleural effusion)</td>
<td>➔ Due to elevated capillary hydrostatic pressure in visceral or parietal pleura (e.g., CHF) ➔ Due to decreased plasma oncotic pressure (e.g., hypoalbuminemia) ➔ Due to increased intrapleural pressure (e.g. atelectasis).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Big Organs</th>
<th>The causes of the majority of pleural effusions are identified by a thorough history, examination and relevant investigations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Cardiac failure:</strong></td>
<td>Serous fluid, straw-coloured</td>
</tr>
<tr>
<td>2. <strong>Liver:</strong> Cirrhosis:</td>
<td>Movement of ascitic fluid from the peritoneal cavity into the pleural space through diaphragmatic defects.</td>
</tr>
<tr>
<td>3. <strong>Renal:</strong> Nephrotic syndrome.</td>
<td></td>
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<tr>
<td>4. <strong>Thyroid:</strong> Hypothyroidism.</td>
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<tr>
<td><strong>Others:</strong> ovarian tumours producing right-sided pleural effusion - Meigs’ syndrome.</td>
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Pulmonary embolism can cause both exudate and transudate (doctor said this is for your information)

1. **Bacterial Infections:**
   - **Tuberculosis** (chronic):
     - Fluid is *serous*, usually amber-coloured,
     - Fluid contains predominantly Lymphocytes (The diagnostic test for pleural TB is pleural biopsy)
   - **Pneumonia** (acute):
     - Parapneumonic effusion’ may lead to empyema

2. **Malignancy:**
   - Serous, often *blood* stained,
   - Serosal cells and lymphocytes ,
   - Often clumps of malignant cells.

3. **Inflammatory Diseases:**
   Collagen Vascular Disease (also called connective tissue disease)
   - Rheumatoid Disease,
   - *SLE* و أخواتها. (Serous, Lymphocytes are the predominant cells)

4. **Pulmonary infarction:**
   - Serous, or *blood* stained,
   - Fluid contains: Red blood cells and Eosinophils

5. **Viral infection.**
   Others: idiopathic pleural effusion, drugs (hydralazine).

<table>
<thead>
<tr>
<th>Light’s criteria for distinguishing pleural transudate from exudate: (Important).</th>
<th>98% sensitive and 83% specific for exudative effusion using Light’s criteria.</th>
</tr>
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<tbody>
<tr>
<td>Exudative effusions have at least one of the following <em>(transudates have none of these)</em>:</td>
<td></td>
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<tr>
<td>● Protein (pleural)/protein (serum) &gt;0.5 for example, you have a pleural fluid with protein level 40, and serum with protein level 20, the total is 0.5 and it is exudative pleural effusion because it should exceed 0.5.</td>
<td></td>
</tr>
<tr>
<td>● LDH (pleural)/LDH (serum) &gt;0.6</td>
<td></td>
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<tr>
<td>● LDH &gt; two-thirds the upper limit of normal serum LDH (same concept in point 2)</td>
<td></td>
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</tbody>
</table>
The most common causes are:

1. **CHF** is the most common cause.
2. **Pneumonia** (bacterial)
3. **Malignancies**: lung (36%), breast (25%), lymphoma (10%)
4. **Pulmonary embolism** (PE)
5. Viral diseases
6. Cirrhosis with ascites

**Manifestations of Fluid Collections**

(To differentiate between empyema and complicated parapneumonic effusion look at the color; empyema has pus (~yellow) while parapneumonic effusion is turbid)

**THE 5 C’s: (very important)**

1. **Cytology**: to tell you if there’s malignancy or not e.g. cells of metastatic adenoma from the breast.
2. **Culture**: for diagnosis of Parapneumonic effusion, Empyema, TB
3. **Cell count**: look for the DDx depending on the predominant cells (not the total number of WBC):
   - **Lymphocytes** (chronic)
     - Think about the causes for red color
     - Malignancy, TB, Connective tissue disease (e.g. sarcoidosis, SLE) & trauma or bleeding.
     - Predominant (>60%) lymphocytes = red color
   - **Neutrophils** (PMN) (acute)
     - Parapneumonic (Acute infection), Empyema, Rheumatoid or Pulmonary infarction
   - **Eosinophils**
     - Lymphatic obstruction, Fungal Infection, Allergy, Drugs (e.g. hydralazine).
     - Others: Trauma, pneumothorax, CA, Asbestos, parasites, Pneumonia
     - Predominant eosinophils = green color
   - **RBC > 100,000/mm**
     - Malignancy, Trauma, Pulmonary infarction
4. **Color/Character**: pleural fluid is normally colorless (transparent)
   - **Red**: Exudative effusions that are primarily lymphocytic:
     - Blood (Hemorrhagic effusion/trauma), Malignancy, TB (chronic infection), Connective tissue disease. How to know if this blood is hemothorax or iatrogenic? We divide the hematocrit level in the pleura by the hematocrit level in the blood, if it is ≥50% = hemothorax (blunt)
   - **Green**: Fungal infection
   - **White/Milky**: Lymphatic obstruction as in Lymphoma, Thoracic duct injury, Chylothorax (lymph in the pleural space)
   - **Yellow**: Any of the mentioned causes above can cause yellow “it’s the most common color”.
   - **Turbid**: Acute infection = Pneumonia (Parapneumonic effusion)
Acute infection will give you turbid while chronic infection (TB) will give you red

Aspergillus niger and Rhizopus oryzae, metastatic melanoma, Read more

→ Pus → Empyema.

So how to differentiate between Empyema and Parapneumonic effusion?
By appearance and color: Parapneumonic = Turbid  empyema = PUS

5. Chemistry: To minimize your DDX.

<table>
<thead>
<tr>
<th>PH (&lt; 7.2), Glucose, Protein &amp; LDH(for light’s criteria)</th>
<th>In general, pleural fluids with a low glucose level also have low pH and high LDH levels (Exudate), as in infections (parapneumonic effusion or empyema), connective tissue disease, TB and malignancies, esophageal rupture, pancreatitis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated pleural fluid amylase</td>
<td>Elevated pleural fluid amylase: esophageal rupture, pancreatitis, malignancy.</td>
</tr>
<tr>
<td>Milky, opalescent fluid</td>
<td>Chylothorax (lymph in the pleural space)</td>
</tr>
<tr>
<td>Frankly purulent fluid</td>
<td>Empyema (pus in the pleural space)</td>
</tr>
<tr>
<td>Bloody Effusion</td>
<td>Malignancy</td>
</tr>
<tr>
<td>Exudative effusions that are primarily lymphocytic</td>
<td>TB</td>
</tr>
<tr>
<td>pH &lt; 7.2 (most important indication for inserting chest drain)</td>
<td>Parapneumonic effusion or empyema</td>
</tr>
</tbody>
</table>

- **Empyema:** (pus within the pleural space)

Exudative pleural effusions -if left untreated- can lead to empyema, which means the pleural effusion is infected.

- The Pus may be as thin as serous fluid or so thick that it is impossible to aspirate
- **Most cases** occur as a complication of bacterial pneumonia (parapneumonic effusion).
- Empyema may involve the whole pleural space or only part of it (‘loculated’ or ‘encysted’ empyema).

◆ **Clinical features:** The clinical features are those of the underlying disease (most commonly pneumonia).
◆ **Diagnosis:** CXR and CT scan of the chest are the recommended tests.
◆ **Treatment:** aggressive drainage of the pleura (via thoracentesis) and antibiotic therapy.
  - If the condition is not adequately treated, pus may rupture into a bronchus, causing a bronchopleural fistula and pyopneumothorax.

To differentiate empyema from complicated parapneumonic effusion we look at the color. If it is pus (usually very yellow, but not always) then it is empyema. If it is Turbid, then it is parapneumonic.

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8 Lactate dehydrogenase
9 A parapneumonic effusion is a non infected pleural effusion secondary to bacterial pneumonia.
10 Over 40% of patients with community-acquired pneumonia develop an associated pleural effusion (‘parapneumonic’ effusion)
11 Chest X-ray appearances may be indistinguishable from those of pleural effusion.
Signs & Symptoms of Pleural Effusion

- **Clinical Features: (important)**
  
  - **History / Symptoms: (Often asymptomatic)**
    
    1. **Symptoms of pleural effusion:**
       - Pleuritic chest pain (on inspiration and coughing) (defined as pain in the lung)
       - Cough
       - Dyspnea (ALL patient with Pleural Effusion will present with pain and dyspnea)
    
    2. **Symptoms of the underlying cause**, e.g. in CHF: Peripheral edema, orthopnea, paroxysmal nocturnal dyspnea. Or Sx related to malignancy.
    
    e.g. if related to pneumonia or aspiration then cough.
    SLE patient: classical symptoms of SLE (rash, fatigue) + (musculoskeletal pain – joint pain) + chest pain, shortness of breath.

  - **Physical examination / Signs: (very important)**
    
    (Findings usually present for effusions > 300 mL)
    
    - **Stony dullness** to Percussion\(^\text{12}\).
    - **Reduced** tactile fremitus\(^\text{13}\).
    - Asymmetrical chest wall expansion → reduced in affected side. The side containing the fluid moves slower.
    - **Decreased vesicular breath sounds** over the effusion.
    - Egophony\(^\text{14}\) above the effusion.
    - Trachea will shift away from the affected side.
    - Palpation of apex beat → if the effusion was on the left side apex beat will be displaced, or if it was on the right side but there was cardiomegaly.

- **Physiological & pathological breath sounds** 6:03 minutes

**Diagnosis**

- **Diagnosis:**
  
  1- **History & 2- Physical examination** → give 85% of diagnosis.
  
  3- **Chest x-ray:** Initial diagnostic test for pleural effusion. (Very simple and non-invasive)
    
    - **Postero-anterior:** Around 250-500 mL of pleural fluid must accumulate before an effusion can be detected. Look for: **blunting of costophrenic angle**\(^\text{15}\)

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\(^{12}\) Characteristic for pleural effusion.  
\(^{13}\) Tactile fremitus is a vibration that you can feel with the palm of your hands when someone says "blue moon" or "99". increased fremitus is a sign of consolidation. Decreased fremitus is a sign of pneumothorax or pleural effusion.  
\(^{14}\) Is an increased resonance of voice sounds heard when auscultating the lungs, often caused by lung consolidation and fibrosis. This finding is referred to in clinical contexts as the "E to A transition."
- **Lateral decubitus films** (patient lying on one side): very sensitive, can detect effusions as small as 50 mL. (it is old, not used anymore)

4- **CT scan**: What’s the indication for CT in pleural effusion?
- CT scanning is indicated where malignant disease is suspected.
- Better characterization of underlying lung parenchyma and certain processes that may be obscured on radiographs by large pleural effusions. E.g. consolidation or masses. More reliable than CXR for detecting effusions.
- To detect the underlying cause, PE, ovary masses could cause pleural effusion (meigs syndrome)\(^6\)
- Gold standard for detecting loculated pleural effusion.
- Fluid is darker than solid. Solid can be pus (empyema), consolidation (pneumonia), Tumor, atelectasis (mucus bands that adhere to the lung tissue and appears like pus).

5- **Ultrasound**: What are the advantages of ultrasound?
- More sensitive and specific\(^7\) and it can detect minimal fluid.
- It will help you to rule out others like pneumothorax and fluid collection.
- A very important step in diagnosing the patient.
- Cheap and available at bedside
- Can help identify free vs. loculated effusions. Disadvantage: Operator dependent. Usually a pulmonologist will perform it and not a radiologist.

6- **Thoracentesis**\(^8\): It’s aspiration of fluid *facilitated by ultrasound guidance*

   Has two aims: diagnostic & therapeutic
- Thoracentesis is not immediately indicated if there is an obvious explanation for pleural effusion without atypical features. E.g. a patient with CKD and on hemodialysis, we don’t need to do thoracentesis as we already know the cause. Or a patient known for HF and regularly comes with pulmonary edema and pleural effusion.
- Indications for thoracentesis:
  - NEW Pleural effusion of **unknown** etiology, with >10mm depth on lateral decubitus CXR or Ultrasound
  - Therapeutically for **symptomatic relief**
  - Concern for empyema
  - Air fluid level in pleural space\(^9\)
- Pneumothorax is a complication seen in 10% to 15% of thoracenteses. - After you get the fluid send it for analysis.

   - Pleural effusion on CT or CXR can’t show the nature of the effusion whether it’s blood, pus or any other type, so thoracentesis helps identifying the nature of the effusion.

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\(^{15}\) Need to be larger than 500 mL to cause much more than blunting of the costophrenic angle. On an erect film they produce a characteristic shadow with a curved upper edge rising into the axilla. If very large, the whole of one side of the thorax may be opaque, with shift of the mediastinum to the opposite side.
\(^{16}\) Meigs syndrome is defined as the triad of benign ovarian tumor with ascites and pleural effusion
\(^{17}\) More accurate than plain chest X-ray for determining the presence of fluid.
\(^{18}\) an invasive procedure to remove fluid or air from the pleural space
\(^{19}\) The pleural effusion behaves according to basic fluid dynamics. If the pleural space contains both air and fluid, then an air-fluid level that is horizontal will be present, instead of conforming to the lung space.
### Cell Count

| Lymphocytic > 50% | - CA (30-35%)  
| - TB (15-20%)  
| - Sarcoidosis  
| PMNs | - Empyema  
| - Parapneumonic  
| - Rheumatoid  
| - Pulmonary infarction  
| PMN or Lymphocytic | - PE  
| - Conn tissue disease  
| - Post-cardiac injury  
| Eosinophilic > 10% | - Trauma  
| - PTX  
| - CA  
| - Asbestos, parasites  
| - Pneumonia  
| RBC > 100,000/mm | - CA  
| - Trauma  
| - Pulmonary infarction  

### Treatment

**Treatment:** (one sentence: Treat the underlying cause)

**Thoracentesis – then treat underlying disease**

- **Uncomplicated pneumonia:** antibiotics.
- **Hemithorax involved/empyema:** tube thoracostomy\(^{20}\) +/− VATS\(^{21}\)
- **Malignant effusion:** chest tube +/− pleurodesis (sclerosants)\(^{22}\) / VATS

(Chest tube is the first step in treating empyema (drain))

Drain is optional for symptomatic relieve, but its mandatory for empyema.

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

2. **Exudative effusion treat underlying cause.**

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\(^{20}\) Tube thoracostomy is the insertion of a tube (chest tube) into the pleural cavity to drain air, blood, bile, pus, or other fluids. [How is it different from thoracocentesis?](#)

\(^{21}\) Video-assisted thoroscopic surgery (VATS) is a type of thoracic surgery performed using a small video camera that is introduced into the patient’s chest via small incisions.

\(^{22}\) Pleurodesis is a medical procedure in which the pleural space is artificially obliterated. It involves the adhesion of the two pleurae.
3- Parapneumonic effusions:
- 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.

A patient came to the ER with SOB, weight loss and CXR showed massive pleural effusion, what’s the next step?
➔ Ultrasound?
➔ Thoracocentesis?
➔ CT?

The right step is to perform Thoracocentesis, since the patient came to ER your aim should be to relieve his symptoms and approach to diagnose him, and that will be done through aspirating the fluid (Relive) and sending it to Pathology (Diagnose)

**Summary**

- **Pleural effusion** is an excessive accumulation of serous fluid within the pleural space.
  - If it is: - Frank pus > empyema, - blood > haemothorax, - chyle > chylothorax.
- Types: 1) Exudative.  2) Transudative.
- **Light’s criteria:** Exudative effusions have at least one of the following:
  1- Protein (pleural)/protein (serum) >0.5
  2- LDH (pleural)/LDH (serum) >0.6
  3- LDH >2/3 the upper limit of normal serum LDH

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<th>Manifestations of Fluid Collections THE 5 C’s:</th>
<th>4. Color/Character:</th>
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<td>1. Cytology:</td>
<td>Red</td>
</tr>
<tr>
<td>2. Culture:</td>
<td>Blood (Hemorrhagic effusion), Malignancy, TB</td>
</tr>
<tr>
<td>3. Cell count:</td>
<td>Green</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>Fungal infection</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>White/Milky</td>
</tr>
<tr>
<td>Eosinophils</td>
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<td>RBC &gt; 100,000/mm</td>
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<td>RBC &gt; 100,000/mm</td>
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</tr>
<tr>
<td>PH (&lt; 7.2)</td>
<td>Yellow</td>
</tr>
<tr>
<td>Glucose, Protein &amp; LDH</td>
<td>Malignancy, Trauma, Pulmonary infarction</td>
</tr>
<tr>
<td>Lymphatic obstruction, Fungal Infection, Allergy, Drugs</td>
<td></td>
</tr>
<tr>
<td>(Parapneumonic effusion)</td>
<td>Brown/ Roasted</td>
</tr>
<tr>
<td>RBC &gt; 100,000/mm</td>
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<td>Yellow</td>
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- **Clinical Features:** chest pain \ Cough \ Dyspnea \ Stony dullness \ Decreased vesicular breath sounds \ Trachea will shift away from the affected side \ Reduced tactile fremitus.
- **Diagnosis:** Initial diagnostic test > Chest x-ray
- **Treatment:** Thoracentesis – then treat underlying disease
1) A 55-year-old man presents with progressive shortness of breath. Other than a history of heavy smoker, the patient has no significant past medical history. Breath sounds are absent two-thirds of the way up on the left side of the chest. Percussion of the left chest reveals stony dullness, the trachea appears to be deviated toward the right. Which of the following diagnoses is most likely? *(From the doctor’s lecture)*

A. Bacterial pneumonia  
B. Viral pneumonia  
C. Bronchial obstruction  
D. Pleural effusion  
E. Pneumothorax  

The correct answer is **D**

2) A 59-year-old male presents with a community acquired pneumonia complicated by pleural effusion. A thoracentesis is performed, but the results are not currently available. Which characteristic of the pleural fluid is most suggestive complicated parapneumonic pleural effusion? *(From the doctor’s lecture)*

A. Presence of more than 30% polymorphonucleocytes (PMNs)  
B. Glucose less than 150 mg/dl  
C. Presence of more than 100 white blood cells  
D. pH less than 7.20  
E. Lactate dehydrogenase (LDH) more than two-thirds of the normal upper limit for serum  

The correct answer is **D**

(In this question, which answer (feature) says that it is parapneumonic? (A) is wrong because neutrophils must be more than 60%. (B) is wrong because glucose is very high. (C) is wrong because the total number of WBC is not needed here. (D) is correct because of low pH. (E) is wrong because LDH levels are specifically used to indicate if the fluid is exudate or transudate.)

3) A 50 year old lady presents to the emergency department with increased shortness of breath on exertion over the past 3 months. She has a past history of breast cancer 10 years previously treated with mastectomy and no known recurrence. Oxygen saturations are 94% on air and PO2 of 9 kPa on arterial blood sampling. Chest X-ray shows a large right-sided pleural effusion. The next appropriate investigation would be: *(Kumar)*

A. Chest CT  
B. Chest drain insertion  
C. Pleural aspiration
4) A 59 year old man with shortness of breath is brought to the emergency department for evaluation. He has a past medical history of hepatitis B, cirrhosis, and recurrent pulmonary infections. A chest x-ray is obtained and reveals a large, right-sided pleural effusion. Thoracentesis is undertaken, which reveals that the ratio of pleural protein to serum protein is >0.5. What is the most likely explanation for these findings? (step-up)

   A. Pulmonary infarction
   B. Atelectasis
   C. Hypoalbuminemia
   D. Cirrhosis
   E. Pneumonia

The correct answer is E

Explanation: This patient has an exudative pleural effusion as suggested by the pleural effusion found on chest x-ray. Thoracentesis reveals that the pleural protein/serum protein ratio is >0.5, which is characteristic, based on Light’s criteria rule, for an exudative effusion. The differential diagnosis of an exudative effusion includes bacterial pneumonia, TB, malignancy, viral infection, pulmonary embolism, and collagen vascular diseases. Atelectasis and cirrhosis are both common causes of transudative pleural effusion; in these patients, the pleural protein/serum protein ratio is <0.5. Hypoalbuminemia is also a common cause of a transudative pleural effusion with a pleural protein/serum protein ratio <0.5; further, the pleural LDH/serum LDH ratio is <0.6. Pulmonary embolism, not pulmonary infarction, is associated with formation of transudative pleural effusion. In these patients, the pleural protein/serum protein ratio is <0.5.

5) A 55 year old man presents to the emergency department with shortness of breath and chest pain. Physical examination suggested the presence of pleural effusion in the right side of the chest. A PA chest X-ray was taken. What is the most likely finding in the X-ray?

   A. Hyperinflation of the lungs.
   B. Blunting of the right costophrenic angle.
   C. Flattening of the diaphragm.
   D. Normal chest X-ray.

The correct answer is B

6) Thoracocentesis was done to a patient who’s physical exam and chest X-ray were positive for pleural effusion. Cell count showed predominant PMNs. What is the most likely cause for this patient’s pleural effusion?

   A. Malignancy.
   B. Tuberculosis.
   C. Parapneumonic.
   D. Fungal infection.

The correct answer is C

7) A 57 year old man with bacterial pneumonia is hospitalized on the medical service. He has a left-sided pleural effusion and underwent thoracentesis. The pleural LDH/serum LDH is >0.6. One week later, he reaccumulates the effusion, and chest X-ray shows a large left-sided pleural effusion. What is the most appropriate course of action to take? (Step-up)

   A. Antibiotics, oral.
   B. Consideration for rib resection with open drainage.
   C. Antibiotics, intravenous.
   D. Lung lobectomy.
   E. Corticosteroid infusion.

The correct answer is B

Explanation: This patient has empyema. Most cases are a complication of bacterial pneumonia, but it can also occur with mediastinitis or abscess. This condition should be treated with open drainage since the patient has failed treatment with thoracentesis. Recurrent exudative pleural effusion is best treated more aggressively than simply with antibiotics.
Corticosteroids may suppress the immune system and worsen the empyema. Lung lobectomy should not be required; once the exudative effusion is removed, the lung should heal.

8) A 38 years old female who have been smoking Shisha daily for 20 years, came to the ER with severe shortness of breath exacerbating with lying down. On history, the patient mentioned loss of 10 kg on the last 3 months. On clinical examination there was asymmetrical chest expansion. Chest X-Ray showed massive pleural effusion on the left lung. Thoracocentesis was performed and red colored effusion was shown. What is the first DDx comes to your mind?
   A. Fungal infection.
   B. Pneumonia.
   C. Tuberculosis.
   D. Trauma.
   E. Malignancy.
   The correct answer is E

7) Abnormality in which organ can affect the amount of the fluid in pleural space?
   A. Lungs.
   B. Brain.
   C. Ovaries.
   D. Testes.
   E. Liver.
   The correct answer is C

8) Which procedure can relieve symptoms but can’t treat the primary cause?
   A. CT angiogram.
   B. Thoracocentesis.
   C. Treating the underlying disease.
   D. B&C.
   E. None of the above.
   The correct answer is B

9) Which one of the following is considers the most common cause of pleural effusion?
   A. Primary lung cancer.
   B. Congestive heart failure.
   C. Mesothelioma.
   D. Trauma.
   E. Pneumonia.
   The correct answer is B

10) Choose the clinical signs that matches a patient with sever pleural effusion.
    A. Chest inflation > 5cm, resonant on percussion.
    B. Infraclavicular dullness, sharp costophrenic angles on CXR.
    C. Stony dullness on percussion, asymmetrical chest expansion.
    D. B&C.
    E. None of the above.
    The correct answer is C