Diagnosis of Pleural Effusions

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KEYWORDS

• Pleural effusion • Transudate • Exudate • Thoracentesis • Malignant pleural effusion

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Consider heart failure and malignancy in patients with bilateral pleural effusions.
2. Consider the possibility of cancer or bacterial infection in patients with unilateral massive effusions.
3. Suspect malignancy whenever pleural thickening or nodules are present on transthoracic ultrasonography (TUS) or contrast-enhanced computed tomography (CT) imaging.
4. Use TUS to help locate small effusions, identify loculations, and guide pleural procedures, such as thoracentesis and chest tube insertion.
5. Apply Light's criteria for discriminating exudates from transudates. Exudates have either a pleural fluid to serum protein ratio greater than 0.5, a pleural fluid to serum lactate dehydrogenase (LDH) ratio greater than 0.6, or a pleural fluid LDH greater than two-thirds the laboratory's upper limit of normal for serum.
6. Calculate the serum to pleural fluid albumin gradient if an effusion meets Light's exudative criteria by a narrow margin.
7. Provide chest tube drainage in parapneumonic effusions with marked pleural fluid acidosis (pH <7.20).
8. Establish a presumptive diagnosis of tuberculous pleuritis in lymphocytic exudates with a pleural adenosine deaminase activity between 35 U/L and 250 U/L. A greater value suggests lymphoma.
9. Be aware of the relatively low sensitivity of pleural fluid cytology (50%–60%) in malignant effusions.

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10. Use pleuroscopy in most cases of suspected malignant effusions with negative fluid cytology; but consider CT-guided pleural biopsy, provided there is nodularity or thickening of the parietal pleura.
11. Review the history and imaging, reanalyze pleural fluid, and follow up until there is a resolution of the effusion in undiagnosed cases.

PATHOPHYSIOLOGY AND EPIDEMIOLOGY

1. How do pleural effusions develop?

The normal pleural cavity contains 8 to 12 mL of fluid per hemithorax for lubrication.[1] The fluid mainly arises from the microvessels of the parietal pleura, enters the pleural space, and is then absorbed through the parietal pleural lymphatics. When the volume of liquid increases in the pleural space, the rate of absorption can increase up to 30-fold. Hence, when pleural fluid accumulates in excess, both increased formation and decreased absorption are likely.[2]

Pleural effusions have classically been divided into transudates and exudates. According to the Starling law, a transudate is caused by an imbalance of the hydrostatic (eg, heart failure, superior vena cava syndrome) or osmotic (eg, hypoalbuminemia) pressure gradient between the pulmonary capillaries and the pleural space, along with the inability of the parietal lymphatics to keep up with the fluid influx.[2] Decreased pleural pressures (eg, atelectasis, trapped lung) and the transdiaphragmatic transfer of transudative fluid from the peritoneal cavity (eg, hepatic hydrothorax) can also result in pleural transudates. In contrast to transudates, where pleural membranes are normal, exudates accumulate because of factors local to the pleura, such as increased capillary permeability and/or an impaired lymphatic drainage resulting from many potential inflammatory and malignant causes. Alternatively, a ruptured thoracic duct or blood vessel may permit the entry of chyle (chylothorax) or blood (hemothorax) into the pleural cavity. Unlike transudates, exudates are caused by numerous different conditions, and they may require an extensive diagnostic investigation (**Table 1**).[2]

2. What are the leading causes of pleural effusions?

In most series, more than three-fourths of all effusions are caused by heart failure, malignancy, pneumonia, and, in developing countries, tuberculosis.[2,3] Specifically, in the author's experience during the last 17 years, with more than 2900 consecutive adult patients having diagnostic thoracentesis at the Arnau de Vilanova University Hospital (Lleida, Spain), 80% of pleural effusions were explained by the following: cancer (27%), heart failure (20%), pneumonia (18%), tuberculosis (9%), pericardial diseases (3.5%), and cirrhosis (3%).[4] Effusions that are seldom aspirated because the diagnosis is clear or their sizes are small (eg, heart failure, pulmonary embolism) are underrepresented in this series. On the other hand, the burden of tuberculosis varies widely among different countries, being highest in Asia and Africa. Both the United States and Spain were classified by the World Health Organization as areas of low incidence rates of tuberculosis (0–24 cases per 100,000 population) in 2011, in contrast to many African countries (>300 cases per 100,000 population).[5] However, there are about 670 new cases of pleural tuberculosis each year in the