Causes and Management of Common Benign Pleural Effusions

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KEYWORDS

• Pleural • Effusion • Empyema • Pleurodesis • Malignant • Parapneumonic • Chylothorax • Mesothelioma

KEY POINTS

- Benign pleural effusions have diverse causes and manifestations, which often makes their diagnosis and management challenging. They are twice as common as malignant effusions.
- Differentiating effusions as a transudate or exudate is helpful in directing investigations and management. Extensive investigations may not be necessary in transudative effusions.
- Congestive heart failure and hepatic hydrothorax are the commonest causes for transudative effusion. Treatments are directed at the underlying cause, although a more specialized approach may be required in refractory cases.
- Parapneumonic effusions secondary to bacterial infections and tuberculous effusions (in endemic regions) are the commonest type of benign exudative effusions. Other common causes include pulmonary embolism, drugs, collagen vascular diseases, or they may occur after cardiac surgery. More extensive diagnostic evaluation including detailed clinical history, appropriate imaging and pleural sampling, and a tailored management approach are often required in exudative effusions.

INTRODUCTION

Pleural effusion is a common cause of morbidity worldwide; its incidence and causes vary depending on the population studied. An estimated 1 million patients suffer from a pleural effusion annually in the United States alone.[1]

Pleural effusions can arise from diseases of the pleura or extrapleural, particularly cardiopulmonary, though anatomical variations are common disorders. More than 90% of all effusions in developed countries are caused by congestive heart failure (CHF), malignancy, pneumonia, and pulmonary embolism.[2] Tuberculosis (TB) is a common cause of pleural effusions in endemic regions.

Although malignancy is always a concern in patients presenting with a pleural effusion, more than 60 benign causes have been described.[3] Benign pleural effusions are at least twice as common as malignant ones in most epidemiologic

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series (**Table 1**). The diverse causes and manifestations of benign effusions make them common diagnostic challenges. This article describes the clinical approach to common benign pleural effusions.

PATHOPHYSIOLOGY OF PLEURAL EFFUSION FORMATION

The normal physiologic pleural fluid is a transudate with an estimated volume of 0.1 to 0.2 mL/kg body weight.[4] Excessive accumulation of pleural fluid develops when the rate of fluid formation exceeds its drainage capacity. This situation can result from increased pleural fluid formation or decreased fluid absorption, or often both.[5]

LIGHT'S CRITERIA

Given the many causes of pleural effusions, conventionally the workup of pleural effusions begins by broadly triaging them as transudates and exudates. The differential diagnosis and pathophysiology of transudates and exudates are different, as is often the management.

Transudates arise from imbalances between the hydrostatic and/or oncotic pressures, which result in fluid extravasation and accumulation in the pleural cavity.[6] The underlying pleura and the vascular permeability to proteins remain normal. In contrast, most exudative effusions develop as a result of vascular hyperpermeability and plasma leak, usually a manifestation of malignant or inflammatory disorders. The underlying disease(s) may also impair fluid drainage via the stomata on the parietal pleura or the downstream lymphatic channels.

Table 1
Estimated annual incidence of common benign pleural effusions in the United States

Type of Effusion	Annual Incidence
CHF effusions	500,000
Parapneumonic effusion (including empyema)	300,000
Pulmonary emboli-related effusions	150,000
Viral pleuritis	100,000
Postcoronary artery bypass surgery effusions	60,000
Hepatic hydrothorax	50,000
Collagen vascular disease-related effusions	6000
TB pleuritis	2500
Asbestos-related pleural effusions	2000

Data from Light RW. Pleural diseases. 4th edition. Philadelphia: Lippincott Williams & Wilkins; 2001.

The Light's criteria are commonly used to distinguish between transudative and exudative pleural effusions.[7] An exudative pleural effusion is one that fulfills 1 or more of the following 3 criteria, whereas a transudate is one that meets none[7]:

1. Pleural fluid/serum protein ratio greater than 0.5
2. Pleural fluid/serum lactate dehydrogenase (LDH) ratio greater than 0.6
3. Pleural fluid LDH greater than two-thirds the upper limit of normal for serum LDH

The Light's criteria can identify an exudative effusion with a sensitivity of 98% and specificity of 74%,[8] and is better than other parameters proposed to date. The Light's criteria are designed to be conservative and to rather overcall effusions as exudates than to misclassify exudates as transudates. False-positive and false-negative results do occur, and clinical judgment must be exercised in the interpretation of results. One common example of false exudate occurs in patients with CHF receiving diuretics whose pleural fluid often has a protein level in the exudative range.[9] Clinicians may also be misguided by separation of effusion into a transudate or exudate if there are concurrent (and opposing) causes of the effusion (eg, concomitant pleural malignancy and CHF).

Triaging effusions into transudates or exudates does not provide a diagnosis. An increasing number of disease-specific biomarkers are now available to help define the cause of an effusion.[10]

Nonetheless, defining a pleural effusion as a transudate or exudate remains helpful in directing investigations in most cases. Extensive investigations are unnecessary in cases of transudative effusions and management is primarily directed at treating the underlying cause (eg, CHF). An exudate often demands a more extensive diagnostic evaluation, and management is directed toward control of the effusion and treatment of the underlying cause.[11]

TRANSUDATIVE PLEURAL EFFUSIONS

Overall, transudative pleural effusions are more common than exudates in unselected patient populations. CHF and hepatic hydrothorax are the commonest causes for a transudative effusion. Uncommon causes include nephrotic syndrome, amyloidosis, urinothorax, peritoneal dialysis, and hypothyroidism (**Table 2**).[3,11]

CHF

CHF accounts for almost half of all pleural effusions in many series.[2,12]