Case #124

NAME Educational Activities Committee

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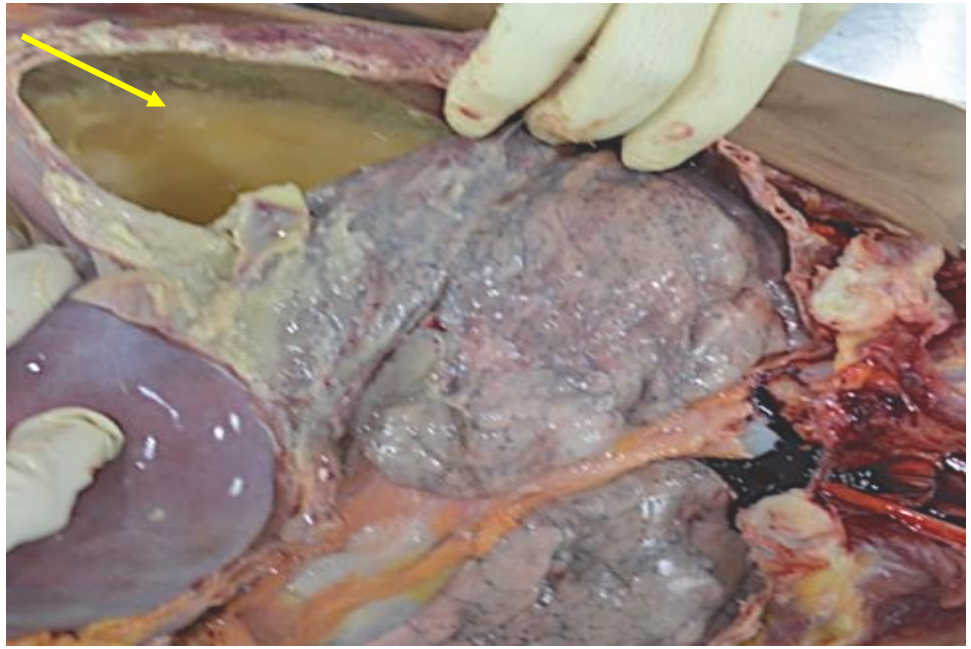


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1. A 46-year-old homeless woman with a history of chronic smoking was found dead after experiencing weeks of right-sided chest pain without respiratory symptoms and refusing medical care. Autopsy revealed a right-sided subareolar breast abscess with purulent, necrotic tissue, along with a large right-sided pleural empyema containing approximately 300 mL of thick, foul-smelling pus. Cultures from both sites confirmed the presence of Proteus mirabilis. No signs of trauma or gross evidence of pneumonia or infections in other organs were identified.

What is the most likely pathophysiological mechanism of pyothorax in this patient?

- ◯ Hematogenous dissemination of breast infection to the pleura
- ◯ Direct contiguous spread from an infected breast abscess into the pleural space
- ◯ Lymphatic spread
- ◯ Occult pneumonia with parapneumonic empyema

ANSWER

B. Direct contiguous spread from an infected breast abscess into the pleural space

(CORRECT ANSWER, 75.19 % of responses)

The patient's empyema (pyothorax) most likely resulted from direct contiguous spread of infection from the subareolar breast abscess into the adjacent pleural cavity. This explanation is supported by the identical microbiological findings—***Proteus mirabilis***—isolated from both the breast and pleural sites, and by the anatomical proximity between subareolar tissue and the thoracic cavity. No alternative infectious focus was identified on autopsy. This mechanism is highly plausible given the rare but documented phenomenon of fistulization or local invasion by chronic subareolar abscesses, particularly in smokers. Chronic smoking leads to ductal epithelial damage and squamous metaplasia, which predispose to duct obstruction, abscess formation, and recurrent infection. Over time, chronic inflammation may result in tissue necrosis, fibrosis, and erosion into adjacent compartments, including the pleural space. Although uncommon, this route has been previously reported in the literature, particularly among neglected breast infections in high-risk or immunocompromised individuals. Cases such as that reported by Valente et al[3] demonstrate how chronic abscesses can penetrate deep tissue layers, potentially reaching the thoracic cavity. As emphasized in pleural disease reviews, direct extension from nearby structures—though far less common than parapneumonic spread—should be considered when the clinical and microbiological evidence align.

This rare but clinically significant pathway underscores the importance of early recognition and appropriate management of chronic, non-puerperal breast infections, especially among high-risk populations such as smokers and socioeconomically vulnerable women, to prevent progression to life-threatening complications like empyema.

INCORRECT ANSWERS

A. Hematogenous dissemination (4.86 % of responses)

Hematogenous dissemination, or the spread of infection via the bloodstream, is highly unlikely in this case of pyothorax. This mechanism typically requires the presence of systemic bacteremia, with multifocal organ involvement and clinical or autopsy evidence of sepsis—none of which were observed in this patient. The autopsy revealed no signs of septicemia or distant organ infection, and there were no features suggesting septic emboli or disseminated abscesses. Furthermore, Proteus mirabilis, the organism isolated from both the breast abscess and pleural space, is not commonly associated with hematogenous spread to the pleura. It is primarily linked to urinary tract and wound infections, and rarely implicated in pleuropulmonary disease via the bloodstream, especially in the absence of instrumentation or healthcare-associated exposure.

Anatomically and pathophysiologically, the pleura is not a frequent site for hematogenous seeding, particularly without preceding or concurrent lung infection. Most pleural infections via the bloodstream are secondary to severe bacteremia or infective endocarditis and involve more common respiratory pathogens like *Streptococcus pneumoniae* or *Staphylococcus aureus*.
Hematogenous pleural infections are rare and usually part of a widespread septic process. Given the localized nature of infection, the lack of pulmonary or systemic involvement, and the direct anatomical connection between the breast and pleural cavity, the pathophysiological mechanism most consistent with the evidence is direct contiguous spread rather than hematogenous dissemination.

C. Lymphatic Spread (9.21 % of responses)

Lymphatic spread from the breast to the pleural space is anatomically possible but extremely rare, and the circumstances in this case do not support it as a plausible mechanism. Normally, lymphatic drainage of the breast flows toward the axillary, supraclavicular, and parasternal (internal mammary) lymph nodes. From there, it may communicate with deeper nodes, such as the mediastinal group. However, this route is typically associated with the spread of breast cancer, not infections. The lymphatic network does not establish direct pathways to the pleural cavity unless a nodal rupture or direct invasion occurs—neither of which were seen here.

Furthermore, autopsy findings in this case showed no lymphadenopathy, mediastinal involvement, or signs of systemic or nodal infection. The absence of enlarged or inflamed lymph nodes, along with the lack of infection in other organs, argues strongly against a lymphatic route. Additionally, the matching microbiological profile—***Proteus mirabilis*** found in both the breast abscess and the pleural empyema—points to direct spread, rather than dissemination through lymphatic vessels.

Infections that spread via lymphatics, when they do occur, often result in intermediate lymph node involvement (lymphadenitis) or localized inflammation, neither of which were present. lymphatic spread is a rare cause of empyema and is largely confined to cases involving malignancy or widespread systemic infection, not isolated breast abscesses.

D. Occult Pneumonia with Parapneumonic Empyema (10.74 % of responses)

While pneumonia is indeed the most frequent underlying cause of empyema, occult pneumonia is highly unlikely in this case based on both clinical presentation and autopsy findings. Occult pneumonia typically refers to a pneumonia that is not clinically evident and may be radiographically subtle, often occurring in elderly, immunocompromised, or hospitalized patients. It is more common among those with impaired cough reflexes or reduced immune surveillance, such as patients with cancer, HIV, organ transplants, or chronic debilitating illnesses. This patient, although socially vulnerable, had no known history of immunosuppression, was not hospitalized or ventilated, and did not exhibit any of the typical risk factors or signs of respiratory distress prior to death. Moreover, she presented with weeks of right-sided chest pain without respiratory symptoms, which is atypical for even occult pneumonia.

Autopsy further rules out this hypothesis. There was no evidence of pulmonary consolidation, bronchopneumonia, or alveolar exudates—hallmarks of pneumonia-related empyema. The lungs were described as clear, with no gross or microscopic features suggestive of infection. Furthermore, the organism isolated—*Proteus mirabilis*—is not a recognized pathogen in typical or atypical pneumonia.

Proteus species are rarely involved in primary lung infections, and when they are, it usually occurs in nosocomial settings involving patients with indwelling devices or aspiration risk. Given the absence of pulmonary pathology, lack of clinical signs, and the microbiological mismatch, occult pneumonia with secondary empyema is not a tenable explanation in this case.

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