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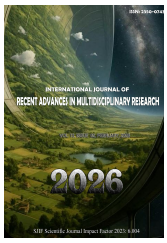

RESEARCH ARTICLE

SPONTANEOUS RIGHT-SIDED PNEUMOTHORAX WITH SECONDARY PNEUMOPERITONEUM DUE TO DIAPHRAGMATIC AIR DISSECTION IN A 16-YEAR-OLD WITH SEPTIC PULMONARY EMBOLI AND SEPTIC SHOCK

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ABSTRACT

Pneumoperitoneum is traditionally considered a surgical emergency suggestive of hollow viscus perforation. However, rare non-surgical causes such as thoracic air leaks may also result in free intraperitoneal air. We report a case of a 16-year-old male who presented with spontaneous right-sided pneumothorax secondary to septic pulmonary emboli and subsequently developed pneumoperitoneum due to trans-diaphragmatic air dissection. The patient was critically ill with sepsis and septic shock requiring intensive care and multiple vasopressors. Contrast-enhanced computed tomography (CECT) of the abdomen revealed pneumoperitoneum without evidence of gastrointestinal perforation. The patient was managed conservatively with chest tube drainage, antibiotics, and supportive care, with favorable outcome. This case highlights the importance of recognizing thoracic causes of pneumoperitoneum to avoid unnecessary surgical intervention.

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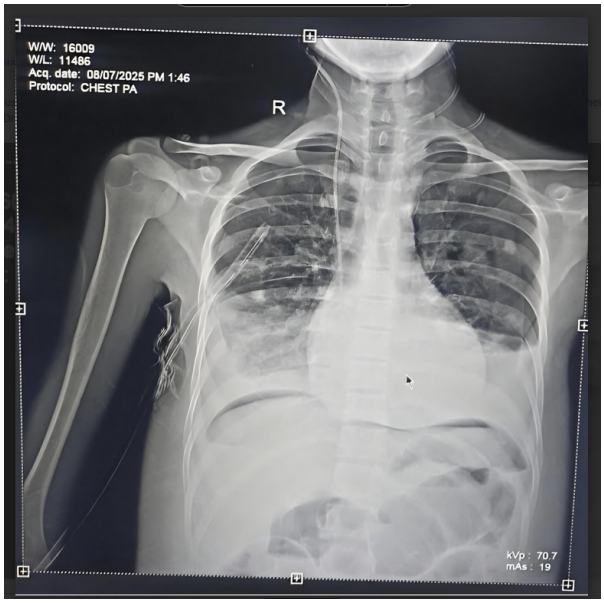
INTRODUCTION

Pneumoperitoneum usually implies perforation of a hollow abdominal viscus and often mandates urgent surgical intervention. However, a subset of patients have non-surgical pneumoperitoneum, where free intraperitoneal air arises from non-abdominal sources. Thoracic causes such as pneumothorax, pneumomediastinum, and barotrauma are well-recognized mechanisms, allowing air to track across diaphragmatic defects or tissue planes into the peritoneal cavity. Failure to recognize these entities may lead to unwarranted laparotomy with increased morbidity.

CASE REPORT

A 16-year-old previously healthy male presented with sudden onset right-sided chest pain and progressive shortness of breath of one-day duration. There was no history of trauma, recent procedures, or known lung disease. On examination, the patient was tachypneic, hypoxemic, and tachycardic. Breath sounds were markedly reduced on the right side. Initial chest radiograph revealed a right-sided pneumothorax. The patient was admitted to the intensive care unit. CECT chest demonstrated a right pneumothorax along with multiple bilateral peripheral cavitary nodules, suggestive of septic pulmonary emboli, likely responsible for pulmonary parenchymal damage and air leak. During the hospital course, the patient developed sepsis progressing to septic shock, requiring multiple vasopressor support and invasive monitoring in the ICU. Despite clinical features of sepsis, multiple blood cultures were negative. Broad-spectrum intravenous antibiotics were initiated empirically. Subsequently, the patient developed abdominal distension without guarding or rigidity. Abdominal radiography showed free intraperitoneal air, raising suspicion of gastrointestinal perforation. However, CECT abdomen with intravenous contrast revealed pneumoperitoneum without evidence of hollow viscus perforation, bowel wall defect, free fluid, or intra-abdominal pathology. In the absence of peritoneal signs and normal abdominal imaging, pneumoperitoneum was attributed to air dissection from the thoracic cavity across the diaphragm, a phenomenon reported in association with pneumothorax. Given the patient's critical condition and imaging findings, a conservative approach was adopted. The patient underwent right intercostal chest tube insertion with gradual lung re-expansion. Over the next several days, vasopressor support was tapered, abdominal distension subsided, and serial imaging showed resolution of pneumoperitoneum without surgical intervention.



DISCUSSION

Non-surgical pneumoperitoneum accounts for approximately 5–15% of all cases and includes thoracic, gynecological, and iatrogenic causes. Pneumothorax-related pneumoperitoneum occurs when air traverses diaphragmatic hiatuses or microscopic defects into the peritoneal cavity. One well-described mechanism is the Macklin effect, wherein alveolar rupture leads to air tracking along bronchovascular sheaths into the mediastinum and subsequently into other compartments, including the peritoneum. This mechanism explains the association between thoracic air leaks and extrathoracic air collections. Several case reports and series describe pneumoperitoneum associated with pneumothorax or thoracic trauma that were successfully managed conservatively once gastrointestinal perforation was excluded. The key distinguishing features include absence of peritoneal signs, stable abdominal examination, and normal contrast-enhanced abdominal imaging. Barotrauma-related pneumoperitoneum has also been described in critically ill and mechanically ventilated patients, especially in pediatric populations, adding further diagnostic complexity. Rare idiopathic cases further reinforce the need for careful clinico-radiological correlation. In our patient, septic pulmonary emboli resulted in pulmonary cavitation and spontaneous pneumothorax. The subsequent pneumoperitoneum was secondary to thoracic air dissection rather than gastrointestinal perforation.

Recognition of this rare but important entity prevented unnecessary surgical exploration in a critically ill adolescent.

CONCLUSION

Pneumoperitoneum does not always indicate hollow viscus perforation. Thoracic causes such as pneumothorax should be considered, especially when abdominal imaging and clinical findings do not support gastrointestinal pathology. Awareness of non-surgical pneumoperitoneum and careful clinico-radiological evaluation are essential to guide appropriate conservative management and avoid unnecessary surgery.

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