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Pneumothorax ex vacuo in a Patient with Malignant Pleural Effusion After PleurX Catheter Placement

Meera Bhardwaj, MS4 and Loheetha Ragupathi, MD

INTRODUCTION

Pneumothorax *ex vacuo* (“without vacuum”) is a type of pneumothorax that can develop in patients with large pleural effusions. Unlike spontaneous or tension pneumothoraces, pneumothorax *ex vacuo* does not require chest tube placement. Careful recognition of this type of pneumothorax may save patients and physicians from an unnecessary procedure, and limit patient risk of infection, bleeding and further lung injury.

CASE REPORT

An 81 year old woman with a history of osteoarthritis, depression, and remote smoking history, presented to her primary care provider complaining of progressive cough, dyspnea, and 30 lb unintentional weight loss. An outpatient chest radiograph revealed total opacification of the right lung. She was admitted to the hospital for further management. Computed tomography showed a large right pleural effusion with partial collapse of the right lung, bilateral pulmonary nodules, and obliteration of the right lower lobe bronchus. A diagnostic thoracentesis showed an exudative effusion, and cytology was consistent with primary lung adenocarcinoma. Bronchoscopy revealed an aerated right upper lobe, and endobronchial biopsy was unrevealing.

Due to worsening hypoxia, a PleurX drainage catheter was placed, and one liter of pleural fluid was removed daily. Lungs were monitored with post-drainage radiographs, and the patient improved clinically. Five days after PleurX placement, however, she was noted to develop right upper lobe atelectasis and a right apical pneumothorax with no tracheal deviation (Figure 1). In the setting of collapsed lung due to sudden atelectasis, this represented pneumothorax *ex vacuo*. Her management continued unchanged and she was safely discharged to a rehabilitation facility with pneumothorax *ex vacuo* and PleurX catheter in place.

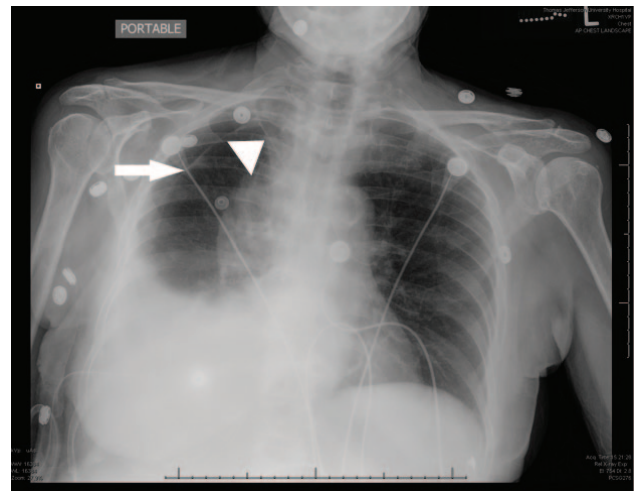


Figure 1. Portable chest radiograph demonstrating right upper lobe atelectasis (white arrow head) with pneumothorax *ex vacuo* (white arrow), in the setting of right pleural effusion and right-sided PleurX catheter.

Pneumothorax *ex vacuo*: A pneumothorax *ex vacuo* was traditionally thought to develop when a mucus plug, foreign body, or extrabronchial mass obstructs a bronchus causing acute lobar collapse. The sudden lobar collapse generates a negative intrapleural pressure that draws gas—mainly nitrogen—from the neighboring tissues and blood into the adjacent pleural space.¹ More recently, pneumothorax *ex vacuo* is also thought to develop when a lung is unable to re-expand following drainage of pleural fluid.^{2,3} The seal between the visceral and parietal pleura remains intact at the sites of the aerated lobes, causing the pneumothorax *ex vacuo* to surround only the collapsed lobe, distinguishing it from both tension and spontaneous pneumothoraces.¹ Boland et al.² and Ponrartana et al.³ demonstrate that chest tubes are not beneficial for asymptomatic patients with malignant lung parenchymal disease and pneumothorax *ex vacuo*. Malignant infiltration of the lung tissue leads to poor lung compliance and unresponsiveness to chest tubes.² One hypothesis is that malignant cells create a fibrinous peel limiting re-expansion of the lung, while

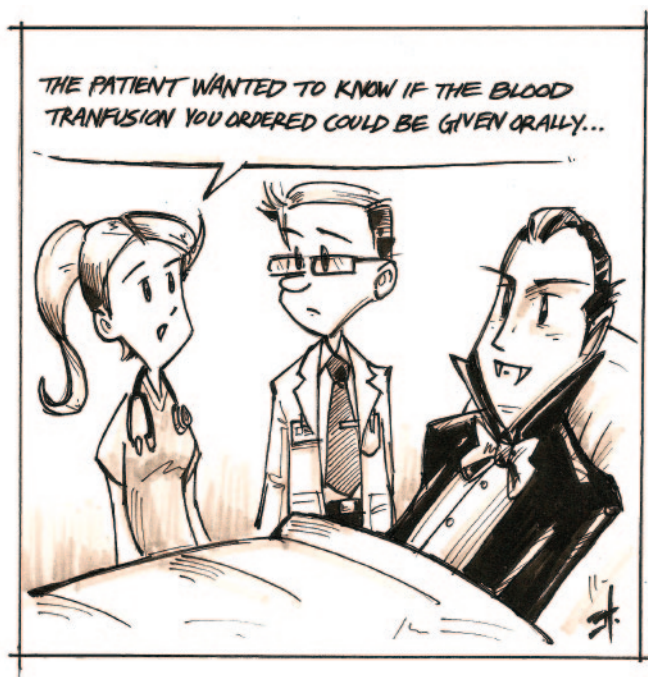
another suggests that chronic atelectasis, interrupted blood flow, and pulmonary edema decrease production of pulmonary surfactant prohibiting lung re-expansion after pleural fluid drainage.³ Observation is appropriate and sufficient in asymptomatic patients.^{2,3} If there is concern for trapped lung, Pien et al. found that PleurX catheter placement is an effective treatment.⁴

KEY POINTS:

Pneumothorax *ex vacuo* develops in the setting of sudden acute lobar collapse, and persists from an inability of the lung to re-expand. Unlike tension or spontaneous pneumothoraces, it only surrounds the atelectatic lobe and does not surround the lobe(s) that are healthy and aerated.¹ Unlike spontaneous and tension pneumothoraces, pneumothorax *ex vacuo* should be observed without chest tube placement in the asymptomatic patient.^{2,3}

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