Spontaneous Pneumomediastinum: An Uncommon Cause of Chest Pain

Tyler Harris, MD, and Thaddeus Herliczek, MD

A three-year old boy with a history of reactive airway disease requiring occasional nebulizer therapy presented to the Hasbro Emergency Department with complaints of cough, dyspnea, and chest pain. His physical examination was significant for an otherwise healthy appearing but mildly distressed child with diminished breath sounds bilaterally and a bilateral expiratory wheeze. His laboratory workup was unrevealing. Imaging studies are presented in Figures 1-4.

Diagnosis

Spontaneous pneumomediastinum, due to increased alveolar pressure related to bronchiolar constriction and cough.

Discussion

Pneumomediastinum is gas within the anatomic space bordered by the thoracic inlet superiorly, diaphragm inferiorly, mediastinal pleura laterally, and chest wall antero-posteriorly. It is generally classified as either spontaneous, without clear antecedent event, or secondary, most commonly to trauma, interstitial lung disease, iatrogenic causes, perforated esophagus or less likely due to pneumoperitoenum or pneumoretroperitoneum. Spontaneous pneumomediastinum, as in the present case, is related to increased alveolar pressures resulting in alveolar rupture, with air tracking to the mediastinum via peribronchovascular spaces in a process known as the Macklin effect.[1] It is relatively rare, thought to represent approximately 1 in 30,000 ER visits, most commonly affecting adolescent males.[2] Purported etiologies for spontaneous pneumomediastinum include forced expiration against a closed glot-

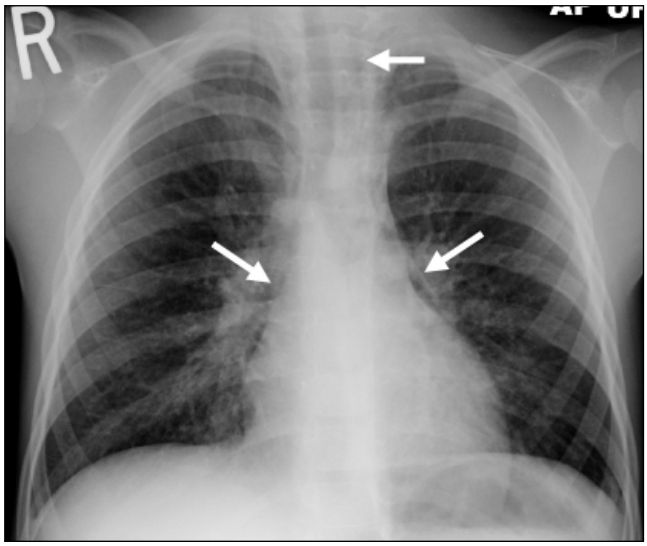

Figure 1: Presenting AP Upright chest radiograph demonstrating lucency tracking along the lateral heart borders bilaterally and into the cervical soft tissues.

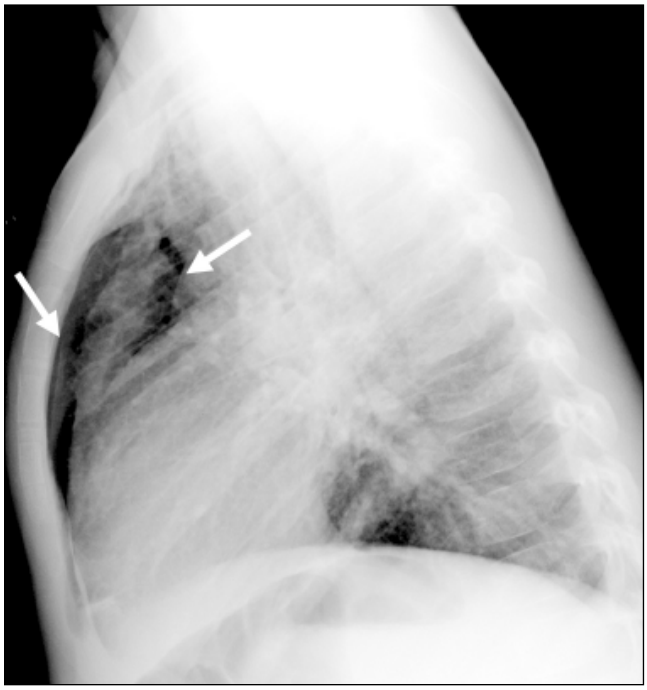

Figure 2: Presenting lateral chest radiograph demonstrating retrosternal lucency compatible with pneumomediastinum surrounding the retrosternal fat and thymus.

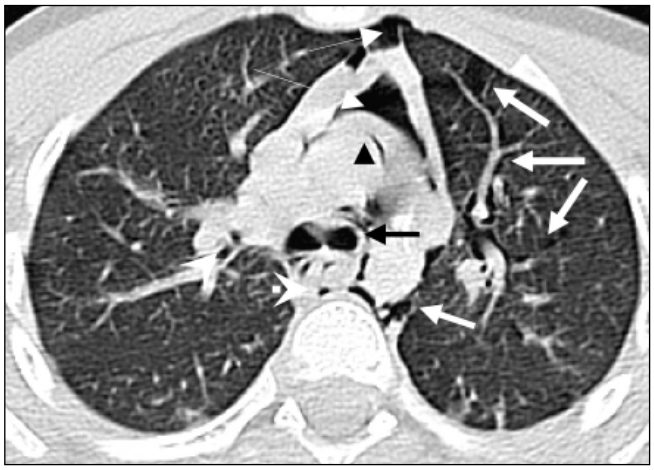

Figure 3: Axial CT image of the upper mediastinum demonstrating pulmonary interstitial emphysema of the left upper lobe (thick white arrows) as well as mediastinal air surrounding the thymus (thin white arrows), ascending aorta (black arrowhead), descending aorta (hollow white arrow), azygous (white arrowheads), and main stem bronchi (black arrow).

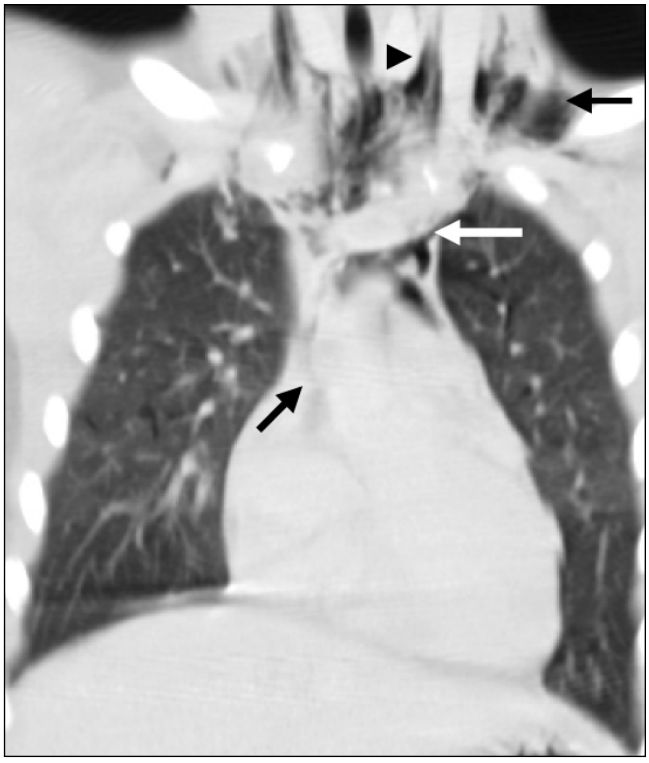

Figure 4: Coronal CT image demonstrating extensive cervical soft tissue subcutaneous emphysema (upper black arrow) as well as air surrounding the left jugular vein, left brachiocephalic vein (white arrow), and ascending aorta (lower black arrow).

tis (coughing, straining), aspirated foreign body, inhalational drug use, asthma, and wretching.

Clinically, the patients can present with retrosternal chest pain and dyspnea. Physical examination may reveal crepitus within the subcutaneous tissues of the chest and neck[2]. A relatively specific finding of crepitus timed to the cardiac cycle, rather than the respiratory cycle, termed Hamman's sign, may rarely be seen.

Plain radiographic features of pneumomediastinum are well demonstrated in the present case, and include air on either side of the cardiac silhouette extending into the superior mediastinum and the cervical soft tissues. Infants and young children may exhibit the "thymic sail sign" on the frontal chest radiograph in which gas outlines the thymus. The lateral radiograph is generally more sensitive than the frontal view, and demonstrates linear retrosternal gas. CT recapitulates these findings and can demonstrate air tracking along the bronchovascular tree including interstitial emphysema, air surrounding main stem bronchi, and paratracheal air. Air surrounding mediastinal vascular structures can result in a "ring around the artery" sign.[3] CT is not typically performed in the setting of spontaneous pneumomediastinum and a diagnostic radiograph. In the present case, CT was performed to assess suspected mediastinal lymph node enlargement.

While associated with startling radiographic features, spontaneous pneumomediastinum carries a benign clinical course, with resolution of findings after 7-14 days. In contrast, pneumomediastinum secondary to a perforated esophagus (Boerhaave's Syndrome), carries a grim prognosis, with a reported mortality of approximately 20-30%.[4] These latter patients are distinguished by a history of emesis, typically in the setting of excessive food or alcohol intake, with severe lower chest pain and cervical emphysema (Meckler's triad). Often, these patients experience cardiovascular collapse related to mediastinitis and subsequent shock. Historical and clinical features are often helpful in distinguishing benign causes of spontaneous pneumomediastinum from the potentially fatal pneumomediastinum secondary to esophageal rupture. Radiographically, the presence of a pleural effusion, enlarging pneumothorax, or focal air or fluid adjacent to the esophagus on cross-sectional imaging should alert the clinician to the possibility of esophageal rupture.[5,6] In clinically indeterminate cases, a contrast esophagram can be helpful in excluding esophageal tear.

References

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Disclosure of Financial Interests

The authors and/or significant others have no financial interests to disclose.

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