The Many Presentations of Pneumomediastinum

Tianyou Yang, MD¹, Jiliang Yang, MD¹, Tianbao Tan, MD¹, Jing Pan, MD¹, Chao Hu, MD¹, Jiahao Li, MD¹, and Yan Zou, MD¹

Received October 6, 2017. Accepted for publication October 20, 2017

Case Report
An 8-month-old boy presented with dyspnea and fever for 1 week. Chest radiography findings showed bilateral pneumonia, pneumomediastinum, and subcutaneous emphysema in the neck and axillae. Mechanical ventilation was initiated shortly after admission. The oxygen saturation and blood pressure suddenly decreased 2 days later, and the patient had decreased breath sounds and a distinctly distended abdomen. Radiography results showed bilateral pneumonia, bilateral pneumothorax, pneumomediastinum, subcutaneous emphysema in the neck and axillae, and pneumoperitoneum (Figure 1). Chest tubes were inserted, and the oxygen saturation level and blood pressure stabilized shortly afterwards. Results of repeat radiography showed the resolution of pneumoperitoneum, pneumothorax, subcutaneous emphysema, and pneumomediastinum (Figure 2). However, he died of severe pneumonia 4 days later.

Discussion
Pneumomediastinum is defined as the presence of air in the mediastinum. Gas can enter mediastinal spaces from ruptured alveoli, a laceration of the tracheobronchial tree or gastrointestinal tract, and a sinus fracture or iatrogenic manipulation after dental extraction.¹ Alveolar rupture is the most common cause of pneumomediastinum, and mechanical ventilation is a predisposing factor of pneumomediastinum.

The radiographic signs of pneumomediastinum depend on the depiction of normal anatomic structures that are outlined by the air as it leaves the mediastinum. Various radiographic signs have been well described, such us subcutaneous emphysema, the thymic sail sign, pneumopericardium, a ring around the artery sign, the tubular artery sign, double bronchial wall sign, continuous diaphragm sign, extrapleural sign, and air in the pulmonary ligament sign.²,³ However, most of the patients presented with 1 or 2 radiographic signs. Constant

Figure 1. Chest radiography findings showing bilateral pneumomediastinum, subcutaneous emphysema in the neck and axillae, pneumoperitoneum, and pneumomediastinum. The accumulation of air in the anterior mediastinum (curved arrow), tubular artery sign (arrow), extrapleural sign (arrow head), and continuous diaphragmatic sign were observed together.

¹Guangzhou Women and Children’s Medical Center, Guangzhou Medical University, Guangzhou, China

Corresponding Author:
Yan Zou, Department of Pediatric surgery, Guangzhou Women and Children’s Medical Center, Guangzhou Medical University, No. 9 Jinsui Road, Tianhe District, Guangzhou 510623, China.
Email: 378319696@qq.com
mechanical ventilation or increased pressure may cause extensive pneumomediastinum. Our patient showed accumulation of air in the anterior mediastinum, tubular artery sign, continuous diaphragmatic sign, and subcutaneous emphysema simultaneously. These radiographic signs are rarely observed together.

Pneumomediastinum can lead to pneumoretroperitoneum. The increased buildup of pressure in the mediastinum because of gas leaking from the alveoli can result in perforation of the parietal pleura and pneumothorax. The air may move further caudally through the aortic and esophageal openings and the sternocostal origin of the diaphragm until it reaches the retroperitoneum space or peritoneal cavity. Although pneumoperitoneum is usually the result of a gastrointestinal tract perforation, caution should be exercised when it occurs after pneumomediastinum. Pneumomediastinum alone has no main clinical significance; thus, physicians should treat patients on the basis of their overall clinical findings, associated injuries, and imaging findings.

**Author Contributions**

TY: Contributed to conception and design; contributed to acquisition; drafted manuscript; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

JY: Contributed to conception; contributed to acquisition and interpretation; drafted manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

TT: Contributed to acquisition and interpretation; drafted manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

JP: Contributed to acquisition and analysis; drafted manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

CH: Contributed to interpretation; drafted manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

JL: Contributed to acquisition; drafted manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

YZ: Contributed to conception and design; contributed to acquisition, analysis, and interpretation; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by National Natural Science Foundation of China (Grant Number 81602199); Guangzhou Science, Technology and Innovation Commission (Grant Number 201607010395); and Natural Science Foundation of Guangdong Province, China (Grant Number 2016A030313496).

**References**

1. Sandler CM, Libshitz HI, Marks G. Pneumoperitoneum, pneumomediastinum and pneumopericardium following dental extraction. *Radiology*. 1975;115:539-540.

2. Bejvan SM, Godwin JD. Pneumomediastinum: old signs and new signs. *AJR Am J Roentgenol*. 1996;166:1041-1048.

3. Zylak CM, Standen JR, Barnes GR, Zylak CJ. Pneumomediastinum revisited. *Radiographics*. 2000;20:1043-1057.

4. Lellouche N, Bruneel F, Mignon F, et al. Pneumomediastinum causing pneumoperitoneum during mechanical ventilation. *J Crit Care*. 2003;18:68-69.

5. Banki F, Estrera AL, Harrison RG, et al. Pneumomediastinum: etiology and a guide to diagnosis and treatment. *Am J Surg*. 2013;206:1001-1006.

**Figure 2.** Radiographic scan obtained 20 hours later showing resorption of pneumoperitoneum and remarkable absorption of subcutaneous emphysema, pneumothorax, and pneumomediastinum.