



Case Report

Spontaneous pneumothorax resulting in tension physiology

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ABSTRACT

Spontaneous pneumothorax (SP) is a relatively common pathology in emergency medicine; however, scant information is published regarding SPs developing tension physiology in the literature. Risk factors for spontaneous pneumothorax include smoking, family history, and underlying lung disease such as chronic obstructive lung disease (COPD), cystic fibrosis, tuberculosis, among others. Treatment often involves conservative management, needle aspiration, catheter placement, or tube thoracostomy. Tension pneumothorax, however, is a life threatening condition requiring emergent intervention. Case reports have demonstrated large SPs with midline shift but without tension physiology as patients largely remained hemodynamically stable. We report the case of an 18-year-old male presenting to the Emergency Department (ED) with a SP that rapidly developed tension physiology with mediastinal shift and hypotension resolved by needle decompression and CT placement.

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1. Case report

An 18-year-old male with a past medical history of precordial catch syndrome and spontaneous left sided pneumothorax 1 year prior presented to the ED complaining of left sided chest pain and shortness of breath. The patient had a previous spontaneous left sided pneumothorax 1 year prior with no identifiable underlying etiology. He had no family history of alpha1-antitrypsin deficiency, Birt-Hogg-Dube syndrome, or any connective tissue disorders. Patient denied history of smoking or trauma, and his prior pneumothorax occurred at rest.

The patient's symptoms started approximately 11 h prior to arrival and awoke him from sleep. Pain is sharp and worse with deep inspiration. He described the symptom constellation as feeling similar to his previous pneumothorax. Initial vital signs were stable with a blood pressure of 124/81 mm Hg. Initial portable bedside chest x-ray (Fig. 1) demonstrated a moderate sized left pneumothorax with left to right mediastinal shift.

Pigtail catheter placement was planned. Approximately 30 min after arrival and initial assessment, the patient suddenly became hypotensive with increased work of breathing. His blood pressure dropped to a low of 68/39 mm Hg; this was confirmed with manual blood pressure reading. Given the pigtail catheter chest tube setup was already at bedside, the decision was made to needle decompress at the planned site of insertion. The patient's scar from his previous chest tube was used as a guide for needle insertion as well as traditional landmarks. After needle insertion, a large rush of air occurred with normalization of vital signs. Repeat blood pressure after decompression was 117/79 mm Hg. A

pigtail catheter was placed under sterile conditions. A repeat bedside chest x-ray was performed (Fig. 2), and demonstrated near complete resolution of left sided pneumothorax.

The patient was admitted to the hospital under the pulmonology service. He underwent a video-assisted thoracoscopic surgery (VATS), left upper lobe wedge resection, as well as mechanical pleurodesis 2 days after admission. Patient was discharged from the hospital 5 days after initial admission.

2. Discussion

A SP is an accumulation of air in the pleural space that is not the result of trauma or iatrogenic causes. The etiology of SP is contested but thought to be commonly the result of a ruptured subpleural bleb and is encountered frequently in emergency medicine with an incidence of 18–28 per 100,000 in males and 1.2–6.0 per 100,000 in females [1]. SPs can be either primary or secondary. Primary spontaneous pneumothorax (PSPs) present in patients with no known underlying lung disease or inciting event while secondary spontaneous pneumothorax (SSP) occurs as a complication of underlying lung disease such as cystic fibrosis, chronic obstructive pulmonary disease, tuberculosis, malignancy, pneumonia, etc. Although PSP is rarely a medical emergency, SSP can lead to rapid decline secondary to poor respiratory reserve and comorbidities [2]. Treatment is often focused on removing air from the pleural space and preventing subsequent pneumothoraces.

Tension pneumothorax is a medical emergency and results when positive pressure develops in the intrapleural space throughout the entire respiratory cycle, compressing structures of the chest, causing ventilation perfusion mismatch, and decreasing venous return [3–5]. Tension pneumothorax is a clinical diagnosis and typically associated

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Fig. 1. Initial chest x-ray. Formal radiology impression: “Moderate left-sided pneumothorax with associated left to right mediastinal shift is noted.”

with trauma and patients receiving positive pressure ventilation [3–5]. It is important to note that chest x-ray findings such as contralateral mediastinal and tracheal deviation are not diagnostic of tension physiology and can be a normal finding in pneumothorax without tension physiology [5]. A case report published in the *Emergency Medicine Journal* by

Holloway VJ et al. noted 4 cases of spontaneous “tension pneumothorax” with 3 patients that were hemodynamically stable diagnosed on x-ray and the fourth with 700 ml of hemothorax [6]. Clinically these patients did not have tension pneumothorax. Several papers note an estimated 1–2% of SP will be under tension but is uncertain where this original data is emanating from and whether tension pneumothorax was diagnosed based on x-ray findings alone or on tension physiology. In the absence of trauma or positive pressure ventilation it appears that pneumothoraces developing tension physiology is very rare.

This case demonstrated a young healthy male who rapidly developed tension physiology following a SP that resolved with decompression. It is important to recognize that although rare, SPs can develop into tension physiology.

Conflict of interests statement

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers’ bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

References

- [1] Henry M, Arnold T, Harvey J. BTS guidelines for the management of spontaneous pneumothorax. *Thorax* 2003;58(Suppl. 2):39–52.
- [2] Noppen M. Spontaneous pneumothorax: epidemiology, pathophysiology and cause. *Eur Respir Rev Sep.* 2010;19(117):217–9. <https://doi.org/10.1183/09059180.00005310>.
- [3] Light RW. Tension pneumothorax. *Intensive Care Med* 1994;20:468–9.
- [4] Baumann MH, Sahn SA. Tension pneumothorax: diagnostic and therapeutic pitfalls. *Crit Care Med* 1993;21:177–9.
- [5] Leigh-Smith S, Harris T. Tension pneumothorax-time for a re-think? *Emerg Med J* 2005;22:8–16. <https://doi.org/10.1136/emj.2003.010421>.
- [6] Holloway VJ, Harris JK. Spontaneous pneumothorax: is it under tension? *Emerg Med J* 2000;17:222–3.

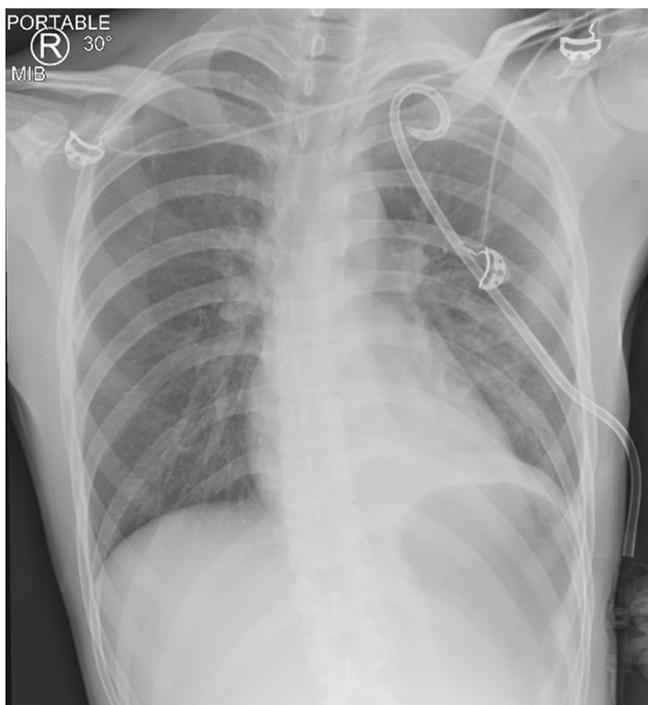


Fig. 2. Post pigtail catheter placement chest x-ray with near complete resolution of previously seen left sided pneumothorax.