Spontaneous Pneumothorax Developing into Tension Pneumothorax: A Case Report

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We report a 19-year-old man without a history of primary lung disease or recent trauma presenting with a spontaneous pneumothorax which later developed into a tension pneumothorax. Immediate chest decompression was delayed while awaiting results of chest radiography, despite the patient’s rapidly deteriorating condition. His vital signs subsequently became stable after chest decompression. A tension pneumothorax is a clinical emergency that can occur after a spontaneous pneumothorax. It should be suspected in any patient with a spontaneous pneumothorax whose condition deteriorates acutely. Immediate chest decompression should not be delayed.

Key words: spontaneous pneumothorax, tension pneumothorax

Introduction

Tension pneumothorax is common after a traumatic pneumothorax, mechanical ventilation, or during cardiopulmonary resuscitation1, but rarely occurs after a spontaneous pneumothorax2-3. It is a clinical diagnosis that should not be overlooked, even in the absence of trauma. A previous study of four cases revealed that the treating physicians were unaware that a spontaneous tension pneumothorax could occur. Patients may appear clinically well until they decompensate2. Herein, we describe a young adult without a history of primary lung disease or recent trauma who presented with a spontaneous pneumothorax which later developed into a tension pneumothorax.

Case Report

A 19-year-old man with a height of 165 cm and weight of about 53 kg, presented to our emergency room (ER), complaining of dizziness and blurred vision for one hour. He had experienced sudden left-sided chest pain and difficulty breathing while playing basketball two days previously. There was no history of trauma, smoking, or underlying lung disease such as pulmonary tuberculosis or emphysema. His breathlessness persisted and became worse with movement. Dizziness and blurred vision developed an hour prior to arrival in the ER. On arrival, the patient was conscious, coherent and ambulatory with a blood pressure of 86/48 mmHg, temperature of 36.4°C, pulse rate
of 86 beats per min, and a respiratory rate of 28 breaths per min. Oxygen saturation was 93% on room air. Chest examination revealed absent breath sounds and hyperresonant percussion on the left side. The white blood cell count was 12,600/µL and the hemoglobin level was 13.4 g/dL. His blood pressure failed to increase after a 500 mL normal saline challenge. The initial supine chest radiograph (Fig. 1) showed collapse of the entire left lung, a marked mediastinal right shift, and a depressed left hemidiaphragm. The clinical-radiologic findings were consistent with a left tension pneumothorax. A chest tube was promptly inserted and air, as well as 100 mL of blood was drained. His blood pressure rose to 134/74 mmHg and his blurred vision resolved five minutes later. Dyspnea improved and oxygen saturation increased to 99% with an oxygen flow rate of 2 L/minute. A chest radiograph (Fig. 2) obtained 30 minutes after the procedure showed return of the mediastinum to midline, a still collapsed left lung, and total opacification of the left hemithorax. The patient had a persistent air leak without active bleeding from the chest tube during the next 24 hours. The follow-up hemoglobin level was 13.3 g/dL. He later underwent video-assisted thoracoscopic surgery. During the procedure, a blood clot of about 400 mL was removed from the left pleural space, and multiple apical blebs without active bleeding were found. A wedge resection of the apical blebs and mechanical pleurodesis were subsequently performed. Subpleural bullae were confirmed by histopathological examination. He was discharged in improved condition on the 3rd postoperative day. A chest radiograph obtained eight days after the initial film (Fig. 3) showed full expansion of the left lung, and there was no recurrence of the pneumothorax in the following year.

**Discussion**

In this case, dyspnea developed suddenly without any history of trauma, smoking, or underlying lung disease. However, subpleural bullae

![Initial supine chest radiograph showing a collapsed left lung (white arrows), a marked mediastinal right shift (black arrows), left hemidiaphragm depression (black arrowheads), increased rib separation, and increased thoracic volume](image-url)
were confirmed by histopathological examination, yielding consistent evidence of a spontaneous pneumothorax. In this patient, inspired air may have become trapped in the pleural space, presumably on the basis of a bronchopleural ball-valve mechanism, eventually leading to a tension pneumothorax\(^4\). Resolution of symptoms and stabilization of vital signs after chest decompression suggested a successfully treated tension pneumothorax. Although the patient had a hemopneumothorax, the follow-up hemoglobin was not decreased and blood transfusion was not given. Therefore, bleeding or hypovolemia was not the immediate cause of the shock.

Tension pneumothorax is a medical emergency requiring immediate chest tube drainage to relieve high intrapleural pressure. If the patient is hemodynamically unstable (e.g. oxygen saturation <92%, blood pressure <90 mm Hg, respiratory rate <10 per min, decreased level of consciousness), immediate chest decompression must always precede a chest radiograph\(^5\). However, in an awake, stable patient, a chest radiograph is the first test of choice\(^4\). In this case, immediate chest decompression was delayed while waiting for the chest radiograph, despite the patient's rapidly deteriorating condition.

Radiologic findings of a tension pneumothorax include mediastinal shift, ipsilateral flattening of the heart border, hemidiaphragm depression, increased rib separation, and increased thoracic volume\(^5\). Shift of the mediastinum away from the pneumothorax is not a reliable finding of tension\(^5,6\) and can be seen with any large pneumothorax\(^6\). However, this finding, combined with the clinical symptoms of circulatory compromise is usually considered diagnostic. Downward displacement or inversion of the hemidiaphragm may also suggest tension\(^6\).

Although 400 mL of blood had accumulated in the left pleural space, it was not readily visible in
the radiograph shown in Fig. 1 because the patient was in a supine position and had an increased left thoracic volume caused by the tension pneumothorax. However, the blood resulted in a less hyperlucent image of the left pneumothorax. Later, the left thoracic volume returned to normal after chest decompression. Therefore, the blood became evident, as shown by the radiograph in Fig. 2.

In conclusion, tension pneumothorax is a clinical diagnosis that can occur after a spontaneous pneumothorax. It should be suspected in any patient with a spontaneous pneumothorax whose condition deteriorates acutely. Chest decompression should not be delayed.

References

自發性氣胸進展成張力性氣胸之病例報告

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一位19歲的男性，無肺部及創傷的病史，因為自發性氣胸進展成張力性氣胸，被送至急診室。雖然
病患的生命徵象已經不穩定，但是為了要等胸部X光片的確診，因而延遲了緊急胸管的引流。後來，經
過胸管的引流，病患的生命徵象逐漸穩定。張力性氣胸是一種臨床的急症，它可能會發生在自發性氣胸
之後。當病患發生自發性氣胸之後，隨即有生命徵象不穩定，應該懷疑已經進展成張力性氣胸，此時應
該立即胸管引流。

關鍵詞：自發性氣胸，張力性氣胸