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Bilateral spontaneous pneumothorax in undiagnosed asthma in an adult

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ABSTRACT:

Introduction: Bilateral spontaneous pneumothorax (BSP) is a rarely observed complication during an acute asthma attack. However, it can cause serious respiratory distress and must be rapidly treated.

Case presentation: A middle-aged male patient and active smoker with no previous medical illnesses presented to the emergency room, reporting severe dyspnea over the past 3 days. His vital signs were unstable, with severe desaturation (85% in room air). Physical examination revealed hyperresonance on percussion, diminished breath sounds in both lungs, and diffuse polyphonic wheezing. Chest X-ray displayed a moderate to large amount of bilateral pneumothorax with partially collapsed lungs. Thoracic computed tomography confirmed bilateral pneumothorax without evidence of cystic lung lesions or subpleural blebs. Importantly, imaging revealed diffuse mild bronchial wall thickening, indicative of chronic airway inflammation. The patient underwent treatment with bilateral tube thoracostomy and systemic corticosteroids. His treatment was maximized to control airway inflammation.

Conclusions: Acute asthma attacks can worsen due to disease progression or complications from other conditions mimicking asthma symptoms. BSP or unilateral spontaneous pneumothorax is a rare condition observed during an acute asthma attack, but it can be life-threatening. Delayed treatment and misdiagnosis may lead to serious respiratory distress and even death.

Keywords: Bilateral spontaneous pneumothorax; Acute asthma attack; Life-threatening

INTRODUCTION

Asthma is one of the most common respiratory diseases, characterized by chronic airway inflammation with multiple heterogeneities [1]. The symptoms vary from wheezing to shortness of breath, chest tightness, coughing, and even being asymptomatic. Asthma is frequently misdiagnosed due to a lack of awareness about airflow limitation, as some individuals perceive dyspnea as normal or experience only minor reductions in physical activity despite having low lung function [2]. The presence of nonspecific symptoms further complicates the diagnosis. Notably, up to 30% of asthma exacerbations can be fatal, even in individuals with infrequent symptoms [3]. Death can occur as a consequence of an acute exacerbation or complications of the disease, including pneumothorax. Bilateral spontaneous pneumothorax (BSP) is a rare complication that may occur during

an acute asthma attack. Nonetheless, it can lead to severe respiratory distress and necessitates prompt treatment. Left untreated, it may progress to tension pneumothorax or lead to fatal outcomes [4]. This case demonstrates BSP, which was early recognized and treated appropriately, emphasizing this life-threatening condition.

CASE PRESENTATION

A male patient in his 40s, physically fit and healthy, with a height of 172 cm and a body weight of 80 kg, presented to the emergency room (ER) with severe dyspnea that persisted for 7 hours. His history revealed active smoking (6 cigarettes per day for 20 years). Three days prior to admission (PTA), he experienced difficulty performing his usual work due to frequent shortness of breath throughout the day, accompanied by wheezing. Resting and using a bronchodilator provided only partial relief. However, 7 hours PTA, he suddenly developed severe shortness of breath, chest tightness, and sweating. Despite using a bronchodilator more than 10 times, his symptoms persisted, leading him to seek medical attention.

Upon arrival at the ER, his overall condition was poor. His blood pressure was 165/100 mmHg, peripheral pulse rate was 110 beats per minute, and respiratory rate was 40 breaths per minute. Oxygen saturation was 85% while breathing room air. Physical examination revealed bilateral hyperresonance on percussion, decreased breath sounds, and diffuse polyphonic wheezing. No subcutaneous emphysema was detected, and the trachea was midline. A room-air arterial blood gas analysis revealed acute hypoxemia with respiratory acidosis (pH 7.32, pCO₂ 49.3 mmHg, pO₂ 43.5 mmHg, SaO₂ 73.6%). A portable emergency chest X-ray (CXR) showed a moderate to large amount of bilateral pneumothorax with partially collapsed lungs (Figure 1A). To remove air in bilateral pleural cavities, relieve the pressure on the lungs and allow

KEY MESSAGES:

- Acute asthma attacks can worsen due to disease progression or complications, including conditions that mimic asthma.
- Bilateral or unilateral spontaneous pneumothorax (BSP) may develop during an acute asthma attack, potentially leading to a life-threatening situation.
- Delayed diagnosis and treatment of pneumothorax, particularly in patients with asthma, can result in severe respiratory distress and increased mortality risk.

them to re-inflate, bilateral tube thoracostomy (20F) was performed on both lungs (Figure 1B). An oxygen mask with a bag (10LPM) was provided to minimize the patient's work of breathing, and nebulized salbutamol was administered to relieve airflow obstruction. Following stabilization, a thoracic computed tomography (CT) scan was requested. The CT images showed residual bilateral pneumothorax and post-procedural subcutaneous emphysema (Figure 2), without evidence of cystic lung lesions or subpleural blebs. Diffuse mild thickening of the bronchial walls indicated chronic airway inflammation.

The sputum workup for bacteria and mycobacterium yielded negative results, and there was no evidence of acute viral infection. The patient's medical history revealed similar episodes of chest tightness and shortness of breath occurring 1-2 times per month, particularly at night or in cold weather. Occasionally, he experienced a runny nose, which he managed with nasal irrigation in the morning. The patient worked as a car mechanic. He noticed that his symptoms were associated with specific triggers, such

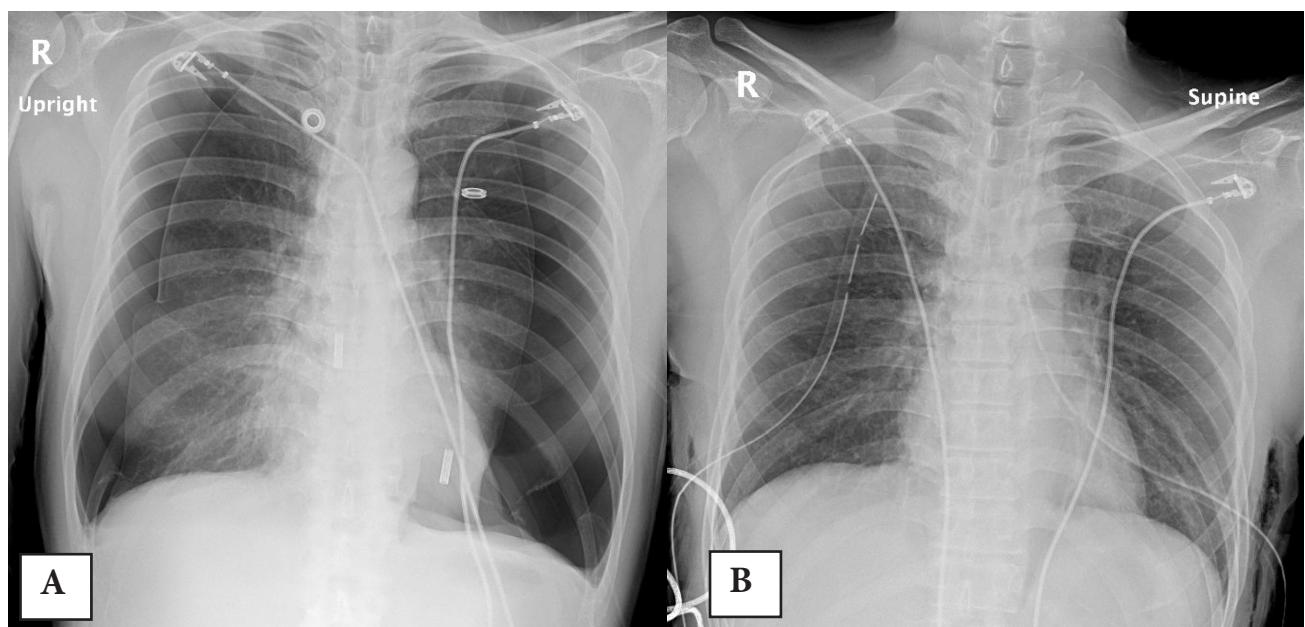


Figure 1. (A) The chest x-ray showed a moderate to large amount of bilateral pneumothorax, measuring 4.9 cm on the left side and 3.3 cm on the right side, at hilar level with partial lung collapse. (B) Follow-up imaging after bilateral chest drain insertion, demonstrated near total lung re-expansion.

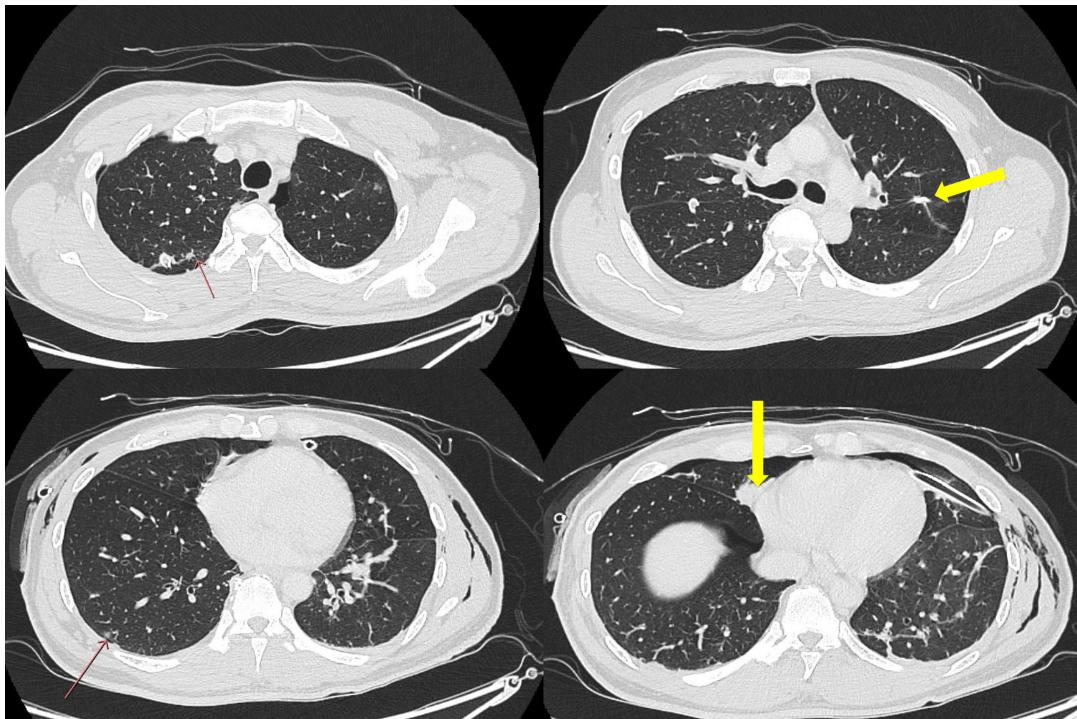


Figure 2. Thoracic CT images revealed bilateral tube thoracostomies in the upper hemithorax, a small residual amount of bilateral pneumothorax, and slight subcutaneous air in the anterolateral chest wall due to post-procedural changes. Multiple indeterminate nodules (thin arrow) were observed in both upper lobes. Additionally, multifocal fibroreticular (thick arrow), possibly indicated prior granulomatous infection, and diffuse mild bronchial wall thickening suggested chronic airway inflammation.

as smoking, working with sprayed paint, and using solvents. These symptoms improved after using bronchodilator therapy. Consequently, the patient self-medicated with an over-the-counter bronchodilator, using one inhaler per week.

Based on the clinical and radiologic findings, the patient was diagnosed with an acute asthmatic attack complicated by bilateral spontaneous pneumothorax. He was admitted for 12 days. The left tube thoracostomy was maintained for 3 days and the right tube thoracostomy for 11 days. Systemic corticosteroid therapy was initiated and tapered over 10 days due to prolonged expiratory wheezing. Maintenance therapy with budesonide-formoterol (160/4.5 mcg, two puffs twice daily) was prescribed. The patient was also diagnosed with allergic rhinitis and treated with intranasal steroids and nasal irrigation. Neither surgical intervention nor medical pleurodesis was required.

During the 8-month follow-up period, the patient demonstrated overall improvement. He changed his job to avoid occupational exposure and successfully quit smoking. He experienced occasional shortness of breath (1-2 times per week), relieved by bronchodilators. There were no recurrent pneumothorax episodes, nocturnal symptoms, or exercise limitations. Chest auscultation revealed good air entry, equal breath sounds and no adventitious sounds. Spirometry confirmed obstructive airflow limitation with a bronchodilator response (postbronchodilator FEV1 improved by 420 ml and 18%) (Table 1). These findings indicated persistent airway inflammation despite treatment. The patient's inhaler technique was reviewed, and the treatment plan adjusted to better control airway inflammation.

DISCUSSION

The main symptoms of asthma include repeated episodes of wheezing, dyspnea, chest tightness, and cough [1]. While severe asthmatic patients account for the majority of asthma-related deaths, it is important to recognize that deaths can also occur in individuals with mild or moderate asthma [3]. Diagnosing pneumothorax in asthma patients may challenging, as its clinical presentation can be mimic that of an asthma exacerbation [4, 5]. Pneumothorax is considered a complication of childhood asthma [6], with an incidence 1.35 times higher in asthma patients than in the general population [7]. Physicians must remain vigilant, as pneumothorax can be a potential cause of asthma-related mortality.

Pneumothorax is classified into two types: primary spontaneous pneumothorax, which occurs without underlying disease, and secondary spontaneous pneumothorax, which occurs in the presence of underlying disease [8]. BSP is a rare manifestation, occurring in approximately 1-1.3% of spontaneous pneumothorax cases [9]. Poor air entry and focal findings in asthmatic patients may indicate pneumothorax [4]. In patients receiving positive pressure ventilation, air trapping can worsen, necessitating suspicion of barotrauma. Chest X-rays (CXR) are not routinely recommended in adult asthma patients but should be performed if standard treatments fail or complications develop [1, 4]. The occurrence of BSP in conjunction with asthma is uncommon but may arise during severe asthma attacks, even in the absence of cystic lung lesions or subpleural blebs. Two possible explanations are hypothesized. The first is suspected expiratory airflow obstruction

Table 1. Patient's spirometry data after the pneumothorax resolved for 8 months.

Parameters	Pred (ml)	Pre (ml)	%Pred Pre	Post (ml)	% Pred Post	% Change (ml)
FVC	4.13	4.14	100%	4.32	105%	4% (180)
FEV1	3.38	2.33	69%	2.75	81%	18% (420)
FEV1/FVC	82.04	56.29	-	63.58	-	-

Abbreviations: Pred: predicted; Pre: prebronchodilator; Post: postbronchodilator; ml: milliliter

and severe air trapping, leading to bilateral alveolar rupture with or without structural lung disease. The second is a unilateral pneumothorax with pre-existing communication between the pleural cavities, also known as "buffalo chest" because buffalos have a single pleural cavity [10]. In some cases, pleuro-pleural communication is suspected but not confirmed or detected during surgery. There have also been reports of patients who initially presented with unilateral spontaneous pneumothorax and later developed BSP, successfully treated with unilateral chest tube thoracostomy [10]. However, despite cardiothoracic surgeons' investigations, no air space connection between the two pleural cavities was found [10].

In this case, we suspected bilateral alveolar rupture due to severe expiratory air trapping was the most likely cause of BSP. Treatment focused on controlling the underlying airway inflammation, avoiding interventions such as thoracotomy or pleurodesis. Smoking, a known risk factor for spontaneous pneumothorax, was strongly addressed through cessation counseling. Additionally, managing comorbidities such as rhinosinusitis, gastroesophageal reflux, depression, and obesity was crucial for improving respiratory symptoms and quality of life [1]. By addressing these factors, the goal was to minimize the risk of future pneumothorax episodes and improve long-term outcomes for the patient. The CARE Checklist has been completed by the authors for this case report, attached as supplementary material.

CONCLUSION

Asthma is a common respiratory problem that can lead to significant morbidity and mortality even in individuals with infrequent symptoms. Acute exacerbation or complications such as pneumothorax can result in severe respiratory distress and fatal outcomes. Physicians must maintain a high index of suspicion and perform thorough clinical assessments. Chest X-rays are particularly important in hypoxic patients unresponsive to standard asthma treatments to evaluate for complications. Early recognition and prompt management of BSP are vital to improving patient outcomes and preventing fatal consequences.

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AUTHORS' CONTRIBUTIONS

Pipu Tavornshevin plays a vital role in the data collection, data interpretation, conception, and design of the original draft of this case report and in critically revising the manuscript for intellectual information. Napplika Kongpolprom contributed to the revision and final approval of this paper. All authors agree to be accountable for the accuracy of the work and to read and approve the final manuscript before submission.

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