

CASE REPORT

# Management challenges of tension bullae in the emergency department: a case report and literature review

Maedeh Asna Ashari Amiri<sup>1</sup>, Saeid Gholami Gharab<sup>2</sup>, Kouros Javdani Esfehiani<sup>3</sup>, Hamidreza Khoshnezhad Ebrahimi<sup>4</sup>, Shabahang Jafarnejad<sup>4</sup>, Nader Sadigh<sup>2</sup>, Alireza Javan<sup>5\*</sup>

## ABSTRACT

**Background:** Patients with chronic obstructive pulmonary disease (COPD) are at risk for tension bullae, potentially leading to tension pneumothorax. Distinguishing tension bullae from tension pneumothorax in acutely dyspneic COPD patients is essential but challenging. A case was presented where chest tube placement in a tension bulla provided initial benefit but resulted in a bronchopleural fistula.

**Case Presentation:** A middle-aged male with COPD presented to the Emergency Department with severe dyspnea. History, bedside ultrasound, and chest radiograph suggested tension bulla or tension pneumothorax. Computed tomography was done which confirmed tension bulla. Despite bullectomy being the preferred treatment, clinical deterioration necessitated urgent chest tube placement, leading to rapid improvement. However, 2 days later, a bronchopleural fistula developed, requiring thoracotomy.

**Conclusion:** Emergency physicians must be aware of tension bullae as a rare cause of acute dyspnea in COPD. This case underscores the need for specific management protocols, potentially including smaller diameter catheters for stabilization before definitive surgical treatment.

**Keywords:** Tension bulla, pneumothorax, COPD, chest tube, bronchopleural fistula.

## Introduction

Chronic obstructive pulmonary disease (COPD) predisposes patients to the formation of bullae, which are air-filled spaces within the lung parenchyma exceeding 1-2 cm in diameter [1]. Bullae can lead to secondary spontaneous pneumothorax or, in rare instances, develop into giant compressive bullae that significantly impair lung function [2]. In COPD patients presenting with acute dyspnea, distinguishing between compressive bullae and tension pneumothorax poses a critical diagnostic challenge, as the treatment approaches differ drastically [3].

While bedside ultrasound and chest radiography offer initial clues, they often lack the specificity to differentiate these entities definitively [4]. In stable patients, computed tomography (CT) of the lungs is the gold standard for diagnosis. The preferred treatment for symptomatic giant bullae is bullectomy [5]. Conversely, tension pneumothorax necessitates immediate needle thoracostomy followed by chest tube placement. Due

to the high risk of bronchopleural fistula formation, chest tube insertion in a tension bulla is relatively contraindicated [4]. Unfortunately, clear guidelines for managing unstable patients with compressive bullae are lacking in the emergency medicine literature.

This case report describes a case of a patient with a compressive bulla who initially experienced clinical improvement with chest tube placement. However, this intervention ultimately resulted in a bronchopleural fistula necessitating thoracotomy. This case report highlighted the complexities and potential pitfalls

**Correspondence to:** Alireza Javan

\*Student Research Committee, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

**Email:** alirezajavan76@gmail.com

*Full list of author information is available at the end of the article.*

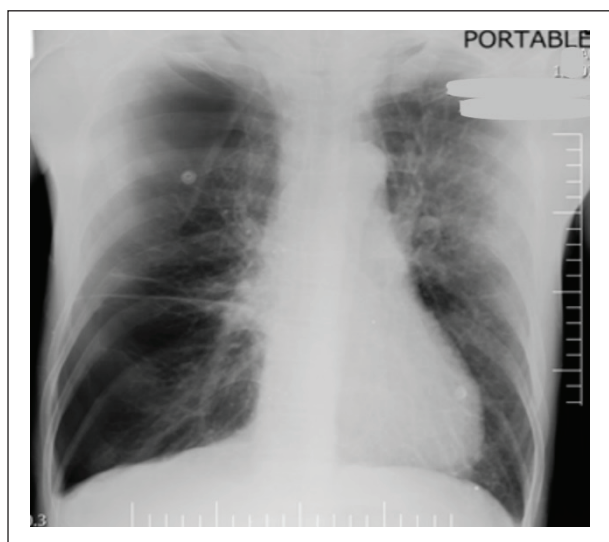
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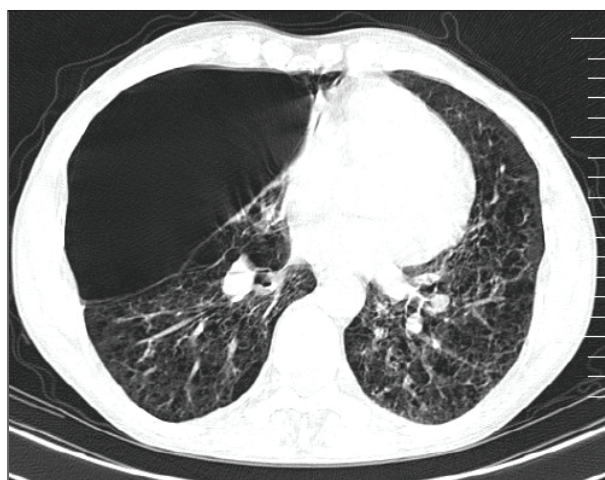
encountered by emergency physicians when managing this rare but critical presentation.

### Case Presentation

A 46-year-old male with a history of COPD and recent hospitalization for a respiratory infection presented to the emergency department (ED) with severe dyspnea. On arrival, the patient was in significant respiratory distress with vital signs including blood pressure of 150/80 mmHg, heart rate of 135 beats per minute (bpm), respiratory rate of 32 breaths/minute, and pulse oximetry showed 85% on room air (improving to 94% with supplemental oxygen). A physical examination revealed jugular venous distention, diminished right-sided breath sounds, and leftward mediastinal shift.



**Figure 1.** Portable chest X-ray shows two areas of hyper lucency in the right lung. A mediastinal shift to the left is also seen.



**Figure 2.** CT scan of the patient's chest shows a large pleural effusion in the right lung with a shift of the mediastinum to the left.

The patient's prior chest radiograph showed a large right-sided bulla. Bedside lung ultrasound suggested right-sided pneumothorax. However, a new portable chest radiograph demonstrated increasing right-sided lucency and mediastinal shift, raising concern for either compressive bulla or tension pneumothorax (Figure 1).

Due to the divergent treatment pathways, a chest CT scan was obtained, confirming a giant compressive bulla in the right lung (Figure 2).

Despite surgical intervention being the preferred approach for stable patients, the patient's clinical deterioration necessitated urgent management. After thoracic surgery consultation, a chest tube was placed into the bulla, resulting in significant improvement in the patient's respiratory status. Follow-up CT of the patient demonstrated resolution of the mediastinal shift with the chest tube within the bulla (Figure 3).

However, persistent air leaks and the development of abundant air bubbles within the chest tube indicated a bronchopleural fistula. The patient ultimately required a thoracotomy (Figure 4).

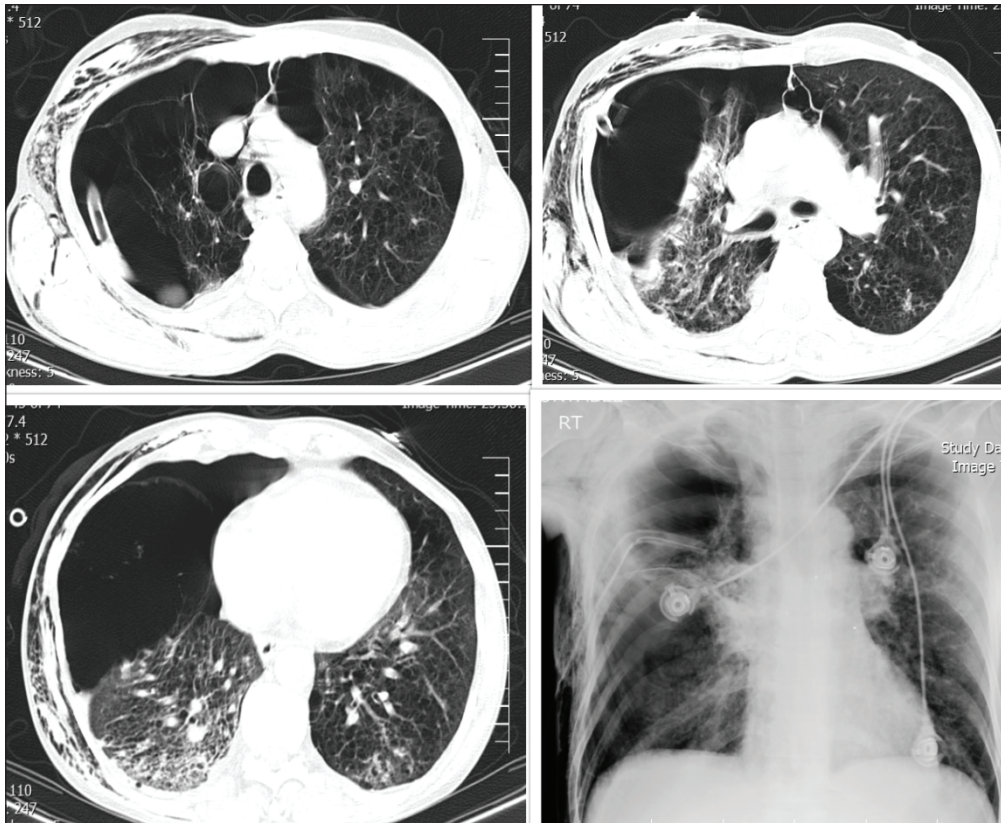
### Discussion

Pulmonary bullae, air-filled spaces within the lung parenchyma exceeding 1-2 cm, are common in COPD [1]. Giant bullae, occupying at least 30% of a hemithorax, can cause secondary spontaneous pneumothorax or, less frequently, exert a compressive effect mimicking tension pneumothorax [2,3]. Distinguishing these entities is critical, as chest tube placement, the standard treatment for tension pneumothorax, is relatively contraindicated in bullae due to the high risk of bronchopleural fistula formation.

Bedside tools like lung ultrasound and chest radiography offer initial diagnostic clues in unstable patients. However, in cases of ambiguity, particularly in stable patients, a CT scan of the chest remains the gold standard. The definitive treatment for symptomatic giant bullae is bullectomy, typically performed by thoracic surgeons [5]. Less invasive techniques exist, including intracavitary drainage, the Brompton technique, and intra-bullous adhesion procedures [6,7]. However, these are generally elective procedures, and their role in the emergency setting is limited.

The presented case highlighted the challenges faced in the ED when thoracic surgeons might not be immediately available. The patient's clinical deterioration necessitated urgent intervention despite the risk of complications with chest tube placement. While this approach initially provided relief, it ultimately resulted in a bronchopleural fistula.

Based on the experience and a review of the literature, it was proposed that smaller-diameter pleural catheters (e.g., pigtail or central venous catheters) might offer a temporizing measure for unstable patients with suspected tension bullae [8-10]. These catheters could potentially alleviate respiratory distress while minimizing the risk of fistula formation before definitive surgery. A significant



**Figure 3.** In non-contrast CT scan of the chest and chest X-ray, the chest tube embedded in the pulmonary embolus is seen along with subcutaneous emphysema.



**Figure 4.** The chamber of the chest tube shows the bubbles.

challenge in the ED setting is the precise localization of the bulla for catheter placement.

### Conclusion

This case underscores the diagnostic and management complexities of tension bullae within the ED. As these patients often present in acute distress, emergency physicians must be prepared to differentiate tension bullae from tension pneumothorax while simultaneously

considering interventions to alleviate life-threatening respiratory compromise.

The experience suggested that in unstable patients, smaller-diameter pleural catheters (such as pigtail catheters) might offer a temporary measure to decompress the bulla while minimizing the risk of bronchopleural fistula formation. This approach could provide essential stabilization before definitive surgical management. However, there remains a critical need for clear emergency medicine-specific guidelines for managing tension bullae. Further research should focus on optimal catheter selection evaluating the safety and efficacy of different small-diameter catheter types in this context. Image guidance exploring the potential role of bedside ultrasound or rapid CT protocols to assist with precise catheter placement within the bulla. The standardized approach developing evidence-based algorithms to guide ED decision-making when managing unstable patients with suspected tension bullae.

This case highlighted the importance of recognizing this rare but potentially life-threatening presentation and the need for continued research to optimize patient care.

### List of Abbreviations

COPD	chronic obstructive pulmonary disease
ED	Emergency Department
CT	Computed tomography
Bpm	beats per minute

### Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this case report.

### Funding

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### Consent for publication

Written consent was obtained from the patient to publish this case report and accompanying images.

### Ethical approval

Ethical approval is not required at our institute for an anonymous case report.

### Author details

Maedeh Asna Ashari Amiri<sup>1</sup>, Saeid Gholami Gharab<sup>2</sup>, Kourosh Javdani Esfehiani<sup>3</sup>, Hamidreza Khoshnezhad Ebrahimi<sup>4</sup>, Shabahang Jafarnejad<sup>4</sup>, Nader Sadigh<sup>2</sup>, Alireza Javan<sup>5</sup>

1. Emergency Medicine Management Research Center, Health Management Research Institute, Iran University of Medical Sciences, Tehran, Iran
2. Department of Emergency Medicine, School of Medicine, Iran University of Medical Sciences, Tehran, Iran
3. Iranian Hospital, Dubai, UAE
4. Department of Emergency Medicine, School of Medicine, Iran University of Medical Sciences, Aliasghar Children Hospital, Tehran, Iran
5. Student Research Committee, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

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