

Traumatic Open Pneumothorax in one of Bogor Rural Hospital Area: A Case Report Muhammad Satrio Primaeso^{a*}

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Abstract

Background: Open Pneumothorax is a condition where large injury occurs in the chest wall into the thoracic cavity and the injury remains open, also known as sucking chest wound. **Methods:** We present a case of Open Pneumothorax patient in our health care unit in rural hospital area. Complimentary databases were collected from PubMed and Scholar Google. **Case Illustration:** A 20-year-old male presented to the emergency department with a penetrating thoracic injury caused by a sharp weapon. The patient exhibited signs of respiratory distress, diminished breath sounds, and a visible wound indicating an open pneumothorax condition. **Discussion:** Thoracic trauma remains a serious problem, although trauma-related injury occurs in many parts of the body, but one out of four patients die due to thoracic injury or its complications. Trauma can be categorized into two primary types: penetrating and blunt. Penetrating injuries, such as those caused by cutting or firearms, lead to the disruption of tissue integrity. **Conclusion:** In conclusion, thoracic trauma represents a critical medical challenge, accounting for a substantial proportion of trauma-related fatalities. The distinction between penetrating and blunt injuries is pivotal, with the latter, constituting most cases, being associated with various mechanisms such as falls, accidents, and occupational incidents.

Keywords: Open Pneumothorax, Chest Trauma, Penetrating Thoracic Trauma, Sharp Weapon Injury

1. Introduction

Open Pneumothorax is a condition where large injury occurs in the chest wall into the thoracic cavity and the injury remains open, also known as sucking chest wound. The clinical sign of open pneumothorax is decrease or absent breathing sound on the affected side, pain, and or noisy air through the chest wall injury. (Student Course Manual ATLS © Advanced Trauma Life Support ©, 2018)

Pneumothorax is the collapse of the lung where air accumulates between the parietal and visceral pleura inside the chest. The air is outside the lung but inside the thoracic cavity. This places pressure on the lung and can lead to its collapse and a shift of the surrounding structures. Pneumothorax can be traumatic or atraumatic. Traumatic pneumothoraces occur secondarily to penetrating or blunt trauma, or they are iatrogenic. Iatrogenic pneumothorax is a traumatic pneumothorax that results from injury to the pleura, with air introduced into the pleural cavity secondary to a diagnostic or therapeutic medical intervention. Atraumatic pneumothoraces are further divided into primary (unknown etiology) and secondary (patient with an underlying pulmonary disease) (Sahota & Sayad, 2022) Here we present a quite rare and challenging case, A Case of open pneumothorax caused by sharp weapon at rural hospital in bogor.

2. Methods

A Case was reported about a patient came to the ER after injury of sharp weapon who was admitted to the Ciawi Regional General Hospital Bogor, throughout Anamnesis, Physical Examination, Laboratory

Examination, and Chest X-Ray Examintaion were performed. The patient received indicated treatment and observed in the ER due to Full Intensive ward.

3. Case illustration

A 20-year-old male presented to the emergency department with a penetrating thoracic injury caused by a sharp weapon. The patient exhibited signs of respiratory distress, diminished breath sounds, and a visible wound indicating an open pneumothorax condition (Figure 1). Immediate interventions were done, including the application of 3-sided occlusive dressing to the chest, followed by an emergent chest tube insertion. Diagnostic assessments, including imaging studies (Figure 2) and clinical examinations, confirmed the diagnosis of open pneumothorax.



Figure 1. Open Wound at Left Posterior Thorax

At the time of presentation, the patient reported a pain score of 8 out of 10 on Numeric Rating Scale. Vital signs upon admission indicated a blood pressure of 120/80 mmHg, a heart rate of 90 beats per minute, a respiratory rate of 30 breaths per minute, and oxygen saturation of 90% on room air. Laboratory examination at the time of presentastion revealed hemoglobin 11.9 g/dL and hematocrite 34.1%. Total leukocyte count was 16,100 cells/mm³ which slightly rising from the normal. The random blood sugar level was 86 mg/dl, Blood Gas Analysis showing Ph of 7.45 mmHg, PCO₂ of 29mmHg, PO₂ 167 mmHg, HCO₃ of 21 mmol/L, SaO₂ 99%, and Base Excess -2.0mEq/L (Table 1), there are no imbalance of blood gas during patient first presentation. Chest X-ray PA view revealed collapsed left lung with no vascular markings suggesting the left sided pneumothorax (Figure 2).

Complete Blood Count		
Haemoglobin (g/dL)	11.9	13.0-18.0
WBC (cell/mm ³)	16.10 x10 ³	4.1-10.9

HCT (%)	34.1	40-50
Blood Sugar count (mg/dL)	86	<200mg/dL
Blood Gas Analysis		
Ph	7.45	
PCO2	29 mmHg	
PO2	167 mmHg	
HCO3	21 mmol/L	
SaO2	99%	
Base Excess	-2.0mEq/L	

Table 1. laboratory result

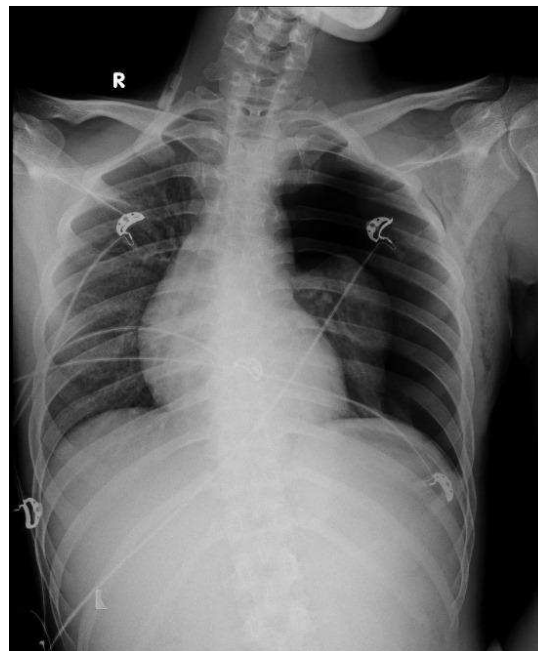


Figure 2. Chest X-Ray

Intravenous line access was given with the ringer lactate fluid combined with morphine 10mg drip, also antibiotic ceftriaxone 2g iv to prevent following infection and anti-tetanus serum 250iu was given due to the rusty weapon. Open wound injury was treated with a 3-sided occlusive dressing, and a 28F chest tube insertion in the left fifth intercostal space and after the insertion, the chest tube was connected to the self-made one-way heimlich valve. The one-way heimlich valve is made by Ringer Lactate fluid bottle with only leaving a quarter of total fluid then with the tube that connect from the chest tube drowned in half of the fluid. There is an undulation coming from the chest tube signified by the fluid is coming in and out by the patient breathes, no bleeding was found.

Throughout the course of treatment, the patient's pain was regularly assessed, and the pain killer was given. Follow-up examinations provided insights to the long-term outcomes and recovery of the patient. This

case highlights not only the clinical intricacies of managing open pneumothorax resulting from sharp weapon injuries but also emphasizes the significance of addressing and managing pain to optimize the overall patient experience and well-being.

4. Discussion

Thoracic trauma remains a serious problem, although trauma-related injury occurs in many parts of the body, but one out of four patients die due to thoracic injury or its complications. Trauma can be categorized into two primary types: penetrating and blunt. Penetrating injuries, such as those caused by cutting or firearms, lead to the disruption of tissue integrity. On the other hand, blunt injuries have the potential to damage organs and structures beneath the tissue surface without directly affecting tissue integrity. Common mechanisms for blunt injuries include falls from height, traffic accidents, and occupational incidents. Notably, approximately 70% of all chest traumas are of the blunt type (Dogrul et al., 2020). Physical traumas are sudden and complex injuries that pose an immediate threat to life. Despite ranking as the third most common cause of death across all age groups, a quarter of trauma-related fatalities result from thoracic injuries or associated complications. Blunt injuries, including incidents such as motor vehicle accidents, falls from height, blunt instrument injuries, and physical assaults, constitute many chest traumas. Thus, highlights the significance of chest trauma in the broader context of traumatic injuries (Dogrul et al., 2020).

In this case, 20-year-old male is present with a visible open wound in his posterior wall chest after stabbed by a sharp rusty weapon. The patient's complaints were difficulties to breath and chest pain. Blood pressure was in normal range, heart rate is 90 bpm, no increasing of jugular vein pressure, and the oxygen saturation is 90% of room air. Laboratory tests within normal limit, meanwhile Chest X-Ray was revealing a collapsed left lung sign by visceral pleural line is in midclavicular line with a hyperlucent of left thoracic cavity without lung vascularity indicates that there were trapped air. Typically, symptoms observed during initial presentation include chest pain and difficulty breathing. Secondary spontaneous pneumothorax (SSP) can be linked to various underlying lung conditions, with chronic obstructive pulmonary disease (COPD) identified as the most prevalent among them. In certain cases, pneumothorax related to acquired immunodeficiency syndrome (AIDS), particularly in conjunction with *Pneumocystis pneumonia*, may emerge as a predominant cause. The manifestation of symptoms, such as dyspnea, tends to be more pronounced in individuals with SSP due to the presence of pre-existing lung diseases. Consequently, the mortality rate, which is typically minimal in primary spontaneous pneumothorax (PSP), may considerably rise in patients experiencing SSP (Haynes & Baumann, 2010).

Diagnostic imagings are a significant component to clear the exact diagnosis of the patient. Among these methods, CT stands out as the most efficient for pneumothorax diagnosis. While chest X-rays (CXR) are also valuable in diagnosis, it's important to note that in certain cases of pneumothorax, the presence of air in the pleural cavity may not be visible on CXR (Dogrul et al., 2020). In this case, the chest CT-scan outperforms the CXR in evaluating pneumothorax size and identifying the causes of secondary pneumothorax. Nevertheless, due to factors such as cost, time constraints, and radiation exposure, it is not recommended as the initial diagnostic examination (Jouneau et al., 2023).

Immediate needle decompression has been done in this case after the CXR evaluation and 3-sided occlusive dressing was applied. Penetrating thoracic injuries have the potential to induce immediate life-threatening conditions, and a few simple interventions in the prehospital environment can effectively manage them. The most straightforward approach involves needle decompression for pneumothorax. Certain authors advocate not only primary decompression but also the insertion of a prehospital chest drain should be done to

individuals suspected of having pneumothorax (Bieler et al., 2021) The Royal College of Surgeons supports the adoption of chest seals for open pneumothorax and acknowledges that a three-sided occlusive dressing is frequently deemed ineffective (Kotora et al., 2013). Then again, lack of facilities and tools in this rural hospital, we decided to make a self-made dressing.

5. Conclusion

In conclusion, thoracic trauma represents a critical medical challenge, accounting for a substantial proportion of trauma-related fatalities. The distinction between penetrating and blunt injuries is pivotal, with the latter, constituting most cases, being associated with various mechanisms such as falls, accidents, and occupational incidents. This case report outlines the significance of chest trauma, particularly in instances to penetrating injuries, where prompt intervention is imperative to address immediate life-threatening conditions.

Our presented case involves a 20-year-old male with a penetrating thoracic injury, manifesting symptoms of chest pain and difficulty breathing. Diagnostic imaging, including Chest X-Ray and CT scans, played a crucial role in identifying the collapsed left lung and determining the underlying causes. The limitations of rural healthcare facilities necessitated resourceful interventions, such as a self-made dressing due to the unavailability of specialized tools.

Furthermore, the case highlights the importance of immediate measures in the prehospital setting. Needle decompression emerged as a fundamental intervention, aligning with the recommendations of various authors. While advanced diagnostic tools like CT scans are superior, constraints such as cost, time, and radiation exposure make them less feasible as initial diagnostic measures, especially in resource-limited environments.

Despite the challenges posed by the lack of facilities, the case emphasizes the significance of adaptive and resourceful approaches in managing thoracic trauma. This highlights the critical need for healthcare providers to adapt interventions based on the available resources, particularly in rural settings where access to specialized tools and facilities may be limited. The case underscores the importance of timely and appropriate interventions in ensuring the best possible outcomes for patients experiencing thoracic trauma in resource-constrained environments.

Conflict of interest

The author declare no conflict interest financial or otherwise.

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Declared done

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