

Case Report

Blast-Induced Pneumothorax Following Mine Explosion in a Young Military Patient: A Case Report

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Abstract

Blast injuries represent a significant cause of morbidity among military personnel deployed in conflict zones. Pulmonary blast injury (PBI) may occur even in the absence of external thoracic trauma, due to the transmission of high-pressure waves through the thoracic cavity. We report the case of a 30-year-old soldier who developed a pneumothorax secondary to a blast effect following a mine explosion, without evidence of direct penetrating injury or burns. Early recognition and prompt management led to a favorable outcome. This case highlights the importance of considering blast lung injury in victims exposed to explosive devices, even when external trauma appears minimal.

Keywords: Blast lung injury; Pneumothorax; Mine explosion; Pulmonary trauma; Military medicine

Introduction

Explosive devices such as land mines remain a major cause of combat-related injuries, particularly in regions of military deployment. The blast wave generated by an explosion produces a complex pattern of injury, including primary, secondary, tertiary, and quaternary effects. The lungs are particularly vulnerable to primary blast injury due to their air-filled structure, making pneumothorax, hemothorax, or pulmonary contusion common manifestations [1,2]. Pneumothorax from blast effect is often underrecognized when there are no external signs of trauma, which can delay diagnosis and treatment. This case illustrates an isolated blast-induced pneumothorax in a young soldier, emphasizing the need for vigilance and rapid intervention in similar contexts.

Case Report

A 30-year-old male soldier was involved in a mine explosion while traveling in a military vehicle during a reconnaissance mission. The explosion occurred in close proximity to the vehicle, producing a high-pressure blast wave that impacted the patient without causing visible external wounds. Upon initial evaluation on-site, the patient presented with marked dyspnea, a respiratory rate of 34 breaths per minute, and an oxygen saturation of 80% on ambient air. Hemodynamic parameters were stable, and no burns, tympanic membrane rupture, or external thoracic lesions were observed. A left leg fracture line was noted, but there was no open wound.

A chest X-ray performed immediately revealed a left-sided pneumothorax without mediastinal shift. The patient was administered high-flow oxygen therapy and was rapidly transferred to the Military Hospital of Laayoune. On arrival, a pleural drainage was performed using a thoracostomy tube in the fifth intercostal space,

resulting in rapid clinical improvement. The patient was subsequently admitted to the intensive care unit for monitoring and supportive care. No need for mechanical ventilation was identified. Serial imaging confirmed re-expansion of the lung, and the pleural drain was removed after three days. The patient's evolution was favorable, and he was discharged after one week with orthopedic management of the limb fracture.

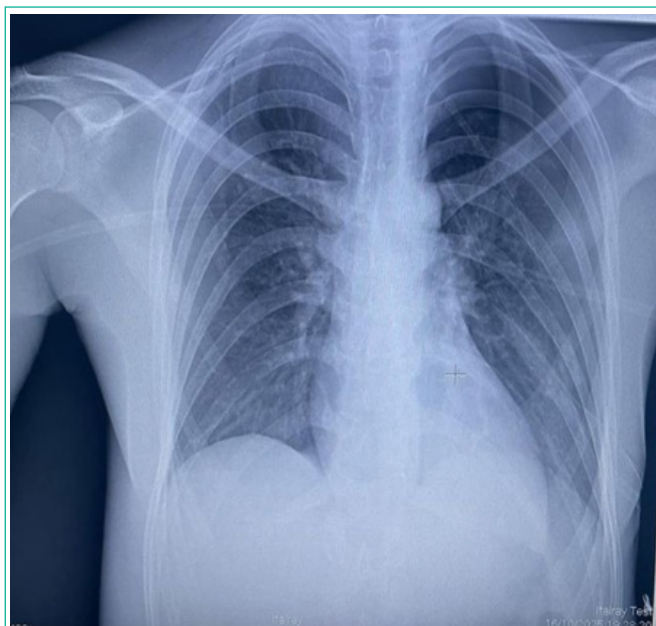


Figure 1 : Left-sided pneumothorax without mediastinal shift.

Discussion

Pulmonary blast injury (PBI) is a direct consequence of the overpressure wave generated by an explosion. The sudden increase and subsequent negative pressure phase cause alveolar rupture, interstitial hemorrhage, and air leaks that may lead to pneumothorax or pneumomediastinum [3]. Unlike penetrating or blunt trauma, PBI can occur in the absence of visible thoracic lesions. The mechanism involves complex interactions between the blast wave and tissue interfaces with differing acoustic impedance, particularly at the air-tissue junctions of the lung and gastrointestinal tract [4].

The clinical presentation of PBI is highly variable, ranging from mild dyspnea to acute respiratory failure. Pneumothorax is one of the most frequent manifestations and may progress to tension pneumothorax if not promptly identified. In the military context, early diagnosis is often challenging due to the chaotic environment and the presence of multiple casualties. Field chest radiography or ultrasonography can aid in early detection. In the present case, the absence of external trauma could have delayed recognition, but systematic evaluation and prompt imaging enabled rapid diagnosis.

Management of blast-induced pneumothorax follows standard trauma protocols, with supplemental oxygen and pleural drainage as first-line interventions. Early chest tube insertion remains the cornerstone of treatment in symptomatic cases or in patients requiring positive pressure ventilation [5,6]. Intensive care observation is recommended to monitor for delayed complications, such as recurrent pneumothorax or acute respiratory distress syndrome (ARDS). Our patient's favorable evolution following timely drainage underscores the importance of rapid and protocolized management.

This case is consistent with previously reported data suggesting that isolated thoracic blast injury may occur without associated burns or tympanic rupture. Similar cases have been described among soldiers exposed to improvised explosive devices (IEDs) or underwater

detonations, emphasizing that even moderate overpressure can induce alveolar damage [7,8]. Preventive strategies, including reinforced vehicle armor and improved blast protection, are crucial to reduce the incidence of such injuries among military personnel.

Conclusion

This case report demonstrates that pneumothorax may occur as an isolated manifestation of primary blast injury, even in the absence of external thoracic trauma. Early recognition, oxygen administration, and timely pleural drainage are essential for favorable outcomes. Clinicians managing blast victims should maintain a high index of suspicion for pulmonary injury, particularly in military settings where exposure to explosive devices is frequent. Systematic imaging and intensive monitoring are recommended to prevent potentially fatal complications.

References

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