

Clinical Observations of Unilateral Reexpansion Pulmonary Edema: A Critical Review

Abstract

Unilateral reexpansion pulmonary edema (URPE) is a rare but significant complication that can occur following the re-expansion of a collapsed lung, typically after thoracentesis, pleural drainage, or pneumothorax treatment. This article aims to provide an overview of the clinical observations related to URPE, exploring its pathophysiology, clinical presentation, management strategies, and potential outcomes. Despite its rarity, URPE remains a challenging condition, and understanding its underlying mechanisms and optimal treatment approaches is essential for clinicians. We also discuss preventive measures and the importance of early recognition in reducing complications and improving patient prognosis.

Keywords: Unilateral reexpansion pulmonary edema • URPE • Thoracentesis • Pneumothorax • Pleural drainage • Pulmonary edema • Lung re-expansion • Clinical management

Seemin Shiraz*

Department of Intensive Care Unit of
Mediclinic Parkview Hospital, UAE

*Author for correspondence:

E-mail: shiraz@mediclinic.ae

Received: 01-Mar-2025, Manuscript No. fmcp-25-158679; **Editor assigned:** 03-Mar-2025, Pre-QC No. fmcp-25-158679 (PQ); **Reviewed:** 17-Mar-2025, QC No. fmcp-25-158679; **Revised:** 21-Mar-2025, Manuscript No. fmcp-25-158679 (R); **Published:** 28-Mar-2025, DOI: 10.37532/2044-9038.2025.22(1).1-3

Introduction

Unilateral reexpansion pulmonary edema (URPE) is an uncommon but serious condition that may develop after the re-expansion of a collapsed lung. Typically occurring following procedures such as thoracentesis, pleural drainage, or management of spontaneous pneumothorax, URPE is a clinical complication that can significantly affect a patient's prognosis if not managed promptly and appropriately. Despite its low incidence, clinicians need to be aware of this condition as it can lead to severe respiratory distress and, if untreated, potentially life-threatening complications. This article aims to provide a comprehensive review of the clinical observations related to URPE, with a particular focus on pathophysiology, clinical presentation, diagnosis, management, and prevention [1].

Pathophysiology of unilateral reexpansion pulmonary edema

The exact mechanisms underlying URPE remain incompletely understood, but it is generally believed that the rapid re-expansion of a collapsed lung leads to increased capillary pressure, disruption of the alveolar-capillary

barrier, and the subsequent leakage of fluid into the alveolar spaces. Factors contributing to the development of URPE include:

Rapid re-expansion of the lung:

The abrupt restoration of normal lung volume following thoracentesis or pleural drainage can lead to a rapid shift in intrapleural pressure, overwhelming the ability of the pulmonary vasculature to cope with the increased blood flow.

Pulmonary vascular endothelial dysfunction:

In some cases, the re-expansion process can lead to endothelial injury and subsequent vascular permeability, which allows fluid to leak into the alveoli, causing edema.

Increased capillary permeability:

The sudden increase in lung volume can stress the pulmonary capillaries, leading to an increase in permeability and the development of pulmonary edema. Although URPE is often a self-limiting condition, it can cause significant clinical manifestations and may require urgent medical intervention [2,3].

Clinical presentation

Patients with URPE typically present with sudden onset respiratory distress, following a procedure aimed at re-expanding a collapsed lung. The key clinical signs and symptoms include:

Rapid onset of dyspnea:

Often occurring within minutes to hours after the re-expansion procedure, the patient may experience sudden shortness of breath that progressively worsens.

Hypoxemia:

Pulse oximetry will often reveal a drop in oxygen saturation, necessitating supplemental oxygen or more aggressive intervention.

Cyanosis:

In more severe cases, patients may develop cyanosis due to insufficient oxygenation of the blood.

Tachypnea and tachycardia:

Increased respiratory rate and heart rate are common as the body attempts to compensate for impaired gas exchange [4].

Chest radiograph findings:

A chest X-ray typically shows diffuse pulmonary edema in the re-expanded lung, without signs of infection, consolidation, or other underlying causes of pulmonary edema. In some cases, patients may also experience mild pleuritic chest pain, which can be attributed to the irritation of the pleura during the re-expansion procedure.

Diagnosis

The diagnosis of URPE is largely clinical and based on the temporal relationship between the lung re-expansion procedure and the onset of symptoms. Key diagnostic steps include:

Chest Radiography:

A chest X-ray is the first imaging modality used to assess for pulmonary edema. In the case of URPE, it will typically reveal diffuse bilateral or unilateral infiltrates, suggesting fluid accumulation in the alveolar spaces [5,6].

Arterial blood gas (ABG) analysis:

Blood gases can confirm hypoxemia and the severity of respiratory compromise, guiding the need for further management.

Exclusion of other causes of pulmonary edema:

It is essential to rule out other potential causes of pulmonary edema, including heart failure, pneumonia, and acute lung injury. This can be done through clinical history, echocardiography, and laboratory investigations.

Management of unilateral reexpansion pulmonary edema

The management of URPE generally involves supportive care, with the goal of reducing the severity of symptoms and improving oxygenation. Specific treatment strategies include:

Oxygen therapy:

Supplemental oxygen is typically required to correct hypoxemia. In more severe cases, non-invasive positive pressure ventilation (e.g., CPAP or BiPAP) or invasive mechanical ventilation may be needed [7,8].

Fluid management:

Careful management of fluids is essential. Diuretics may be used to help reduce pulmonary edema, although their use should be cautious as patients are at risk of hypotension due to fluid shifts.

Intensive monitoring:

Patients should be closely monitored in a hospital setting for any worsening of symptoms. Continuous monitoring of oxygen saturation, respiratory rate, and arterial blood gases is essential.

Avoiding re-expansion injury:

To prevent further complications, re-expansion of the lung should be performed cautiously, and any interventions that may worsen the edema should be avoided.

Prevention

While URPE remains a complication of lung re-expansion procedures, there are several strategies to minimize its risk:

Gradual re-expansion:

In cases of large pneumothorax or pleural effusion, slow and controlled re-expansion of the lung may reduce the likelihood of causing a significant pressure shift [9,10].

Proper technique:

Adequate technique during thoracentesis, pleural drainage, or pneumothorax management, including appropriate needle placement and careful monitoring, can minimize the risk of re-

expansion pulmonary edema.

Use of steroids:

Some studies have suggested that corticosteroids may help reduce the inflammatory response following lung re-expansion, potentially reducing the risk of developing edema.

Conclusion

Unilateral reexpansion pulmonary edema is a rare but potentially severe complication that can arise

after lung re-expansion procedures. Clinicians should be vigilant in recognizing the early signs of URPE and manage patients with supportive measures to optimize outcomes. Prevention through careful technique and gradual re-expansion, alongside early intervention, remains key in minimizing the impact of this condition. While the pathophysiology of URPE is still being explored, understanding its clinical features and timely management strategies will help clinicians improve patient care and reduce the morbidity associated with this complication.

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