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Case Report

REPE after Spontaneous Pneumothorax Drainage

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ABSTRACT

Spontaneous pneumothorax is a common clinical condition in respiratory medicine, typically managed through either conservative measures or pleural drainage. One of the recognized complications following drainage is re-expansion pulmonary edema (REPE), which is usually mild and self-limiting. However, in rare instances, REPE can manifest severely. This report describes a case of unilateral severe REPE that developed shortly after pleural drainage for a spontaneous pneumothorax, complicated by extensive pulmonary plasma leakage. The patient experienced a sudden and critical decline in both respiratory and circulatory status. Emergency management included prone and head-down positioning to optimize ventilation-perfusion matching, aggressive fluid resuscitation, and initiation of mechanical ventilation. This clinical course highlights the potential for REPE to progress rapidly to life-threatening respiratory and hemodynamic failure. Clinicians should maintain a high index of suspicion for severe pulmonary re-expansion edema in patients who deteriorate shortly after seemingly successful pleural decompression. Early recognition and supportive interventions are vital for improving outcomes in such critical presentations. In this case report, we discuss such a challenging case, its management and further course we learnt to support our readers.

KEYWORDS

• REPE • Spontaneous Pneumothorax • Re-expansion Pulmonary Edema

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INTRODUCTION

Spontaneous pneumothorax is a frequently encountered condition in respiratory medicine, and its management often involves either conservative observation or the insertion of a chest tube for pleural drainage. One of the potential complications following this intervention is re-expansion pulmonary edema (REPE), which, although typically mild, can occasionally present in a severe and life-threatening form. The reported incidence of REPE following treatment for spontaneous pneumothorax varies significantly in the literature, ranging from less than 1% to as high as 75%.[1] This wide variability is largely attributed to differences in diagnostic approaches, clinical criteria, and imaging techniques used to identify the condition.

In most cases, REPE manifests mildly and resolves with supportive care alone. Patients may require oxygen supplementation, fluid management, and close monitoring. While corticosteroids have been administered in some cases, their routine use remains controversial due to inconsistent evidence of benefit.[2] Severe presentations, although rare, demand more intensive interventions and can significantly complicate the clinical course. Given the potential for deterioration, it is important for healthcare providers to be aware of REPE as a possible outcome following rapid lung re-expansion, particularly in large or chronic pneumothoraxes.[2,3] Prompt recognition and appropriate supportive management remain key to favourable outcomes.

CASE

A 42-year-old male brought to the emergency department with chest pain and shortness of breath that had been progressively worsening over the past week. He denied any recent trauma. His initial vitals in the ED, he was tachypneic (28 breaths/min), tachycardic (138/min), with normal blood pressure (110/70 mmHg) and oxygen saturation of 89% on room air. Left auscultation on the left side was silent and immediate diagnosis of pneumothorax was made. This was supported by chest X-ray done in the ED (Figure 1). His medical history included active smoking, and hidradenitis suppurativa.

Figure 1: Department of Emergency Medicine, SHBG, New Delhi

Initial stabilization included fluid resuscitation, oxygen therapy, and analgesics. A pleural drain (8-Fr) was placed. Suction at -20 cm H^2O was applied. Post-procedure imaging confirmed full lung re-expansion, though parenchymal abnormalities were noted (Figure 2). The patient showed initial improvement with normalized heart rate and respiratory effort.

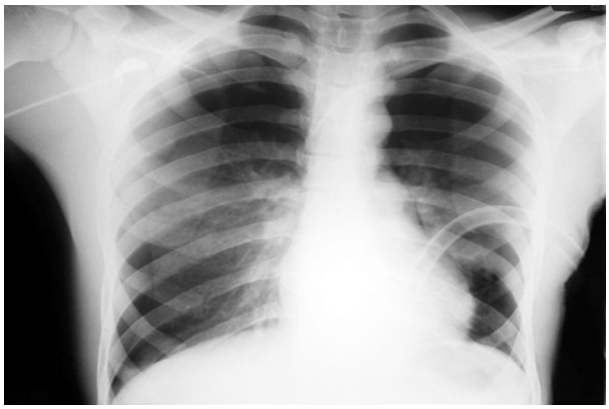

Figure 2: Post Left Side ICD Insertion Courtesy: Department of Emergency Medicine, Max SSH SHBG, New Delhi

Figure 3: HRCT Chest Left Side Pulmonary EDEMA
Courtesy: Department of Emergency Medicine, Max SSH SHBG, New Delhi

Approximately 2 hours later waiting for transfer to ICU, he developed sudden respiratory distress with hypoxemia (SpO_2 70% on 15 L O_2), tachycardia (170 bpm), hypotension (SBP 80 mmHg), and subcutaneous emphysema. Urgent imaging and echography revealed basal lung consolidation and a new apical pneumothorax. A second drain was inserted with limited effect. Due to worsening hypoxemia and shock, he was intubated; large volumes of frothy sputum were noted (Figure 4).

A CT scan showed persistent pneumothorax, pneumomediastinum, emphysema, and massive unilateral pulmonary oedema (Figure 3). Blood gas showed severe hypoxemia (PaO_2/FiO_2 = 63) and acidosis. Echocardiography ruled out cardiac failure.

Given his critical status, prone positioning combined with transient head-down tilt was initiated to enhance sputum clearance and venous return. This, along with aggressive fluid resuscitation (3.5L) and vasopressor support, stabilized his hemodynamic. No infectious source was identified. He was shifted to ICU where same treatment strategies were carried out. He remained ventilated for four days, and was successfully extubated on day 7 of admission. Persistent air leak resolved by day 20.

After 24 days of hospitalisation, the patient was safely discharged home.

The post discharge follow-ups were uneventful and the patient recovered well with lowering his smoking episodes.

DISCUSSION

This case highlights a severe episode of re-expansion pulmonary edema (REPE) presenting with both respiratory and circulatory failure, which was managed successfully using a combination of prone and transient head-down positioning, alongside other resuscitative interventions. While the exact pathophysiology of REPE remains incompletely understood, several mechanisms have been proposed. These include increased pulmonary vascular permeability driven by inflammatory cell infiltration, oxidative stress due to free radicals, and abrupt increases in regional blood flow following lung re-expansion and reversal of hypoxic vasoconstriction.[4]

Several risk factors have been identified in the development of REPE, including the duration and completeness of lung collapse and the use of negative suction during drainage.[3,4] Additional contributors may involve impaired surfactant function, altered pulmonary arterial pressure, and underlying conditions such as diabetes mellitus. In this patient, CT imaging findings and the timing of symptom onset were consistent with patterns previously reported in the literature, though the clinical severity appeared more pronounced.

The patient also had a history of Verneuil's disease (hidradenitis suppurativa), which may be associated with chronic comorbid conditions but has not been directly linked to acute pulmonary oedema or pneumothorax.[5,6] Although the individual had a prior history of substance use, there had been no recent exposure, making it unlikely to be a direct contributor in this presentation.[7]

The clinical course was notable for rapid onset of profound hypoxemia and hemodynamic instability. Laboratory findings further underscored the severity of the episode, with a sudden haemoconcentration despite fluid administration suggesting significant capillary leakage, and marked leucocytosis indicating systemic inflammatory response.[8] Although negative suction was applied, its timing in a chronic pneumothorax may have exacerbated the edema; however, current evidence does not definitively establish suction as a preventable factor.

The therapeutic approach included careful pleural management followed by

prone and brief Trendelenburg positioning. This dual strategy was selected to optimize cardiopulmonary status: head-down tilt was used temporarily to improve venous return and preload, while prone positioning has proven efficacy in improving oxygenation, ventilation-perfusion matching, and secretion clearance during severe respiratory failure.[9] Caution is warranted with prolonged Trendelenburg due to aspiration risk, but when used judiciously, these techniques contributed meaningfully to the patient's stabilization and recovery.

CONCLUSION

In conclusion, re-expansion pulmonary edema (REPE) is a rare but potentially life-threatening complication following pneumothorax drainage. This case emphasizes the importance of early recognition and comprehensive management in severe presentations involving both respiratory and hemodynamic compromise. Prone positioning, combined with transient head-down tilt, proved effective in stabilizing the patient and improving outcomes when conventional measures were insufficient. While certain risk factors such as prolonged lung collapse and negative suction use may increase vulnerability, tailored supportive care remains essential. Clinicians should maintain vigilance for REPE in similar contexts to facilitate prompt intervention and reduce the risk of adverse clinical outcomes.

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