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Case report

A common gesture with a rare but potentially severe complication: Re-expansion pulmonary edema following chest tube drainage

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A B S T R A C T

Background: Primary Spontaneous Pneumothorax (PSP) is usually considered as a benign pathology occurring in young people. In about half of cases, observation only is purposed. In case of intervention, chest tube drainage remains the preponderant strategy even if no studies conclude about superiority of drainage or aspiration. Re-expansion pulmonary edema (REPE) is a rare but potentially severe complication of chest tube drainage. Risk factors are not well identified, but REPE is more frequent for patients with diabetes, younger than 40 years, with large pneumothorax, lung collapse more than one week and fast re-expansion.

Case report: We report a case of a 19-year old male presenting to the Emergency Department with a first episode of PSP. He was treated by chest tube drainage with immediate suction. He developed a REPE 3 hours after chest tube drainage with suction. Conservative management and oxygen therapy led to withdrawing the chest tube 9 days later.

Conclusion: For the initial management of PSP, prevention of this complication is essential. In case of risk factors, prevention consist of absence of immediate suction after chest tube drainage and suction should be reserved in case of failure of initial treatment after 24 hours. Even if chest tube drainage is a common gesture, clinical presentation of REPE must alert physicians taking care of these patients.

1. Introduction

Primary spontaneous pneumothorax (PSP) is usually considered a benign pathology occurring in young people. In about half of the cases, observation only is proposed. In case of intervention, chest tube drainage remains the preponderant strategy even though no studies have concluded on the superiority of drainage or aspiration. Re-expansion pulmonary edema (REPE) is a rare but potentially severe complication of chest tube drainage. The risk factors are not clearly identified, but REPE is more frequent in patients with diabetes, those younger than 40 years, with large pneumothorax, lung collapse lasting more than 1 week, and fast re-expansion. For the management of PSP in an emergency department (ED), prevention of this complication by emergency physicians is essential. Even if chest tube drainage is a common act in EDs, clinical presentations must alert physicians.

2. Case report

A 19-year-old male presented to the ED with dyspnea and left chest pain evolving over 2 weeks. He had no medical history and declared no smoking habits. Initial vital parameters were stable with blood pressure at 125/86 mmHg and air ambient oxygen saturation at 96% without any signs of respiratory failure. Tachycardia at 110 beats per minute was noted. The chest radiograph (Fig. 1) showed a large left primary spontaneous pneumothorax (PSP). First-line treatment consisted of a single aspiration, but incomplete re-expansion of the lung was observed. Secondarily, a chest tube drainage was performed with an immediate suction at -20 cm H_2O. The success of this strategy was highlighted by a second chest radiograph completed after the procedure. However, 3 h later, acute respiratory failure with dyspnea, cough, and hypoxemia with an oxygen saturation level that had dropped to 85% required oxygen therapy at 3 L/min. Interstitial opacities of the left lung on the chest radiograph (Fig. 2) was interpreted as re-expansion pulmonary edema (REPE). The chest computed tomography confirmed the diagnosis (Fig. 3). The patient was admitted to an intensive care unit. Conservative management and oxygen therapy led to withdrawing the chest tube 9 days later. Antalgics and physiotherapy were prescribed after discharge.

3. Discussion

3.1. Management of PSP: less invasive strategy to prevent complication

Management of PSP consists of an immediate resolution of pleural

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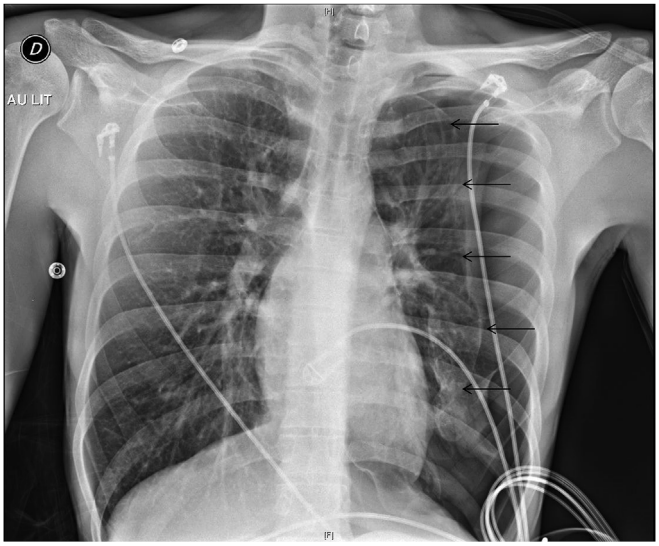

Fig. 1. Anteroposterior chest radiograph showing a large left spontaneous pneumothorax (black arrow).

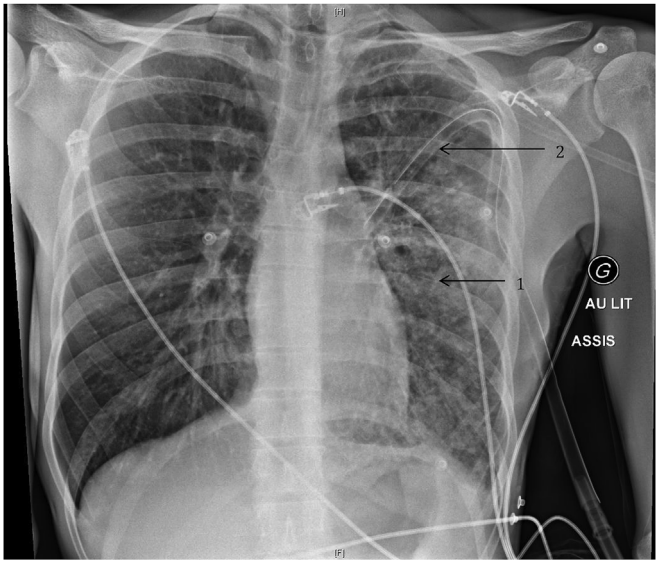

Fig. 2. Anteroposterior chest radiograph showing left-sided pulmonary edema (black arrow 1) 3 h after tube thoracostomy (black arrow 2).

air or observation. The optimal initial approach in the management of SP remains the subject of debate, with no superiority of thoracic drainage versus aspiration as first-line treatment [1]. In the absence of international consensus, the choice of first-line treatment is left to the discretion of the practitioners caring for these patients. In real-life conditions, even if drainage is a more invasive strategy, it remains the preponderant first-line strategy in the management of SP [2]. Furthermore, the indication of invasive treatment depends on the size of SP, which is not consensual according to the British Thoracic Society and the American College of Chest Physicians guidelines [3]. For about half of the patients, observation can be retained.

In case of intervention, REPE is a rare but major complication of thoracentesis, occurring in less than 1% of cases. The mortality rate is about 20%.

3.2. Physiopathology of REPE

Physiopathology of REPE is not well known and several theories were evoked. REPE has the characteristic of hydrostatic edema [4].

Fig. 3. Axial CT of the chest showing re-expansion pulmonary edema with ipsilateral ground-glass opacities (black arrow 1) and septal thickening (black arrow 2).

Some authors have suggested that REPE could be explain by histological changes due to lung collapse, occurring bloods vessels damage and an increase of capillary permeability [5]. Anoxic stress linked with reperfusion of lung after reexpansion could also can initiate REPE by endothelium damage [6]. Then, hydrostatic forces in the lung microcirculation generated by rapid reexpansion of the collapsed lung may contribute to the development of REPE [7].

3.3. Clinical presentation of REPE and risk factors

REPE usually develops between 1 h and 24 h after treatment [8], mostly ipsilateral. Some cases of contralateral or bilateral REPE have been described. Risk factors have not been clearly identified, but REPE is more frequent in patients with diabetes, those younger than 40 years, and in case of large pneumothorax and lung collapse lasting more than 1 week [9–11]. Another risk factor is fast re-expansion, as in our case. Dyspnea and cough are the first signs. The onset of these symptoms after chest tube drainage must alert emergency physicians. A chest radiograph confirms the diagnosis, and chest computed tomography demonstrates ground-glass opacities, septal thickening, consolidation, and persistent areas of atelectasis.

3.4. Treatment and prevention of REPE

The treatment of REPE consists of supportive care with oxygen and CPAP if necessary. Mechanical intubation and inotropics could be used in the most serious cases. Lateral decubitus on the affected side could be purposed for unilateral case to reducing the pulmonary shunt and improving oxygenation.

Attention should be paid to the rapidity of reexpansion, which could favorise development of REPE. Oxygen supplementation or anti-oxidants have been purposed by some authors to prevent REPE, but it appears difficult to concluded about the impact of these interventions [6,12,13].

3.5. Impact of initial suction in the development of REPE

According to previous guidelines [14], suction should not be routinely employed in most cases of SP managed in the ED and should be reserved in case of failure of initial treatment after 24 h. Suction remains necessary for the management of secondary spontaneous pneumothorax with signs of poor tolerance and in case of pneumothorax under mechanical ventilation.

4. Conclusion

Although chest tube drainage is a common act in emergency medicine practice in cases of pneumothorax, major complications such as REPE can occur. The risk factors of REPE include young age as well as large and prolonged pneumothorax. In these cases, prevention of REPE consists of the absence of immediate suction after chest tube drainage.

Conflict of interest

No author has any conflict of interest to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rmcr.2019.100838.

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