

Case report

Bilateral re-expansion pulmonary edema: an uncommon complication of the pneumothorax drainage

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Abstract

Re-expansion pulmonary edema after chest tube drainage of spontaneous pneumothorax is a very rare complication, even more when it is bilateral. We report the case of a middle age patient presenting to our emergency department for syncope without shortness of breath. A chest X-ray showed a complete pneumothorax, but the treatment worsened the patient condition. The drainage led to a re-expansion pulmonary edema. We discuss the mechanism and predictors of this entity and suggest treatment including preventive measures.

Keywords: *Re-expansion pulmonary edema; drainage; pneumothorax; complication.*

Introduction

Pneumothorax is a well-known entity to emergency physicians and pretty easy to diagnose. It is defined by the presence of air in the pleural cavity. When it is spontaneous and idiopathic, its prevalence is 1.2 to 18 cases per 100,000 inhabitants [1] with a male prevalence.

The purpose of the treatment is to obtain a complete pulmonary re-expansion. However, there is a rare (incidence of 0 to 1% [2]) and little-known complication that can be fatal: the re-expansion pulmonary edema (*a vacuo*).

Case report

A 48-year-old man, with no previous medical history, non-smoker, was admitted to the emergency department for a syncope at work the same day. He reported a dry cough

without fever, dyspnea or chest pain progressing for 3 days.

When he arrived, the patient had low peripheral oxygen saturation (91% on room air) but well tolerated. His vital signs were as follows: blood pressure 113/64 mmHg, heart rate 95 beats/min, temperature 36.7°C. The clinical examination found an abolished vesicular murmur of the right pulmonary field without sign of acute respiratory distress suggesting a complete spontaneous right pneumothorax. The chest X-ray confirmed the diagnosis (Figure 1).

He was given oxygen via a nasal cannula and we performed chest drainage with a Fuhrman drain equipped with a Heimlich valve. Five hundred mL of air were removed by a soft and slow manual drainage. We used a drain with a non-suction backflow valve system.

On the postprocedure chest radiography (Figure 2), the drain was well positioned, and the lung was completely glued back to the wall. The patient benefited of a close nurse monitoring in the emergency department. One hour later, the patient was out of breath and the peripheral oxygen saturation dropped to 90% and then rapidly to 88% despite oxygen supply (6L/min) via face mask.

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Fig. 1. Radiograph of chest showing a complete right pneumothorax

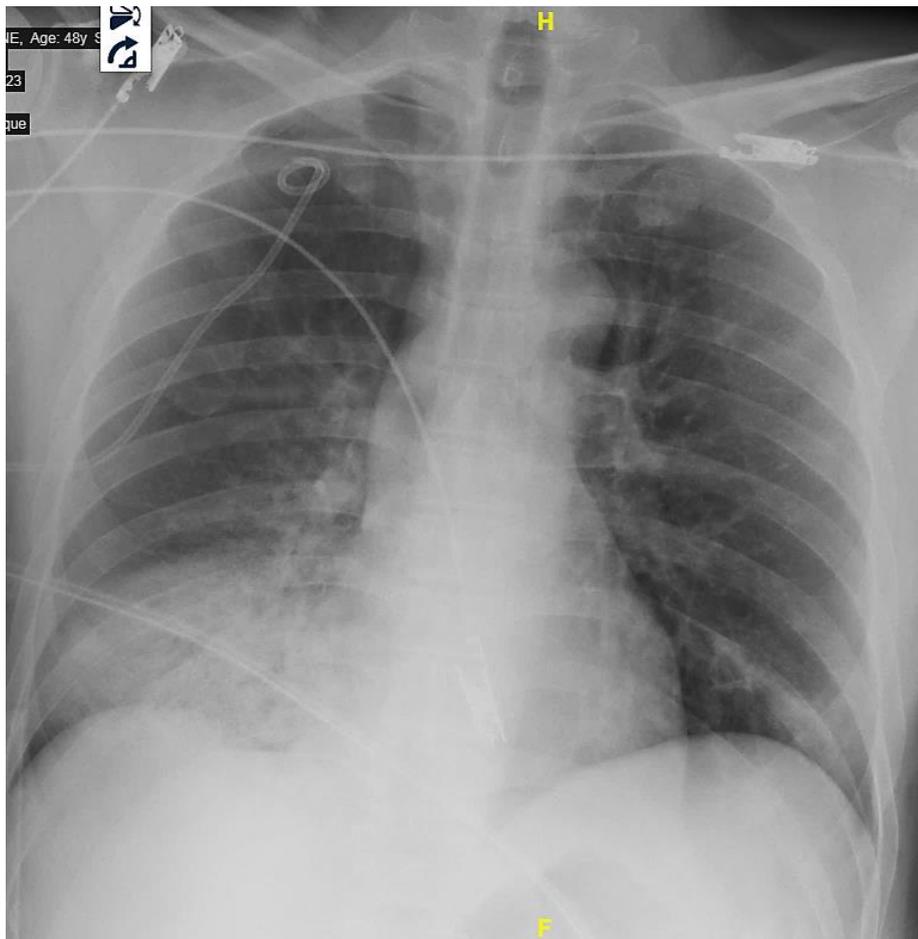


Fig. 2. Postprocedure chest radiography



We performed a chest CT scan to search for any complication linked to the drainage. It showed extensive bilateral alveolar consolidation predominating on the right side (Figure 3). The diagnosis was a re-expansion pulmonary edema. No fluid had been administered during his stay in the Emergency Department. We finally admitted the patient to the intensive care unit for closer monitoring and further care. He started on non-invasive

respiratory support with positive end-expiratory pressure (PEEP) and the Heimlich valve was removed. Instead, he benefited from a Pleurevac drainage system. The outcome was favorable and the patient was discharged two days later without any follow-up, but he did not consult the emergency department as he was asked in case of shortness of breath or thoracic pain.

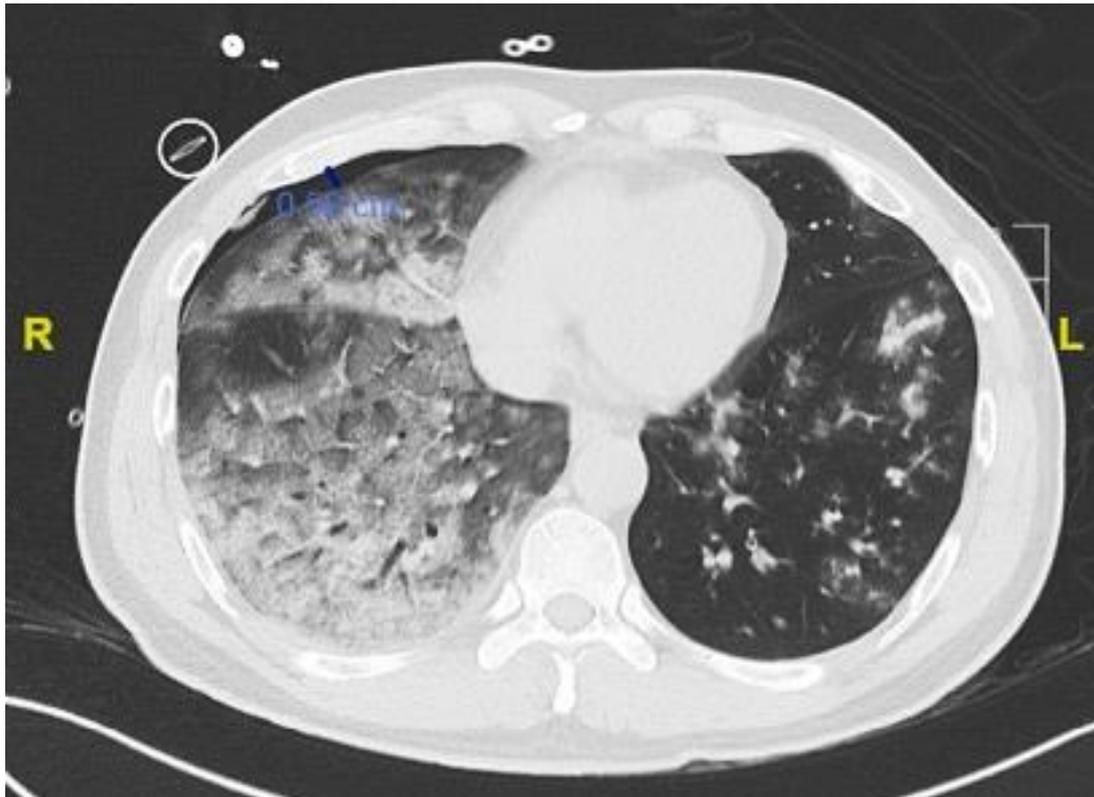


Fig. 3. Chest CT scan showing bilateral ranges of pulmonary edema predominating on the right side

Discussions

The aspect of the CT scan showing extensive bilateral alveolar is not specific of re-expansion pulmonary edema. Then, many differential diagnoses were assessed. No previous CT scan was available. But the patient did not report any chronic heart or lung disease. Cardiogenic edema was excluded because he had no sign of heart congestion, CT scan did not show any associated pleural effusion and the brain natriuretic peptide level was normal (20pg/mL).

We found no infection on bloodstream culture, no lymphopenia, no hyperleukocytosis

and C reactive protein was low (6.9mg/L). Also, the onset was sudden, following the drainage procedure, suggesting a viral or bacterial infection is less likely.

The pathophysiology of the re-expansion pulmonary edema is poorly defined although several hypotheses are put forward: an increase in the permeability of pulmonary capillaries [3], the action of a pro-inflammatory mediator released during pulmonary re-expansion [4] or a decrease in the activity of the surfactant [5].

Its presentation is varied: the patient may be asymptomatic or have a simple cough [4]. It

may also mimic a cardiogenic pulmonary edema.

Almost all cases described in literature occurred on the same side of the pneumothorax. Contralateral re-expansion pulmonary edema has been poorly described. Our case represents the second case reported in the medical literature of bilateral re-expansion pulmonary edema caused after relief of pneumothorax [6]. And it is the first one not caused by a suctioned system.

The risk factors suggested by the literature are: chronic collapse (>7 days [2]), pleural effusion associated with pneumothorax [7], trocar drainage [8], young age (Matsuura et al [9] report in their series a majority of re-expansion pulmonary edema *a vacuo* in the 20-39 years old group), diabetes, pneumothorax size [5] and rapid re-expansion of the collapsed lung.

Regarding its treatment, no recommendation is available at this time. Oxygen therapy is required in case of hypoxia. Some authors propose the use of non-invasive ventilation to apply a PEEP [4, 10, 11]. The need for intubation has been described by some authors [10, 12]. The British Thoracic Society 2010 guidelines recommend avoiding high intrapleural pressures during the procedures. It also emphasizes that a maximum of 1.5 L should be drained in the first hour after insertion of the drain.

In contrast to cardiogenic pulmonary edema, an aggressive vascular filling may be needed in order to preserve hemodynamics [13]. Preventive measures are required, including progressive pulmonary re-expansion.

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Whether diuretics, bronchodilators or steroids are of added benefit is unproven [12, 14]

Finally, its mortality is not well defined in the literature.

Conclusions

Pneumothorax is a common entity in emergency medicine. Much rarer however and much less known, acute re-expansion pulmonary edema is one of the complications of drainage, even more when it is bilateral. Its presentation can be widely varied and its diagnosis not easy, but the prognosis can be serious and life-threatening. Particular care should be taken in young people and diabetic patients, also, if the pneumothorax is chronic, associated with pleural effusion or in case of a large volume pneumothorax. Finally, rapid re-expansion of the collapsed lung must be avoided.

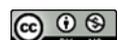
This case emphasizes that the absence of an aspiration system does not protect against the risk of acute re-expansion pulmonary edema. Moreover, after chest drainage, patients must be systematically monitored in the emergency room during a few hours by an experimented nurse.

Consent

Written informed consent was obtained from the patient for publication of this case report.

Competing interests

The authors declare that they have no competing interests.



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