Clinical Case Reports

Brazilian Journal of Case Reports

Re-expansion pulmonary edema after a thoracic surgery: a rare complication

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Research Ethics Committe Aproval: We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

Received on: Sep 29, 2021. Accepted on: May 6, 2022. Available online: Aug 12, 2022.

Abstract

Re-expansion pulmonary edema rarely complicates thoracic drainage. The diagnosis of this pathology is radiological and clinical and must be noted in the event of any respiratory distress following pleural drainage. A 70-year-old patient was admitted to the operating room for a pleurectomy with surgical removal of an emphysema bubble after the failure of 02 pneumothorax drainage attempts. The immediate post-operative consequences were marked by the occurrence of re-expansion edema, which motivated the transfer of the patient to the intensive care unit for ventilatory support. The evolution was favorable due to the early recognition of the radioclinical presentation.

Keywords: Pulmonary edema; Re-expansion; Pneumothorax; Chest drainage; Pleurectomy.

Introduction

Acute Re-expansion Pulmonary Edema (REPE) is defined by the development of non-cardiogenic pulmonary edema during drainage of gaseous or fluid pleural effusions [1].

Mostly unilateral, this edema can occur in other circumstances, especially after pleural decortication, or removal of a large lung tumor [3]. This clinical case led us to know that reexpansion pulmonary edema can also occur in the post operative period of thoracic surgery, which can lead to life-threatening consequences [4].

Case Report

A 70-year-old patient chronic smoker at the rate of thirty packs-years,

ISSN: 2763-583X. doi: 10.52600/2763-583X.bjcr.2022.2.3.130-135.

weaned 03 years ago, was admitted for the management of a total right pneumothorax (Figure 1). The evacuation was marked by clinical and radiological improvement (Figure 2).

However, 72 hours later, the patient presented a recurrence of pneumothorax by bursting of an emphysema bubble.

Figure 1. Right spontaneous pneumothorax.

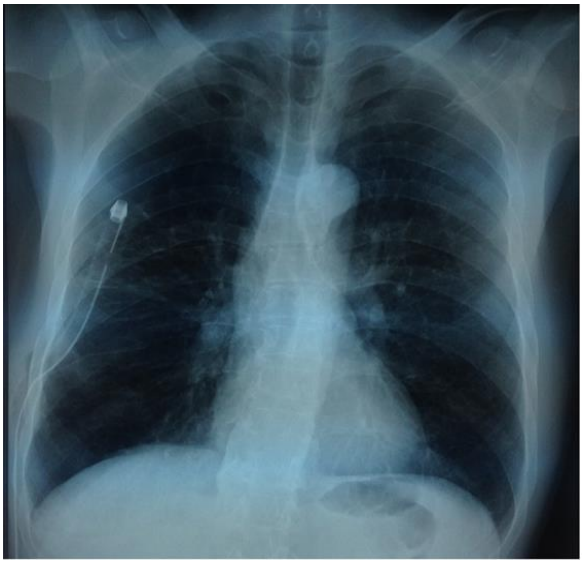

Figure 2. Right drained pneumothorax.

Chest x-ray taken after placing a new drain to evacuate the recurrent pneumothorax showed that the drainage was ineffective since the right lung remained collapsed at the level of the pulmonary hilum (Figure 3).

Partial apical pleurectomy with surgical removal of the emphysema

bubble was indicated. The surgical approach consisted of a right lateral thoracotomy. The exploration revealed a right lung detached from its wall, in which there was a bursted emphysema bubble.

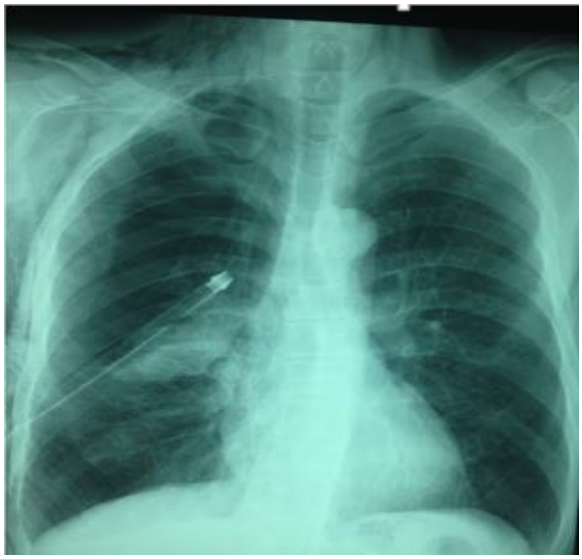

Figure 3. Drainage failure of recurrent right pneumothorax

The immediate post-operative consequences were marked by the occurrence of a respiratory distress presentation made up of polypnea, desaturation with an SpO2 not exceeding 85% under 15l/min O2 therapy and signs of respiratory struggle (intercostal and suprasternal indrawing), all accompanied by a quintuous cough with whitish sputum.

The patient presented a tachycardia at 140 Bpm. His Blood Pressure was 85 / 50mmhg. Auscultation of the 02 pulmonary fields revealed the unilateral presence of crackles in the right hemithorax. In view of the worsening of the symptoms, the patient was admitted to intensive care unit. The arterial blood gases (ABG) objectified the presence of a shunt effect with PaO2 at 160mmhg for a PaO_2 / FiO_2 ratio at 177mmhg and $PaCO_2$ at 42mmhg. Chest radiography objectified diffuse alveolar opacities throughout the right pulmonary field (Figure 4), confirming the diagnosis of unilateral postoperative REPE.

Therapeutic management consisted on the use of an inspiratory support ventilation of 10cm H_2O with 5 cm H_2O PEEP which led to an improvement in respiratory symptoms with reduction in dyspnea and disappearance of crackles as well as an improvement in ABG parameters (PaO_2 at 230mmhg for a PaO_2 / FiO_2 ratio at 380mmhg).

Chest x-ray taken 12 hours after admission showed the resolution of the pulmonary edema (Figure 5). The

patient was discharged 24 hours later after withdrawal of oxygen.

Figure 4. Right postoperative alveolar syndrome.

Figure 5. Radiological clean up with disappearance of alveolar opacities.

Discussion and Conclusion

REPE rarely occurs after the evacuation of a pleural fluid or gas effusion. Carlson et al described the first case in the literature which was a REPE after drainage of a spontaneous pneumothorax [1].

Though there have been reports of REPE following pneumothorax aspiration [2], very few cases of postoperative REPE have been identified. Indeed, Yashuhiro et al reported a case in the immediate post operative period of a total

pneumectomy for a lung cancer [3], whereas Lemoine et al reported a pediatric case after pleural decortication for pulmonary tumor [4].

There are many patho-physiological theories for REPE. On one mechanical theory, the reperfusion and reoxygenation of the collapsed lung after its re-expansion cause a mechanical distension of the endothelial pores and the excessive production of free radicals toxic to the alveolar-capillary membrane [5].

On the other hand, Nakamura et al. have found much higher levels of IL8, leukotriene B4, elastase, and P selectin in Broncho alveolar lavage of pleural effusions, enhancing more the inflammatory theory [6].

The management of REPE is mostly ventilatory support. Indeed, the benefit of early initiation of NIV-CPAP, even for the most severe cases of REPE, has been demonstrated in several studies [7]. On the other hand, invasive ventilation by an endotracheal tube is indicated if the clinical picture is that of severe respiratory distress or after failure of the NIV.

In some more severe cases of REPE, the use of differential pulmonary ventilation is essential. It will be performed using right or left double-lumen tubes depending on the affected side. In these cases, conventional ventilation may worsen the shunt effect, as the affected lung will be perfused with low compliance, while the healthy lung will be relatively hypoperfused with better compliance [8].

Several studies suggest that the method of thoracic drainage and therefore the speed of re-expansion may play a role in the development of REPE [9]. Indeed, some risk factors of REPE are the size of effusion, the duration of collapse and also the technique used for re-expansion [10]. This is why it is recommended that the drainage volume of pleural effusion does not exceed 1–2 L every 2 h [11].

As for the prevention of postoperative REPE and especially during unipulmonary ventilation, it is based on the principle of protective ventilation, which ensures minimum effective ventilation.

Finally, REPE is mostly an iatrogenic complication. Its frequency is low and most often underestimated. Many clinical situations can be the cause, mainly pleural drainage, and exceptionally postoperative forms.

This observation described a case of postoperative REPE. Indeed, early recognition of clinical and radiological signs allowed early management as well as favorable outcome for the patient.

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Conflict of interest: The author declares no conflicts of interest.

Acknowledgements: None.

Funding: None.

How to cite this article: Mohamed Bahi M, Aissaoui Y, Alaoui H, Seddiki R. Re-expansion pulmonary edema after a thoracic surgery: a rare complication. Brazilian Journal of Case Reports. 2022 Jul-Sep;02(3):130-135.