

Bilateral refractory pneumothorax treated by pleurodesis and bronchial occlusion in a COVID-19 patient

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November 7, 2022

Abstract

Coronavirus disease 2019 (COVID-19) can cause various complications. Pneumothorax secondary to COVID-19 is relatively uncommon and bilateral pneumothorax is even more so. In patients with poor general health to undergo surgery for pneumothorax, internal treatments are essential to relieving refractory pneumothorax.

CASE REPORT

Bilateral refractory pneumothorax treated by pleurodesis and bronchial occlusion in a COVID-19 patient

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ABSTRACT

Coronavirus disease 2019 (COVID-19) has become a worldwide outbreak, and it can cause various complications. However, pneumothorax secondary to COVID-19 is relatively uncommon. We herein report a 60-year-old man with bilateral refractory pneumothorax with severe COVID-19. In patients with poor general health to undergo surgery for pneumothorax post COVID-19, internal treatments such as chest drainage, bronchial occlusion and pleurodesis are essential to relieving refractory pneumothorax. It also indicates that autologous blood patch pleurodesis is a useful method in terms of efficacy and side effects.

1 INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) infection has been widespread all over the world. COVID-19 infection can cause various complications and pneumothorax secondary to COVID-19 is relatively rare. Pneumothorax as a complication of COVID-19 infection occurs in 1% of hospitalized COVID-19 patients¹ and 2% of COVID-19 patients in intensive care unit². Simultaneous bilateral spontaneous pneumothorax is an extremely rare condition that is found in only 1% of all patients with spontaneous pneumothorax³. There have been few reports of bilateral pneumothorax due to COVID-19. There is no

treatment strategy for secondary spontaneous pneumothorax due to COVID-19. In patients with poor general condition and who are not fit for surgery, refractory pneumothorax must be cured by internal therapies (chest drainage, bronchial occlusion and pleurodesis, and so on). There are various drugs in pleurodesis and autologous blood is a better adhesion in terms of efficacy and side effects. We herein report a rare case of a severe COVID-19 patient with bilateral refractory pneumothorax treated by combining internal treatments.

2 CASE HISTORY

A 60-year-old Japanese man with no medical, family, or smoking history was diagnosed with coronavirus disease 2019 (COVID-19). Two weeks later, he was brought to our hospital in an ambulance because of high fever and dyspnea. He required oxygen supplementation at 15 L/min via an oxygen mask with an oxygen reservoir and he was immediately intubated. Computed tomography (CT) revealed bilateral diffuse infiltrations (Fig.1A, 1B) and he was diagnosed as having bacterial and secondary organizing pneumonia following COVID-19 infection. He was treated with antibiotics, methylprednisolone, and heparin sodium. His respiratory condition improved gradually, and mechanical ventilation was discontinued on day 15. He complained of right chest pain on day 22, and CT revealed right-sided pneumothorax. A chest drain was inserted immediately, which was removed on day 29 after pleurodesis with minocycline (MINO) 200 mg and OK-432 5KE. However, the right-sided pneumothorax recurred on day 50, and a left-sided pneumothorax appeared on day 56. Chest drainage was performed on both sides, and an additional drain was placed on the right side (Fig. 1C). He underwent pleurodesis on both sides (right side: twice with MINO 200 mg and OK-432 5KE and twice with 100mL of autologous blood, left side: twice with 100mL of autologous blood); however, the air leak persisted. There were more leaks on the left side than on the right side; therefore, we performed a bronchial occlusion procedure using Endobronchial Watanabe Spigots[®] (EWS[®]; Novatech, La Ciotat, France) for the left-sided pneumothorax on day 68. We inserted a 6-mm EWS[®] into B8bi and a 7-mm EWS^(r) into B8bii on the left (Fig. 1D). Bronchial occlusion procedure was performed using flexible bronchoscopes (1T290 and P290, Olympus, Tokyo, Japan) and curette (CC-4CR-1, Olympus, Tokyo, Japan). The right lung expanded fully after bronchial occlusion and pleurodesis with 100mL of autologous blood added on both sides, performed once on the right side and twice on the left side. Thereafter the air leaks on both the sides stopped, and bilateral pneumothorax improved. The right drain was removed on day 73 and the left drain on day 75. Thereafter, there was no recurrence of pneumothorax and he was discharged on day 202 after rehabilitation for ICU-acquired weakness.

3 DISCUSSION

Bilateral pneumothorax due to COVID-19 has not been widely reported in the literature so far. The pathophysiology for the development of pneumothorax in patients with COVID-19 is unclear; however, cystic and fibrotic structural changes caused by COVID-19 may be related⁴. In addition to this, treatment with positive pressure by non-invasive or mechanical ventilation in patients with severe COVID-19 infection may contribute to the development of pneumothorax⁵. Systemic corticosteroids exhibit anti-inflammatory and anti-fibrotic effects in patients with severe COVID-19 infection. However, corticosteroid therapy may also cause a delay in the wound healing process of pneumothorax⁶. There is no established treatment strategy for secondary spontaneous pneumothorax due to COVID-19. Surgical intervention presents a better outcome than tube thoracostomy in simultaneous bilateral primary spontaneous pneumothorax⁷. However, in some patients surgical intervention for pneumothorax may pose high risk from the perspective of general and respiratory condition. In patients with poor general condition and who are not fit for surgery, refractory pneumothorax must be cured by other internal therapies. Internal treatments for pneumothorax include procedures such as chest drainage, pleurodesis, endobronchial approach⁸. In some cases, it is important to combine multiple methods. We decided that our patient's general condition was not good enough to operate. Thus, the combination bronchial occlusion and pleurodesis relieved the patient's bilateral refractory pneumothorax. Bronchial occlusion using an EWS^(r) is one of the most effective and minimally invasive treatments for secondary refractory pneumothorax, postoperative pulmonary fistula, fistulous empyema, and bronchial fistula in patients with poor general condition. Bronchial occlusion alone or in combination with pleurodesis for secondary refractory pneumothorax, postoperative pulmonary fistula, or fistulous empyema

enabled drain removal in 57.1% to 86.0% of patients⁹⁻¹¹.

Mitsuyama et al. reported that autologous blood patch pleurodesis may be a treatment option for recurrent and refractory pneumothorax secondary to COVID-19¹². In our case, pleurodesis with MINO and OK-432 was ineffective, whereas the one with autologous blood was effective. Pleurodesis with autologous blood has fewer side effects than that with other drugs such as OK-432, talc, glucose and minocycline hydrochloride¹³. Therefore, pleurodesis with autologous blood is a better strategy for refractory pneumothorax in patients with poor general condition after severe COVID-19 infection. In case of inoperable patients with refractory pneumothorax after severe COVID-19 infection, bronchial occlusion and pleurodesis can be key treatment strategies.

CONCLUSION

Bilateral pneumothorax can occur as a complication of COVID-19 infection. Refractory pneumothorax in severe COVID-19 patients with poor general condition may be inoperable. In such situations, combining internal treatments such as chest drainage, bronchial occlusion and pleurodesis is essential for relieving refractory pneumothorax.

DISCLOSURE STATEMENT : The authors declare no conflicts of interest (COI).

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Figure 1.

A, B: Contrast computed tomography on admission shows infiltration shadows on both sides

C: Computed tomography shows bilateral pneumothorax after bilateral tube drainage.

D: Flexible bronchoscopy shows bronchial obstruction using EWS^(r) (a 6-mm EWS^(r) into B8bi and a 7-mm EWS^(r) into B8bii on the left).

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