Giant lung bulla as a late-onset complication of mild SARS-CoV-2 pneumonia

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Abstract

A 49-year-old Caucasian man was admitted to the Emergency Department for shortness of breath and cough. Computed tomography (CT) imaging showed bilateral mild COVID-19-related pneumonia. He was hospitalized in the low-intensity COVID-19 unit, where he received O_2 therapy and oral corticosteroids. Three weeks after discharge, a high-resolution CT (HRCT) found a giant bulla in the inferior lobe. The bulla was resected by video-assisted thoracoscopic surgery, and the patient recovered completely. In our patient, it is reasonable to suspect that the development of the bulla is a result of SARS-CoV-2 infection since no bulla was observed in the first HRCT two months before. SARS-CoV-2-related pneumonia may be responsible for lung remodeling due to diffuse alveolar damage and later interstitial myofibroblastic proliferation. Corticosteroids might have played a role in increasing SARS-CoV-2 dystrophic action. COVID-19 leads to pulmonary damages, which are still partially unknown and might result in the development of bullae. In fit patients, surgical treatment can be carried out safely.

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Introduction

The COVID-19 pandemic spread in the last 2 years throughout the world with a significant number of deaths. According to the Centers for Disease Control and Prevention, common symptoms of COVID-19 include fever, cough, shortness of breath, muscle aches, and, in some cases, loss of taste or smell. Gastrointestinal manifestations may include nausea, vomiting, diarrhea, and abnormal liver function. Other less common manifestations encompass headaches, dizziness, conjunctivitis, ocular irritation, and erythematous rash [1].

In this report, we present the case of a patient who developed a massive lung bulla 2 months after COVID-19 pneumonia, and he was successfully treated with a surgical resection.

Case Report

Written consent was obtained by the patient. On November 8, 2021, a 49-year-old Caucasian man was admitted to the emergency department for shortness of breath and cough. He tested positive for SARS-CoV-2 polymerase chain reaction (PCR) nasal swab, and he was not vaccinated. His past medical history was negative for significant comorbidities, including smoking history. Computed tomography (CT) imaging showed bilateral diffuse ground-glass areas compatible with mild COVID-19-related pneumonia (Figure 1).

Due to mild symptoms, the patient was discharged home with empiric antibiotic therapy (azithromycin), antithrombotic prophylaxis with low-molecular-weight heparin, and anti-inflammatory treatment. The day after, his family doctor implemented the therapy with oral corticosteroids (CS) (prednisone 25 mg per day).

On November 12, the patient returned to the emergency department for worsening dyspnea and cough. The 6-minute walking test was positive for desaturation, but the radiological evaluation did not reveal significant changes; the patient was then transferred to the low-intensity COVID-19 unit, where he received O_2 therapy with nasal cannula and oral CS, with a notable improvement of respiratory function. On November 18, he was discharged again with a prescription for home isolation and CS.

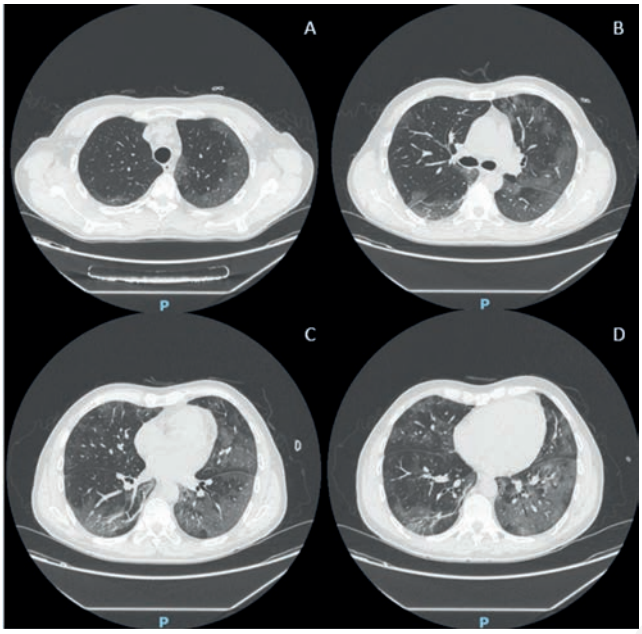

Figure 1. A-D) Computed tomography scan showing mild COVID-19 pneumonia with no bullae.

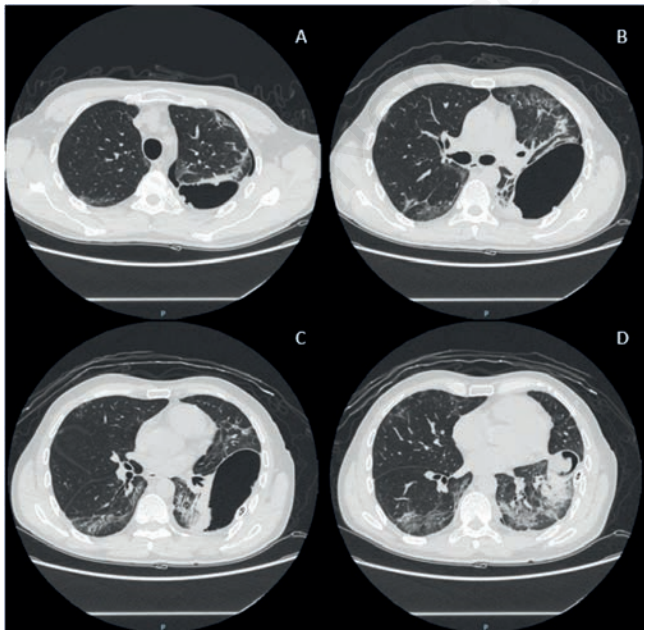

Figure 2. A-D) Computed tomography scan showing the giant bulla in the fissure between the left upper and lower lobes.

Three weeks after discharge, he tested negative for SARS-CoV-2 PCR nasal swab and a follow-up chest X-ray was performed, showing a large pneumothorax; the patient only reported a slight worsening of his dyspnea, and he was hospitalized again. A pleural drainage was inserted with no benefit on symptoms and no resolution of pneumothorax. A high-resolution CT (HRCT) showed a large amount of air in the left hemithorax with a differential diagnosis of either pneumothorax or a giant bulla developing in the fissure between the left upper and lower lobes (Figure 2).

The patient was therefore transferred to our hospital, and on December 27, he underwent a biportal thoracoscopy (timeline summarized in Figure 3). During surgery, a giant bulla with a diameter of roughly 10 cm arising from the fissure face of the left lower lobe was discovered. Dense adhesions attached the bulla to the upper lobe and the chest wall. A diffuse parietal pleural thickening and inflammation were visible, while the remaining lung was macroscopically normal. After gentle dissection, the bulla was resected from the lung parenchyma using a reinforced endoscopic stapler. A TachoSil® strip was applied to prevent air leaks. The postoperative course was uneventful; the chest drain was removed on the 5th postoperative day and the patient was discharged the following day. Histopathological examination showed evidence of bullous emphysema and squamous metaplasia with the presence of macrophages and lymphocytes in the specimen.

At follow-up in an outpatient clinic, a chest X-ray showed a complete re-expansion of the lung. The patient reported a full resolution of symptoms (Figure 4).

Discussion

Late-onset pneumothorax is a common complication of mechanical ventilation due to possible barotrauma on the airway. Thus, pneumothorax and pneumomediastinum have not been uncommon in COVID-19 patients who are treated with invasive ventilation [2]. On the other hand, the development of a bulla is a rare event in COVID-19 patients who have not undergone intubation. In the literature, only a few cases have been reported so far. Similarly, to our cases, Yasukawa and Murayama reported patients with mild COVID-19 pneumonia, no relevant medical history, and no SARS-CoV-2 vaccination. None of the patients underwent mechanical ventilation. In the first case [3], the patient was treated

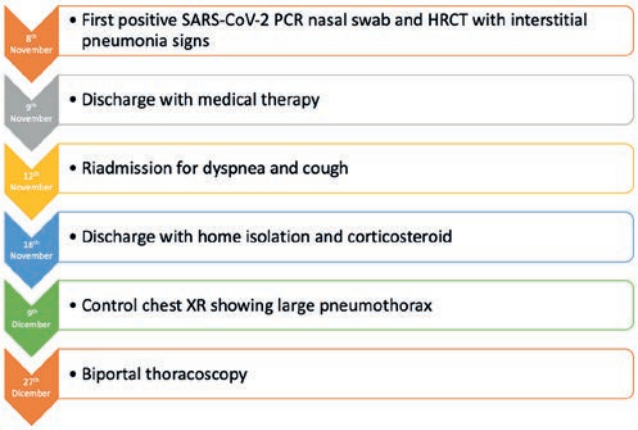

Figure 3. Our patient's timeline. PCR, polymerase chain reaction; HRCT, high-resolution computed tomography; XR, X-rays.

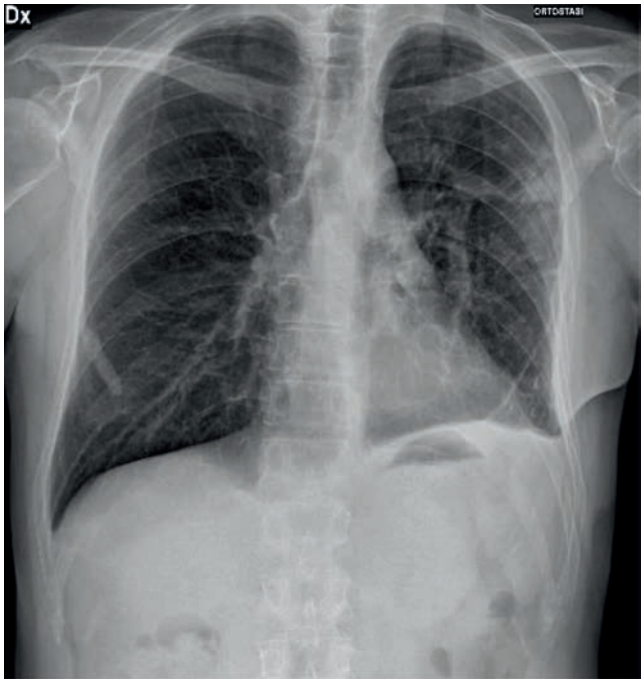

Figure 4. Postoperative chest X-ray.

with medical treatment (remdesivir), convalescent plasma, and a chest drain was positioned, while in the second case [4], the authors do not describe any specific treatment and no surgical procedures were performed. To the best of our knowledge, this is one of the first cases describing a bulla resection after COVID-19.

In our patient, it is reasonable to suspect that the development of the bulla is a result of SARS-CoV-2 infection since no bulla was observed in the first HRCT 2 months before. Liu *et al.* linked SARS-CoV-2 infection to lung cystic dystrophy, but the physiopathology is still unknown [5]. According to Pednekar [6], SARS-CoV-2-related pneumonia may be responsible for lung remodeling due to diffuse alveolar damage and later interstitial myofibroblastic proliferation; we can speculate that this remodeling of lung parenchyma could be the base for the development of giant bullae.

We also focused our attention on the potential role of CS in developing bullous dystrophy. Although they have no direct role in damaging lung parenchyma, it is well known that CS causes a significant reduction in tissue regeneration. Moreover, Rocco *et al.* state that prolonged use of CS for acute alveolar damage reduces the elastic properties of lung tissue [7]. Our patient was treated with CS to counteract the chronic inflammation produced by SARS-CoV-2, but on the other hand, it might have delayed the virus clearance [8]. We can therefore hypothesize that CS might have played a role in increasing SARS-CoV-2 dystrophic action.

Lastly, we can also speculate that vaccination could have prevented the development of viral pneumonia and possibly the resulting long-term complications.

More studies are needed to better understand the connection between COVID-19 pneumonia and long-term pulmonary damage. However, a careful follow-up with chest imaging in these patients is mandatory.

Conclusions

In conclusion, the development of lung bullae could be a late-onset complication in patients with COVID-19 pneumonia. A surgical approach can be safely proposed based on bulla features and patients' comorbidities.

Although the etiopathology is still unclear, we can hypothesize that SARS-CoV-2 and CS play a simultaneous impairing role in lung parenchyma.

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