

A Secondary Spontaneous Pneumothorax in a Patient with COVID-19

Case report

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ABSTRACT: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel coronavirus, represents an unprecedented global threat. We report a 78-year-old male patient who presented to the Emergency Department at a tertiary care hospital in Muscat, Oman, in June 2020 with a one-day history of right chest pain and severe breathlessness. The patient was an ex-smoker and known to have idiopathic pulmonary fibrosis (IPF) with two previous pneumothoraces in the left lung. On presentation, the patient was breathless with an oxygen saturation of 90% on room air. Chest X-ray demonstrated bilateral lung infiltrates and right-sided pneumothorax. The patient tested positive for SARS CoV 2. A chest drain was placed which resulted in good resolution of the pneumothorax. The patient's condition improved remarkably and he was discharged after 17 days of hospitalisation. To the best of the authors' knowledge, this was the first case of pneumothorax reported in a patient infected with COVID-19 who was known to have underlying IPF.

Keywords: Spontaneous Pneumothorax; Pulmonary Fibrosis; SARS Coronavirus; Oxygen; Pleurodesis; COVID-19; Case Report; Oman.

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-CoV-2), a novel coronavirus, represents an unprecedented global threat, with more than 12.3 million confirmed cases and 556,335 deaths at the time of the writing.¹ There have been many trials of therapeutic agents, but none of them have proved to be efficacious to date.^{2,3} Spontaneous pneumothorax is a very rare manifestation of COVID-19 and the exact mechanism is not fully understood.⁴ This article reports the first case of spontaneous pneumothorax in a patient with idiopathic pulmonary fibrosis (IPF) who was admitted with COVID-19 pneumonia. The safety of using some of the therapeutic trial agents for treating COVID-19 in patients with pneumothorax is not clear. This article explores the possible underlying mechanism of pneumothorax in patients with COVID-19.

Case Report

A 78-year-old male patient presented to the Emergency Department (ED) at a tertiary care hospital in Muscat, Oman, in June 2020 with a one-day history of right chest pain and severe breathlessness. There was no history of fever or cough. The patient was an ex-smoker and was known to have IPF. Additionally, he had had two spontaneous pneumothoraces involving the left lung four years prior without a clear precipitating factor. His previous chest computed tomography scan had demonstrated bilateral lung fibrosis and honeycombing

with posterior and basilar predominance, which was associated with significant volume loss of both lungs and traction bronchiectasis [Figure 1]. A previous lung function test had demonstrated a restrictive lung disease pattern.

On presentation to the ED, the patient appeared to be in respiratory distress; his vitals were as follows: respiratory rate of 23 breath per minute, oxygen saturation of 90% on room air, heart rate of 100 bpm and a normal temperature of 37.2°C and blood pressure of 153/88 mmHg. He had reduced breath sounds in the right lung. Other systemic examinations were unremarkable.

Blood investigations showed normal haemoglobin, lymphocyte count, platelet count and ferritin; elevated results were found for total white blood count, neutrophil count, C-reactive protein, D-dimer and lactate dehydrogenase [Table 1].

Chest X-ray demonstrated bilateral lung infiltrates and moderate right-sided pneumothorax with a mediastinal shift to the left-side [Figure 2]. Additionally, there was bilateral reticular shadowing with diffuse ground-glass opacity. Because the patient presented with respiratory symptoms, he underwent polymerase chain reaction (PCR) testing for SARS-CoV-2 using the Xpert® Xpress SARS-CoV-2 test of nasal and pharyngeal swabs (Cepheid, Sunnyvale, California, USA), which was positive for SARS CoV-2 RNA. Other investigations, including electrocardiogram, urea and electrolytes, liver function tests, coagulation profiles

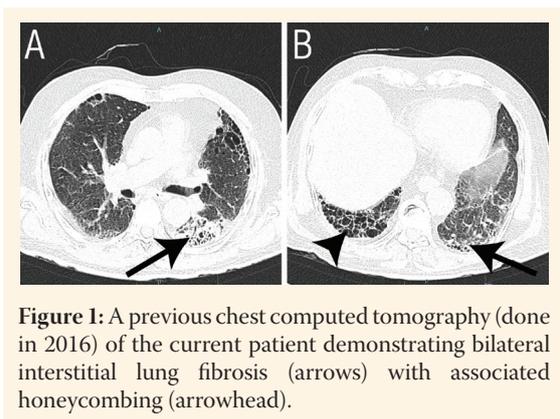


Figure 1: A previous chest computed tomography (done in 2016) of the current patient demonstrating bilateral interstitial lung fibrosis (arrows) with associated honeycombing (arrowhead).

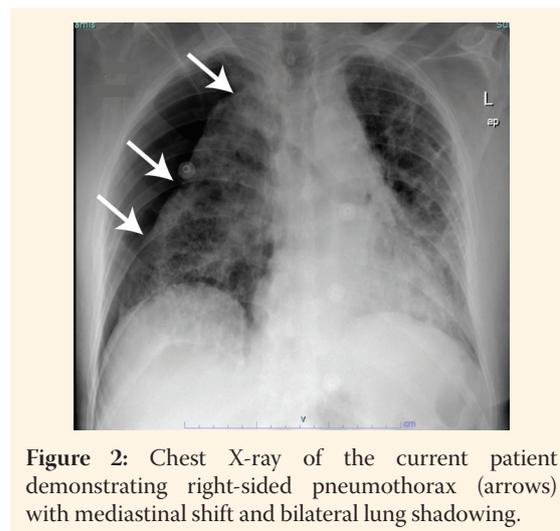


Figure 2: Chest X-ray of the current patient demonstrating right-sided pneumothorax (arrows) with mediastinal shift and bilateral lung shadowing.

Table 1: Blood investigations of a 78-year-old male patient with a secondary spontaneous pneumothorax and COVID-19

Investigation	Result	Reference range
Haemoglobin in g/dL	15.1	11.5–15.5
Total white blood count in $\times 10^9/L$	17.2	2.2–10.0
Neutrophil count in $\times 10^9/L$	14.4	1.0–5.0
Lymphocyte count in $\times 10^9/L$	1.8	1.2–4.0
Platelet count in $\times 10^9/L$	217	150–450
C-reactive protein in mg/L	7	0–5
D-dimer in mg/L	75.2	<0.5
Lactate dehydrogenase in U/L	615	135–225
Ferritin in $\mu g/L$	141	30–400

chest X-ray showed a near-complete expansion of the rigid lung [Figure 3A]. In terms of the treatment for COVID-19, there were several trials at the treating hospital, including dexamethasone, convalescent plasma and anakinra. The patient consented to receive dexamethasone (6 mg daily for 10 days) and convalescent plasma (one dose) as part of a clinical trial and routine medical care.

and troponin levels were unremarkable. The clinical presentation and laboratory and radiological test results were not suggestive of acute exacerbation of IPF. Other differential diagnoses in this clinical setting, including myocardial ischaemia, were excluded.

The patient's condition continued to improve with gradual oxygen weaning. Dexamethasone was discontinued on the 10th day; the patient was off oxygen support on the 14th day, followed by the removal of the chest drain on the 17th day. Repeated chest X-ray showed no reoccurrence of pneumothorax [Figure 3B]. Ideally, pleurodesis should have been performed during admission, but given the recent use of steroids, COVID-19 diagnosis and rapid resolution of the pneumothorax, pleurodesis was deferred. The patient remained well at the two-week follow-up visit and a repeated chest X-ray (day 30) showed stable bilateral IPF without evidence of pneumothorax. The patient's consent was obtained in order to publish this case report and the relevant laboratory and radiological findings.

The patient was started on 15 L oxygen via a non-rebreathing mask, enoxaparin (40 mg twice daily), intravenous ceftriaxone (2 gm daily for seven days) and azithromycin (500 mg daily for three days). He had an urgent chest drain insertion and a repeated

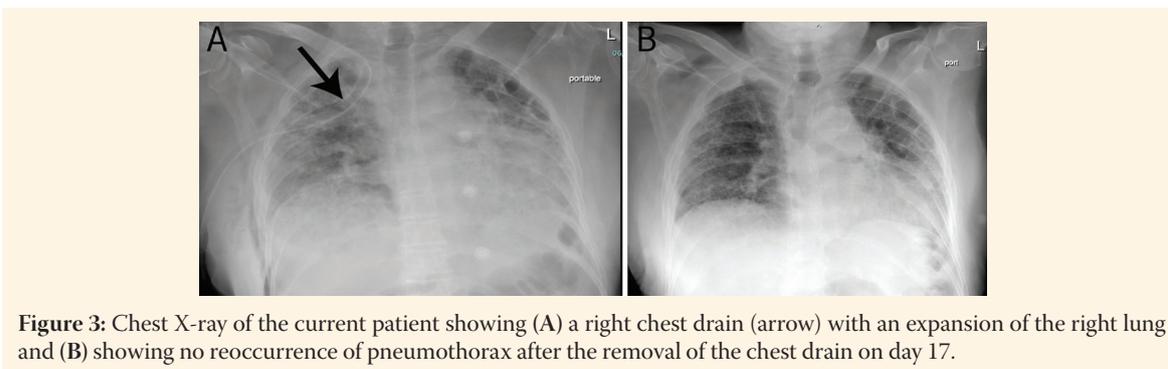


Figure 3: Chest X-ray of the current patient showing (A) a right chest drain (arrow) with an expansion of the right lung and (B) showing no reoccurrence of pneumothorax after the removal of the chest drain on day 17.

Discussion

Spontaneous pneumothorax can complicate pulmonary infections with *Pneumocystis jirovecii*, mycobacteria, fungi or other microorganisms and the incidence varies with the frequency of these diseases in the population.^{5,6}

Spontaneous pneumothorax is an unusual complication in patients with COVID-19; there are very few case reports and the majority of cases occur after the second week of infection.^{4,7-12} Post mortem examination of COVID-19 cases demonstrated alveolar exudative inflammation and damage with thickened interalveolar septa, interstitial inflammation and fibrosis and platelet–fibrin thrombi small arterial vessels.^{13,14} Pneumothorax may occur due to the rupture of necrotic lung tissue caused by intense inflammation or ischaemia and the rupture of overdistended alveoli caused by bronchiolar inflammation.¹⁵

Spontaneous secondary pneumothorax is a potential complication of interstitial lung disease (ILD) and it is associated with a poor outcome.¹⁶ The current patient had ILD and he had had two previous pneumothoraces in the left lung, suggesting that he had a secondary rather than a primary pneumothorax. It was uncertain whether COVID-19 was a coincident or a precipitating factor for pneumothorax. Per local guidelines for treating patients with COVID-19, the patient received intravenous ceftriaxone and azithromycin. Additional treatments were available as a part of ongoing clinical trials at the treating hospital. The patient opted to receive dexamethasone as well as to be enrolled in the convalescent plasma trial. He made a remarkable recovery and was weaned off oxygen within two weeks. The follow-up chest X-ray, after removing the chest drain, showed no reoccurrence of the pneumothorax.

Pleurodesis was considered but deferred due to several factors, including the rapid resolution of the pneumothorax, the current COVID-19 infection and the recent use of steroids that may have slowed the healing process.

To the best of the authors' knowledge, this is the first report to describe a case of spontaneous secondary pneumothorax in a patient with IPF who was treated for COVID-19. It highlighted the complexity of decision-making in managing a common disease, i.e. pneumothorax, in the setting of an emerging infection. There are many uncertainties regarding the appropriateness of using specific COVID-19 treatments in patients with pneumothorax at this time, especially those who might require pleurodesis. Nevertheless, it is believed that the authors adopted a

patient-centred approach to treatment that resulted in an excellent outcome.

Conclusion

SARS-CoV-2 infection may precipitate spontaneous pneumothorax in patients with underlying lung disease. The options for managing SARS-CoV-2 infection should consider the potential impact of the treatment of other active health issues. Additionally, this case illustrated potential uncertainties regarding the management of common conditions coinciding with SARS-CoV-2 infection.

AUTHORS' CONTRIBUTION

AA conceptualised the work and edited the scientific content. ZN drafted the manuscript and prepared the figures. Both authors approved the final version of the manuscript.

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