

Bilateral spontaneous pneumothorax- A late complication of COVID-19 infection- case report and review of literature

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ABSTRACT

We report a case of bilateral spontaneous pneumothorax in a 32-year-old non-smoker male. The patient presented to the emergency department with complaints of sudden-onset left-sided chest pain and breathlessness. A chest X-ray was taken, which revealed a left pneumothorax. Immediately, left-sided intercostal chest drain was placed. The patient gave a history of similar complaints 1 week back and was diagnosed with right-sided pneumothorax, for which right-sided chest drain was placed in an outside hospital. The patient was a non-smoker and had no comorbidities. He reported having a COVID-19 infection 1 month back, which was treated symptomatically under home quarantine, not requiring any hospitalization or supplemental oxygen. After 1 week of placement of chest drain, as air leak persisted, a computed tomography-chest was done, which revealed a left mild hydropneumothorax and communication with the apical segment and pleural cavity suggestive of bronchopleural fistula. The right lung had expanded. After ruling out secondary infection, the patient was referred to cardiothoracic surgery for decortication and surgical closure of the bronchopleural fistula. The patient recovered with no complications in the post-operative period. Spontaneous pneumothorax in post-COVID patients can happen as a late complication, which requires high clinical suspicion and vigilance for timely diagnosis and treatment.

Key words: Bronchopleural fistula, Hydropneumothorax, Post-COVID-19, Spontaneous pneumothorax

COVID-19 infection, caused by the SARS-CoV-2 virus, became a global pandemic in 2020. The spectrum of illness varies from mild flu-like illness to severe pneumonia causing acute respiratory distress, multiorgan failure, sepsis, and shock. There are numerous complications after a COVID-19 infection. Due to the release of inflammatory cytokines, there is a high risk of thromboembolic events in the post-COVID period. In the lungs, it can cause fibrosis and cyst formation. These can eventually cause spontaneous pneumothorax, having an incidence of 1% [1,2]. The mean duration of presentation is from 3 weeks to 1 month [3]. Although mechanical ventilation serves as a risk factor for pneumothorax, chances of pneumothorax post-mild infection are also seen. Patients who smoke and have existing lung diseases are at a higher risk. Radiological features such as diffuse ground-glass opacities, parenchymal bands mainly along the periphery, are noted. There are cystic lesions in the lungs that can develop into bigger blebs, which are at risk of rupture or secondary infection [4].

In this case report, we report a male patient, a non-smoker, who had mild COVID-19 infection developing bilateral pneumothorax after almost a month of recovery from the illness.

CASE REPORT

A 32-year-old male, non-smoker, presented to the emergency department with complaints of sudden-onset left-sided chest pain and breathlessness. There was no history of trauma or straining. The patient had similar complaints 1 week back for which he went to an outside hospital, where he was diagnosed with right pneumothorax, and an emergency intercostal chest drain was placed. The patient reported having a COVID-19 infection 1 month back, which was treated symptomatically. He did not require hospitalization or supplemental oxygen.

On arrival, his vitals were as follows: Room air saturation of 79% and 90% with full flow oxygen, pulse rate of 122/min, blood pressure of 90/60 mmHg, and respiratory rate of 33/min. Arterial blood gas analysis on presentation was indicative of respiratory alkalosis. On

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Table 1: Complete blood counts of the patient

Day	Hemoglobin (11–15 g/dL)	WBCs (4000–11,000 cells/ μ L)	Platelets (150–450 $\times 10^3/\mu$ L)	D-Dimer
Day 0	12.1 g/dL	8,300 cells/ μ L	2,25,000 cells/ μ L	0.2 mg/dL
Day 3	12 g/dL	9700 cells/ μ L	2,26000 cells/ μ L	-
Day 7	12g/dL	12,200 cells/ μ L	2,28,000 cells/ μ L	-

WBCs: White blood cells

auscultation, there was absent air entry on the left side. Other system examination was normal.

An emergency chest X-ray was taken, and it showed left pneumothorax, right-sided intercostal chest tube *in situ*. An emergency chest drain was placed, and the patient was stabilized. Baseline blood investigations were done. Complete blood count, renal function test, and liver function test were all within normal limits. D-Dimer level was <0.5 mg/L, ruling out pulmonary thromboembolism (Table 1). After 1 week, there was a persistent air leak present with minimal drainage on the left side, suspecting bronchopleural fistula, for which a computed tomography (CT) chest was taken, which showed complete expansion of the right lung. Bilateral lung parenchyma showed diffuse ground-glass opacities with parenchymal bands peripherally distributed, suggestive of the resolving stage of COVID-19 infection. On the left side, there was a mild hydropneumothorax with communication between the apical segment and the pleural cavity, suggestive of a bronchopleural fistula. There was no evidence of pulmonary thromboembolism. The right-sided chest tube was removed as there was no air leak.

After more than a week of hospital admission, the patient started developing fever spikes. Blood counts were repeated, and it showed mild leukocytosis. The patient was started on antibiotics empirically. Pleural fluid was aspirated and sent for analysis. It was reported exudative, with predominance of neutrophils. Pleural fluid cultures were reported sterile (Table 2).

After the completion of the antibiotic course, the patient was referred to cardiothoracic surgery for decortication and surgical closure of the bronchopleural fistula. The surgery was performed through open thoracotomy. The chest drain was removed on the 2nd day. The post-operative period was uneventful, and the patient recovered well and was discharged on the 5th post-operative day.

DISCUSSION

COVID-19 infection is caused by the SARS-CoV-2 virus. The spectrum of disease varies from asymptomatic to mild flu-like illness to severe pneumonia, causing respiratory distress requiring mechanical ventilation. Post-recovery, residual symptoms were also noted. In the lungs, one such complication is spontaneous pneumothorax. The incidence of spontaneous pneumothorax post-COVID is 1% [1,2], and is more common among males as compared to females [3]. Unilateral pneumothorax is more common than bilateral. The mean duration of presentation is from

Table 2: Pleural fluid analysis of the patient

Pleural fluid proteins	4.6 g/dL
Neutrophils	83%
Lymphocytes	16%
Adenosine deaminase	30 U/L
Culture sensitivity	Sterile
Serum proteins	6.3 g/dL

3 weeks to 1 month post-recovery from COVID-19 [4-6]. Rarely, it can happen many years after the primary infection [7]. The chances of spontaneous pneumothorax are higher in patients with severe lung involvement requiring mechanical ventilation, it can also occur as a post-mild COVID-19 infection. In this, there is recurrent spontaneous pneumothorax without previously known risk factors, as mentioned by Naghavi *et al.* in their case report [2].

Spontaneous pneumothorax in the absence of trauma in post-COVID patients can be attributed to the damage to the alveoli, causing rupture and air leak into the pleural cavity. Macklin effect can be attributed to spontaneous pneumothorax and pneumomediastinum in post-COVID-19 patients [8]. Macklin effect is a pathophysiologic process initiated by alveolar basement membrane destruction, rupture, and interstitial emphysema dissecting along the pulmonary vasculature. COVID-19 causes widespread damage to alveolar capillary exchange units, resulting in impaired gas exchange and cyst formation. The sudden air leak can occur as a result of violent coughing, leading to an increase in distal airway pressure and rupture [9]. These cysts can develop into bigger blebs, causing a risk of spontaneous rupture, secondary infection [10].

Lung parenchyma can show bilateral diffuse ground glass opacities, which are peripherally distributed, suggestive of the resolving phase of COVID-19 infection. There can be fibrotic bands, traction bronchiectasis, or cystic changes on chest imaging [10]. Radiological imaging, like CT-chest, is useful not only in grading the severity of the infection but also in the recovery phase to look for any structural changes. The clinician should be vigilant to look for complications in the recovery period if there is sudden worsening or an increase in oxygen requirement for early diagnosis and better outcomes.

CONCLUSION

Spontaneous pneumothorax post-COVID-19 infection can occur as a late complication even in mild infection

in the absence of mechanical ventilation. Radiological imaging can not only help in grading the severity of active infection but also in predicting complications in the recovery period. The clinician should be vigilant to look for the symptoms for early diagnosis and outcomes.

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