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CASE REPORT

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Bronchopleural fistula associated persistent pneumothorax in a patient recovering from COVID-19 pneumonia: A case report

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Key Clinical Message

Pneumothorax and bronchopleural fistula (BPF) are potentially fatal complications that can occur in patients with COVID-19 pneumonia. Early detection, appropriate treatment, and consideration of surgical intervention are necessary for optimum outcomes.

Abstract

Introduction

Healthcare professionals face complex challenges as a result of the rare emergence of pneumothorax among the variety of COVID-19 complications, including severe viral pneumonia.

Case History

A 57-year-old male with multiple comorbidities diagnosed with COVID-19 pneumonia was admitted to our center and exhibited bilateral crepitations. During hospitalization, the patient developed right-sided pneumothorax that persisted despite chest tube insertion was linked to the presence of BPF.

Discussion

The occurrence of pneumothorax in COVID-19 patients is relatively rare risk factors for which are not yet fully understood, although smoking history may play a role. Conservative management is recommended for asymptomatic cases, while intercostal drainage is necessary for symptomatic patients. Surgical intervention may be required to manage the BPF in some instances.

Conclusion

Pneumothorax and BPF are rare but potentially life-threatening complications in patients recovering from COVID-19 pneumonia. Early recognition, appropriate treatment, and consideration of surgical intervention are crucial for optimizing patient outcomes.

KEYWORDS
bronchopleural fistula, COVID-19 pneumonia, pneumothorax, respiratory complications

1 | INTRODUCTION

Coronavirus belongs to Ribonucleic Acid (RNA) viruses that cause respiratory, neurologic, enteric, and hepatic diseases distributed among mammals, including humans and birds.[1] A novel coronavirus discovered in late 2019 in China caused Coronavirus Disease 2019 (COVID-19). It is associated with complications like severe viral pneumonia, Acute Respiratory Distress Syndrome (ARDS), Acute Kidney Injury (AKI), cardiac injury, liver dysfunction, spontaneous pneumothorax, lung cavitation, pleural effusion, pericardial effusion, along with other minor ailments like fever, loss of smell, myalgia, dry cough, lymphadenopathy.[2,3]

Pneumothorax due to COVID-19 pneumonia is very rare, and few cases are reported with bronchopleural fistula (BPF)-associated persistent pneumothorax while recovering from COVID-19 pneumonia.[4,5,6]

2 | CASE HISTORY

A 57-year-old male with shortness of breath, fever, dry cough, and chest pain was admitted to our center. Six weeks back, he was diagnosed with COVID-19 on RT-PCR and was being managed at another center with oxygen via nasal cannula at 2 L/min. However, due to the increased severity of his symptoms, he was referred to our center.

His medical history was notable for type 2 diabetes mellitus and hypertension for 6 years. He had been noncompliant with his medication for 1 year. He had a myocardial infarction 2 years back, for which coronary artery grafting was performed. He also had features of hypertensive heart disease with mild concentric left ventricular hypertrophy and grade 2 left ventricular diastolic dysfunction.

The physical examination at admission revealed an ill-looking patient with bilateral crepitations. Blood investigations showed a fasting blood glucose level of 165.3 mg/dL and a postprandial glucose level of 226.6 mg/dL. He was managed with IV antibiotics, heparin, insulin on a sliding scale, and other supplemental medications. He developed an AKI with hyperkalemia during the course, which resolved after 3 days.

On the 10th day of admission, he had worsening shortness of breath and an inability to maintain saturation at an oxygen flow rate of 2 L/min. Therefore, a chest X-ray (Figure 1A) was performed, which showed a right-sided pneumothorax associated with bilateral lung opacities. However, a chest X-ray performed 6 days after admission showed no findings suggesting pneumothorax (Figure 1B).

The patient was managed with a non-rebreather face mask with an oxygen flow rate of 15 L/min, and a chest tube was inserted at the fourth intercostal space to drain the pneumothorax. Despite those measures, he deteriorated, for which an HRCT chest was ordered. HRCT scan (Figure 2A,B) revealed a right hydropneumothorax with passive right lung atelectasis and an intermediate walled cavity in the right lower lobe with BPF. Also, multifocal ground glass consolidations were seen predominantly in bilateral peripheral lung fields with fibro-bronchiectatic changes with crazy pavement patterns suggesting sequelae of COVID-19 pneumonia.

The patient showed no sign of improvement even after placement of the chest tube for 3 days. Therefore, a repeat chest X-ray had to be performed that revealed minimal re-expansion of the right lung, indicating persistent

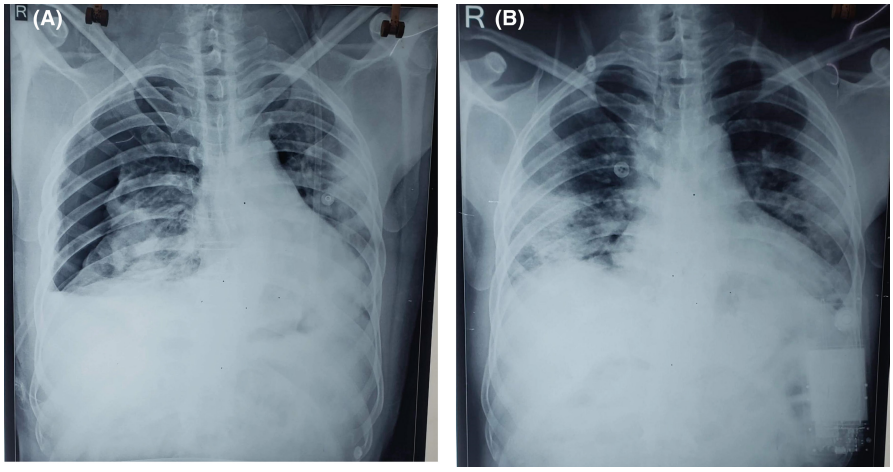

FIGURE 1 (A) Chest X-ray showed bilateral lung opacities with a visible visceral pleural line, absent lung markings, and peripheral radiolucency on the right side, suggesting pneumothorax. (B) Chest X-ray showing bilateral lung opacities (before pneumothorax).

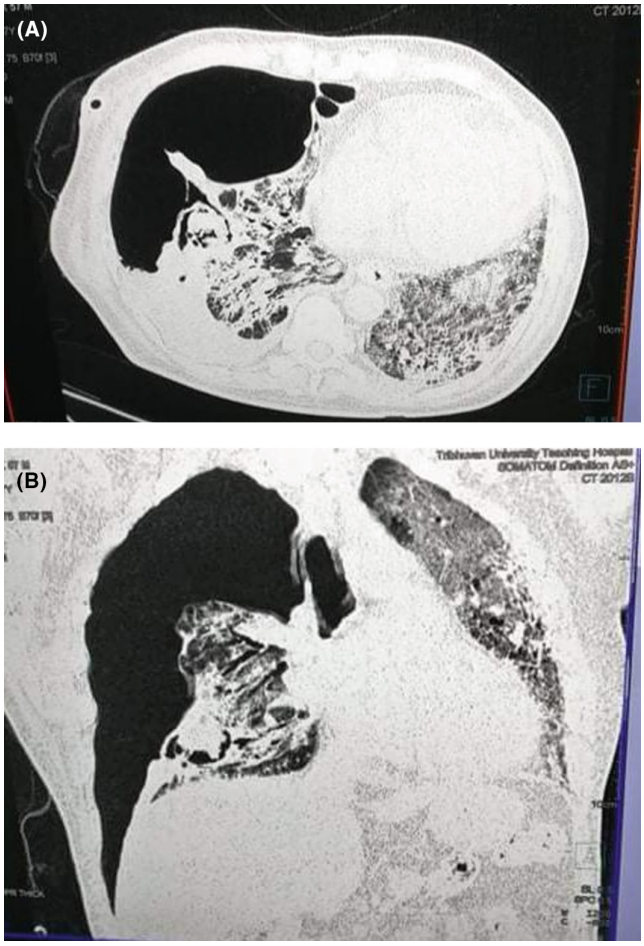

FIGURE 2 (A,B) HRCT scans showing right-sided hydropneumothorax with an intermediate walled cavity in the right lower lobe with BPF and multifocal consolidation with ground glass in bilateral lung fields with fibro bronchiectatic changes and crazy pavement patterns.

pneumothorax. For this, the chest tube's functionality was assessed, which showed signs of leakage, and a second chest tube had to be inserted. Despite implementing all necessary and aggressive interventions, the patient's overall condition continued to deteriorate, necessitating collaboration with the thoracic surgical team to plan a surgical procedure for repairing the BPF. Regrettably, despite efforts to stabilize the patient, his condition deteriorated rapidly, leading to a cardiorespiratory arrest for which a few cycles of cardiopulmonary resuscitation were performed, but we could not revive him, resulting in the death of the patient. So, we could not perform any surgical intervention as planned.

3 | DISCUSSION

Pneumothorax is the presence of air in pleural space, which can be broadly classified as spontaneous and traumatic.[7] Spontaneous pneumothorax not associated with any underlying lung disease is called primary, and those associated with some underlying lung disease are categorized as secondary.[7] Our patient, who was in the recovery phase of COVID-19, experienced a spontaneous pneumothorax. Given the association with COVID-19 pneumonia, this condition was classified as a secondary spontaneous pneumothorax. The occurrence of pneumothorax in COVID-19 patients varies, with a range of 0.3% in hospitalized individuals and a higher prevalence of 12.8%–23.8% among those who require mechanical ventilation.[8] A study by Chong et al. did not identify age or active smoking status as a risk factor for COVID-19-related pneumothorax.[8] Our patient smoked one pack of cigarettes daily and stopped just after he was diagnosed with COVID-19.

Studies have shown the development of subpleural bullae that are visible on X-ray or CT scans before the occurrence of spontaneous pneumothorax. However, in our patient, a Chest X-ray (Figure 1B) performed 6 days before the development of pneumothorax did not show any subpleural bullae.[2] Interestingly, the pneumothoraces that are caused by COVID-19 usually tend to be right-sided and unilateral, as seen in our case as well.[8]

Conservative treatment is recommended to manage asymptomatic pneumothorax, that is, without significant breathlessness. Simple aspiration must be performed for symptomatic cases and should be admitted and observed for at least 24 h.[9] Intercostal drainage is recommended for those patients who fail to respond with aspiration and in all cases of secondary pneumothorax. The procedure is, however, not recommended for asymptomatic secondary pneumothorax or patients with apical pneumothorax measuring less than 1 cm.[9] Weissberg et al. recommend chest tube drainage when pneumothorax occupies more than 20% of pleural space. In our case, more than 50% of the pleural space on the right lung was occupied by pneumothorax, which warranted the placement of a chest tube.[10]

However, even with the chest tube in situ, there was minimal lung re-expansion, which prompted further investigations to discover the cause of persistent pneumothorax. An HRCT scan of the lungs showed the presence of a BPF, an abnormal connection between a bronchus and pleural space associated with very high morbidity and mortality. Many factors are related to developing a BPF, including necrotizing infection of the lungs, persistent spontaneous pneumothorax, radiotherapy, and chemotherapy.[11] Our patient may have developed the fistula due to persistent spontaneous pneumothorax. BPF may be associated with empyema of the lungs if it persists for a long duration, for which chest drainage and long-term antibiotics are crucial to treatment.[6] In our patient, after visualization of hydropneumothorax on HRCT, surgical consultation was done to assess the functionality of the

previously inserted chest tube and to manage the BPF surgically. The second chest tube drain was inserted to give negative suction pressure as the first chest tube was not functioning correctly. Endobronchial intervention is preferred for seriously ill patients with small-size fistulas. The endobronchial intervention included sealing agents like glues, blood patches, or endobronchial valves. Surgical management is usually indicated for large BPF measuring more than 8 mm in size or persistent symptomatic pneumothorax due to the BPF.[6] Surgical intervention, although planned, could not be performed as our patient succumbed to death due to rapid deterioration, even with appropriate management.

In contrast to our patient, whose condition worsened despite the insertion of two chest tubes, Sangam et al. reported a case of bilateral pneumothorax with BPF in a young patient of 24 years old that was successfully treated with a chest tube alone. They advise using a blood patch, Glues, or an invasive bronchoscopic procedure like Endo Bronchial Valve (EBV) to treat an unresponsive case like ours. If the condition does not get better, they said open thoracic surgery might be necessary.[12] On the other hand, a patient with COVID-19 pneumonia who had a persistent pneumothorax was treated for 53 days without any surgical intervention by inserting a long-term chest tube. For patients who are not candidates for invasive or surgical treatment, they suggest long-term chest tubes.[13] These two cases, unlike our case, had different outcomes because of the various treatment modalities used. This justifies the need for specific guidelines in the management of BPF in COVID-19 in order to ensure standard patient care and the best possible result.

4 | CONCLUSION

Pneumothorax and BPF are rare complications of COVID-19 pneumonia. This case report emphasizes the challenges in managing these conditions in patients recovering from COVID-19 pneumonia. Early recognition, appropriate diagnostics, and timely intervention are crucial for optimal outcomes. Close monitoring and careful management are necessary for pneumothorax and BPF in COVID-19 patients, with conservative or interventional approaches based on symptoms and severity. The differences in treatment results highlight the need for thorough COVID-19 BPF management guidelines to create efficient, standardized care pathways.

AUTHOR CONTRIBUTIONS

Milan Regmi: Conceptualization; data curation; methodology; project administration; supervision; visualization; writing – original draft; writing – review and editing. **Anurag Karki:** Writing – review and editing. **Moon Shrestha:** Writing – original draft; writing – review and editing. **Nibesh Pathak:** Writing – review and editing. **Sanjeev Bhandari:** Writing – review and editing. **Niraj Kumar Sharma:** Writing – review and editing. **Pankaj Pant:** Supervision.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study

CONSENT

Written informed consent was taken from the patient before the initiation of the study to publish this report.

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