Post-Corona Virus Disease 2019 (COVID-19) Pneumothorax

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ABSTRACT

Corona Virus Disease 2019 (COVID-19) infection is worldwide, and still up to present, we are incessantly studying the virus from presentation down to its complications. Yet, this virus remains a mystery to be unfold. There are several literatures regarding the onset of pneumothorax from COVID-19 infection. However, the cause is still unknown. We will be presenting a case of a 61-year-old male who developed sudden onset of chest pain associated with shortness of breath 19 days post COVID-19 infection.

CASE REPORT

A case of a 61-year-old Male, with no history of tuberculosis and a never smoker. He was diagnosed to have COVID19 infection by RT-PCR testing, he underwent isolation and tested negative on repeat RT-PCR. In the interim, he was asymptomatic and recovered, until 19 days later, he developed sudden onset of chest pain associated with shortness of breath. At the emergency room, chest radiograph showed a questionable pneumothorax on the right. (Figure 1) He was admitted under Pulmonary Service and a Chest CT scan was done to confirm the chest x-ray finding which showed moderate amount of pneumothorax in the right. (Figure 2) Also, there is peripheral patchy reticular densities in both lungs probably from previous inflammatory process. The patient stayed in the hospital for 12 days with oxygen support as its primary treatment. No progression of pneumothorax was noted. Prior to discharge, latest chest radiograph revealed 5%-10% pneumothorax. (Figure 3)

Figure 1: Initial Chest Radiograph: Noted area of lucency devoid of lung markings is seen in the right lateral
DISCUSSION

Pneumothorax has been reported in a few patients with coronavirus disease 2019 (COVID-19), although the exact incidence and risk factors are still unknown. Retrospective studies of patients with COVID-19 have suggested that pneumothorax might occur in 1% of those requiring hospital admission, 2% of patients requiring intensive care unit (ICU) admission and 1% of patients dying from the infection. The clinical presentation of SARS-CoV-2 infection is variable. Most of the patients develop fever and cough. The diagnosis is confirmed by reverse transcription–PCR (RT-PCR). Several literatures described the radiologic hallmarks of COVID-19 on chest CT scan such as groundglass opacity patterns (peripheral, nodular, or mass-like). The other reported features include bronchiectasis, lymphadenopathy, and pleural and pericardial effusion, but pneumothorax is either uncommon or underreported in patients with COVID-19. In addition, Chen et al. first reported pneumothorax as a rare radiologic feature in 1% of 99 patients, early in the pandemic. Thus, the prompt identification and management of pneumothorax is essential.

Pneumothorax is defined as the presence of air in the pleural cavity. Pneumothorax can be categorized by etiology which are spontaneous and traumatic, and spontaneous pneumothorax can be further characterized into primary or secondary. Primary spontaneous pneumothorax occurs in patients with no background of respiratory disease, and the pathophysiology is thought to be from asymptomatic blebs and bullae which disrupt due to shear force. Secondary pneumothorax occurs in patients with underlying lung abnormality and lung diseases. Pulmonary barotrauma is another cause of iatrogenic pneumothorax occurring in patients being mechanically ventilated due to high inspiratory inflation pressures. Tension pneumothorax which is a medical emergency develops when damaged tissue forms a one-way valve leading into the accumulation of air in the pleural space with inhalation. This results in rising volume of air and pressure in the affected hemithorax, leading to collapse of the affected lung and displacement of the mediastinum towards the contralateral side. As the mediastinal shift exerts pressure on the contralateral lung and the vena cava, resulting in respiratory insufficiency, cardiovascular compromise, and death if untreated.

Patients with COVID-19 infection can develop severe pneumonia leading to acute respiratory distress syndrome (ARDS). Their disease is characterized radiographically by ground glass opacities, evolving into consolidative changes and in late stages of the disease, fibrotic changes. Similar changes including severe lung injury and diffuse alveolar damage were thought to contribute to the mechanism of spontaneous pneumothorax complicating severe acute respiratory syndrome (SARS). These changes, in addition to possible overdistention of the alveoli by using mechanical ventilation may put patients at risk for developing pneumothorax. In addition, it is possible that the triggering factor is prolonged coughing, which is a predominant symptom of COVID-19 disease. In a journal by Zantah et al., an underlying pulmonary disease is the primary risk factor for the development of secondary spontaneous pneumothorax. These include chronic obstructive pulmonary disease with emphysema, cystic fibrosis, tuberculosis, lung cancer, HIV associated Pneumocystis jiroveci pneumonia, and other
In conclusion, the reported cases of COVID-19 pneumonia complications are still possible.\textsuperscript{6} This mainly means that even after the infection is overcome, severe scarring does not occur after the recovery from the disease. This is predominantly during active SARS-CoV-2 infection and it is rarely reported after the recovery from the disease. The case series suggests the complication of pneumothorax is more prevalent in males (3.3:1); large series of patients with COVID-19 suggest that males are more commonly affected by severe forms of the disease, which may account for this observation.\textsuperscript{1} In another case series by Al-Shokri et al, the occurrence of pneumothoraces were reported on day 2, 7 and 15. The probability that pneumothorax occurs in the setting of COVID-19 pneumonia may result from advanced alveolar damage, bronchial distortion and narrowing caused by SARS-CoV-2 leading to pulmonary bullae formation. Moreover, the severe cough associated with viral infections increases the intrapulmonary pressure. This may precipitate bullae rupture and pneumothorax formation.\textsuperscript{3}

In summary, the main cause of pneumothorax is cystic lesions, which could occur as a result of barotrauma due to mechanical ventilation, and alveolar damage due to coughing, which causes an increase in chest pressure and ultimately an alveolar breach. Moreover, COVID-19 pneumonia results in alveolar swelling, inflammation of alveolar septa, fibrosis, giant bullae and subpleural infiltrates. All of these conditions contribute to parenchymal damage with possible alveolar rupture and pneumothorax. A review of the literature shows that pneumothorax is a rare finding. Spontaneous pneumothorax is reported in only 1% of cases with a higher prevalence (88%) in men.\textsuperscript{6}

In a case series by Martenelli (2020), the study includes ventilated and non-ventilated patients, pneumothorax with COVID-19 found out that it occurs even in patients with no pre-existing lung disease and does not require positive-pressure ventilation. Demographically they stated that, cases are atypical for either primary spontaneous pneumothorax, being of average height with 48% aged between 60 and 80 years, or secondary pneumothorax, with few having significant pre-existing respiratory disease or significant smoking history. The case series suggests the complication of pneumothorax is more prevalent in males (3.3:1); large series of patients with COVID-19 suggest that males are more commonly affected by severe forms of the disease, which may account for this observation.\textsuperscript{1} Moreover, the severe cough associated with viral infections increases the intrapulmonary pressure. This may precipitate bullae rupture and pneumothorax formation.\textsuperscript{3}

Pneumothorax can be an emergency. It can easily be diagnosed by physical examination and chest radiograph. In conclusion, the reported cases of COVID-19 pneumonia can be complicated by pneumothorax and also can occur after recovery from the disease. The timely diagnosis and management will reduce COVID-19–associated morbidity and mortality.\textsuperscript{3} It is therefore necessary to maintain a high level of attention in monitoring patients who have overcome active infection, and to exclude pneumothorax in case of sudden respiratory symptoms appearance.\textsuperscript{6}

**CONCLUSION**

Spontaneous pneumothorax is a rare complication of COVID-19 pneumonia which may occur in any time during the course of the disease. This case report aims to provide additional information to existing cases that reported pneumothorax from post COVID-19 infection. In summary, this shows a case of a secondary pneumothorax as a complication of COVID-19 infection or probably a spontaneous pneumothorax which cannot be totally ruled out. CT scan is a more sensitive to detect a pneumothorax. It is useful for not only for diagnosis but also of its complications.

Meanwhile, a sequential chest radiograph is a useful tool in the diagnosis and follow-up of pneumothorax patients. Furthermore, the importance of urgent chest X-ray and prompt clinical examination in patients with COVID-19 that develop a sudden increase in oxygen requirements and sudden respiratory symptoms appearance to exclude possibility of pneumothorax. Further research is needed to determine the relationship of COVID-19 and pneumothorax. Yet, the timely diagnosis and management will reduce COVID-19–associated morbidity and mortality.

**References**


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