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Does COVID-19 Increase the Risk for Spontaneous Pneumothorax?

Dear Editor:

The scope of symptoms of COVID-19 infection is diverse, varying from presentation of a typical viral infection with fever and myalgia, to the occurrence of other symptoms such as anosmia, dysgeusia, odynophagia and diarrhea. Also, the viral pneumonia with cough and dyspnea can progress to severe acute respiratory syndrome (SARS) usually after the fifth day of symptom onset, which increases the risk of morbidity and mortality.[1]

On the other hand, there is scarce evidence that this infection may also increase the risk of spontaneous pneumothorax and pneumomediastinum. This article aims to present two patients with COVID-19 infection without other pulmonary comorbidities that developed spontaneous pneumothorax.

Case 01: A 34-year-old male was admitted complaining of sudden dyspnea starting one day before. He also reported diarrhea in the last two weeks. There was no history of trauma or comorbidities. At admission, the patient was afebrile. Heart rate (HR), respiratory rate (RR), blood pressure (BP), and peripheral oxygen saturation (SpO2) with 2 L/minute of supplemental oxygen (O_2) were 112 beats per minute, 24 breaths per minute, 100/90 mmHg and 93%, respectively. Thoracic examination showed hypersonority to percussion and abolished vesicular murmur in the left hemithorax. Test swab oropharynx with polymerase chain reaction test for real-time reverse transcriptase (RT-PCR) was positive for COVID-19. High-resolution chest computed tomography (HRCT) scan showed bilateral consolidations and ground-glass opacities with peripheral predominance, compromising around 50% of the lung parenchyma, and pneumothorax on the left side with deviation of contralateral mediastinal structures and ipsilateral lung collapse (Figure 1A and 1C). Thoracic drainage was performed in the left pleural space with clinical stabilization. The patient is still hospitalized and stable, needing oxygen supplementation.

Case 02: A 62-year-old and ex-smoker (18 pack-years) male was admitted to the emergency department with anosmia, fever, general malaise, dry cough and dyspnea that started twenty days before, with worsening cough and dyspnea in the last day. At admission, he was afebrile, and HR, RR, and BP were 97 beats per minute, 21 breaths per minute, and 220/110 mmHg, respectively. The initial SpO2 was 81% on room air and 91% with a non-reigning mask with 9 L/min of O_2. Nasopharynx swab RT-PCR for COVID-19 was positive. HRCT showed bilateral pulmonary consolidations with air bronchograms and ground-glass opacities and, right pneumothorax (Fig. 1B and 1D), which has been drained. The patient remains hospitalized and stable.

Pneumothorax is a potential complication usually associated with cystic lung lesions.[2] The most frequent underlying disorders responsible for secondary spontaneous pneumothorax include chronic obstructive pulmonary disease with emphysema, cystic fibrosis, tuberculosis, lung cancer, Pneumocystis carinii pneumonia, lymphangioleiomyomatosis and Langerhans cell histiocytosis.[3]

The mechanism of pneumothorax formation in patients with COVID-19 is still not completely understood.[3] It is speculated that such complication occurs secondary to cell adhesion in type I and II pneumocytes, which facilitates damage to the alveolar membrane, rupture of the alveoli and the formation of pulmonary cystic lesions.[4] Additionally, COVID-19 determines ischemic parenchymal damage, activation of fibroblasts and lung fibrosis, and inflammatory storm, which can exudate into alveoli and airway leading to check-valve obstruction in the small airways and cystic formation.[4] Furthermore, the radiological main involvement of COVID-19 in the peripheral lung parenchyma may increase the risk of peripheral cystic formation facilitating its rupture into the pleural cavity.

As spontaneous rupture of cystic lesions is uncommon, it is necessary to take into account the severity of respiratory symptoms as a potential trigger. We hypothesize that the increase in respiratory effort to compensate ventilation/perfusion mismatch oxygenation and the frequent cough may increase the intra-alveolar pressure and contribute to the cystic lesion rupture and pneumothorax formation.[5,6]

There is still no data showing the risk of spontaneous pneumothorax in patients with COVID-19, but it seems to be rare (incidence of 1%) and possibly underestimated.[7] First, COVID-19 patients are often treated with non-invasive or mechanical ventilation for respiratory support. The positive pressure applied can facilitate the rupture of subpleural cysts, and the development of pneumothorax. Second, asymptomatic patients can present pulmonary cysts, blebs, bubbles and emphysema. These lesions may rupture due to the disease itself and to the treatment with positive pressure.

Some cases of pneumothorax in COVID-19 patients presented an initial CT scan without cysts, which can be explained by both the lower CT resolution to identify small lesions or their development during the follow-up.[4] Therefore, the assessment of respiratory symptoms worsening in COVID-19 should take into account the

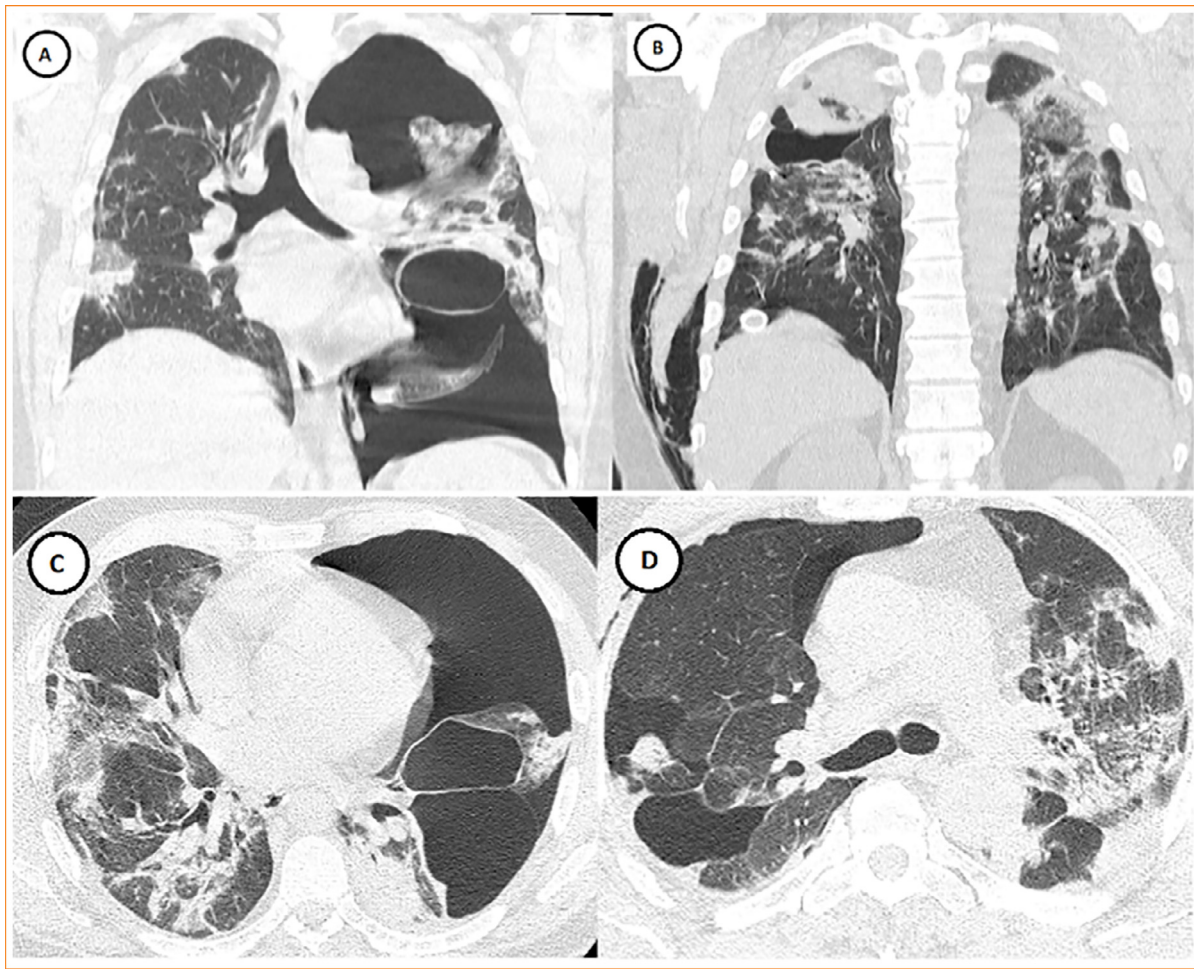

FIGURE 1. A (coronal reconstruction) and C (axial reconstruction): High-resolution chest computed tomography (HRCT) with pneumothorax on the left side and bilateral consolidations and ground-glass opacities with peripheral predominance; B (coronal reconstruction) and D (axial reconstruction): HRCT with pneumothorax and subcutaneous emphysema on the right side and bilateral consolidations and ground glass opacities.

possibility of mechanical complications such as pneumothorax.

In conclusion, spontaneous pneumothorax in COVID-19 patients seems to be rare and with pathophysiological mechanisms still unknown. Pneumothorax may be included as a potential complication in patients with viral pneumonia without pulmonary comorbidities.

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