Spontaneous Pneumothorax and Pneumomediastinum Following COVID-19

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1. Background
COVID-19, which began in Wuhan, China, and has affected many countries, is a beta-corona virus that infects the lower respiratory tract and is similar to pneumonia infection. Pneumonia caused by coronavirus disease 2019 (COVID-19) is a highly contagious disease and has caused many deaths worldwide. COVID-19 in terms of severity includes mild disease in 81% of cases, severe disease in 14%, and critical disease in 5% of cases.

The total mortality rate is expected to vary between 2% and 3%. No deaths have been reported in non-critical cases. The mortality rate in hospitalized adults ranged from 4% to 11%. Most deaths are due to old age or certain prior diseases such as cardiovascular disease, diabetes, chronic lung disease, high blood pressure, and cancer.

Spontaneous pneumothorax is due to sudden rupture of a subpleural bullae, and is usually a rarer condition. Spontaneous pneumomediastinum has been reported in the past. Some cases of pneumothorax and pneumomediastinum have been reported in COVID-19. This study examines the progress of pneumonia of the COVID 19 to spontaneous pneumothorax and pneumomediastinum in a patient.

2. Case Presentation
The patient was a 40-year-old man who complained of nonproductive cough and dyspnea. He also complained of fever, sore throat, back, and chest pain. The patient used to smoke but now he quit. His O2 saturation was 89% at the time of admission. He was assessed with suspicion of COVID-19. CT scans of the chest showed brief changes of emphysema and a ground glass view was also seen in the lungs. In the patient's tests, RT-PCR testing of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was performed and it was positive. Treatment was initiated and because of the progression of symptoms, the serial CT scanning of the patient's lungs was performed daily; and cavitary changes, air-fluid appearance, and destructive changes of lungs were reported. After eight days, the patient's cough worsened. CT scans of the patient's lungs showed some bullae, pneumothorax, and pneumomediastinum, thus a chest tube was inserted and oxygen therapy was begun on the patient with 3-6 L/min. After 5 days in CT, the patient was relieved of pneumothorax and pneumomediastinum and after a week, the chest tube came out.

Conclusion: Pulmonary lesions of COVID 19 can progress to bullae, pneumomediastinum, and pneumothorax. Deterioration of dyspnea and respiratory symptoms can be a warning of pneumomediastinum and pneumothorax that can be confirmed by graphics and timely treatment of the patient can be life-saving.

Keywords: Pneumothorax, Pneumomediastinum, COVID-19
CT scans of the chest showed brief changes of emphysema. The ground glass view was also seen in the lungs. In the patient’s tests, CRP: 0.6 (mg/L), ESR: 39 (mL/h), LDH: 395 (U/L), WBC = 7400 (×10⁹/L), HB = 11.8 (g/L), PLT = 217000 (×10⁹/L), BUN = 6 (mg/dL), Cr = 1.0 (mg/dL) were reported. RT-PCR testing of SARS-CoV-2 was performed and it was positive. Treatment was initiated by chloroquine (500 mg q12h on the first day followed by 250 mg q12h, orally) plus atazanavir/ritonavir (300/100 mg SD, orally) and due to suspicious co-bacterial infection cefixime (400 mg SD, orally) was recommended. Because of the progression of symptoms, the serial CT scanning of the patient was performed and cavitary changes, air-fluid appearance, and destructive changes of lungs were reported. After eight days, the patient’s cough worsened and O2 SAT was decreases significantly.

CT scans of the patient’s lungs showed some bullae s, pneumothorax, and pneumomediastinum, possibly due to the rupture of the emphysematous bullae. A chest tube was inserted and oxygen therapy was started on the patient with 3-6 L/min and meropenem 1 g IV TDS and levofloxacin 500 mg IV, q24h, were administered. The patient was also received nebulized Pulmicort 0.5 mg qid and Atrovent 250 μg/mL qid. After 5 days in CT, the patient was relieved of pneumothorax and pneumomediastinum and after a week, the chest tube came out. The patient was discharged with NAC 600 mg daily for 2 months, and an Foradil inhaler capsule twice daily for one month (Figure 1).

3. Discussion
This patient was a case with advanced COVID-19, followed by subsequent pneumothorax and pneumomediastinum. Spontaneous rupture of a subpleural bulla is the main cause of early spontaneous pneumothorax and pneumomediastinum is usually a rare disease caused by increased pressure inside the alveolar cavity and later ruptures. Risk factors for spontaneous pneumothorax include smoking, age, short stature, men, body mass index, prolonged cough, strenuous exercise, and certain conditions such as chronic obstructive pulmonary disease. Smoking, aging, tall stature, male, body mass index, prolonged cough, intense exercise, and certain conditions such as chronic obstructive pulmonary disease are factors that may cause spontaneous pneumothorax.

In this patient, the cause of the lesion progress to the bull and its rupture is unknown, but in the initial CT of the patient, mild emphysematous changes were evident and the patient had a history of smoking in the past. Another review study found that active smoking increased the risk of severe COVID-19. Previous studies in SARS have shown the prevalence of 1.7% of pneumothorax in patients receiving mechanical ventilation. Pneumomediastinum has also been reported following COVID-19 intubation, but there is still little information about spontaneous pneumothorax and pneumomediastinum in
COVID-19.\textsuperscript{7,18} The management of pneumothorax and pneumomediastinum in COVID-19 is probably similar to other cases with the installation of chest tube pneumothorax.\textsuperscript{19}

4. Conclusion
Depending on the condition, pulmonary lesions of COVID-19 can progress to bullae, pneumomediastinum, and pneumothorax. Deterioration of dyspnea and respiratory symptoms can be a warning of pneumomediastinum and pneumothorax that can be confirmed by graphics and timely treatment of the patient can be life-saving.

Authors’ Contributions
EV designed the study, SJM conceived and planned the treatments, HM wrote the paper and ED provided final approval of the version to publish.

Conflict of Interest Disclosures
The authors declare that there is no conflict of interests.

Ethical Approval
All the procedures were confirmed by Baqyatallah Hospital Research Committee.

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