CASE REPORT

DOI: 10.5336/caserep.2021-81092

A Case of Bilateral Spontaneous Pneumothorax in a Patient with COVID-19 Pneumonia

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ABSTRACT One of the rare complications of coronavirus disease-2019 (COVID-19), which can present with different clinical pictures, is pneumothorax. In our case, a patient who did not have predisposing risk factors for pneumothorax such as a history of trauma, smoking, past intubations, asthma, chronic obstructive pulmonary disease, and who developed bilateral spontaneous pneumothorax while under treatment with the diagnosis of COVID-19 is presented. Acute worsening in COVID-19 patients may be due to primary disease or pulmonary embolism. With this case, we emphasize the importance of considering spontaneous pneumothorax in patients with acute clinical deterioration.

Keywords: COVID-19; pneumonia; pneumothorax

Although coronavirus disease-2019 (COVID-19) has been struggled worldwide since December 2019, we still do not have complete information about the pathophysiology and presentations of the disease. In this period, when we learn different information about this disease every day, it is seen in the literature that there is an increase in the cases of COVID-19 and pneumothorax.[1-3] In this case report, a case of bilateral spontaneous pneumothorax in a COVID-19 patient is presented.

CASE REPORT

A 57-year-old male patient with no known history of any diseases was admitted to the emergency department with chest pain and shortness of breath. Pneumothorax was observed in the left hemithorax in the chest radiography of the patient who did not have a history of regular drug use and smoking (Figure 1A). Tube thoracostomy was performed, and it was seen in the x-ray that the left lung was expanded (Figure 1B). After tube thoracostomy, blood pressure was recorded as 110/70 mm/Hg, body temperature was 36.7°C in room air, and fingertip oxygen saturation value was 90%. Laboratory values were unremarkable. In the thorax computed tomography (CT) imaging performed in the emergency room before tube thoracostomy, the left hemithorax was observed as collapsed due to pneumothorax, and the right hemithorax was in normal appearance (Figure 2). The patient was hospitalized for follow-up and treatment. A reverse transcriptase-polymerase chain reaction (PCR) sample was sent from the patient with a nasopharyngeal swab due to the COVID-19 positive cases in the contacts of the patient. The patient's COVID-19 PCR test was positive. His treatment was started with current guide recommendations. Control thorax CT scan performed on the 7th day of hospitalization showed subcutaneous emphysema on the left hemithorax and diffuse ground-glass areas in both lungs (Figure 3). Immune plasma therapy was given

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Peer review under responsibility of Turkiye Klinikleri Journal of Case Reports.

Received: 05 Jan 2021 ***Received in revised form:*** 02 Apr 2021 ***Accepted:*** 04 Apr 2021 ***Available online:*** 13 Apr 2021

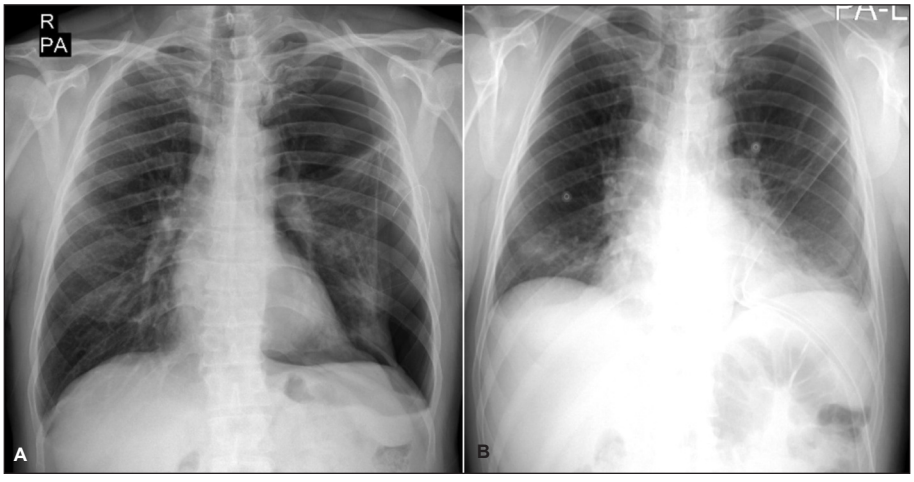

FIGURE 1: A) Pneumothorax is observed in the left hemithorax on P-A lung imaging. B) The left lung is seen to be expanded after tube thoracostomy.

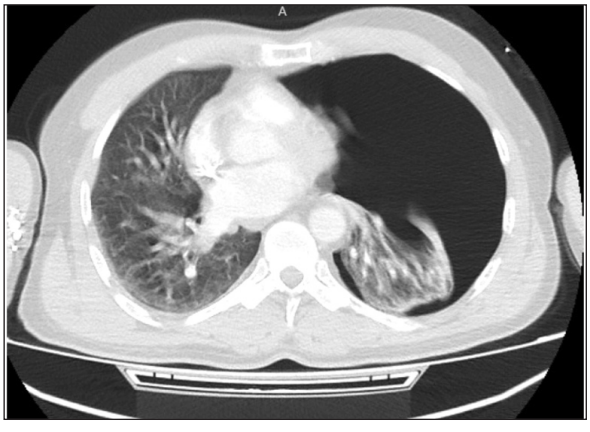

FIGURE 2: Computed tomography reveals pneumothorax and collapsed lung in the left hemithorax. Parenchyma in the right lung seems to be natural.

FIGURE 3: Due to the progression of parenchymal infiltration on chest radiography, the computed tomography performed again shows progression in both lung parenchyma.

to the patient, and corticosteroid treatment was initiated. The patient developed sudden chest pain and severe shortness of breath on the 9th day of the service follow-up. Fingertip oxygen saturation value was 70% with oxygen support. The patient was agitated and in severe respiratory distress. He was quickly taken to the pandemic intensive care unit. A lack of ventilation in the right lung was detected by lung oscultation. He was monitored. Blood pressure was measured as 150/80 mm/Hg, and the oxygen saturation value was 65-70% with a reservoir mask of 10 lt/min. Arterial blood gas was recorded as, pH=7.23, pCO_2=67 mmHg, PaO_2=50 mmHg, SO_2=68%, HCO_3=22 mEq/L. On the chest radiography performed, it was seen that this time there was a right pneumothorax (Figure 4A). Right tube thoracostomy was performed immediately. A partial expansion was observed in the right lung following the procedure (Figure 4B). Fingertip oxygen saturation value was 90% with 6 lt/min oxygen support in the patient whose vital values became normal. The patient's agitation regressed. Arterial blood gas was recorded as pH=7.45, pCO_2=37 mmHg, PaO_2=62 mmHg, SO_2=89%, HCO_3=26 mEq/L. Control radiographs showed that both lungs expanded. The patient, whose parenchymal infiltrations increased in the lungs during follow-up, was intubated due to respiratory failure and followed up with mechanical ventilation. During this period, tocilizumab treatment was given considering macrophage activation syndrome. How-

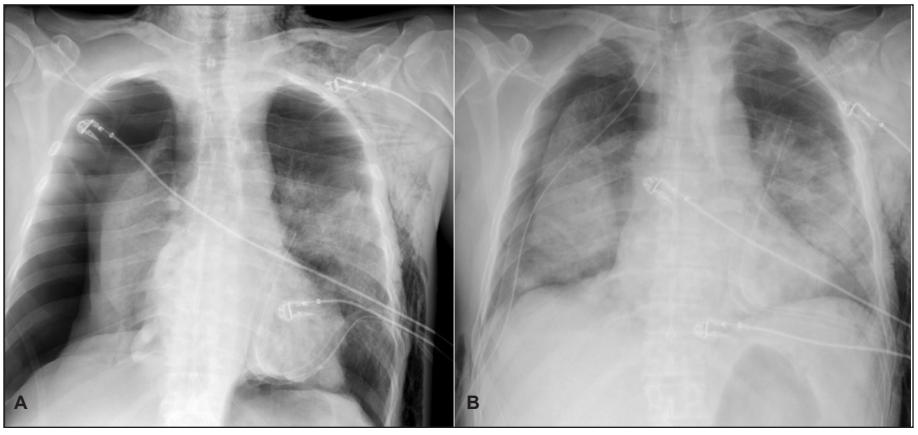

FIGURE 4: A) P-A chest radiography reveals the pneumothorax line in the right hemithorax. B) Intense infiltration is observed in the lung tissue expanded by tube thoracostomy in both lungs.

ever, the patient died while being followed in the intensive care unit due to respiratory failure. Written consent was obtained for this case report from the patient's relative.

DISCUSSION

Although COVID-19 has a lower mortality rate than severe acute respiratory syndrome-coronavirus and the Middle East respiratory syndrome-coronavirus, the spread rate is much higher than these viruses.[4] COVID-19 has main signs and symptoms such as fever, dry cough, sputum, shortness of breath, fatigue, muscle pain or arthralgia, headache, and sore throat. Many case reports followed up with the diagnosis of COVID-19 and observed to develop unilateral pneumothorax in its course are encountered in the literature.[5,6] Bilateral pneumothorax is seen as a rare complication developed in COVID-19 patients. Apart from our case, there are two bilateral pneumothorax cases that we can find in the literature.[2,3] The age, gender, and anamnesis information of the cases reported in these cases are similar to our case. Also, only two cases of bilateral pneumothorax were reported in the largest case series described, including 71 patients, published in the European Respiratory Journal.[7]

Known risk factors for the development of primary spontaneous pneumothorax include male gender, tall height, slim body structure, and the age group of 10-30. Secondary causes include infections, smoking, chronic obstructive pulmonary disease, and alpha-1 antitrypsin deficiency. Severe alveolar and airway inflammatory damage from cytokine release in COVID-19 can result in the weakening of the bronchial walls. Edema, vascular occlusion, and the microthrombus may contribute to the rupture of pre-existing bullae, and the rupture of these bullae may cause a pneumothorax.[8] Risk factors for bullae development include smoking history, pulmonary sarcoidosis, alpha-1 antitrypsin deficiency, alpha-1 anti-chymotrypsin deficiency, Marfan's syndrome, Ehlers-Danlos' syndrome, inhaled fiberglass exposure, and smoking marijuana.[9] The underlying pathophysiology of bullae formation is inflammatory damage to the bronchiole, causing air trapping. No pathology was found to explain the development of bulla and pneumothorax in our patients. In COVID-19 pneumonia, it is thought that strong cough attacks and a sudden increase in alveolar pressure that may cause widespread alveolar damage may cause pneumothorax, but the exact mechanism of pneumothorax is unknown. We think that extensive endothelial cell damage of the disease may help explain the development of pneumothorax. Bullous changes may represent an undiagnosed pulmonary disease that occurs after inflammatory changes and excessive mechanical forces caused by COVID-19 infection, leading to unilateral spontaneous pneumothorax followed by bilateral pneumothorax. Although the exact mechanism of spontaneous pneumothorax in COVID-19 is unknown, it may be linked to several factors. Statistical data of pneumothorax cases developing in COVID-19 patients is not yet clear.

Acute worsening in COVID-19 patients may be due to primary disease or pulmonary embolism. With this case, we emphasize the importance of considering spontaneous pneumothorax in patients with acute clinical deterioration. Pneumothorax may rarely be associated with COVID-19 pneumonia, but needs prompt recognition and treatment to prevent fatal consequences.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Abdurrahman Kotan, Neslihan Özçelik;* ***Design:*** *Abdurrahman Kotan, Neslihan Özçelik;* ***Control/Supervision:*** *Hasan Türüt, Ünal Şahin;* ***Data Collection and/or Processing:*** *Abdurrahman Kotan, Neslihan Özçelik, Gökçen Sevilgen;* ***Analysis and/or Interpretation:*** *Neslihan Özçelik, Hasan Türüt, Ünal Şahin;* ***Literature Review:*** *Neslihan Özçelik, Abdurrahman Kotan;* ***Writing the Article:*** *Neslihan Özçelik, Abdurrahman Kotan;* ***Critical Review:*** *Hasan Türüt, Ünal Şahin.*

REFERENCES

1. Mallick T, Dinesh A, Engdahl R, Sabado M. COVID-19 Complicated by spontaneous pneumothorax. Cureus. 2020;12(7):e9104. [Crossref]
2. González-Pacheco H, Gopar-Nieto R, Jiménez-Rodríguez GM, Manzur-Sandoval D, Sandoval J, Arias-Mendoza A. Bilateral spontaneous pneumothorax in SARS-CoV-2 infection: a very rare, life-threatening complication. Am J Emerg Med. 2021;39:258.e1-e3. [Crossref] [PubMed] [PMC]
3. Ahluwalia AS, Qarni T, Narula N, Sadiq W, Chalhoub MN. Bilateral pneumothorax as possible atypical presentation of coronavirus disease 2019 (COVID-19). Respir Med Case Rep. 2020;31:101217. [Crossref] [PubMed] [PMC]
4. Zhao W, Zhong Z, Xie X, Yu Q, Liu J. Relation between chest CT findings and clinical conditions of coronavirus disease (COVID-19) pneumonia: a multicenter study. AJR Am J Roent genol. 2020;214(5):1072-7. [Crossref] [PubMed]
5. Flower L, Carter JL, Rosales Lopez J, Henry AM. Tension pneumothorax in a patient with COVID-19. BMJ Case Rep. 2020;17;13(5): e235861. [Crossref] [PubMed] [PMC]
6. Rohailla S, Ahmed N, Gough K. SARS-CoV-2 infection associated with spontaneous pneumothorax. CMAJ. 2020;11;192(19):E510. [Crossref] [PubMed] [PMC]
7. Martinelli AW, Ingle T, Newman J, Nadeem I, Jackson K, Lane ND, et al. COVID-19 and pneumothorax: a multicentre retrospective case series. Eur Respir J. 2020;19;56(5): 2002697. [Crossref] [PubMed] [PMC]
8. Goldberg C, Carey KE. Bullous lung disease. West J Emerg Med. 2013;14(5):450-1. [Crossref] [PubMed] [PMC]
9. Burguete SR, DeArmond DT, Soni NJ, Peters J. Part 9: Disorders of Pleural Space. Chapter 78: Pneumothorax. Grippi M, Elias J, Fishman J, Kotloff R, Pack A, Senior R, eds. Fishman's Pulmonary Diseases and Disorders. 5th ed. New York, ABD: McGraw Hill; 2015. p.789-91. [Link]