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CASE REPORT / OLGU SUNUMU

COVID-19 Pneumonia and Pneumothorax: Series of Six Cases

COVID-19 Pnömonisi ve Pnömotoraks: 6 Olguluk Seri

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ABSTRACT

Both pneumothorax and pneumomediastinum are complications of intubation. Pneumothorax or pneumomediastinum may be present in COVID-19 patients even in the absence of barotrauma. Here, we report 6 patients with pneumothorax and / or pneumomediastinum. COVID PCR test was positive in all. Tube thoracostomy was not performed in two of the cases. One of them was pneumomediastinum and there was no pneumothorax in the parenchyma and the other one had minimal pneumothorax in the right lung. Bilateral tube thorocostomy was performed in one of the cases, with a history of hospitalization in the intensive care unit and extensive subcutaneous emphysema and pneumomediastinum. There was no mortality in our patients. Consequently, spontaneous pneumomediastinum and pneumothorax are not a common picture in COVID-19 infection and could potentially be an aggravating factor in the treatment of COVID-19 pneumonia.

Keywords: COVID-19, pneumonia, pneumomediastum, pneumotoraks.

ÖZ

Hem pnömotoraks hem de pnömomediastinum entübasyonun komplikasyonlarıdır. COVID-19 hastalarında barotravma olmasa bile pnömotoraks veya pnömomediastinum mevcut olabilir. Burada, pnömotoraks ve/veya pnömomediasteni olan 6 hastayı sunuyoruz. COVID PCR testi hepsinde pozitif çıktı. Olguların ikisine tüp torakostomi uygulanmadı. Biri pnömomediastinumdu ve parankimde pnömotoraks yoktu, diğerinde sağ akciğerde minimal pnömotoraks vardı. Yoğun bakım ünitesinde yatış öyküsü ve yaygın cilt altı amfizem ve pnömomediasten öyküsü olan bir olguya bilateral tüp torakostomi uygulandı. Hastalarımızda mortalite olmadı. Sonuç olarak, spontan pnömomediastinum ve pnömotoraks, COVID-19 enfeksiyonunda yaygın bir tablo değildir ve COVID-19 pnömonisinin tedavisinde potansiyel olarak ağırlaştırıcı bir faktör olabilir.

Anahtar kelimeler: COVID-19, pnömoni, pnömomediastinum, pnömotoraks.

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INTRODUCTION

Pneumothorax and pneumomediastinum are defined by the presence of free air in the pleural and mediastinal spaces. Subcutaneous emphysema occurs when air enters the tissues. Both pneumothorax and pneumomediastinum are among the complications that can occur in patients who depend on mechanical ventilation.[1,2] However, pneumothorax or pneumomediastinum, or more rarely, both of them, might exist in the context of COVID-19 without barotrauma.[3,4] Radiology is the cornerstone in the management of COVID-19 pneumonia, especially in the diagnosis and follow-up period. Many parenchymal and extra-parenchymal abnormalities in the context of the novel coronavirus SARS-COV-2 were identified in Computed Tomography (CT). Parenchymal lesions may appear as alveolar or interstitial changes. Images on CT vary depending on the course of the COVID-19 infection. The most common and earliest detectable CT finding is parenchymal ground-glass opacities. However, pneumothorax and pneumomediastinum are detected more commonly in COVID-19 patients with different clinical characteristics.

Here, we discussed that it occurs even in patients who do not have previous lung disease and do not need positive pressure ventilation by reporting a series of 6 pneumothorax cases with COVID-19 involving non-intubated patients with the literature data.

THE CASES

All of the 6 patients who had COVID-19 pneumonia and pneumothorax were male. The median age of the patients was 60 (min-max: 26–72). General characteristics of the patients are given in Table 1. The COVID-19 PCR test was positive in all cases.

CASE 1

67-year-old male, with no comorbidite diseases, was admitted to the hospital with the complaint of shortness of breath. Pneumothorax and bilateral uncommon peripheral ground glass opacity were detected on thoracic computed tomography (CT) (Fig. 1). The patient underwent tube thoracostomy had a unilateral pneumothorax. Patients were monitored with daily Chest X-Rays to determine any progress. Tube thoracostomy was terminated at the end of the 3rd day (Table 1).

CASE 2

40-year-old male with no comorbidite diseases was admitted to the hospital with the complaint of shortness of breath and bilateral chest pain. The patient underwent bilateral tube thoracostomy and had a history of hospitalization in ICU, widespread subcutaneous emphysema, and pneumomediastinum. On CT bilateral diffuse ground glass opacities were detected (Fig. 2). He was not intubated in ICU, he took high flow oxygen. Tube thoracostomy was terminated at the end of the 16th day (Table 1).

CASE 3

A 72-years-old male with hypertension was admitted to the hospital. He has got shortness of breath and left chest pain. On CT, there were

Table 1: Demographic and clinical features of the cases

Case	Age	Gender	Comorbidity	History of smoking	COVID PCR test	Tube thoracostomy	COVID-19 parenchymal infiltration	Tube thoracostomy time
Case 1	67	Male	Absent	Ex smoker	Pozitive	Present/Unilateral Right pneumothorax	Present - Bilateral uncommon peripheral ground glass	3 days
Case 2	40	Male	Absent	Non smoker	Pozitive	Present Bilateral	Present - Bilateral diffuse ground glass	16 days
Case 3	72	Male	Hypertension	Ex smoker	Pozitive	Present/Unilateral Left pneumothorax	Present - Bilateral uncommon peripheral ground glass	5 days
Case 4	26	Male	Absent	Nonsmoker	Pozitive	Absent	Present - minimal peripheral ground glass	–
Case 5	60	Male	Absent	Ex smoker	Pozitive	Present/Unilateral Right pneumothorax	Present - Ground glass, more on the left bilateral	5 days
Case 6	70	Male	COPD	Ex smoker	Pozitive	Absent/Unilateral Right pneumothorax	Present - Bilateral uncommon peripheral ground glass	–

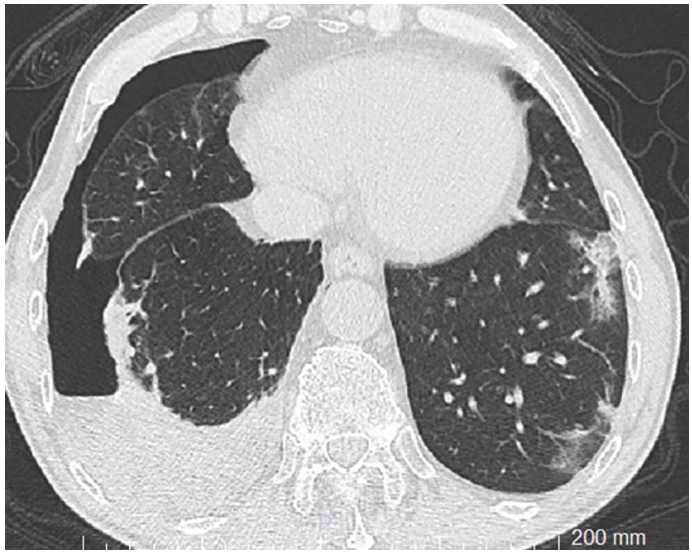

Figure 1: Pneumothorax and hemothorax in the right lung and infiltration in the parenchym.

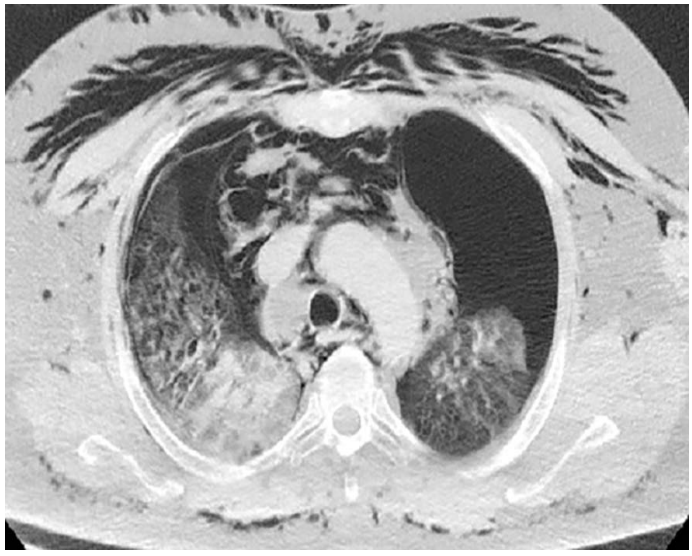

Figure 2: On thorax computed tomography, bilateral pneumothorax and pneumomediastinum findings are common subcutaneous emphysema, atelectatic lung parenchyma areas and accompanying peripheral subpelvral and peribronchial ground-glass infiltration areas.

bilateral uncommon peripheral ground-glass opacities and left pneumothorax (Fig. 3). Tube thoracostomy was terminated at the end of the 5th day (Table 1).

CASE 4

A 26-year old male was admitted due to chest pain. He had pneumomediastinum with no pneumothorax and minimal ground glass opacity on the thorax CT (Fig. 4). Tube thoracostomy was not applied to the patient. The patient was observed, there was no hypoxemia. He received only oxygen inhalation therapy. Chest pain resolved within a few days and the patient was discharged on the 5th day (Table 1).

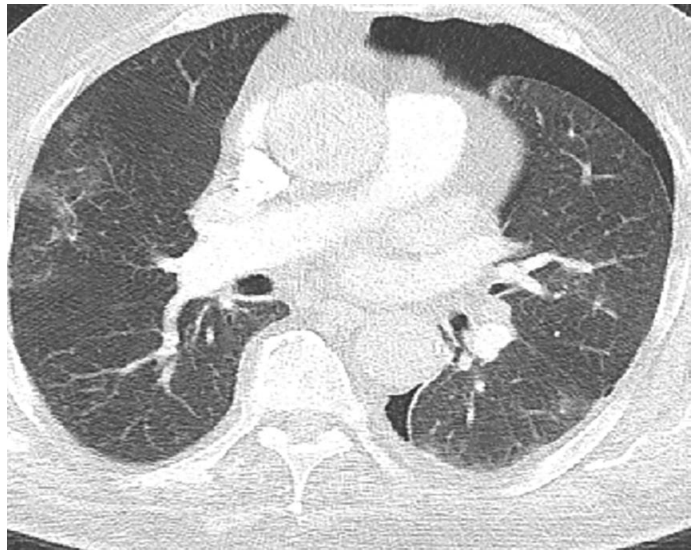

Figure 3: Scattered ground-glass infiltration areas in both lungs and pneumothorax in the left lung.

CASE 5

A 60 year old male with no comorbidity was admitted to the hospital with complaint of chest pain and fever. Bilateral parenchymal infiltration, more on the left and right pneumothorax, was detected on Thorax CT (Fig. 5). Tube thoracostomy was applied to the patient and was terminated at the end of the 5th day (Table 1).

CASE 6

A 70 year old male with chronic obstructive chest disease (COPD) was admitted to the hospital. He had cough, shortness of breath, and weakness. There were bilateral groung-glass opacity and minimal right pneumothorax on Thorax CT (Fig. 6). Tube thoracostomy was not applied to the patient. The patient was observed, there was no hypoxemia. He was followed up with oxygen inhalation because he had minimal pneumothorax. There wasn't progression in the pneumothorax line in the daily chest radiographs and the patient was discharged on the 10th day (Table 1).

DISCUSSION

Pneumothorax due to mechanical ventilation is associated with barotrauma due to high airway pressures. However, it has been confirmed by case reports of an increased incidence of spontaneous and iatrogenic pneumothorax and/or pneumomediastinum in COVID-19 patients.[5–7] Also, spontaneous pneumothorax was reported as a complication of Severe Acute Respiratory Syndrome (SARS, SARS-Coronavirus (CoV)-1) with 1.7% frequency in hospitalized patients.[8] In a review that examined cases with Covid-19-related pneumothorax and pneumomediastinum,[9] the male gender was found to be most affected among pneumomediastinum cases (66.6%; 4/6). All of our 6 cases were male.

Spontaneous pneumomediastinum (SPM) and pneumothorax can be seen rarely in COVID-19 infection. SPM is defined as the presence of air in the mediastinum without an obvious cause such as traumatic, iatrogenic, subsequent organ perforation, surgery, and

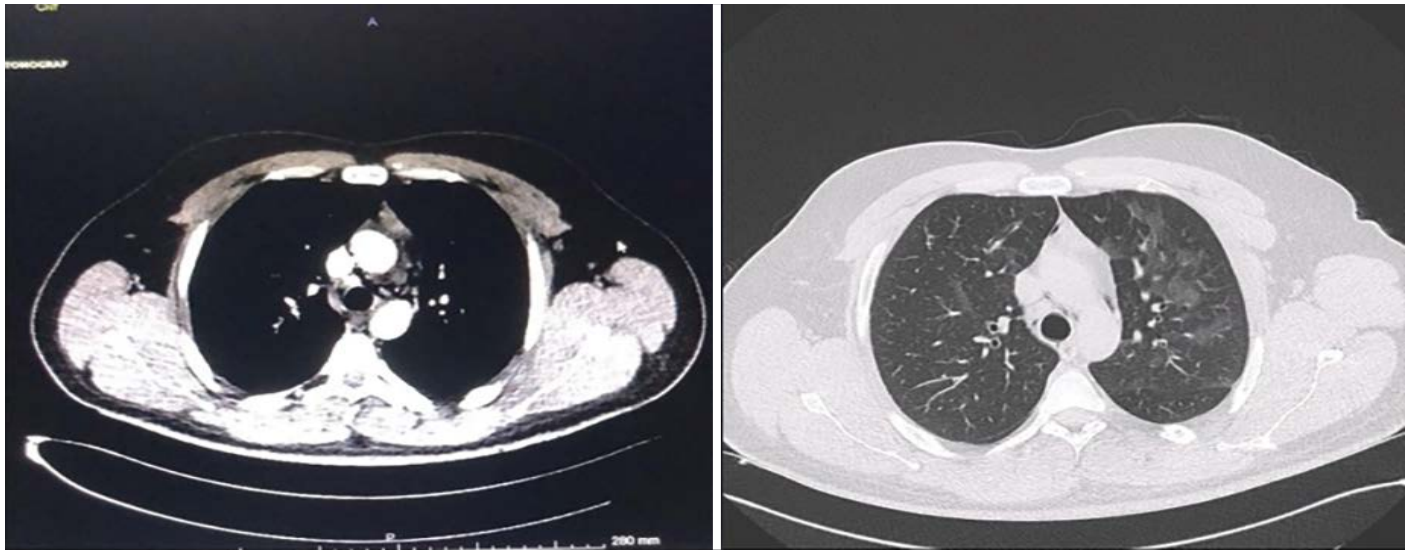

Figure 4: Pneumomediastinum and minimal ground glass areas in the parenchyma in thorax computed tomography.

Figure 5: Right pneumothorax and Bilateral parenchymal infiltration, more on the left.

gas-producing infections. Our patient had no history of trauma or intubation. It is thought that cystic and fibrotic changes in the lung parenchyma that can be seen on CT in Covid-19 pneumonia may result in pneumothorax.[8] Pathological changes in the parenchyma can cause alveolar ruptures. It can also be considered that mucus plugs may act as check valves and thus facilitate local alveolar pressure increases. Previous reports found that cyst formation was not limited to patients who received positive pressure ventilation, which suggests that barotrauma might not explain these findings alone.[10] Similarly, a large number of pneumothorax in patients without mechanical ventilation also suggests that barotraumas cannot explain this relationship alone. Also, the cyst formation was recorded as a late result of ARDS because of SARS, and these disease processes were accepted, including ischemic parenchymal damage and inflammation in this respect.[11] One of our patients received intensive care and mechanical ventilation for about two days. However, this patient had bilateral pneumothorax in pre-NIMV hospitalization. Pneumothorax developed regardless of mechanical ventilation. On the contrary, there are studies suggesting that pneumothorax cases after Covid-19 infection are secondary to NIMV-associated barotrauma.[12] According to Gattoni et al.[13] found that the incidence of pneumothorax was higher in ARDS patients using mechanical ventilation for a long time.

Chest pain and shortness of breath are the most commonly detected symptoms.[14,15] Drug abuse, asthma, Chronic Obstructive Pulmonary Disease, and interstitial lung disease are some predisposing factors; Smoking is the most important risk factor.[15] None of our patients were active smokers, four patients were ex-smoker, and only one patient had COPD.

Pneumothorax treatment may be a clinical difficulty in ARDS patients who undergo invasive ventilation. In actual fact, previous reports indicated that intubated COVID-19 patients developed pneumothorax resistance to chest drainage, which required surgery ultimately.[16] In our 6 series case, only one of our cases received NIMV, and after the tube thoracostomy, the bilateral pneumothorax did not go far enough to require surgery. Drainage was applied to our pneumothorax patients with tube thoracostomy except for two patients. The other two patients recovered with conservative treatment (oxygen inhalation). In a study that examined the largest number of cases, 69% of cases received chest drains, one case underwent surgery after chest tube, 24% and 5% cases were treated with conservative and palliative treatment methods.[17] Permanent pneumothorax occurred despite the insertion of two chest drains in a patient who was scheduled for surgery, and treatment and discharge were achieved only after bullectomy and pleurodesis. Therefore, surgical procedures can yield successful results in specific patients. On the contrary, studies have shown that persistent air leakage increases mortality.[18] The British Thoracic Society guidelines state that persistent pneumothorax and air leak should be referred to surgery.[19]

The development of pneumothorax during coronavirus infection has been discussed in some publications as a predictor of poor prognosis.[8,9] Pneumothorax is likely to be a marker of more serious lung

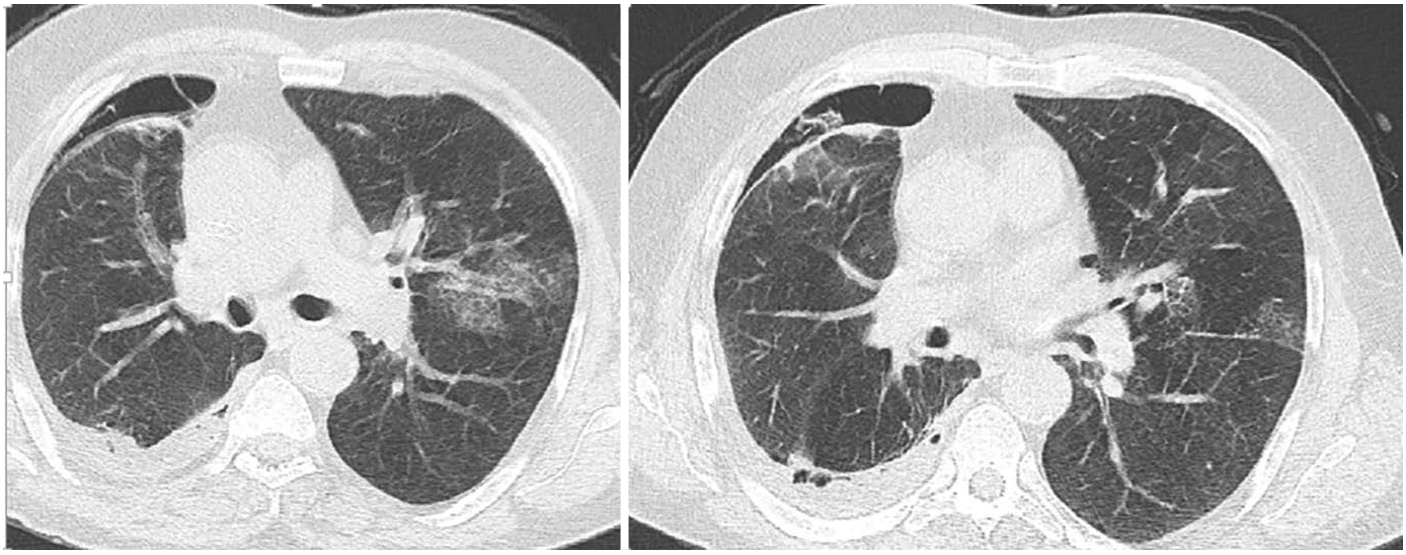

Figure 6: Minimal pneumothorax area in the right lung on thorax computed tomography.

disease caused by COVID-19. This assumption is supported by the fact that patients with pneumothorax have lower gas exchange and respiratory system compliance than those without pneumothorax. The probable cause of pneumothorax in patients with COVID-19 infection is due to barotrauma caused by excessive positive pressure ventilation applied to a structurally vulnerable lung. This is a well-known phenomenon in mechanically ventilated patients with other forms of ARDS.[20] Pneumothorax has a high incidence and mortality in severe COVID-19 patients.[20] None of our cases, even the bilateral pneumothorax case, had mortality, and all cases were discharged. In a study with wide range series, overall survival of 63.1% was reported.[17] In the same study, overall 28-day survival was not significantly different after pneumothorax (63.1%±6.5%) or isolated pneumomediastinum (53.0%±18.7; p=0.854). Also, 28-day survival was not different between genders, and patients who were aged 70 and over had significantly lower survival rates than younger individuals. In our case series, two patients were 70 years of age or older. In one case, the chest drain remained for 5 days, and although the other patient had COPD, s/he had expanded lungs with conservative treatment. The prognosis was good in our patients.

Although the treatment of the cases mentioned in our study lasted longer than other COVID-19 cases, none of them were mortal. Guven et al.,[21] by in a similar study, 96 cases were examined and there was no statistically significant difference in the mortality of the cases that developed pneumothorax and pneumomediastinum when compared with the other group. One of the limitations of our study was that the number of patients was small. Another limitation was that no ideas could be obtained on how the course would proceed in patients with ventilation because of the absence of patients with invasive ventilation.

CONCLUSION

"In conclusion, pneumothorax and pneumomediastinum are among the possible complications of COVID-19 pneumonia. In actual fact, the association of pneumomediastinum, pneumothorax, and the common parenchymal lesion in CT indicates that the alveolar membrane is severely damaged, and there are potentially worsening clinical outcomes. On the other hand, as it was the case in our report, clinical progression and prognosis seem better.

Disclosures

Informed Consent: Patient consent was not deemed necessary because of the retrospective study design.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The authors have no conflict of interest to declare.

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