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Case Report

Recurrent Pneumothorax and Pneumomediastinum as a Complication of COVID-19 in a Young Athlete

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ABSTRACT

A novel coronavirus, SARS-CoV-2 was identified as the cause of a cluster of pneumonia cases in Wuhan, China in December 2019. Coronavirus Disease 2019 (COVID-19) has rapidly spread worldwide. Numerous studies have shown diverse findings on chest CT scan of the patients with COVID-19. The established well-known features of COVID-19 on chest imaging include bilateral multilobar ground-glass opacification (GGO) predominantly with peripheral distribution, mainly in the lower lobes. Atypical presentation of consolidative opacities superimposed on GGO may be found in a smaller number of cases, mainly in the elderly populations. Pleural and pericardial effusion, lymphadenopathy, cavitation, halo sign on CT scan, and pneumothorax are uncommon but may be seen with disease progression.

We report a case of severe COVID-19 in an athlete man with development of bilateral pneumothorax, pneumomediastinum and subcutaneous emphysema during progression of the disease. The only risk factor for severe COVID-19 in our patient was suggested to be chronic use of dexamethasone as anabolic steroids. Our patient also received three sessions of plasmapheresis. Unfortunately, the patient expired due to recurrence of bilateral pneumothorax and pneumomediastinum.

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Introduction

Coronavirus disease 2019 (COVID-19), the most serious contagious disease caused by SARS-CoV-2 has had a disastrous effect in the world resulting in 6,200,000 deaths worldwide until April 2022, as of writing this letter.[1] In a systematic review on clinical manifestations of COVID-19, a total of 41,409 individuals from 23 countries were identified. The most common symptoms were as follows; fever (58.6%), cough (54.5%), dyspnea (30.8%), malaise (29.7%), fatigue (28%) and sputum or secretion (25.3%). Neurological symptoms, dermatological manifestations, anorexia, myalgia, sneezing, sore throat, rhinitis, chest pain and diarrhea were other common symptoms. The least frequent sign/symptom was hemoptysis (1.65%).[2] The proportion of patients who were asymptomatic was 11.9% obtained from a meta-analysis from China on clinical characteristics of 3,062 COVID-19 patients. The analysis showed 25.8% of patients had lesions involving a single lung and 75.7% of patients had lesions involving bilateral lungs. The incidence rate of respiratory failure or acute respiratory distress syndrome was 19.5% and the fatality rate was 5.5%.[3]

Pneumothorax and pneumomediastinum are among known, albeit rare complications of COVID-19 associated pneumonia. Herein, we report the occurrence of recurrent bilateral pneumothorax and pneumomediastinum in an athlete 28-year-old male with COVID-19 pneumonia. Many studies have shown that factors like advanced

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age, diabetes, pregnancy, cancer and HIV/AIDS are particularly at higher risk of severe disease and poor outcomes.[4] The only probable risk factor for developing severe disease in this patient was prolonged use of dexamethasone as a performance-enhancing drug.

Case Report

A 28-year-old man admitted to the emergency department with symptoms of fatigue and myalgia, dry cough, and shortness of breath. The patient was an expert bodybuilder with positive history of prolonged injections of dexamethasone to increase muscle mass and performance abilities. Initial physical examination revealed tachypnea and low oxygen saturations (SaO2 77%). His temperature, blood pressure, and pulse rate were within the normal range. Initial laboratory tests on admission demonstrated hyperglycemia, leukocytosis, high serum creatinine, lactate dehydrogenase (LDH), and C-reactive Protein (CRP) as an inflammatory marker. According to the positive RT-PCR test for COVID-19 infection through nasopharyngeal swab and his respiratory symptoms, a spiral chest CT-scan was performed which revealed bilateral parenchymal involvement and GGOs distributed over the apical, middle and lower zones of both lungs (Figure 1). Based on clinical findings and imaging features, the patient was admitted to ICU to receive more respiratory support. The patient received immediately supplementary oxygen through Bi-Level Positive Airway Pressure (BiPAP) by a nasal mask since oxygen saturation was decreased to 65%, which resulted in improvement in oxygen saturations. He was scheduled to receive treatment with interferon-beta 1a, subcutaneously every day for 5 days and dexamethasone intravenously every 8 hours.

Meanwhile, considering numerous studies on efficacy of therapeutic plasma exchange (TPE) in severe COVID-19, the patient was planned to undergo TPE sessions to alleviate the cytokine storm syndrome and reduce lung damage, preventing progression to acute respiratory distress syndrome (ARDS) and multiple organ dysfunction.[5-7] He received three TPE sessions with 24-48 hours intervals. While the patient was on plasmapheresis, the condition of the patient began to deteriorate with oxygen saturation levels falling below 70%, despite receiving non-invasive ventilation. Physical examination revealed crepitation on palpation of the trunk (back and sides) bilaterally suggestive of subcutaneous emphysema. An emergently obtained chest-CT scan at this time demonstrated bilateral pneumothorax and pneumomediastinum and subcutaneous emphysema (Figure 2). Bilateral chest tubes were inserted which resulted in the resolution of pneumothorax and pneumomediastinum radiographically and complete re-absorption of the subcutaneous emphysema of the chest and neck. Therefore, the chest tubes were removed after five days. Unfortunately, two days following the removal of the chest tubes, the patient developed respiratory distress due to recurrence of the subcutaneous emphysema and pneumothorax which was unresponsive to re-insertion of the chest tube and expired despite emergency endotracheal intubation.

Discussion

Both pneumothorax and pneumomediastinum are known complications of mechanical ventilation due to intubation.[8,9] However, there are two reports of COVID-19 cases complicated with pneumothorax or pneumomediastinum even without barotrauma.[10] Larger studies revealed a prevalence ranging between 1-2% for pneumothorax in adult COVID-19 patients.[11] Our patient developed the

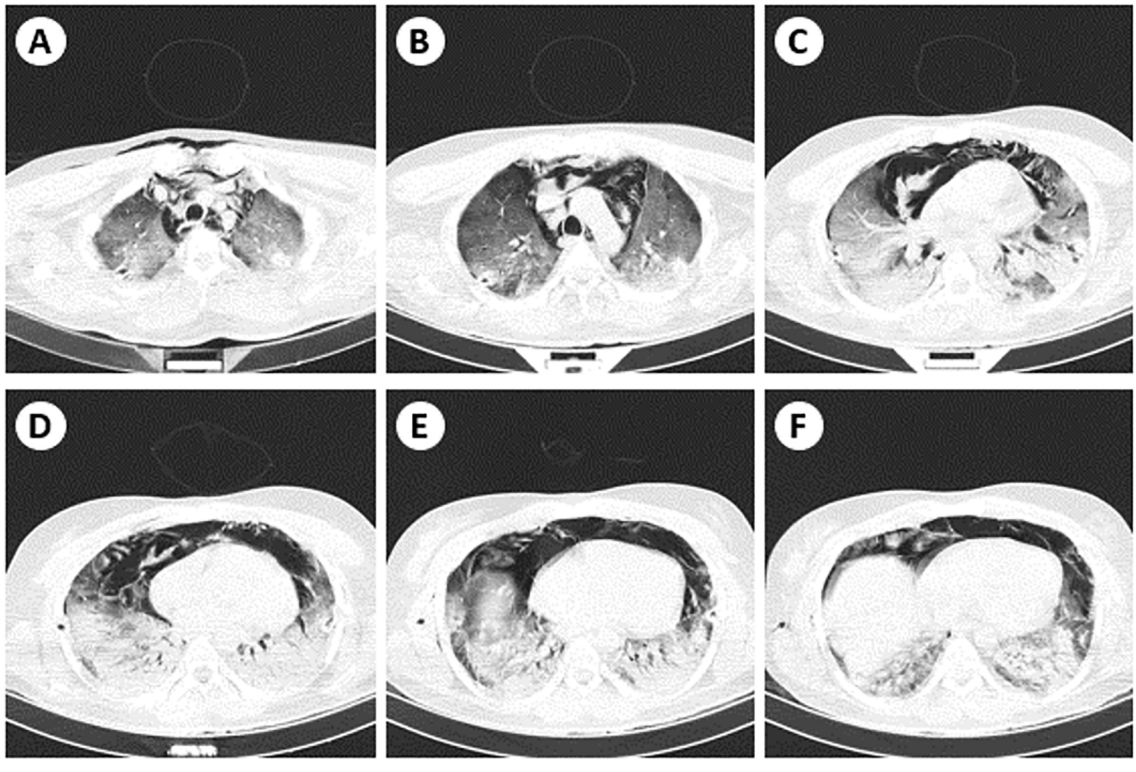

Figure 1: Chest CT scan of the patient showing ground glass opacities in apex (A, B), middle zone (C, D), and the base of both lungs (E, F).

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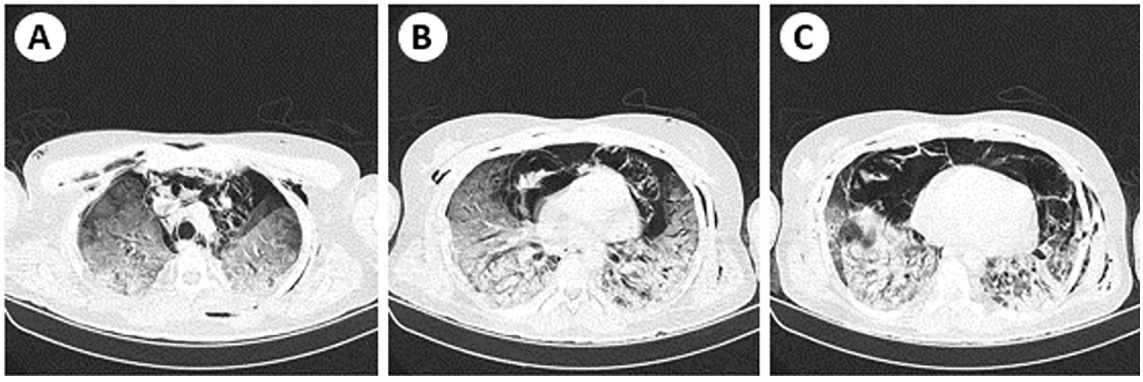

Figure 2: Chest CT scan showing subcutaneous emphysema (A), pneumothorax and pneumomediastinum (B, C).

first episode of pneumothorax and pneumomediastinum after non-invasive ventilation through insertion of BiPAP; nevertheless, none of the episodes of pneumothorax were followed by intubation in our patient. pneumothorax has been reported in two pediatric patients receiving BiPAP ventilation for respiratory insufficiency.[12]

Patients with COVID-19 infection are prone to develop severe pneumonia leading to acute respiratory distress syndrome (ARDS). The radiographic characteristics of the disease are GGO, evolving into consolidative and fibrotic changes in late stages of the disease.[13] The most identified imaging features of COVID-19 include bilateral, multilobar GGOs with peripheral or posterior distribution, mainly in the lower lobes. Septal thickening, bronchiectasis, pleural thickening, and subpleural involvement are some of the less common findings, mainly in the later stages of the disease. Pleural and pericardial effusion, lymphadenopathy, cavitation, halo sign, and pneumothorax are some of the uncommon findings specifically during the progression of the disease.[14]

Quincho-Lopez et al. in a review of the literature have reported 20 patients infected with SARS-CoV-2 who had presented with pneumothorax, pneumomediastinum, or both. Subcutaneous emphysema was a radiological finding present in 35% (7/20) of the patients, two in pneumothorax, three in pneumomediastinum, and two in both.[10]

Review of the literature has reported a series of three patients with COVID-19 treated at the New York City health and hospitals system who presented with pneumothorax. None of these patients had a history of lung disease. Inflammatory markers were elevated compatible with severe COVID-19. CT scans in these patients showed bilateral air space disease with other features including pneumomediastinum, subcutaneous emphysema, and pneumatoceles. The underlying mechanism for pathogenesis of pneumothorax in these patients is suggested to be pulmonary parenchymal injury and necrosis due to severe inflammation followed by subsequent development of air leaks into the pleural cavity.[15] The virus could cause fibrotic changes and bulla formation in lung tissue. Consequently, the rupture of these emphysematous bullae could result in pneumothorax development.[10, 15]

While WHO guidelines do not recommend routine administration of corticosteroids in patients with COVOD-19, using these agents in severe COVID-19 patients is advised due to their anti-inflammatory effects to reduce the severity of symptoms.[16-18]

Our patient had no significant risk factor for developing severe fulminant COVID-19, but prolonged use of dexamethasone. Patients who use corticosteroids prior to COVID-19 infection may have atypical on-admission signs and symptoms, which could mislead diagnosis and treatment processes.[19, 20]

Conclusion

Spontaneous pneumothorax and pneumomediastinum are rare complications of COVID-19 pneumonia, causing acute deterioration and worsening the prognosis of the patients especially those with underlying lung disease. It may occur at any time during the course of the disease. Patients who are mechanically ventilated or receiving positive pressures appear to be at higher risk for developing pneumothorax and pneumomediastinum. Once pneumothorax and pneumomediastinum are present, the patient should be carefully monitored to prevent respiratory deterioration, especially when lung lesions are severe.

This case also proposes the probable adverse effect of chronic corticosteroid usage in COVID-19 patients. Therefore, more investigations are needed to highlight the clinical course of the COVID-19 and its association with probable risk factors.

Conflict of Interest: None declared.

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