Case Report

Spontaneous Pneumomediastinum, Pneumothorax and Subcutaneous Emphysema in Patients with COVID-19: A Case Series

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A B S T R A C T

Introduction: Pneumomediastinum, pneumothorax, and spontaneous subcutaneous emphysema are uncommon conditions. Even in patients who are not on intrusive ventilation, a rising trend in the presence of COVID-19 may point to a different cause.

Case report: Three patients with suspected COVID-19 symptoms were diagnosed with pneumomediastinum, pneumothorax, and subcutaneous emphysema, which might have gone unnoticed if not for a computed tomography scan conducted at the time of admission. In three of these cases, there had been no previous iatrogenic involvement.

Conclusion: As the complication of COVID-19 or as a complication of COVID-19 management, pneumomediastinum, pneumothorax, and subcutaneous emphysema may occur.

Keywords: COVID-19, Pneumomediastinum, Pneumothorax, Subcutaneous Emphysema, Iatrogenic Involvement

INTRODUCTION

COVID-19 has been the most widespread pandemic in recent years, with increased morbidity and mortality, as well as a wide range of complications. The first case of COVID-19 was registered in India on January 30, 2020, and the virus has since reached a peak, with 5.7 million cases and 91,149 deaths.[1] When mechanical ventilation is not present, several cases of PM, PT, and SE (spontaneous pneumomediastinum, pneumothorax, subcutaneous emphysema) have been diagnosed in patients with SARS-2 pneumonia.[2-5] As a result, numerous retrospective studies are performed,[6] such as a comprehensive meta-analysis published by Martinelli et al.,[3] the largest one being a study of the effects of an expanded follow-up. The Macklin effect is the primary pathophysiological mechanism for PM, which describes the formation of a high degree of pressure between the marginal alveoli and the lung parenchyma and determines the air leakage along the bronchosheath around the mediastinum in the presence of extensive alveolar injury. Inflammation is known to make the alveolar wall more vulnerable to rupture, which can be aggravated by a persistent cough or other factors that raise intra-alveolar pressure. Some studies have included patients who spontaneously have developed PT and/or PM as well as those who have developed PT or PM during intrusive positive pressure ventilation,[3] where barotrauma can be the underlying mechanism. In our case series, we only looked at patients who acquired these complications on their own during COVID-19, with some of them having mild/moderate types of the disease that eventually worsened.[7]

CASE PRESENTATION

Case 1

A 30-year-old male presented an emergency room with two days of aggravating breathlessness associated with fatigue and fever. Positive COVID-19 patients were exposed to the workplace. He then became aware of symptoms of the upper respiratory tract and had a positive test 8 days in advance. Cough, chest pain, nausea, vomiting and headaches he denied. He does not drink alcohol, smoke or use recreational medicines.

The physical examination showed a relaxed patient with no signs of respiratory distress when they arrived. On room air, his oxygen saturation was 88 percent–90 percent, but it

increased to 96 percent when he used a non-rebreather mask at 15 L/min. His breathing rate was 24 breaths per minute, his temperature was 37.1˚C, his pulse was 98 beats per minute, and his blood pressure was 111/61 mm Hg. The lung examination showed bilateral rhonchi; the rest of his physical examination was normal. A chest CT revealed extensive bilateral lung fields with pneumomediastinum, peripheral ground-glass infiltrates, and subpleural predominance, as well as pneumomediastinum and peripheral ground-glass infiltrates. There was also some mild interlobular septal thickening. The superior part of the anterior thoracic wall and the soft tissues of the neck have subcutaneous emphysemateous tracks (Fig.1). CORADS 5 was the overall finding, with a severity ranking of 22/25. COVID-19 reverse transcriptase PCR was positive. Ceftriaxone, azithromycin, dexamethasone sodium phosphate, methylprednisolone SS, enoxaparin, and remdesivir were all given to the patient. Over time, the patient progressed and was released in a hemodynamically stable state.

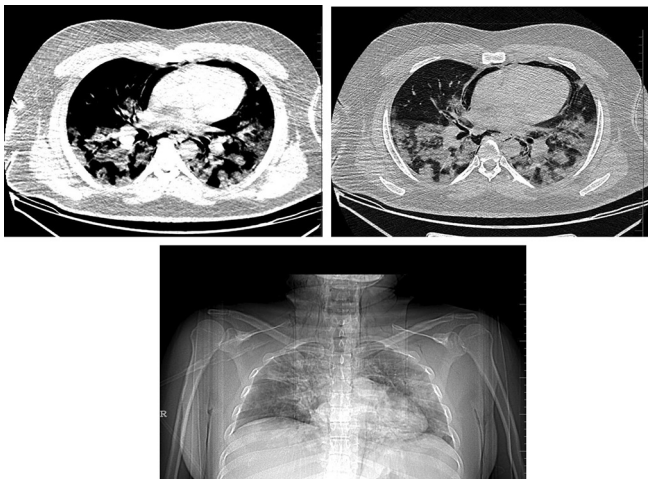

Figure-1: Pneumomediastinum and subcutaneous emphysema

Case 2

A 33-year-old man with a history of interaction with a confirmed case of COVID-19 before presenting symptoms presented with cough for 7 days and fever with moderate shortness of breath for the last 5 days. During his physical examination, he seemed to be a well-developed young man who was short of breath. His temperature was 37.5˚C, his blood pressure was 149/81 mmHg, and his pulse was 98 beats per minute. On room air, his respiratory rate was 42, and his oxygen saturation was 85%, rising to 95% with a 15 L/min non-rebreather mask. His lungs were found to have bilateral rhonchi, but the rest of his physical examination was regular.

On the first day of treatment, a computed tomography scan (CT-Thorax-Plain) showed multifocal patchy ground-glass opacities (GGO) in both lung fields, with Pneumomediastinum peripheral and subpleural predominance and slight interlobular septal thickening. There was also a bilateral mild pneumothorax (Fig.2). CORADS 6 was the overall result. COVID-19 was detected using reverse transcriptase-polymerase chain reaction (RT-PCR). Ceftriaxone, doxycycline, steroids, enoxaparin sodium, and hydroxychloroquine were began, and he remained stable on non-invasive supplemental oxygen at 10–15 L/min.

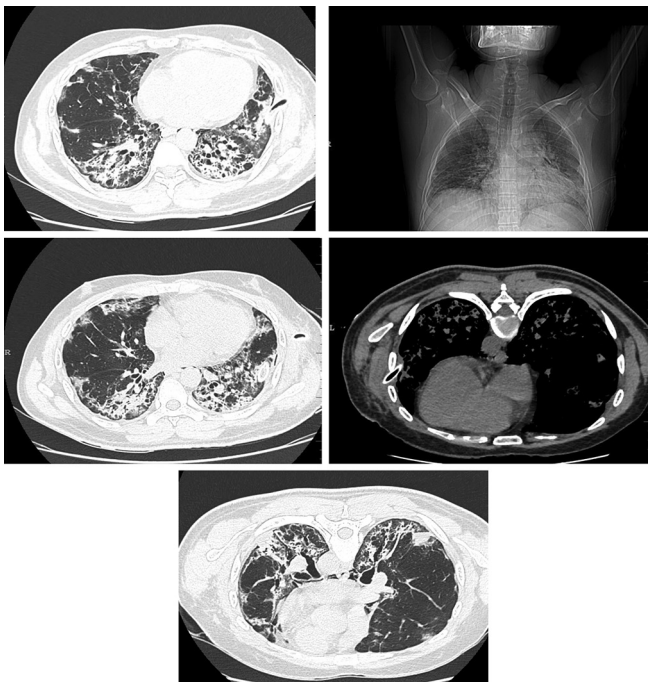

Figure-2: Pneumomediastinum and pneumothorax

Case 3

A 61-year-old man presented with a seven-day history of cough, extreme breathlessness, and palpitations. Temperature was 37.1˚C, heart rate was 122 beats per minute, breath rate was 33 breaths per minute, blood pressure was 150/99 mmHg, and oxygen saturation was 88 percent on 15 litres of high-flow nasal oxygen. Coarse breath sounds, tachypnea, and accessory muscle usage were all found during the physical test.

At admission, a CT-Thorax plain showed multifocal patchy ground-glass opacities (GGO), interlobular septal thickening in bilateral lung fields, diffuse pneumomediastinum, bilateral pneumothorax, and diffuse subcutaneous emphysema of the bilateral chest wall, as well as diffuse pneumomediastinum, bilateral pneumothorax, and diffuse subcutaneous emphysema of the bilateral chest wall (Fig.3). CORADS 5 was the overall finding, with a CT severity of 19/25. The RT-PCR (reverse transcriptase-polymerase chain reaction) was not carried out. The patient was transferred to the intensive care unit (ICU), where he was intubated and given various ionotropic medications. The patient also succumbed to his disease despite intensive medical treatment with empiric antibiotics, remdesivir, paralytics, inhaled epopostenol, diuretics, plasma transfusion, and steroids. On day 8, the patient experienced multiorgan dysfunction and had a seizure, after which his health deteriorated and he was dead.

With a growing pandemic, COVID-19 has been published and the number of cases has increased worldwide in a number of scientific papers starting from March 2020[8-11] which report on the development, in the absence of invasive mechanical ventilation, of spontaneous PT, PM, or even PP. Initially, these conditions were regarded as rare complications of pulmonary SARS-Cov2 infection. Analyzing all 15

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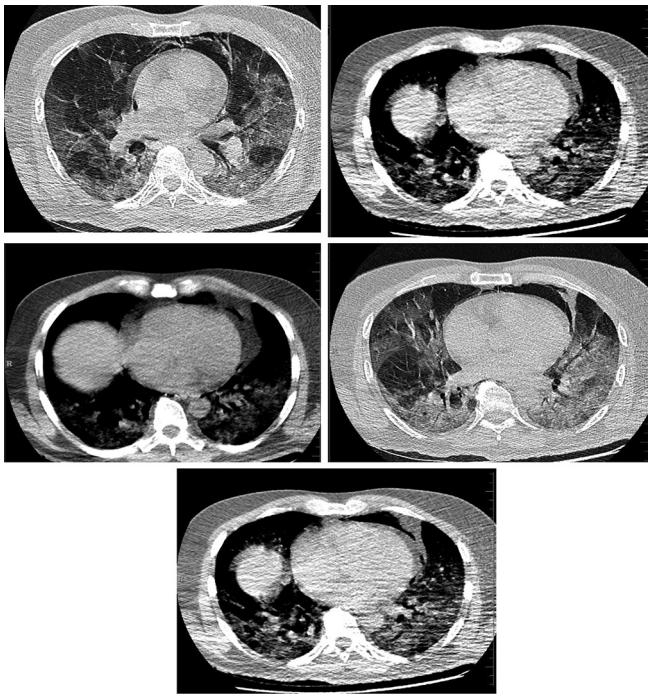

Figure-3: Pneumomediastinum, pneumothorax and subcutaneous emphysema

published cases by June 2020, a literature review conducted by Elhakim et al.[5] showed that most patients had a favourable clinical course; therefore, a mortality rate of around 26 percent. Martinelli et al. analysed COVID-19 treatment hospital databases in the UK and described 71 patients with PT, PM, and SE, both spontaneously and after mechanical ventilation,[4] as the largest study on this topic, published at the end of August. In contrast with the above studies, we have found no indication of such complications when analysing the database of both Timisoara Infectious Disease Hospital clinics of all patients hospitalised for SARS-Cov2 infection during the first outbreak COVID-19 (February 28 to July 31, 2020). In contrast, we observed the occurrence of these complications among 11 subjects after the second outbreak of the pandemic, from 1 October 2020 to the end of January 2021, with a prevalence of 0.66 percent of all 1648 admitted patients, which was similar to about 1 percent of those reported in the medical literature.[4,11-14] The masculine sex prevailed (72.72 percent), and air leakage across the alveolar walls, inflammatory damage and subsequent damage to the cytokine storm[2,3,6,15] were suspected of being pathophysiological mechanisms. In our study all of these problems occurred on a spontaneous basis, following several days of development, often in the absence of invasive mechanical ventilation or positive pressure ventilation, which is due to an aggravation of the pulmonary lesions. Mortality has been associated with risk factors in the literature for ECMO-supported patients with COVID-19, such as age > 65 years, poor functional baseline condition, such as serious chronic obstructive O2-pulmonary illness, pre-ECMO heart arrest or acute renal injury. The final diagnostic tool remains CT scanning. This demonstrates injuries along with the bilateral infiltrations typical of COVID-19 subcutaneous emphysema, the pneumopericardium and potentially tracheobronchial.[16]

The case series highlights the relevant clinical, laboratory, imaging and characteristics of patients who had mechanical ventilation unrelated to pneumomediastin and pneumothorax. For the clinical questions of chest tubing for pneumothorax, more information is needed to avoid intubation and the level of a positive expirory pressure increases pneumomediastin and pneumothorax rate.

CONCLUSION

Pneumomediastinum, pneumothorax, and subcutaneous emphysema are not rarely diagnosed with long-lasting hospitalisation and poor prognosis in men with severe COVID-19. The complication of COVID-19 itself and the complication of COVID-19 management can include, pneumomediastinum, pneumothorax and subcutaneous emphysema. The incidence of pneumomediastinum and subcutaneous emphysema may increase due to susceptible trachea in combination with altering immunological conditions, urgent intubation, frequent proning, and high positive end expiratory pressure (PEEP). The risk of complications could be combated by other factors such as, but not limited to, large turnover of patients under COVID-19, lack of skilled health workers, prolonged work hours and fear of infection among the medical fraternity. In the case of refractory conditions, it can be shown a boon for a patient to follow regular interval with inflammatory markers, and CT following-up after admission.

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