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Spontaneous Pneumothorax, a rare complication of COVID-19: A case report

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ABSTRACT

Coronavirus disease 2019 has been a pandemic outbreak since December 2019. It was notified in Wuhan, China in in December 2019, has rapidly swept around the world, causing a great threat to global health. COVID-19 result in systemic inflammation and lead to multiorgan dysfunction and complications. These complications involved pulmonary and cardiovascular system that result in in significant morbidity and mortality. A rare pulmonary complication of COVID-19 is the development of a spontaneous pneumothorax that detected less commonly in affected patients. Her, we treated a case of COVID 19 with a large spontaneous pneumothorax in middle-aged man with chest decompression by intercostal tube, the pneumothorax resolved and the patient discharged home with good outcome.

Keywords: Spontaneous pneumothorax, Chest radiograph; Computed tomography; Coronavirus; COVID-19 pneumonia

1. INTRODUCTION

COVID-19 is a serious pandemic since December 2019. It declared as pandemic disease by WHO since March 11/2020. Because of high rate of infectivity, low virulence and asymptomatic transmission lead to rapidly spread worldwide. People usually present mainly with respiratory condition. Constitutional and gastrointestinal symptoms are quite common (Wang et al., 2021). A lot of cases between mild to moderate symptoms, while other cases progress to pneumonia, sepsis, ARDS and multiorgan failure (Wang et al., 2021). The severity of illness was observed among elderly, and those who have chronic health conditions such as cardiovascular disease, diabetes mellitus, and obesity and noted in few healthy patients (Wang et al., 2021). Nasopharyngeal or oropharyngeal swab is needed to perform real time–reverse transcription polymerase chain reaction (rRT-PCR), the gold standard diagnosis for COVID-19 (Richardson et al., 2020). Chest computed tomography (CT) imaging more sensitive than chest x-ray for detection of lung abnormalities, despite being highly sensitive, has a low specificity, and hence cannot replace the reference diagnostic test RT-PCR (Wang et al., 2021).

Typical imaging findings include multifocal GGOs and consolidation. Also, in late stages reticular pattern and lung fibrosis. Crazy paving pattern and reversed halo sign. Atypical imaging findings like pneumothorax,

pneumomediastinum and cavitation that reported in few case reports (Farias et al., 2020).

Spontaneous pneumothorax (SPX) is a rare complication of Covid-19 in the absence of preexisting lung disease. First reported early in the pandemic, by Chen et al, as (1%) of SPX, in a retrospective study of 99 patients (Chen et al., 2020).

The underlying pathophysiology of SPX because of COVID-19 infection is not clearly understood, but the proposed mechanism is thought to be related to the structural changes that occur in the lung parenchyma result from diffuse alveolar injury in severe COVID-19 pneumonia, the alveoli may be prone to rupturing (López Vega et al., 2020). Furthermore, increase in intrathoracic pressure during a pronounced cough, which may also induce alveolar rupture (López Vega et al., 2020).

Herein we report another case of spontaneous pneumothorax with review of a literature for all cases has been reported.

2. CASE REPORT

59 years old man presented with sudden onset of severe shortness of breath. His initial vitals were BP 172/154, P135, RR 24 O2 saturation 85% on room air. Temp was 36.6. O2 saturation improved to 92% with 15 L of O2. He was sweating, restless and in respiratory distress. He is known to have hypertension and atrial fibrillation taking only carvedilol, no history of smoking. He was discharged from the hospital 4 days prior to ED presentation after being in isolation for COVID-19 and he was diagnosed based on PCR from nasopharyngeal swab. He had a moderate illness not requiring intubation during his hospitalization and treated with local protocol for Covid-19 patients (Steroids, Ceftriaxone, Azithromycin and enoxaparin). Due to respiratory distress, portable CXR was done (Figure-1) Chest X-ray showed right side pneumothorax. Although radiological resolution seen almost immediately, (Figure-2) his respiratory distress did not follow the same pattern after chest tube insertion but gradually got better over the next day. Hematological and biochemical tests were normal CT chest showed large pneumothorax with thick fibrous adhesive bands making it look like loculated versus cystic lesion along with diffuse ground-glass appearance. These findings is consistent with COVID-19 pattern (Figure -3).

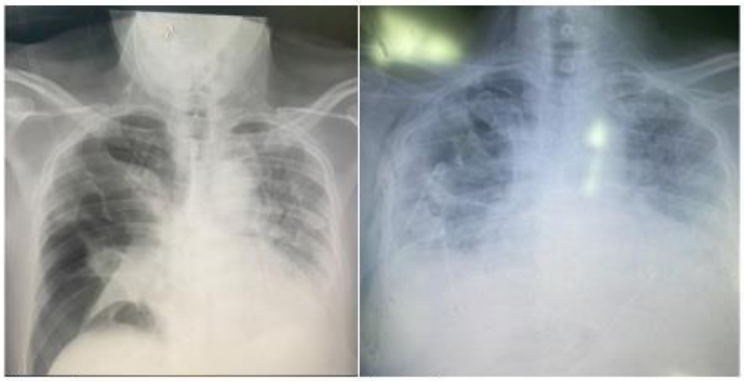

Figure-1 Figure-2

Figure 1: Chest X-ray showed a large pneumothorax in the right side. **Figure 2:** Chest X-ray showed Chest decompression with chest tube in right lung.

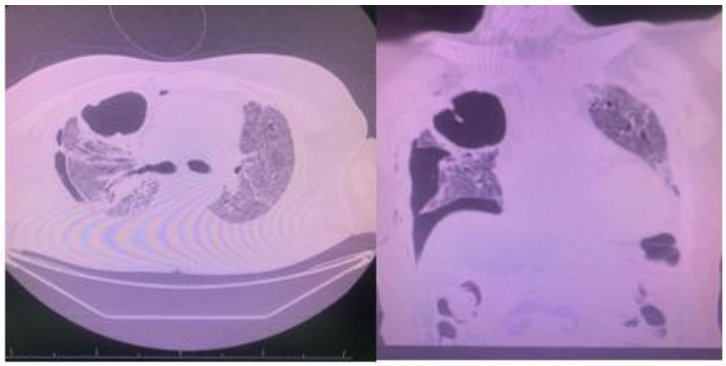

Figure- 3 A Figure-3 B

Figure 3 (A and B): CT Chest showed pneumothorax in upper, middle and lower lobes with reticulation and fibrotic changes.

ECG showed Atrial Fibrillation at rate of 135 that was controlled with diltiazem. The patient was then admitted to ICU for few days before transfer to the general word. Eventually, the patient improved and discharged from the hospital 3 weeks later.

3. DISCUSSION

SPX is a potential complication of COVID-19 as in many other pulmonary conditions. Although recognized as uncommon complication of COVID-19 infection, can be associated with significant morbidity and mortality. The incidence around 1% (Chen et al., 2020). The incidence of SPX was higher in males in a retrospective study of 71 patients; nine cases of them developed SPX seen by imaging during assessment (Hollingshead et al., 2020). Mechanical ventilation and ARDS have higher incidence of pneumothorax, 14 to 87% (López Vega et al., 2020). It correlates directly with the severity and duration of ARDS in critical COVID 19 patients (Chen et al., 2020). SPX divided into primary and secondary. Primary SPX occurred without precipitating factors, while secondary SPX due to an underlying pulmonary disease include chronic obstructive pulmonary disease with emphysema, cystic fibrosis, tuberculosis, and other pulmonary cystic lung diseases (Hollingshead & Hanrahan, 2020). According to the literature, mechanical ventilation is the predominant risk factor for secondary pneumothorax with COVID-19 pneumonia and that due to high local pressure disrupting the lung tissue. Pneumothorax, common seen in all forms of barotrauma that related to mechanical ventilation (Ucpinar et al., 2020).

In our study, the patient was not known to have any pulmonary condition nor exposed to mechanical ventilation and no a recognized risk factors for pneumothorax and yet he developed spontaneous pneumothorax.

The underlying pathophysiology of SPX in COVID-19 is not clearly understood. The expected mechanism due to weakening of the alveolar wall coupled with persistent cough and increased intrathoracic pressure, which eventually results in alveolar rupture and air leak toward pleural cavity and potentially interstitial emphysema. Another mechanism would be a rupture of undiagnosed cystic lesion that leads to a secondary pneumothorax in COVID-19 (Flower et al., 2020). Pneumomediastinum have similar mechanism explained by rupture along the alveolar tree, which leads to an abrupt increase in the intra-alveolar pressure and its pathogenesis hypothesis described as the Macklin effect (Ucpinar et al., 2020).

According to a recent literature review, many COVID 19 cases linked with pneumothorax, most of them developed SPX without any other identifiable risk factors for pneumothorax. Male higher than female. The baseline imaging features for all patients showed diffuse bilateral ground-glass opacities and consolidations, our case showed reticulation and fibrotic features. Hypoxia was marked clinical sign in all patients. Most of patients developed SPX with COVID-19 required chest tube, about six patients treated conservatively and two patient required surgical intervention. Our patient gradually improved after active treatment with chest tube decompression. There were few cases of SPX, intubated and had been on mechanical ventilation as advanced management. In addition, a lot of cases of SPX did not require mechanical ventilation and discharged within 2 to 3 weeks. Furthermore, other complications can be associated with pneumothorax such as emphysema, bulla and pneumomediastinum were observed during the course of the disease (Yamaya et al., 2020). Few studies reported bilateral SPX in COVID 19 patients (Martinelli et al., 2020). Although few studies reported complicated tension SPX associated with COVID 19 (Lei et al., 2020; Afrazi et al., 2021). Martinelli et al., (2020) reported, survival rate 63.1% overall pneumothorax. Although in recent studies, conclude SPX does not seem to be an independent marker of poor prognosis in COVID 19 patients if obtained active treatment early (Ioannidis et al., 2015). In SARS-CoV and MERS-CoV, Pneumothorax was noted as a poor prognostic feature.

Most cases of SPX with COVID-19 managed promptly with an intercostal drain. This procedure needs to be carried out safely with consideration of the necessary infection prevention measures, so that risk to staff is minimized (Ferreira et al., 2020).

The surgical interventions of pneumothoraces in COVID-19 patients like open lung surgery or bedside thoracoscopic blebectomy and pleurodesis can be option of management in advanced cases (Mallick et al., 2020).

4. CONCLUSION

In this case study, a literature review, performed for association of spontaneous pneumothorax with COVID-19. Spontaneous pneumothorax uncommon complication of COVID-19, can developed in first weeks or in advance stage, leads to acute decompensation that can worsen the prognosis of COVID-19 patients, therefor early active treatment in the form of decompression with chest drain insertion result in decrease the mortality and morbidity of this complication.

Author's contributions

TA wrote the case presentation and contributed in introduction and making the table. AH wrote the discussion and make the shape of manuscript.

Consent for publication

Written informed consent for publication of their clinical details and clinical images was obtained from the patient.

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Conflict of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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