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Spontaneous Pneumothorax, A Rare Complication of COVID-19, A Case Report and Review of Literature

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Abstract

Coronavirus disease 2019 (COVID-19) 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. We report a case of a large spontaneous pneumothorax in middle-aged man who managed with chest decompression by intercostal tube, the pneumothorax and symptoms resolved then discharged home with good outcome.

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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. Most cases are mild to moderate, while others can progress to pneumonia, sepsis, ARDS and multiorgan failure [1]. 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 [1]. Nasopharyngeal or oropharyngeal swab is needed to perform real time–reverse transcription polymerase chain reaction (rRT-PCR), the gold standard diagnosis for COVID-19. 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 [2].

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 [3]. 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 [4].

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. Furthermore, increase in intrathoracic pressure during a pronounced cough, which may also induce alveolar rupture [5]. Herein we report another case of spontaneous pneumothorax with review of a literature for all cases has been reported.

Case Report

59 years old man presented to the emergency department 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). 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.

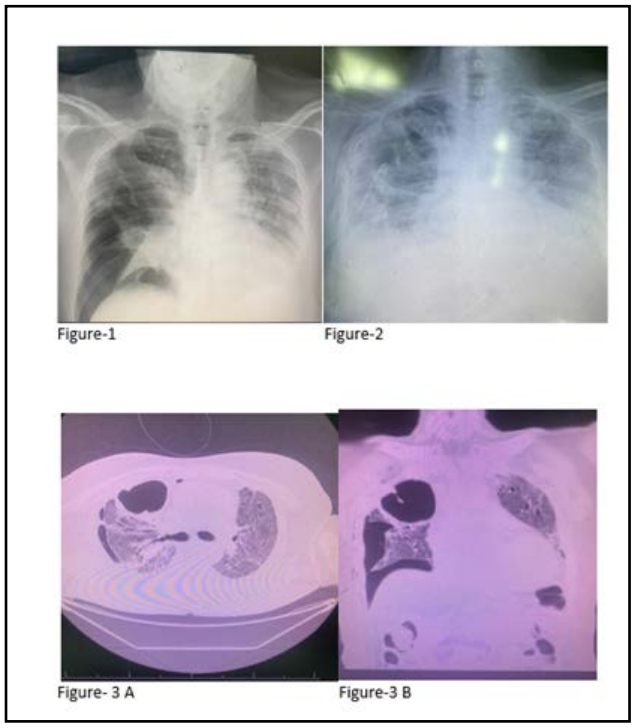

Figure 1: Chest X-ray showed a large pneumothorax in the right side.
Figure 2: Chest X-ray showed Chest decompression with chest tube in right lung.
Figure 3 (A and B) : CT Chest showed pneumothorax in upper, middle and lower lobes with reticulation and fibrotic changes.

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% [4].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 [6]. Mechanical ventilation and ARDS have higher incidence of pneumothorax, 14 to 87%. It correlates directly with the severity and duration of ARDS in critical COVID 19 patients. 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. 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 tissu. Pneumothorax, common seen in all forms of barotrauma that related to mechanical ventilation [7].

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. 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 [8].

In (table 1) we summarize all published literature articles, about 35 cases reports, most of cases reported SPX developed without any other identifiable risk factors for pneumothorax and at the time of presentation. 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 [9]. Few studies reported bilateral SPX in COVID 19 patients [10]. Although few studies reported complicated tension SPX associated with COVID 19 [11]. Martinelli et al., reported, survival rate 63.1% overall pneumothorax [12]. 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 [13]. In SARS-CoV and MERS-CoV, Pneumothorax was noted as a poor prognostic feature.

Table 1: Summary of all published literature about Spontaneous pneumothorax with COVID 19

No.	Author	SPX	Age/ sex	CT Findings	Hypoxia	Required chest tube	Mechanichal Ventilation	Outcome: Survived/Died
1	Sun et al. (16)	One case	38 M	GGO, mediastinal emphysema, giant bulla and pneumothorax.	Yes	No	No	Survived
2	Wang W et al. (15)	One case	62 M	GGO, consolidations and right pneumothorax.	Yes	No	No	Survived
3	Wang J et al. (17)	One cas	36 F	GGO, pleural effusion and pneumothorax.	Yes	No	No	Survived
4	Upcinar et al. (18)	One case	82 F	GGO, pneumothorax and subcutaneous emphysema.	Yes	Yes	No	Survived
5	Flower et al. (19)	One case	36 M	Consolidation and pneumothorax.	Yes	Yes	No	Survived
6	Rohailla et al. (20)	One case	26 M	Large right pneumothorax with complete collapse of the right lung.	Yes	Yes	No	Survived
7	Aydın et al. (21)	One case	24 M	GGO and pneumothorax.	Yes	Yes	No	Survived

8	Correa Neto et al. (22)	One case	80 F	pneumothorax and pneumomediastinum.	Yes	Yes	Yes	Died
9	López Vega et al. (23)	Two cases	84 F 67 M	Bilateral opacities with pneumothorax and pneumomediastinum	Yes	Yes	Yes	Died
10	Hollingshead C et al. (24)	One case	50 M	GGO and pneumothorax.	Yes	Yes	No	Survived
11	Spiro JE et al. (25)	One case	47 M	GGO, consolidations and pneumothorax.	Yes	Yes	No	Survived
12	Ferreira et al. (26)	One case	45 M	GGO and pneumothorax.	Yes	Yes	No	Survived
13	Zantah et al.(14)	Six Cases	49 M 59 M 81 F 45 F 47 F 76 F	GGO, consolidations and pneumothorax.	Yes	Yes	No, but later as advanced management in 4 cases.	All patients survived
14	Mallick et al. (27)	Three cases	40 M 68 M 58 F	GGO, pneumomediastinum, subcutaneous emphysema and pneumothorax.	Yes	Yes	No, but later as advanced management in one case	One died Two survived
15	Fan Q et al. (28)	One case	32 M	Pneumothorax with a giant subpleural bulla.	Yes	Yes	No	Survived
16	Gonzalez-Pacheco et al. (29)	One case	45 M	Bilateral pneumothorax.	Yes	Yes	No	Survived
17	Yasukawa K et al. (30)	One case	37 M	Tension pneumothorax.	Yes	Yes	No	Survived
18	Carvalho do Lago VC et al. (31)	Two cases	34 M 62 M	GGO, consolidations and pneumothorax.	Yes	Yes	No	Survived
19	Khurram R et al. (32)	One case	64 M	Tension pneumothorax.	Yes	Yes	No	Survived
20	Borghesi A et al. (33)	One case	37 F	GGO, consolidations and pneumothorax.	Yes	No	Yes	Survived
21	Alhakeem A et al. (34)	One case	49 M	GGO, bulla and pneumothorax.	Yes	Yes	No	Survived.
22	Marisco et al. (35)	One case	67 M	GGO and pneumothorax	Yes	Yes	Yes	Survived
23	Janssen ML et al. (36)	Three cases	63 M 76 M 72 M	GGO, consolidations and pneumothorax.	Yes	2/3 Yes	No	All survived
24	Quincho-Lopez et al. (37)	One case	55 W	GGO with with pneumothorax and pneumomediastinum.	Yes	No	No	Died
25	Fahad et al. (38)	One case	56 M	GGO and pneumothorax.	Yes	Yes	No, but later as advanced management	Survived
26	Al-Shokri et al. (39)	Three cases	55 M 33 M 50 M	GGO, pneumomediastinum and pneumothorax.	Yes	Yes	No	Survived
27	Ley et al. (40)	One case	58 M	30-40% left pneumothorax with GGO.	No	Yes	No	Survived
28	Shan et al. (41)	One case	67 M	GGO with reticular opacities and pneumothorax.	No	Yes	No	Survived
29	Elhakim et al. (42)	One case	63 M	GGO and pneumothorax.	Yes	No	Yes	Survived
30	Hazariwala et al. (43)	One case	57 F	Multifocal interstitial opacities, pneumomediastinum, pneumothorax.	Yes	No	Yes	Died
31	Oye et al. (45)	Two cases	32 M 56 W	GGO and pneumothorax.	Yes	Yes	Yes	Survived
32	Tucker et al. (46)	Two cases	64 M 65 M	Bilateral GGO and pneumothorax.	Yes	No	One was on M.V The other no.	One died and the other survived
33	Dennison et al. (47)	One case	72 M	Bilateral GGO and pneumothorax.	Yes	Yes	No	Survived
34	Afrazi et al. (48)	One case	35 M	Pneumothorax and cavitary lung disease.	Yes	Yes	No	Survived

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 [14]. 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 [15].

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.

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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.

Ethical approval: not included in this article review.

Consent for publication: Written informed consent for publication of their clinical details and clinical images was obtained from the patient. Availability of data and material: All data underlying the results are available as part of the article and no additional source data are required.

References

1. Wang D, Hu B, Hu C, Zhu F, Liu X, et al. (2020) Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA 323: 1061-1069.
2. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, et al. (2020) Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA 323: 2052-2059.
3. Farias LPG, Fonseca EKUN, Strabelli DG, Loureiro BMC, Neves YCS, et al. (2020) Imaging findings in COVID-19 pneumonia. Clinics (Sao Paulo) 75: e2027.
4. Chen N, Zhou M, Dong X, Qu J, Gong F, et al. (2020) Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 395: 507-513.
5. López Vega JM, Parra Gordo ML, Diez Tascón A, Ossaba Vélez, Set al. (2020) Pneumomediastinum and spontaneous pneumothorax as an extrapulmonary complication of COVID-19 disease. Emerg Radiol. 27: 727-730.
6. C Hollingshead, J Hanrahan (2020) Spontaneous pneumothorax following COVID-19 pneumonia, IDCases https://doi.org/10.1016/j. idcr.2020.e00868.
7. Ucpinar BA, Sahin C, Yanc U (2020) Spontaneous pneumothorax and subcutaneous emphysema in COVID-19 patient: Case report. J Infect Public Health 13: 887-889.
8. Flower L, Carter JL, Rosales Lopez J, Henry AM (2020) Tension pneumothorax in a patient with COVID-19. BMJ Case Rep 13: e235861.
9. Yamaya T, Baba T, Hagiwara E, Ikeda S, Niwa T, et al. (2020) Pneumothorax in a COVID-19 Pneumonia Patient without Underlying Risk Factors. Intern Med 59: 2921-2925.
10. AW Martinelli, T Ingle, J Newman, I Nadeem, K Jackson ND, et al. (2020) COVID-19 and pneumothorax: a multicentre retrospective case series, Eur. Respir. J 56: 2002697.
11. P Lei J Mao, P Wang (2020) Spontaneous pneumomediastinum in a patient with coronavirus disease 2019 pneumonia and the possible underlying mechanism, Korean J. Radiol 929-930.
12. Afrazi A, Garcia-Rodriguez S, Maloney JD, Morgan CT, et al. (2021) Cavitary lung lesions and pneumothorax in a healthy patient with active coronavirus-19 (COVID-19) viral pneumonia. Interact CardioVasc Thorac Surg 32:150-152.
13. Ioannidis G, Lazaridis G, Baka S, Mpoukovinas I, Karavasilis V, et al. (2015) Barotrauma and pneumothorax. J Thorac Dis 7: S38-S43.
14. JG Ferreira, C Rapparini, BM Gomes, LACPinto, MSDSE Freire (2020) Pneumothorax as a late complication of COVID-19. Rev. Inst. Med. Trop. Sao Paulo 62: e61.
15. TMallick,ADinesh,R.Engdahl,M(2020)SabadoCOVID-19 complicated by spontaneous pneumothorax. Cureus doi:10.7759/cureus.9104.