International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Development of a Large Spontaneous Pneumothorax after Recovery from COVID-19 Infection

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Abstract: ***A previously healthy 36 year male patient presented with fever, coughs and generalized weakness since a week. Patient was tested positive for SARS-CoV-2 and was diagnosed as a case of bilateral pneumonia with COVID-19 infection. Patient had 4 zone pneumonia during admission and was treated and discharged after completion of treatment. Seven days after resolution of all symptoms, he developed sudden onset chest pain and breathlessness. Chest imaging revealed a large right sided pneumothorax and patchy subpleural ground glass opacities. Pneumothorax resolved after placement of a Chest tube, which was removed after 4 days of admission. This case concludes that patients with COVID-19 can develop a significant pulmonary complication, a large pneumothorax, after resolution of the original illness. Medical professionals should consider development of a pneumothorax in patients who have recovered from COVID-19 and present with new respiratory symptoms.***

Keywords: Spontaneous pneumothorax, COVID-19, Post recovery pneumomediastenum, ICD, insertion, HRCT

1. Background

Development of a spontaneous pneumothorax is one of the emerging respiratory complications of COVID-19 viral pneumonitis. This complication has been described in mechanically ventilated patients with COVID-19, as well as patients on non-invasive ventilation or high flow nasal cannula during the acute phase of COVID-19 infection. Potential causes include the high airway pressures delivered by these modalities of respiratory support, as well as spontaneous rupture of small airways.

The development of the pneumothorax was preceded by significant respiratory symptoms and with associated significant pulmonary infiltrates on chest imaging. There are very few cases of spontaneous pneumothorax and pneumomediastenum after COVID-19 have been described in the literature till now.

We describe the case of a patient who had spontaneous pneumothorax after having recovered from the acute phase of COVID-19 viral pneumonitis.

2. Case Presentation

Previously healthy 36 year male developed fever, cough and myalgia's since seven days, was diagnosed as a case of bilateral pneumonitis [fig1.1] with COVID-19 infection as he was positive for COVID-19. He was admitted and was treated for the same. He was started with Oxygen therapy (NRBM), 3rd generation cephalosporin, LMWH, low dose steroids and multivitamins. His symptoms resolved gradually. Patient was discharged after treatment completion. Seven days after his discharge, he complained of sudden onset right-sided chest pain and severe dyspnea. He sought care at primary health care center and was treated with Antibiotics and steroids for presumed community-acquired pneumonia. Chest imaging was not performed at that time.

When his chest pain persisted and he subsequently developed shortness of breath on exertion, he presented to tertiary health center. He had no other significant medical or surgical history and no recent trauma or falls. He did not have habit of smoking. He did not consume any alcohol or use illicit drugs. His family history was non-significant.

Initially on presentation to casualty his vital signs were blood pressure of 130/80 mm Hg, pulse 128/min, temperature 98.7 °F, Respiratory rate 30/min, weight 74 kg, height 174 cm, body mass index 26.42 kg/m2. His oxygen saturation on room air was 86%.

Physical examination revealed that patient was having severe respiratory distress. His pupils were normal and reactive to light. Heart rate was regular, and cardiac exam revealed no murmurs, rubs or gallop. His pulmonary examination was significant for decreased breath sounds on the right, without crackles or wheezes. His abdomen was soft, non-tender, non-distended with normoactive bowel sounds. He had no peripheral edema and had strong peripheral pulses bilaterally. His neurological and skin exams were normal.

3. Investigations

The initial labs showed a normal hemoglobin of 16.6 gm/dL and hematocrit of 49.4%; white cell count was elevated at 13710/µL, the lymphocyte count was 2412/µL (normal range: 1320–3570/µL) or 17.6 % and platelets was 139000 /mm3. His sodium was 143.8meq/L, potassium was 3.6meq/L, bicarbonate was 24 meq/L, chloride was 98meq/L, glucose was 94 mg/dL, BUN was 35 mg/dL, creatinine was 0.56 mg/dL, total bilirubin was 1.3 mg/dL,

alkaline phosphatase was 63 U/L, alanine aminotransferase was 53 U/L (normal <55 U/L), aspartase aminotransferase was 71 U/L and albumin was 4.2 g/dL

A chest X-ray was obtained in the emergency room (Fig1.2). This revealed a large right-sided pneumothorax as well as patchy sub pleural ground glass opacities. The electrocardiogram (EKG) showed sinus rhythm of 90 beats per minute and Non-significant ST and T changes. Subsequent chest x-rays were taken after insertion of ICD (fig 1.3), and after removal of ICD (Fig 1.4) HRCT thorax after removal of ICD revealed multiple multilobar central as well as peripheral patches of ground glass opacities / consolidation, parenchymal band, reticulations with interlobular septal thickening are seen in both lung predominantly in both lower lobes, Findings are S/O late phase of COVID-19. CTSS – 16/25. CORADS V with Right sided mild pneumothorax was noted (Fig 1.5).

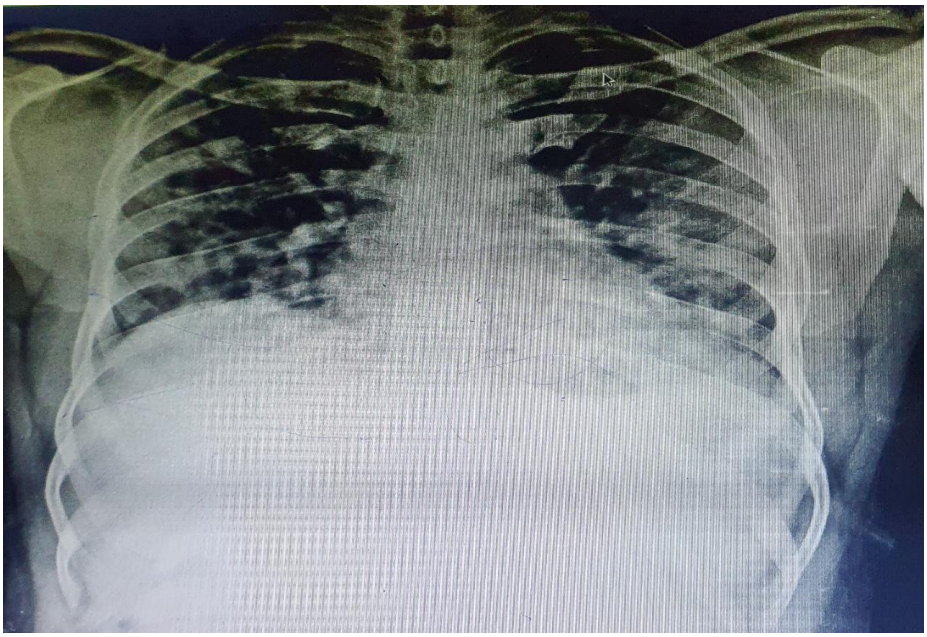

Figure 1.1: Chest Xray of the patient at time of acute phase of COVID-19 infection

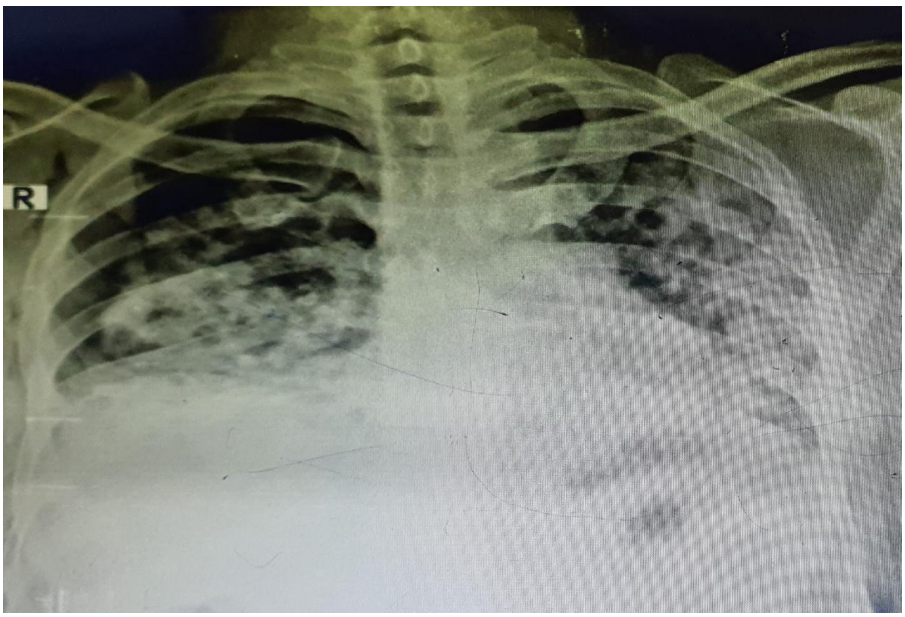

Figure 1.2: Chest xray of the patient taken after development of pneumothorax in emergency department

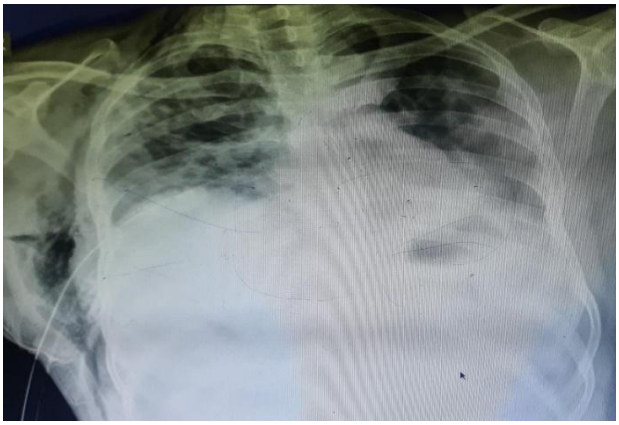

Figure 1.3: Chest X ray of the patient taken after ICD insertion

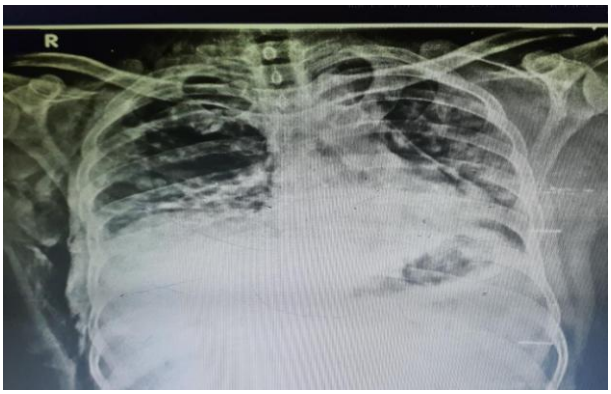

Figure 1.4: Chest X ray of the patient after removal of ICD

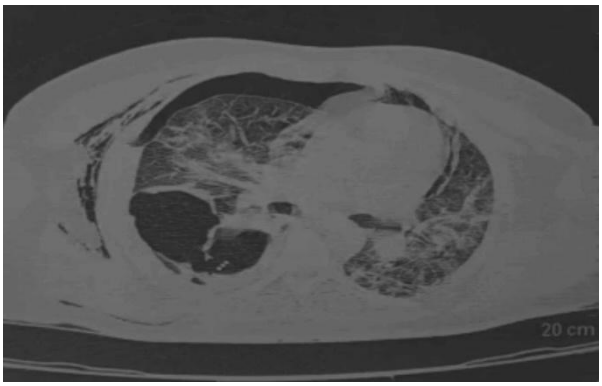

Figure 1.5: HRCT image of the patient after removal of ICD

Differential Diagnosis

Because of COVID-19 pandemic, the initial differential diagnosis of the patient's chest pain and shortness of breath included ARDS due to COVID-19 viral pneumonia, as well as a secondary bacterial or fungal pneumonia. Pulmonary embolism was a consideration since thromboembolic complications have been described in COVID-19 with increased frequency. A myocardial ischemic event was unlikely given the patient's young age and lack of significant risk factors. Costochondritis was also less likely, as the chest pain was not reproducible with palpation, and the patient was in mild respiratory distress and had an abnormal pulmonary exam. Aortic dissection, lung abscess, myocarditis and pericarditis were on the differential as well.

The physical exam with diminished breath sounds was suspicious for a pneumothorax, pleural effusion or atelectasis. Subsequent chest imaging quickly revealed the large pneumothorax without evidence of tension pneumothorax.

Treatment

The patient was transferred from the small outside hospital emergency room to our tertiary care facility for further care. On arrival, the critical care physician on duty placed a small-bore 18 French chest tube under ultrasound guidance into the right pleural space. A repeat chest X-ray showed resolution of the large right pneumothorax with a small residual right apical pneumothorax. The chest tube was placed under water seal, and the patient remained without shortness of breath. Less than 72 hours after insertion, the chest tube was clamped for 12 hours, a repeat chest X-ray was obtained, and since it showed only a tiny residual right apical pneumothorax, the chest tube was removed without complication. Post ICD removal HRCT thorax was done. The patient's chest pain was controlled with oral acetaminophen.

Outcome and Follow-Up

The patient's complain of shortness of breath resolved after placement of the chest tube. The chest tube was removed after 72 hours, the patient stayed symptom free and a repeat chest X-ray and HRCT thorax demonstrated mild residual pneumothorax after chest tube removal, and he was discharged after treatment.

4. Discussion

Pneumothorax is common respiratory emergency which can develop following trauma to chest was or can be spontaneously, either as a primary spontaneous pneumothorax or a secondary spontaneous pneumothorax due to an underlying pulmonary disorder. It can also be iatrogenic, for example, as a complication of central venous catheter placement. [1] [2]

Risk factors for a spontaneous pneumothorax include cigarette and cannabis smoking, male gender, tall stature, thin body habitus, chronic obstructive. pulmonary disease, alpha-1 antitrypsin deficiency, cystic fibrosis, other cystic lung disorders, malignancy, pulmonary infections or architectural abnormalities such as Marfan syndrome, Ehlers-Danlos syndrome or homocystinuria [3] [4]

There are very few cases reported to have spontaneous pneumothorax following recover with COVID-19 pneumonia. In study by Lorenzo Rampa, a 43-year-old man after recovery from COVID-19 pneumonia developed spontaneous pneumothorax due to barotraumatichydropneumatocele. [5]. In study by Wang W, A 62-year-old Chinese man in Wuhan developed a right sided pneumothorax, pneumothorax and pneumomediastinum 20 days after hospitalization, which resolved without invasive interventions; he was treated with high-flow nasal cannula. [6]

In study by alhakeem A, A 49-year-old man without medical history treated with a 100% non-rebreather oxygen mask at 15L/min flow developed a right-sided pneumothorax requiring chest tube placement on day 12 of admission. [7]In

study by Barbara Brogna, A 78-year-old woman with diabetes and hypertension presented with pneumomediastinum at the time of COVID-19 diagnosis, and a 41-year-old man presented with subcutaneous emphysema, pneumomediastinum and a small left pneumothorax. [8] In Study by Hollinhshead C, a 50-year-old man developed a loculated right posterior pneumothorax over a month after his initial presentation with COVID-19 pneumonia. [9]A Case series by Al-Shokri SD described men aged 55, 33 and 50 years with COVID-19 developing a pneumothorax on noninvasive ventilation 3 days after admission. The second patient 15 days after extubation and the third patient 7days post admission, respectively. [10]. A right-sided tension pneumothorax developed in a 47-year-old man requiring noninvasive ventilation for COVID-19 11 days after initial presentation and 4 days after discharge from the hospital. [11]. A 36-year-old man had a left tension pneumothorax on presentation with COVID-19 disease. [12].

After studying above case reports and studies it is clear that patients who were severely ill and were on high flow nasal cannula, non invasive ventilation or intubated patients have high chances of getting pneumothorax due to barotrauma. But in Our patient who had mild subjective shortness of breath, and minimal cough during his acute illness only after he was specifically asked about this symptom. He also required only minimal supplemental oxygen until he presented with right-sided pleuritic chest pain and was diagnosed with the pneumothorax.

Rohailla et al [13] reported a similar case, where the patient was completely asymptomatic and was not aware of his COVID-19 diagnosis until he developed a pneumothorax and presented with sudden onset right-sided pleuritic chest pain, though the positive PCR test for SARS-CoV-2 in that case suggests active infection rather than a postinfectious phenomenon.

Hence it is possible that patients with COVID-19 can develop a spontaneous pneumothorax, despite only minimal to no lower respiratory tract symptoms, even after resolution of the original symptoms. Medical professionals should consider the development of a pneumothorax as a cause of respiratory symptoms in patients with active COVID-19 viral pneumonitis and in patients who have recovered from their COVID-19 illness and present with new respiratory symptoms, irrespective of the severity of their disease prior to resolution of the original illness.

Exact mechanism of development of a secondary spontaneous pneumothorax in COVID-19 infection is not known yet but it could be due to damage predominantly to the subpleural alveoli, leading to spontaneous alveolar rupture into the pleural space. Other potential mechanisms of injury include increased intrathoracic pressures in the setting of frequent coughing. Despite minimal respiratory symptoms during his active COVID-19 illness, our patient had typical CT chest findings of COVID-19 viral pneumonitis with bilateral patchy sub-pleural and peripheral ground glass opacities.

By above discussion we can have interesting question to whether the development of the spontaneous pneumothorax was related to the COVID-19 viral pneumonia or not. Sub pleural infiltrates can cause rupture of alveoli leading to passage of from alveolus to pleural cavity leading to development of spontaneous pneumothorax. [14] Hence we can conclude that there is possibility that pneumothorax can be a direct consequence of COVID-19 infection.

References

[1] McKnight CL, Burns B. Pneumothorax. [Updated 2021 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https: //www.ncbi. nlm. nih. gov/books/NBK441885/
[2] Ojeda Rodriguez JA, Hipskind JE. Iatrogenic Pneumothorax.2021 Aug 11. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan–. PMID: 30252313.
[3] Gupta D, Hansell A, Nichols T, et al. Epidemiology of pneumothorax in England. Thorax 2000; 55: 666–71.
[4] Sahn SA, Heffner JE. Spontaneous pneumothorax. N Engl J Med 2000; 342: 868–74.
[5] Lung complication in COVID-19 convalescence: A spontaneous pneumothorax and pneumatocele case report, Lorenzo Rampa, Antonio Miceli, Francesco Casilli, TullioBiraghi, Baronio Barbara, Francesco Donatelli
[6] Wang W, Gao R, Zheng Y, Jiang L. COVID-19 with spontaneous pneumothorax, pneumomediastinum and subcutaneous emphysema. J Travel Med.2020 Aug 20; 27 (5): taaa062. doi: 10.1093/jtm/taaa062. PMID: 32330274; PMCID: PMC7188125.
[7] Alhakeem A, Khan MM, Al Soub H, Soub HA, et al. Case report: COVID-19-Associated bilateral spontaneous Pneumothorax-A literature review. Am J Trop Med Hyg 2020; 103: 1162–5
[8] Brogna B, Bignardi E, Salvatore P, et al. Unusual presentations of COVID-19 pneumonia on CT scans with spontaneous pneumomediastinum and loculated pneumothorax: A report of two cases and a review of the literature. Heart Lung.2020; 49 (6): 864-868. doi: 10.1016/j. hrtlng.2020.06.005
[9] Hollingshead C, Hanrahan J. Spontaneous Pneumothorax Following COVID-19 Pneumonia. IDCases.2020 Jun 17; 21: e00868. doi: 10.1016/j. idcr.2020. e00868. PMID: 32596131; PMCID: PMC7306487.
[10] Al-Shokri SD, Ahmed AOE, Saleh AO, et al. Case report: COVID-19–Related Pneumothorax—Case series highlighting a significant complication. Am J Trop Med Hyg 2020; 103: 1166–9.
[11] Spiro JE, Sisovic S, Ockert B, et al. Secondary tension pneumothorax in a COVID-19 pneumonia patient: a case report. Infection 2020; 48: 941–4. doi: 10.1007/s15010-020-01457-w
[12] Flower L, Carter J-PL, Rosales Lopez J, et al. Tension pneumothorax in a patient with COVID-19. BMJ Case Rep 2020; 13. doi: 10.1136/bcr-2020-235861. [Epub ahead of print: 17 May 2020].
[13] Quincho-Lopez A, Quincho-Lopez DL, Hurtado-Medina FD. Case Report: Pneumothorax and Pneumomediastinum as Uncommon Complications of COVID-19 Pneumonia-Literature Review. Am J Trop

Med Hyg.2020; 103 (3): 1170-1176. doi: 10.4269/ajtmh.20-0815

[14] Development of a large spontaneous pneumothorax after recovery from mild COVID-19 infection KrishidharNunna and Andrea Barbara Braun.