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Case Report

Spontaneous pneumomediastinum as a complication of a COVID-19 related pneumonia: case report and review of literature

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ABSTRACT

A novel coronavirus, SARS-COV-2, related infection is thought to have originated in Wuhan, China, in November 2019 but spread rapidly to be declared a global pandemic by the WHO in March 2020. The patients typically present with fever and shortness of breath. We describe a case of spontaneous pneumomediastinum at presentation as a complication of severe Covid-19 infection.

A 54 year old male patient with no history of smoking, asthma or other underlying chronic lung disease, presented to our emergency department with severe Covid-19 symptoms. His chest x-ray and CT scan on arrival at the emergency department, and prior to any intervention, demonstrated severe bilateral Covid-19 pneumonia complicated by a pneumomediastinum. The aetiology of the pneumomediastinum is thought to be a direct complication of severe covid-19 pneumonia in absence of any previous respiratory history or iatrogenic cause.

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Introduction

Among the Coronavirus family, the new Coronavirus Covid-19 is the seventh member that can infect humans [1]. Xu et al. [2] reported in their study conducted in Wuhan, that the Covid-19 virus leads to an infection of the human respiratory epithelial cells. The clinical presentation of the Coronavirus disease 2019 (Covid-19) includes fever, dry cough, and dyspnea, [3] consistent with a respiratory tract infection.

Many authors have described the Covid-19 imaging findings. CT scan features typically include ill-defined ground-glass opacities, air bronchograms, septal thickening, and thickening of the adjacent pleura [1]. Complications of Covid-19 infection have been described and reported [4-6]. Even though the lung is the primary organ damaged by the virus, Covid-19 is now regarded as a systemic disease, involving a broad range of other vital organs, including heart,

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Fig. 1 – Chest X-Ray in AP erect view. Subcutaneous emphysema is noted in the supraclavicular area suggesting a pneumomediastinum.

liver, and kidney. The pathological explanation is linked to the angiotensin converting enzyme 2 (ACE-2) receptors which are widely expressed by various organs and tissues and interact with the spike (S) glycoprotein of the Covid-19 allowing the virus to enter the human cells [7].

Even though the Covid-19 infection may lead to neurological, hepatic or cutaneous complications [8-10] the death rate remains significant in patients admitted to intensive care due to complications of respiratory or cardiac failure [11].

We describe spontaneous pneumomediastinum as an unusual complication in a 54 years old patient presenting with advanced stage of Covid-19 pneumonia. Only few cases of pneumomediastinum have been reported in literature [12-16].

Case presentation

A 54-year-old patient of Indian (Southeast Asian) origin, with a clinical history of 10 days of non-productive moderate/severe cough, presented to the emergency department with deteriorating shortness of breath (SOB) for 4 days. He was known to have past history of hypertension and diabetes mellitus type II. The patient was not a smoker, and had no history of asthma, COPD, or substance abuse.

The clinical and respiratory evaluation revealed a profound hypoxia and the respiratory rate of 60.

The pulse rate was 103 pulse and the blood pressure 123/84. Oxygen saturation at presentation was 83% improving to 89%-82% on 6 liters of oxygen nasal cannula. On presentation, the RT-PCR swab result was positive for Covid-19. The laboratory tests showed a C-reactive protein concentration of 329.2 mg/dL (normal range 0-5 mg/L). Complete blood count showed elevated leukocytes of 15,700 cells per μ L (normal range 3000-10,000 cells per μ L). Neutrophils were 14,600 cells per μ L (normal range 2000-7000 cells per μ L), while the

lymphocyte count was in 500 cells per μL , demonstrating lymphopenia (normal range 1500-4000 cells per μL).

The patient underwent a portable chest radiograph (Fig. 1) with an AP erect view. The investigation was limited by suboptimal inspiration related to the respiratory failure.

The chest radiograph showed bilateral moderate airspace opacification in a subpleural and basal distribution. The heart and mediastinal contours were normal, within the limits of AP projection. Subcutaneous emphysema was reported bilaterally over the supraclavicular region, greater on the right than the left. No pneumothorax. The subcutaneous emphysema in the absence of a pneumothorax raised the suspicion of a spontaneous pneumomediastinum.

A CT scan of the chest was performed, which confirmed the subcutaneous emphysema (Figs. 2 and 3) within the right supraclavicular region and within the soft tissues of the neck extending from the mediastinum. Gas locules were noted adjacent to the anterior aspect of the right heart border. The gas was seen to track along the posterior mediastinum adjacent to the oesophagus at the level of carina. Extensive ground-glass opacification was noted throughout both lungs with crazy appearing and extensive bilateral consolidation, typical of severe Covid-19 related lung disease. Apart from focal sparing of the right upper lobes and a small segment of the lingular lobe, all lobes of both lungs were involved. A trace of pleural effusion was noted on the left side.

Cardiac arrest call was put out. The patient was reviewed by the intensive care unit and anesthetist team and was decided not for intubation as chances of survival during intubation were extremely poor. A decision not to attempt cardiopulmonary resuscitation was made.

Given the degree of involvement of both lungs, the pneumomediastinum and the extreme hypoxia, the patient became haemodynamically unstable, leading to cardiorespiratory arrest and unfortunately died. The presentation to death time was 2 hours.



Fig. 2 – Transverse thin-section serial CT scans from a 54 year-old man. Subcutaneous emphysema noted within the right supraclavicular region and within the soft tissues of the neck extending from the mediastinum in keeping with pneumomediastinum.



Fig. 3 – Coronal thin-section serial CT scans from a 54 year-old man. Subcutaneous emphysema noted within the right supraclavicular region and within the soft tissues of the neck extending from the mediastinum in keeping with pneumomediastinum.

Discussion

A novel Coronavirus related infection is thought to have originated in Wuhan, China, and rapidly progressed to a global health emergency [17]. Although the mortality rate appears lower if compared with 2 other recent outbreaks caused by coronaviruses, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), the Covid-19 appears highly infectious, representing an evident health threat [1].

However, compared with the other 2 coronaviruses the novel Covid-19, has a different genome[18] and this may explain the different clinical symptoms and the CT features [19-21].

The role of the CT in the diagnosis of the Covid-19 infection is controversial however in our institution we found it to be beneficial if used along with the clinical presentation, when there was a delay in the result of the reversetranscriptase polymerase-chain reaction (RT-PCR). Recently Fang et al. [22] reported that the sensitivity of CT in diagnosing Covid-19 was greater than RT-PCR (98% vs 71%), therefore the CT imaging of the Covid-19 pneumonia became an essential diagnostic tool. China's Diagnosis and Treatment Plan for Novel Coronavirus-infected Pneumonia (5th Trial Edition) has established CT imaging as part of the diagnostic pathway in Hubei Province [23].

Many authors report as the most frequent CT finding the ground glass opacifications (GGO) [23]. Along with ground glass opacifications other typical CT features have been

described such as air bronchogram, crazy paving pattern, linear densities, bronchiectasis, and consolidation [1,24].

Our patient presented with an advanced stage of the Covid-19 disease with all the typical CT findings present on admission scans.

Zang et al. [24] reported that parenchymal consolidation, air bronchogram, white lung appearance and pleural effusion have been detected predominantly in patients affected by a severe disease. In our case all those features were identified in the CT scan, concordant with the severity of the clinical presentation and the already positive RT-PCR test.

Pneumothorax and pneumomediastinum represent rare complications of Covid-19 pneumonia and only few cases of spontaneous pneumomediastinum have been published to our knowledge [12-16]. In the literature 2 different articles reported the occurrence of a spontaneous pneumomediastinum in patients affected by SARS [25,26].

In a series of 123 patients with virologically proven SARS, Chu et al. reported 24 cases of pneumomediastinum, out of which 13 had spontaneous pneumomediastinum [27].

In patients with lung infection extra-alveolar air leak from ruptured alveoli is infrequent but has been described in staphylococcal and fungal pneumonia [28-29].

According to Chu et al. [27], alveolar rupture may present on a background of advanced and severe alveolar damage seen in SARS leading to an interstitial emphysema. As previously reported the air may leak and dissect along the bronchovascular structures toward the mediastinum [30].

Pneumomediastinum is more likely to occur in patients with an advanced stage of the disease as the virus causes damage and consequent breakdown of the alveolar membrane integrity causing an infection on both type I and II pneumocytes [31].

Considering that our patient present with an advanced Covid-19 pneumonia the postulation of Chu et al. may explain the spontaneous occurrence of the complication.

However, even though the presence of a pneumomediastinum may indicate a poor prognosis as in our and another reported case,[12] it has been described that it can resolve during the hospitalization[14-16] and may even occur without an extensive involvement of the lung parenchyma [14].

As postulated by Kolani et al. it appears that the presence of a pneumomediastinum on a background of an extensive lung disease correlates to a worse outcome. Although in all the cases reporting resolution of the pneumodiastinum, the involvement of the lung parenchyma was not as extensive as in our case and in the case reported by Wang et al. [12]

It is crucial then to accurately assess the severity of the parenchymal involvement. The role of CT in this scenario is particularly relevant to aid prognostication.

In conclusion, spontaneous pneumomediastinum is a rare complication of Covid-19 pneumonia. It has been previously described in patients affected by SARS and may be related to widespread alveolar damage caused by the lung infection. A pneumomediastinum with severe parenchymal pneumonia, makes the management of a patient extremely challenging.

Spontaneous pneumomediastinum correlates with poor outcome if it occurs on a background of extensive pulmonary damage whereas it may resolve if the lungs are less extensively involved by the Covid-19 related infection. Subcutaneous emphysema in the supraclavicular fossa may be the first indication of pneumomedastinum as a complication of Covid-19 pneumonia. Careful review of this area on chest radiograph is suggested.

Conflict of interest

The authors of this manuscript declare no relationships with any companies, whose products or services may be related to the subject matter of the article.

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