Case Report

Spontaneous mediastinal emphysema in a non-intubated patient with COVID-19 related pneumonia: a case report

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Abstract: Spontaneous mediastinal emphysema (ME) is a rare clinical entity often associated with sudden changes in intrathoracic pressures. The presumed pathophysiological mechanism is diffuse alveolar injury leading to alveolar rupture and air leak. Inflammatory alterations installed over the airway following SARS-CoV-2 infection may reduce its distensibility and compliance conferring an increased risk of developing the complication, even in the absence of mechanical ventilation. However, the exact mechanism by which ME occurs in SARS-CoV-2 pneumonia is unknown. We report a case of a 58-year-old man that presented to the emergency department with dyspnea, subcutaneous emphysema of the neck and high clinical suspicion of COVID-19 infection. There was no smoking history and no lung comorbidities. The patient was admitted into a monitored unit and received management accordingly (having never required mechanical intubation). During chest radiological evaluation ME was found and ultimately resolved with noninvasive maneuvers. We want to emphasize the importance of this adverse event despite their non-smoking history and the exclusion of positive pressure ventilation. Given the recent increase in the number of patients with COVID-19 related pneumonia, the presence of pneumomediastinum in patients with COVID-19 infection should alert the clinician to monitor the patients carefully for possible worsening of disease, especially when lung lesions are severe.

Keywords: Pneumomediastinum; subcutaneous emphysema; COVID-19

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Introduction

Recently due to the SARS-CoV-2 viral pandemic a surge in related hospital admissions have presented globally. Mediastinal emphysema (ME) is a complication that rarely presents in non-ventilated patients (1,2). Thus, we describe a case of a patient with isolated pneumomediastinum (ME without pneumothorax) in the context of COVID-19 related pneumonia that was treated conservatively with complete resolution of symptoms. We present the following case in accordance with the CARE reporting checklist (available at http://dx.doi.org/10.21037/med-21-5).

Case presentation

A 58-year-old man with unremarkable past medical history presented to the emergency department with 7 days of marked dyspnea, cough, perception of enlarged neck's

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circumference, crepitus and dysphagia. Previously, he received treatment with azithromycin and dexamethasone every 24 hours during 5 days as an outpatient, with no improvement. He did suspect recent coronavirus exposure. He denied smoking history, alcohol or drug usage. On admission his vital signs showed tachypnea (25 breaths per minute), increased heart rate (105 beats per minute), low grade fever (38.1 ℃) and oxygen saturation of 87% on room air, improving to 95% on 15 L/min non-rebreather mask. On examination, he had shortness of breath without the use of accessory muscles. During examination, he was noted to have crepitus around his neck, anterior chest area and around the submandibular space. The auscultation revealed bilateral basal crackles; a Hamman sign was audible. Laboratory results showed an elevated C-reactive protein (CRP) of 3.66 mg/dL (normal range, 0–0.50 mg/dL), ferritin 577 ng/mL (normal range, 23–336.2 ng/mL), D-dimer 800 ng/mL (normal range, 0–500 ng/mL) and lymphopenia 235 cells/field. His arterial blood gas levels revealed a respiratory insufficiency type 1 and a respiratory alkalosis with pH of 7.54, partial pressure of carbon dioxide (pCO_2) of 26.3 mmHg, pO_2 of 54 mmHg, HCO_3 22 mmol/L, lactate 1.3 mmol/L on supplementary oxygen with nasal canula (4 L/min) and a calculated PaO_2/FiO_2 ratio of 145.

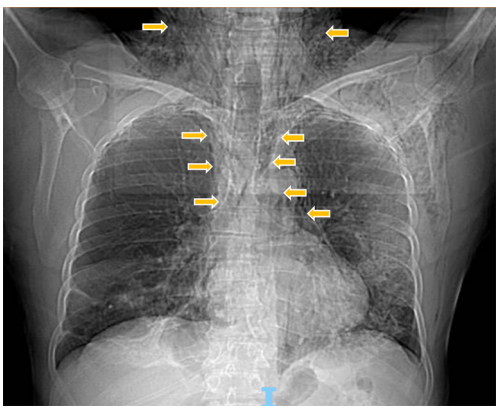

Figure 1 Chest X-ray at admission showing diffuse infiltrates at the bilateral lung bases and subcutaneous emphysema around soft tissues extending in the neck (arrows).

A chest X-ray was performed showing bilateral ground-glass opacities and diffuse infiltrates at the bilateral lung bases, as well as evidence of subcutaneous emphysema (*Figure 1*). Non-contrast chest computed tomography (CT) showed ground-glass opacities with peripheral subpleural location associated with areas of consolidation in posterolateral segments of both lower lobes, a pattern compatible with COVID-19. Pneumomediastinum with extension to the subcutaneous soft tissues of the left hemithorax and neck up to the skull base and submandibular space was also observed (*Figure 2*) reverse transcription (RT)-PCR analysis of COVID-19 resulted positive. The patient was started on dexamethasone 6 mg intravenously and low molecular weight heparin 0.6 mg daily for thromboprophylaxis remaining stable with non-invasive supplemental oxygen without any related adverse

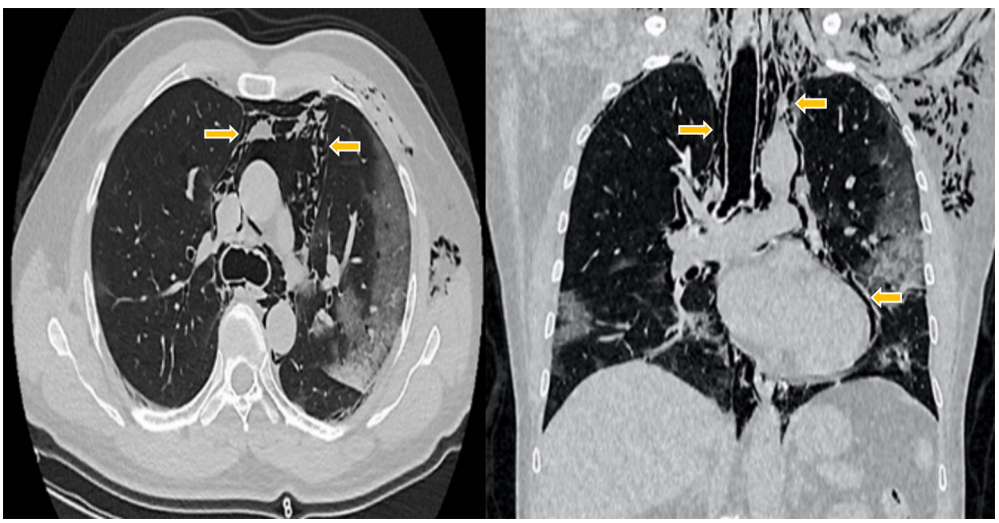

Figure 2 Chest computed tomography (CT) at admission showing pneumomediastinum with extension to the subcutaneous soft tissues of the left hemithorax and neck (arrows) and ground-glass opacities with peripheral subpleural location.

effect. Unfortunately, remdesivir was not available at that moment at our center due to issues related with chain supply. His extensive pneumomediastinum was managed conservatively and monitored by daily chest X-ray where gradual improvement was observed. On 72 hours following admission, a subsequent chest CT-scan demonstrated significant decrease in pneumomediastinum and pneumonia with slight radiological improvement. Subsequently, the radiological follow-up demonstrated complete resolution of ME. The patient was discharged completely asymptomatic on day 10 after admission.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). A written consent has been obtained from the patient.

Discussion

During the SARS-CoV-2 pandemic an increased frequency of air leaks, spontaneous pneumothorax and ME has been reported even in patients without mechanical ventilation or in the absence of another predisposing factors (1,2). Other than COVID-19 related pneumonia the patient presented in this case, reported with no significant risk factors neither a primary pulmonary condition associated with ME. The primary radiologic evaluation of the patient showed no bullae, cyst or associated pneumothorax. The presence of ME in the context of viral associated pneumonia has been proposed as a clinical feature related with poor prognosis, even with increased risk of intubation and morbidity (1,3). Fortunately, in this case the patient had complete resolution of symptoms requiring only conservative management.

The pathophysiology underlying this presentation is not completely understood and requires further research to elucidate. Notably, the presence of ME has been previously reported in association with viral respiratory infections (4,5). The distinguished affection of pulmonary parenchyma putatively caused by SARS-CoV-2 infection has been linked with the presence of diffuse alveolar rupture and unusual patterns of vascular angiogenesis that may predispose to these complications (6,7). Another predisposing factor inducing increased airway pressures in these patients is the presence of pronounced cough that generates a Macklin-like effect, a proposed mechanism of pneumomediastinum that involves alveolar rupture with the consequent dissection of free air along the peribronchovascular interstitial sheaths and in to the visceral pleura of the mediastinum (8).

We aim to emphasize that even though only non-invasive maneuvers are required for the management of most cases with ME. Monitorization of patients assessing for any sign of sudden clinical deterioration is valuable in order to timely recognize and attend life threatening complications in which surgical decompression could be needed. Rarely pneumopericardium have also been reported (9,10). The long-term prognosis of patients with complete resolution of ME in the context of COVID-19 related pneumonia is uncertain. Thus, sequential follow up after discharge could be rational.

The patient shared the following thoughts on his experience during pre-admission and management: "*I was surprised when dyspnea and coughing appeared, however I did not think at all that it was COVID-19. The shortness of breath and the neck enlargement were my main concern when I presented to the emergency department. That growth came on suddenly, even though I was already receiving treatment. Doctors told me that if the disease worsened, intubation was necessary and if the air in the neck did not disappear, some surgical treatment would be considered. They gave me oxygen in a non-rebreather mask. I was worried about everything, not having a clue of how many days and how many nights I would be there. The doctors told me that subsequent chest x-ray images showed improvement of the pneumonia without any subcutaneous emphysema visible. I felt better as the days went by.*".

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at http://dx.doi.org/10.21037/med-21-5

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/med-21-5). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). A written consent has been obtained from the patient.

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