Spontaneous pneumomediastinum and pneumothorax: An uncommon presentation of COVID-19 on computed tomography (CT)

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Abstract

Corona virus disease-19 (COVID-19) usually causes multifocal bilateral peripheral ground glass opacities and patchy consolidations in subpleural location predominantly involving lower lobe and posterior segments on computed tomography (CT). Here, we present a rare mode of presentation of COVID 19 with spontaneous pneumomediastinum and spontaneous pneumothorax on CT. Only few cases of spontaneous pnuemomediastinum and pneumothorax have been reported in COVID-19 pneumonitis. This case highlights the role of CT in the early diagnosis of pneumomediastinum and pneumothorax in patients with COVID-19 Pneumonitis.

Keywords: COVID-19; Pneumomediastinum; Methylprednisolone; Enoxaparin

Introduction

A 69-year-old male patient presented to the emergency department with complaints of breathlessness for the past 2 days. The patient had significant past medical history. The patient gave history of coronary artery bypass graft with permanent pacemaker 4 years back, underwent cholecystectomy 2 years ago for cholelithiasis. The patient was also a known diabetic for the past 7 years and on irregular medication, hypertensive for the past 4 years and on irregular medication. There was no history of smoking or chronic obstructive pulmonary disease. On examination, the patient was afebrile, oxygen saturation was 79% on room air, blood pressure was 170/110 mm/Hg and capillary blood glucose was 339 mg/dl. On systemic examination the patient had bilateral basal crepitations and was severely tachypneic with respiratory rate of 34/min. The pulse rate was 100/minute.

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Case Report

Subsequently CT chest was done which showed diffuse ground glass opacities involving the entire both lungs with predominant involvement of bilateral lower lobes. There was extensive pneumomediastinum with air surrounding the mediastinal vessels and cardiac borders with extension to lower neck and visualized upper abdomen. Moderate pneumothorax was noted on both sides (Figure 1). The blood investigations showed elevated leukocyte count of 33,130 (normal range 4,500-11,000/microliter), with elevated neutrophils 9.5(2-7.5 × 109/l), normal lymphocytes 3.2 × 109/l (normal range 1.1-3.2 × 109/l) and reduced blood platelets 1,27,400 (normal range 150,000 to 400,000 per microliter). D-Dimer was 1155(elevated), ESR 63 mm/hour (normal range 0-22 mm/hour), hypersensitive C-reactive protein was elevated (60 mg/L). With a fraction of inspired oxygen (FiO2) of 33%, blood gas analysis showed a pH of 7.39 (normal range 7.35-7.45), oxygen partial pressure of 206.00 mmHg (normal range 83-108 mmHg) and carbon dioxide partial pressure of 21.8 mmHg (normal range 33-46 mmHg). Real-time fluorescence polymerase chain reaction (RT-PCR) test was performed to confirm COVID pneumonia which was positive. Since CT showed evidence of pneumothorax and pneumomediastinum and the patient had decreasing oxygen saturation level, the patient was intubated and was administered remdesivir, methylprednisolone, enoxaparin and necessary antibiotics and was closely monitored. Despite the supportive measures, the patient developed sudden cardiac arrest 2 days after intubation. Cardiopulmonary resuscitation was initiated as per advanced cardiac life support (ACLS) protocol even after which return of spontaneous circulation could not be established and the patient passed away.

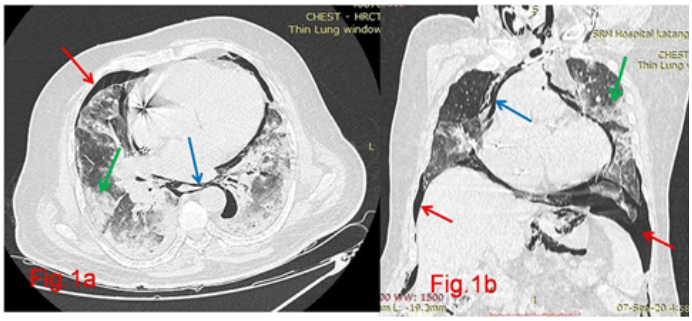

Figure 1: *Axial and coronal CT sections shows extensive pneu-*

momediastinum (blue arrow) and bilateral pneumothorax (red arrow) with ground glass opacities in both lungs suggestive of COVID-19 Pneumonitis.

Discussion

The World Health Organisation (WHO) has declared the coronavirus disease 2019 (COVID-19), a pandemic. The last pandemic reported in the world was the H1N1 pandemic in the year 2009. The common clinical presentation of COVID-19 pneumonitis are with fever, cough, expectoration, myalgia and breathlessness.[1,2] Real-time fluorescence polymerase chain reaction (RT-PCR) test is considered gold standard for the diagnosis of COVID-19 pneumonitis. Computed tomography (CT) chest has a high sensitivity and a high negative predictive value in the diagnosis of COVID 19.[1] CT chest can help in diagnosis and staging of the disease and it can also help in detecting the complications associated with the disease. The most characteristic findings on CT of COVID-19 infection are the ground glass opacities, consolidation and septal thickening.[1] The ground glass densities are usually peripheral, subpleural in location with lower lobe predominance. Development of consolidation is usually seen in late stage of the disease. Mediastinal lymphadenopathy and pleural, pericardial effusion are rare in COVID-19 Pneumonitis. Spontaneous mediastinum and pneumothorax are rare presentation of COVID-19 infection on CT with only limited cases.[3,4]

The causes for pneumomediastinum can be intrathoracic like narrowed airway, straining against closed glottis, trauma, alveolar rupture or extrathoracic like fracture of sinus or hollow viscus perforation. The source of air can be from trachea, major bronchi, esophagus, lung, pleura, head and neck, peritoneum and retroperitoneum. Sometimes it can be spontaneous due to alveolar rupture. Pneumothorax can be divided into three categories which are primary spontaneous pneumothorax for which no cause will be found, secondary spontaneous pneumothorax for which there will be underlying lung cause and the third category is posttraumatic or iatrogenic pneumothorax. Chest radiograph and computed tomography (CT) can easily identify pneumothorax and pneumomediastinum. CT can also helps in detecting the underlying cause for pneumothorax.[5]

The cause for pneumomediastinum and pneumothorax in COVID-19 patients include barotrauma due to intubation or due to underlying emphysema or bulla.5,6 Sometimes it can be spontaneous like in our case. The pathophysiology of COVID-19 is due to cytokine storm in the airway that cause destruction of the alveoli which may cause spontaneous pneumomediastinum through Macklin's phenomenon.[7,8] Spontaneous pneumomediastinum may be caused by the presence of a pressure gradient between the alveoli and pulmonary interstitium leading to alveolar breakdown. According to Macklin, alveolar air released due to alveolar rupture tracks along peri-bronchial vascular sheaths towards the mediastinum.[8] Our patient did not have a history of intubation and the lung parenchyma on CT showed no evidence of bulla or emphysema. Although rare, development of pneumomediastinum or pneumothorax in COVID-19 patients may be a negative prognostic marker. Any sudden decrease in the oxygen saturation or development of acute breathlessness in a COVID-19 pneumonitis patient should raise suspicion for spontaneous pneumothorax or pneumomediastinum. In those patients, CT chest should be immediately done for evaluation of complications and appropriate treatment measures have to be considered. Development of pneumothorax and pneumomediastinum can be fatal in these patients and hence require early diagnosis. For this reason, these conditions should be kept in mind in the treatment and follow-up of Covid-19 infection.

Conclusion

Sudden onset of breathlessness with drop in oxygen saturation in a patient with COVID-19 pneumonitis should prompt a suspicion of pneumomediastinum or pneumothorax. CT should be immediately performed in those patients for early diagnosis and treatment. The cause for pneumomediastinum or pneumothorax in COVID-19 pneumonitis can be spontaneous or due to underlying lung disease like bulla or due to barotrauma if the patient is ventilated.

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