



Case Report

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A Case of COVID-19 with No Pulmonary Involvement, but with Mediastinal and Subcutaneous Emphysema



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ABSTRACT

Spontaneous pneumomediastinum (SPM) is a rare clinical entity. In the normal population, it is more likely to occur in people with conditions including chronic obstructive pulmonary diseases and asthma. In the context of COVID-19 few cases of SPM have been reported which most of them were patients with severe lung parenchymal inflammation or patients under mechanical ventilation. In this case, we report a young male with a history of minor childhood asthma who presented with acute dyspnea, forceful coughs, and subcutaneous emphysema. Chest computed tomography had no clues for COVID-19, however, pneumomediastinum and subcutaneous emphysema were obvious. He was primarily diagnosed with acute asthma exacerbation causing SPM but eventually, he tested positive for SARS-COV-2, therefore, he underwent the standard treatment for COVID-19 and the SPM was managed conservatively. Finally, after 12 days of hospitalization, he was discharged in favorable clinical condition.

Introduction

As COVID-19 is taking more and more lives all around the globe, still novel clinical aspects of this disease are being discovered [1]. Although the common manifestations of COVID-19 are bilateral pneumonia and respiratory impairment accompanied by a severe inflammatory response, a wide variety of unexpected complications

have been reported to be associated with the disease. These unusual features pose difficulties in the diagnosis and management of the patients particularly in emergency situations [2].

Spontaneous pneumomediastinum (SPM) with or without subcutaneous emphysema and pneumopericardium is an infrequent clinical entity mostly happening consequent to alveolar rupture due to alveolar over inflation. This condition, which is also

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known as “air leak syndrome”, is more likely to occur when there is considerable pulmonary parenchymal inflammation [3,4]. Alveolar rupture may be triggered by a rapid rise in intra-alveolar pressure situations such as coughing, sneezing, or Valsalva maneuver [3]. Air leak syndrome is reported to be associated with pneumonia, acute respiratory distress syndrome (ARDS), and positive pressure ventilation [4]. Massive pneumomediastinum and pneumopericardium following air leak syndrome may worsen the situation when contributing to hemodynamic instability.

Macklin effect is the underlying mechanism of air leak syndrome which is described as the movement of air through parenchymal space and peri bronchial sheath to the mediastinum and other potential spaces [5].

Pneumomediastinum, pneumothorax, pneumopericardium and subcutaneous emphysema have rarely been reported in COVID-19 patients [6]. Reports of air leak syndrome in COVID-19 are mostly describing this condition as a complication of severe disease in patients with considerable pulmonary involvement with risk factors for severe COVID-19 [2,3,7], however, in this report, we present a young man, with no considerable risk factor of severe COVID-19, diagnosed for spontaneous pneumomediastinum and subcutaneous emphysema before the diagnosis of COVID-19 without any obvious pulmonary parenchymal involvement in chest computed tomography.

Case presentation

An 18-year-old male presented to emergency department complaining of aggravating shortness of breath followed by heavy coughs and sudden swelling in the neck. On admission, he had a respiratory rate of 32, temperature of 38.3°, pulse rate of 120, and 84% oxygen saturation. He also reported history of minor childhood asthma that was asymptomatic for the last 8 years. Physical examinations revealed left axillary and neck subcutaneous emphysema with normal pulmonary and cardiac sounds. Thoracic computed tomography indicated pneumomediastinum and subcutaneous emphysema. Notably, no obvious pulmonary involvement consistent with COVID-19 was present (Figure 1). Further laboratory tests were normal except a neutrophil dominant (80%) leukocytosis (WBC=12000). Despite normal respiratory sounds and normal spirometry results regarding the unaffected lung parenchyma in the chest CT, our first clinical suspect was pneumomediastinum due to asthma exacerbation, thus we planned to treat him with respiratory support and low dose prednisolone in combination with bronchodilators. Moreover, considering the leukocytosis and fever, he put on a course of ceftriaxone and clindamycin to control the probable occult pulmonary infection. According to our regional COVID-19 pandemic screening and management guidelines, we also tested him for SARS-COV-2 infection. The next day, interestingly, the polymerase chain reaction (PCR) resulted positive for

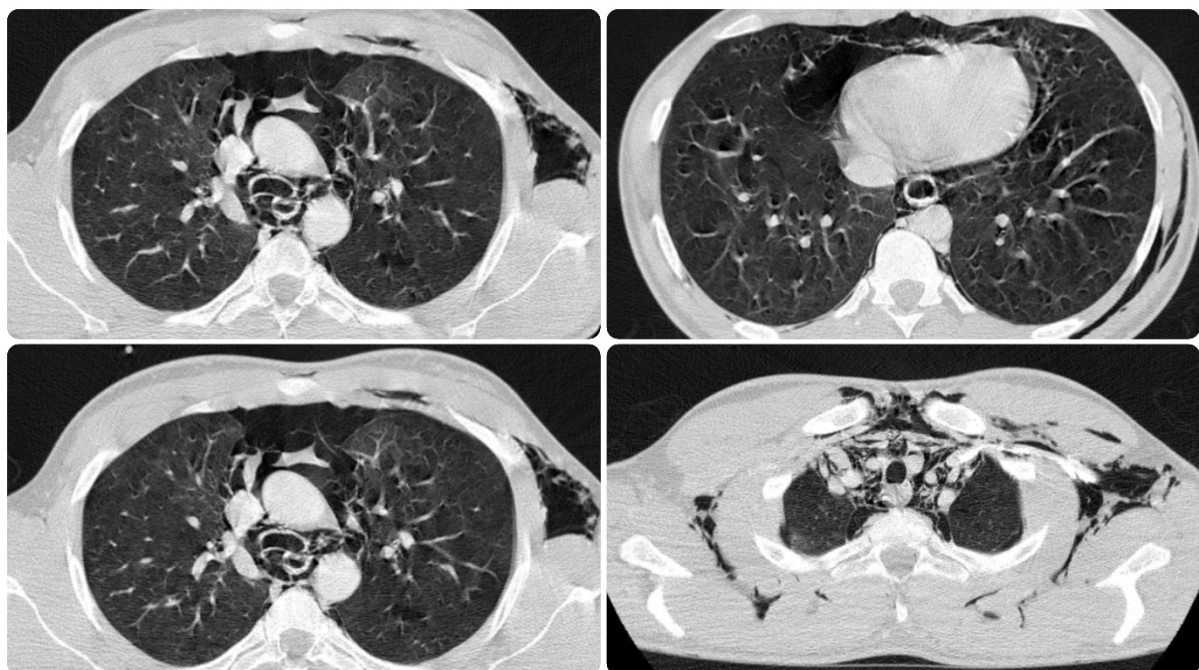


Fig. 1. chest computed tomography (CT) indicates pneumomediastinum and subcutaneous emphysema without any obvious lung parenchymal involvement

SARS-COV-2 RNA. Therefore, to better manage the possible complications of COVID-19 he was referred to a COVID-19 dedicated hospital. There, he was treated due to regional guidelines for the treatment of COVID-19 with remdesivir and dexamethasone. Eventually, after 12 days of hospitalization, he was discharged with favorable clinical conditions.

Discussion

The prevalence of SPM in the general population is reported to be 1.2 per 100000 persons. Spontaneous pneumomediastinum may be a rare complication of acute exacerbations of asthma [4,8], however, in this case, there was no evidence supporting the airway hyper responsiveness and asthma exacerbation. Evidences from other respiratory viral infections indicates high prevalence, up to 12%, of pneumomediastinum in previous SARS and MERS epidemics. Few reports of pneumomediastinum in h1n1 influenza are also available [9].

In the context of COVID-19, several cases have reported the association of severity of the disease with the incidence of air leak syndrome [3]. Despite positive pressure ventilation is a contributing factor, most of the cases are reported to develop spontaneous pneumomediastinum without positive pressure ventilator support however, some cases underwent mechanical ventilation subsequently [10]. Currently, There is no enough evidences to accurately correlate the incidence of SPM in COVID-19 with worse outcomes though, most of case reports indicated high probability for developing severe disease and respiratory failure following the incidence of SPM in COVID-19 patients [3]. Regarding the intricacy of the situation, a better understanding of the pathophysiologic pathways which contribute to the air leak syndrome in COVID-19 may be helpful in the management of the patients. Tucker et al. [7] postulated three distinct mechanisms including pulmonary interstitial inflammation, direct viral invasion to pulmonary and pleural tissue and, thromboembolic pulmonary infarction which may contribute to the alveoli rupture and further air leak syndrome; however, this is still a matter of debate whether particular molecular pathways may affect the pulmonary parenchymal structure [2]. As mentioned, severe pulmonary infiltration and further tissue inflammation may be a cause for pulmonary parenchymal tissue loosening predisposing the patients to develop alveolar rupture but, in this case, we observed the air leak syndrome without any considerable pulmonary infiltration. Moreover, most of the reported cases are patients with the risk factors of developing severe COVID-19. Contra wise, in this case the patient was an 18-year-old

healthy male without any risk factors for developing severe COVID-19. It is also notable that other case reports mostly are about SPM in patients with other complications of COVID-19 such as fever, myalgia, fatigue and other organ dysfunction [2], interestingly in the present case we did not observe any other symptoms of COVID-19 rather than fever. These facts debate the pathophysiology of spontaneous pneumomediastinum in COVID-19 as the previously hypothesized mechanisms, such as severe pulmonary infiltration, were not obvious in this case.

Conclusion

In order to establish a proper management strategy for such situations, we suggest further investigations to better understand the epidemiology, clinical manifestations, and underlying mechanisms of air leak syndrome in COVID-19.

Acknowledgements

Not applicable

Ethical Considerations

Compliance with ethical guidelines

This study was performed according to the principles of Declaration of Helsinki. Institutional Review Board of Isfahan University Of Medical Science have approved this study. Code: IR.MUI.MED.REC.1400.069

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Conflict of Interests

All authors declare no conflict of interests.

Author contribution

H.T contributed to study conceptualization and article editing. M.F & S.M-T contributed in article writing, literature review and submission.

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