

## Case report

## Spontaneous Pneumomediastinum Unrelated to Invasive Ventilation in a Patient with SARS-CoV-2 (COVID-19): A Case Report

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### Abstract

Spontaneous Pneumomediastinum (SP) is a rare complication that has not been reported in patients with coronavirus disease 2019 (COVID-19). In this report, we introduce a patient with COVID-19 with SP unrelated to aggressive ventilation. A 39-year-old woman with COVID-19 with ARDS sign was admitted to the intensive care unit (ICU) of Babol Rouhani Hospital. She died four days after hospitalization with pneumomediastinum with subcutaneous emphysema. According to a chest x-ray and CT scan, the patient had SP before admission and aggressive ventilation. Spontaneous pneumomediastinum could be a complication of acute respiratory syndrome in COVID-19 infected patients with unclear pathogenesis.

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### Introduction

Pneumomediastinum is the presence of air in the mediastinum that usually leaks from the ruptured alveoli into the mediastinum. Spontaneous pneumomediastinum (SP) is a rare condition with a benign and self-limiting period, with an incidence of 1 in 30,000 cases and more common in young men (1). However, it has also been reported for iatrogenic causes, such as intubation and pacemaker insertion (2, 3).

In some cases, the occurrence of SP in patients with SARS has been reported to be unrelated to assisted ventilation (4, 5). Coronavirus disease 2019

(COVID-19), which we are currently witnessing the worldwide spread of the virus after the two MERS and SARS viruses, is the third coronavirus in the last two decades to infect humans through bypassing animal species (6).

Diagnosis of COVID-19 relies on radiological and laboratory results. Radiological examinations are extremely important in the early diagnosis and management of the disease. A prominent feature of radiological imaging in patients with severe coronavirus pneumonia is ground-glass opacity and pulmonary consolidation, which can affect both lungs.

Lymphocytopenia (reduced blood lymphocyte count), increased levels of alanine aminotransferase

(ALT), aspartate aminotransferase (AST), and C reactive protein (CRP) are some of the most important laboratory results of patients with new coronavirus (7).

The cases of COVID-19 are diagnosed by positive results of a molecular diagnostic test on one of the main respiratory samples in one of the national reference laboratories (National Influenza Laboratory or Pasteur Institute of Iran).

The results of an extensive study showed that fever (89.1%), cough (72.2%), and muscle pain or fatigue (42.5%) were the most common clinical symptoms (8). Acute respiratory distress syndrome (ARDS) was also present in 14.8% and abnormal chest radiography was found in 96.6% of patients and 18.1% of patients were in critical conditions (8).

There has been no report of spontaneous Pneumomediastinum in patients with COVID-19 yet. We here report a patient with COVID-19 who developed spontaneous pneumomediastinum unrelated to associate ventilation.

## Case Report

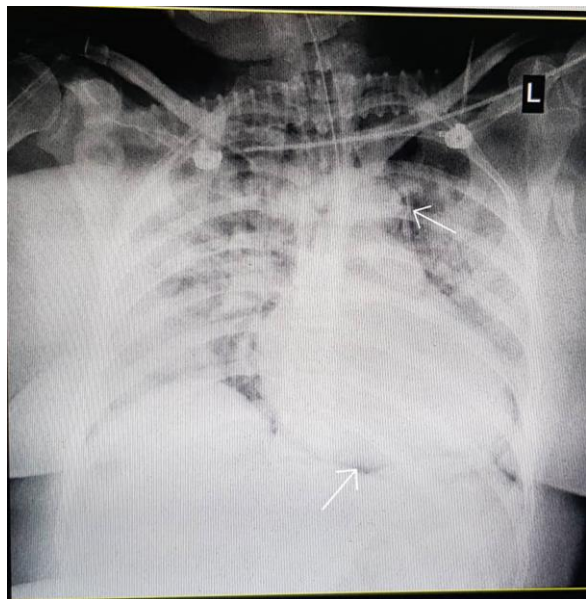
A 39-year-old woman was referred to Babol Rouhani Hospital with asthma and a history of fever and dry cough for the past 5 days. The significant point about the patient's history was that she had been treated for toxoplasmosis for ten days. During hospitalization, the

radiologic results (chest X-ray and CT scan) and laboratory results were consistent with the diagnosis of COVID-19, and treatment was initiated following a national guideline for the patient. After 2 days of hospitalization with severe asthma and reduced oxygen saturation level by 55%, the conscious patient was transferred to the intensive care unit (ICU) and subjected to noninvasive ventilation (NIV) after which oxygen saturation level reached 90%. Upon admission to ICU, temperature=38.5, heart rate=80, respiratory rate=55, pulse rate=90 and in the primary arterial blood gas (ABG) pH=7.39, PCO<sub>2</sub> = 42 mmHg, BE = 0.4 mmol/L, HCO<sub>3</sub> = 25.4 mEq/L, and PO<sub>2</sub> = 58 mmHg.

Two hours after admission to the ICU, the patient was intubated and ventilated with Assist-control mandatory ventilation (ACMV) mode ventilation. The patient's oxygen saturation level was 70%. The following day, she underwent pressure-controlled ventilation (PCV) mode ventilation because of reduced oxygen saturation and high airway pressure and distress. The level of oxygen saturation reached 90% and the conditions continued for one day. On the fourth day of admission to the intensive care unit, oxygen saturation level fell below 60%, which did not change even with the change of mode ventilation to airway pressure release ventilation (APRV). In a few minutes by P<sub>high</sub>=20 cmH<sub>2</sub>O But the oxygen saturation level did not rise and returned to PCV mode.



**Figure 1.** Chest CT scan of the patient before mechanical ventilation.



**Figure 2.** Chest x-ray after mechanical ventilation.

Subcutaneous emphysema appeared on the face, body, and upper limbs, especially on the left side. A surgeon was consulted and there was no need for a chest tube.

A chest radiograph was performed (Figure 2), and pneumomediastinum was diagnosed for the patient. Finally, the patient died of hypoxia from severe lung involvement. The re-examination of the patient's initial CT scan (Figure 1) confirmed the presence of pneumomediastinum at the time of admission.

## Discussion

Regarding the prevalence of SP in the general population, 32,896 cases have been reported (9). In those with pulmonary infection, air leakage is not a common complication, but it has been reported in Staphylococcal pneumonia and fungal pneumonia (10, 11).

In HIV infection, SP was reported in 9.5% of pneumonia cases with *Pneumocystis Carinii* and in 6.8% of cases of tuberculosis (12). Here, it can be assumed that alveolar rupture results from severe and diffuse alveolar injury, causes interstitial emphysema, and then air enters the mediastinum bronchovascular sheath, causing SP, and in some patients' signs of progress to pneumothorax and subcutaneous emphysema.

In the case of the patient mentioned, at the time of admission, spontaneous Pneumomediastinum is present due to the presence of air according to chest CT scan before intubation and mechanical ventilation, and Pneumomediastinum is not present due to ventilator-associated barotraumas (VAB). Recently, there has been a report of spontaneous Pneumomediastinum in the disease (COVID-19) (13). The coronavirus disease 2019 (COVID-19) pneumonia can be complicated by mediastinal emphysema, giant bulla, and pneumothorax (14). In this patient, there was Pneumomediastinum without pneumothorax. The patient was intubated at the time of admission which is one way of treating the pneumomediastinum.

Due to severe lung involvement, the patient's hypoxia did not respond to treatment and died. Therefore, in these patients, there is a possibility of Pneumomediastinum and pneumothorax and early diagnosis can improve survival and decrease morbidity and mortality.

## Conclusion

Spontaneous pneumomediastinum could be a complication of acute respiratory syndrome in patients with coronavirus (COVID-19). Regarding the poor prognosis of this complication, further research is needed to evaluate the incidence of this complication and its pathogenesis.

## Acknowledgment

None.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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