




## Case Report

# Spontaneous Pneumothorax, Pneumomediastinum, and Subcutaneous Emphysema: Rare Complications in COVID-19 Pneumonia

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## Abstract

COVID-19 pneumonia has several complications, such as acute respiratory distress syndrome, septic shock, myocarditis, pulmonary embolism, and thromboembolic stroke. We present a case of a 71-year-old woman who was diagnosed with COVID-19 pneumonia and was found to have a pneumothorax, spontaneous pneumomediastinum (SPM), and subcutaneous emphysema without a history of lung disease. The pathophysiology of SPM and subcutaneous emphysema is likely caused by rupture of the alveolar membrane due to direct damage by COVID-19 infection and frequent cough-induced barotrauma.

**KEYWORDS:** COVID-19 pneumonia, spontaneous pneumomediastinum and COVID-19 pneumonia, COVID-19 pneumonia and its complications

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## INTRODUCTION

The first case of coronavirus surfaced in November 2019, and it quickly turned into a pandemic inflicting a massive toll on human lives. In efforts to understand the transmission and progression of the disease, many cases have been described and closely studied. Among the various complications caused by this disease, spontaneous pneumomediastinum (SPM) and subcutaneous emphysema are rarely seen.

We describe a case of pneumothorax, SPM, and subcutaneous emphysema due to COVID-19 pneumonia.

## CASE PRESENTATION

We present a case of a 71-year-old woman who never smokes or drinks alcohol presented to the emergency department with complaints of fever, cough, and shortness of breath for 1 week. She tested positive for COVID-19 pneumonia a week ago, which she self-monitored at home and took Tylenol as needed. However, her shortness of breath progressively worsened with an occasional dry cough.

The patient tested positive again for COVID in the emergency department. On examination, the patient has generalized body ache, dry cough, shortness of breath with a respiratory rate of 22 breaths/min, oxygen saturation of 79% on room air, heart rate of 110 beats/min, blood pressure 114/59 mmHg, and temperature of 99.4°F. On auscultation, she had clear bilateral breath sounds without any heart murmur. Labs showed elevated D-dimer level of 425 ng/mL, fibrinogen of 767 mg/dL, Troponin I of 0.07 ng/mL, C-reactive protein of 15 mg/dL, ferritin of 502 ng/mL, and normal procalcitonin level. Electrocardiogram (EKG) was significant for sinus tachycardia with no acute ischemic changes. Chest X-ray revealed diffuse bilateral patchy ground-glass infiltrates. CT angiogram of the chest was negative for pulmonary embolism with a significant presence of ground-glass opacities, cystic lesions, and pneumomediastinum with neck emphysema (Figure 1). She was diagnosed with acute hypoxic respiratory failure due to COVID-19 pneumonia, which was further complicated by the presence of pneumomediastinum and neck emphysema (Figure 2).

The patient was given supplemental oxygen via nasal cannula, a 5-day course of intravenous remdesivir, and 6 mg of Decadron per COVID-19 pneumonia treatment protocol. Additionally, tocilizumab was given after increasing oxygen support to 15 L. Thoracic surgery was consulted and decided to conservatively manage pneumomediastinum and neck emphysema and follow up with serial chest X-rays.

Subsequently, the patient was found to have facial swelling due to worsening of subcutaneous emphysema. Chest X-ray also noted the presence of left apical pneumothorax. The patient remained in the COVID unit for almost 1 month due to rare COVID-19 pneumonia complications requiring high flow oxygen support, which was slowly weaned off. She was eventually discharged with 2 L of nasal cannula oxygen support.

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**Figure 1.** CT angiogram of chest showing bilateral ground-glass opacities with cystic lesions and subcutaneous emphysema of neck and pneumomediastinum (yellow arrows). No pulmonary embolism was noticed.

## DISCUSSION

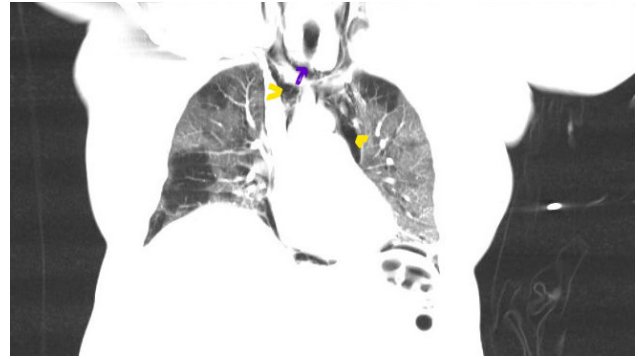
Common symptoms of COVID-19 pneumonia are reported to be fever (98%), cough (76%), and myalgia or fatigue (44%). Later in the course of illness, dyspnea (55%) is also reported. Complications include acute respiratory distress syndrome, thromboembolism, acute cardiac injury, and secondary infection.<sup>1</sup> Subcutaneous emphysema and SPM are rare complications of COVID-19 pneumonia that are not related to positive pressure ventilation. The exact mechanism is unknown; however, the supposed mechanism is a diffuse alveolar injury that might lead to rupture of the alveoli causing leakage of air resulting in pneumomediastinum and neck emphysema.<sup>2,3</sup>

Pneumomediastinum is defined as the presence of free air in the mediastinal cavity. It can be primary, having no clear cause, and is known as SPM or it can be secondary to an inciting event.<sup>4</sup>

SPM is thought to be a direct complication of severe COVID-19 pneumonia without prior underlying respiratory disease or iatrogenic injury.<sup>5</sup> The exact incidence and specific risk factors are not yet recognized.<sup>6</sup> SPM is usually self-limiting; however, it can potentially lead to severe circulatory and respiratory pathology. SPM occurring in patients

### MAIN POINTS

- Spontaneous pneumomediastinum (SPM) and subcutaneous emphysema are rare complications of COVID-19 pneumonia.
- The pathophysiology is likely due to increased alveolar pressure through frequent coughing spells and direct damage of the alveolar membrane by COVID-19 viral infection.
- The clinicians must be aware of these life-threatening complications and should monitor them closely with serial chest X-rays.



**Figure 2.** Coronal view of CTA chest showing neck emphysema (blue arrow) and large volume pneumomediastinum extending to the diaphragm (yellow arrows).

with COVID-19 should be monitored as an indicator of worsening disease. Diagnosis of subcutaneous emphysema and pneumomediastinum has been associated with worse prognosis and outcome.<sup>7</sup> Early diagnosis of pneumomediastinum in patients with COVID-19 pneumonia and appropriate management can result in decreased morbidity and mortality.<sup>8</sup>

Subcutaneous emphysema and SPM present various symptoms, including neck and facial swelling, difficulty swallowing, and chest pain. In addition to the signs and symptoms of COVID-19 pneumonia, physical examination demonstrates crepitus in the chest and neck area. Chest X-ray shows soft tissue gas in the upper thorax and neck. CT scan of chest confirms pneumomediastinum demonstrating subcutaneous emphysema in the thorax and neck region. The esophageal tear can be ruled out by an esophagogram.<sup>9</sup> CT scan of chest typically shows bilateral and peripheral pulmonary parenchymal ground-glass and consolidative pulmonary opacities in COVID-19 pneumonia.<sup>10</sup>

The exact pathophysiology is unclear; however, in this case, it is presumed that increasing alveolar pressure through coughing and direct damage of alveoli by COVID-19 infection results in the development of SPM and subcutaneous emphysema.<sup>11</sup> SPM does not require any specific treatment but its presence might indicate severe damage to the lungs and needs close and careful monitoring of the patient.

## CONCLUSION

Pneumothorax, SPM, and subcutaneous emphysema are rare complications described in COVID-19 pneumonia. Its mechanism is yet to be fully understood. It may be a rupture of the alveolar membrane due to direct damage inflicted by COVID-19 or frequent coughing. Patients with these complications need to be monitored closely to avoid the development of severe complications and worsening of the disease.

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U.Z.; Materials - I.A., N.F.A., U.Z.; Data Collection and/or Processing - I.A., N.F.A., U.Z.; Analysis and/or Interpretation - I.A., N.F.A., U.Z.; Literature Search - I.A., N.F.A., U.Z.; Writing Manuscript - I.A., N.F.A., U.Z.; Critical Review - I.A., N.F.A., U.Z.

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