

# Exuberant spontaneous pneumothorax, pneumomediastinum, pneumopericardium and subcutaneous emphysema in COVID-19 pneumonia

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## DESCRIPTION

A 54-year-old man diagnosed with COVID-19 was admitted to the emergency department for increasing shortness of breath following a 2-week history of fever and fatigue. At admission, his chest X-ray showed bilateral patchy infiltrates, he was hypoxemic and noninvasive mechanical was initiated. On hospital day 4, subcutaneous emphysema was noticed and chest CT showed subcutaneous emphysema extending from the cervical region along the arms associated with pneumomediastinum, pneumopericardium and bilateral pneumothorax (figure 1). A chest drain was placed with pneumothorax resolution. However, respiratory failure further deteriorated and invasive mechanical ventilation was started on the next day. The patient was admitted to the intensive care unit (ICU). Due to prolonged ventilation and critical illness myopathy, a tracheostomy was performed after 22 days of invasive ventilation.

On hospital day 25, a right-sided hypertensive pneumothorax requiring decompression complicated the disease course. CT scan revealed a septate hydropneumothorax suggestive of empyema and a pneumatocele on the same side (figure 2). After insertion of another chest drain directed at the septate collection and a course of antibiotics, the patient progressively improved. Repeated CT scan showed a reduction in the size of the hydropneumothorax. After 54 days in the ICU, the patient was transferred to the ward.

Pneumothorax has been reported as a complication occurring during the course of COVID-19 pneumonia in about 1% of hospital admissions and 2% of ICU admissions.<sup>1</sup> Likewise, cases of



**Figure 2** Chest CT following hypertensive pneumothorax drainage showing septate hydropneumothorax.

pneumomediastinum and subcutaneous emphysema have been described in the literature occurring at presentation or during disease course.<sup>2 3</sup> Traditional risk factors for pneumothorax and mediastinal emphysema include tall and thin stature, smoking, chronic lung disease or asthma. However, an association between these features and pneumothorax occurring in patients with COVID-19 has not been established and it seems that the particular pathophysiology of SARS-CoV-2 pneumonia might have a role in such complications.<sup>1</sup> Despite the mechanism remaining unknown, it is speculated that increased alveolar pressure and diffuse alveolar injury make alveoli prone to rupture, then causing air dissection into the mediastinum and subcutaneous tissue.<sup>4</sup>

The incidence of pneumothorax is higher in mechanically ventilated patients due to the risk of barotrauma and its estimated occurrence is 15%.<sup>1</sup> However, there are reports of patients with pneumothorax or pneumomediastinum that were only treated with noninvasive ventilation. Structural changes to lung parenchyma in conjunction with episodes of coughing that increase intrathoracic pressure could act as inducing factors.<sup>5</sup> Radiological findings in patients with COVID-19 including the presence of pneumatoceles may be implicated in the pathophysiology of secondary pneumothoraces.<sup>6</sup>

Although a rare complication in COVID-19 patients, pneumothorax or subcutaneous emphysema can contribute to profound hypoxemia and complicate clinical evolution. In our patient, recurrent pneumothorax, giant bulla formation and infection were the main challenge in clinical management. These complications can be easily



**Figure 1** Initial chest CT showing subcutaneous emphysema, pneumomediastinum, pneumopericardium and pneumothorax.



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## Images in...

diagnosed with imaging techniques, namely, chest X-ray, lung ultrasound and CT, and it is important to be alert to its diagnosis in order to institute adequate and timely treatment.

### Patient's perspective

I do not remember much from my time in the intensive care unit. I remember dreaming a lot and having a lot of vivid nightmares and being difficult to distinguish what was real and not. Now, rehabilitation is a gradual and slow process, but I begin to feel more strength. All in all, I believe that between dreams and nightmares and obstacle was surpassed.

### Learning points

- ▶ Pneumothorax, pneumomediastinum and subcutaneous emphysema can occur in COVID-19 pneumonia in the presence or absence of mechanical ventilation and contribute to the profound hypoxemia seen in these patients.
- ▶ Radiological findings in patients with COVID-19 include giant bulla formation and pneumatoceles, which may be implicated in the pathophysiology of secondary pneumothorax and pneumomediastinum and its management composes a clinical challenge.
- ▶ On clinical suspicion, imaging techniques like chest X-ray, lung ultrasound and chest CT are useful in identifying patients with these complications in order to timely institute appropriate treatment.

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