

Favourable outcome after a delayed complication secondary to COVID-19

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SUMMARY

A 41-year-old man was admitted to hospital with 7-day history of fever, cough and having had a positive SARS-CoV-2 PCR test. The chest radiograph (CXR) showed bilateral peripheral parenchymal infiltrates. He required 4 L/min oxygen via nasal cannula for 72 hours and was discharged after 7 days with appropriate advice. Four weeks from initial hospital admission, he presented with worsening cough, left chest pain and breathlessness. CXR showed left pneumothorax, and CT pulmonary angiogram (CTPA) scan confirmed left pneumothorax with mediastinal shift and a subpleural bulla. Intercostal chest drain was inserted with good resolution of symptoms and lung re-expansion. Follow-up CT scan 2 months later showed complete resolution of the parenchymal abnormalities. Our case demonstrates the development of pneumothorax as a delayed complication in a patient with COVID-19 who did not require ventilatory support. The case also illustrates a favourable outcome, that is, complete resolution of parenchymal destruction due to COVID-19.

BACKGROUND

Clinicians worldwide have been rapidly adapting to the new protocols to manage the COVID-19 pandemic. The standard management strategies are mainly focused on early identification and treatment with appropriate drugs, interventions to manage respiratory, renal, thrombotic and other complications. Pneumothorax as a complication due to COVID-19 is mainly seen in patients with pneumonitis requiring either ventilatory support or in some cases with high flow oxygen therapy. Although guidelines have been currently developed to standardise the follow-up of patients with COVID-19 based on severity of illness, the long-term pulmonary complication is not yet known. From previous coronavirus outbreaks such as SARS-CoV and the Middle East respiratory syndrome coronavirus, there is evidence that patients experience physiological impairment and persistent radiological abnormalities after acute illness. Our case adds to the understanding of the sequelae of the COVID-19 infection and provides an insight into favourable outcome in these patients with no previous parenchymal lung abnormalities.

CASE PRESENTATION

A 41-year-old man was admitted to hospital in April 2020 with a 7-day history of worsening breathlessness, fever and dry cough after testing positive for SARS-CoV-2 infection. He is an ex-smoker, having stopped 15 years ago with an eight-pack-year

history, no comorbidities and was overweight. He was reviewed in cardiology clinic 4 months prior to admission with recurrent chest pain. As a part of investigations, he had CT coronary angiogram (CTCA) which showed no coronary artery pathology and normal visualised lung fields ([figure 1](#)). He works as hospital theatre personnel with no occupational exposure to any known lung irritants.

He had fever (38°C), required 4 L/min oxygen to maintain oxygen saturation about 94% and was given intravenous antibiotic (co-amoxiclav). The chest radiograph (CXR) ([figure 2](#)) showed bilateral peripheral opacities in the lower zones, appearances typical for SARS-CoV-2 infection. Full blood count demonstrated normal neutrophil count, low lymphocyte count ($0.6 \times 10^9/L$), biochemistry revealed elevated C-reactive protein (105 mg/L; reference 0–4 mg/L) and normal renal and liver function. There were no approved medications for COVID-19 during the admission and he was not given any experimental drugs. Over the next 5 days, he showed clinical improvement and was discharged with a planned follow-up in 6 weeks.

He represented to the emergency care department 4 weeks later with a 2-day history of persistent dry cough and severe left pleuritic chest pain. On examination, breath sounds were reduced throughout the left hemithorax. He was tachycardic, heart rate of 110 beats/min with a regular pulse, normotensive and oxygen saturation of 95%.

INVESTIGATIONS

A portable CXR ([figure 3](#)) demonstrated left pneumothorax. The blood tests showed an elevated white cell count ($11.5 \times 10^9/L$), lymphocyte count $1.8 \times 10^9/L$, normal renal, liver function and troponin level. D-dimer was elevated at 426 ng/mL

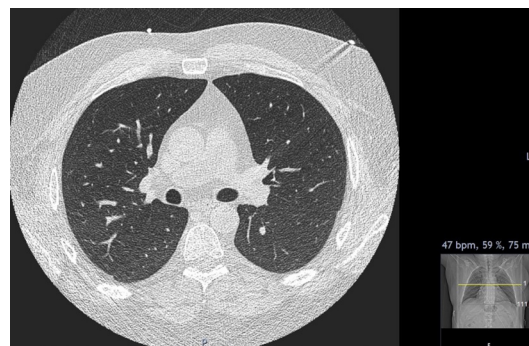


Figure 1 Cross section of CT pulmonary angiogram with normal lung parenchyma.



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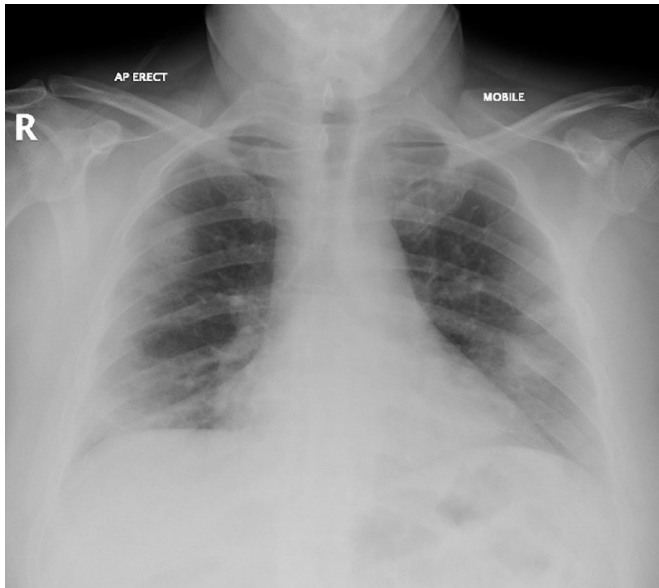


Figure 2 Chest radiograph (April 2020) with bilateral parenchymal opacities.

(reference range 0–350 ng/mL). An ECG revealed sinus tachycardia with no evidence of acute ischaemic changes.

He was further investigated with a CTPA (figure 4). The scan confirmed moderate left pneumothorax with subtle mediastinal shift and a 28 mm subpleural bulla in the left upper lobe. Bilateral peripheral ground glass opacification with architectural distortion and no evidence of pulmonary embolism. A repeat nasopharyngeal swab for COVID-19 PCR test was negative.

DIFFERENTIAL DIAGNOSIS

The differential diagnoses in a patient with known COVID-19 infection presenting with the chest pain and dyspnoea would include worsening infection with acute respiratory distress syndrome, pneumothorax, pulmonary embolism and myocarditis.

The CXR showed pneumothorax which would explain patient's clinical deterioration. Pulmonary embolism is an important differential, based on the recent evidence showing patients with COVID-19 are at a higher risk of developing

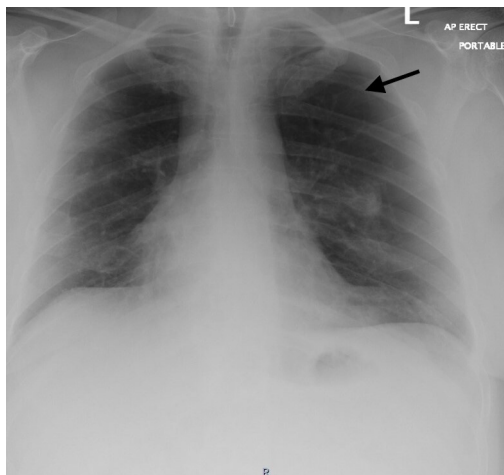


Figure 3 Portable chest radiograph (May 2020) with left pneumothorax.

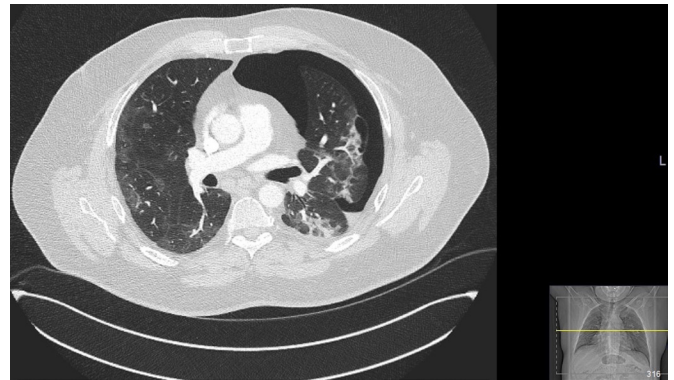


Figure 4 CT pulmonary angiogram with left pneumothorax, parenchymal infiltrates and subpleural bulla.

venous thromboembolism. CTPA was justified in this case, as patient presented with chest pain and had elevated D-dimer. It also enabled the clinical team to assess the lung parenchyma and plan appropriate follow-up. There were no features to suggest pericarditis or myocarditis on ECG.

TREATMENT

An 18F Seldinger chest drain was inserted in the emergency department. He was transferred to the respiratory unit for ongoing treatment.

OUTCOME AND FOLLOW-UP

Tube thoracocentesis achieved complete resolution of the left pneumothorax. The chest drain was removed after 3 days and he was discharged with a follow-up. The CT scan 3 months after discharge showed complete resolution of the parenchymal infiltrates with minor pleural tethering (figure 5). At remote clinic review, the patient reported very mild breathlessness on strenuous exercise, which was gradually improving, and he did not elicit symptoms of anxiety or depression.

DISCUSSION

The radiological features of COVID-19 pneumonia vary according to the stage of the disease. Parenchymal changes usually include bilateral peripheral ground glass opacities, crazy paving pattern, progressive consolidation and eventually leading to architectural distortion and fibrosis.¹

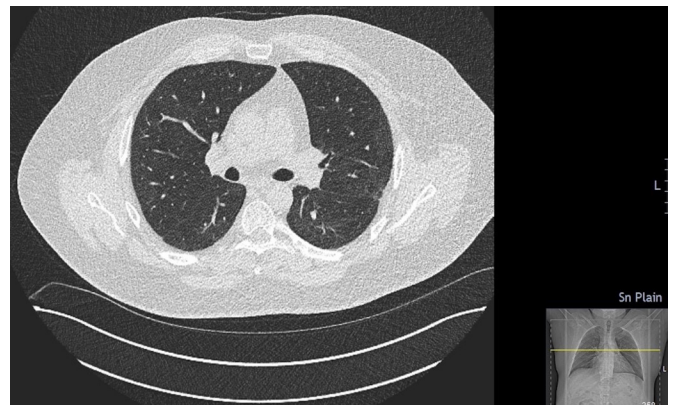


Figure 5 Coronal section of CT (July 2020) with resolved parenchymal infiltrates.

Spontaneous pneumothorax has been described as a complication in patients due to SARS-CoV-2 infection. Based on the published case series, the incidence of pneumothorax is approximately 0.6%–1%.^{2,3} The probable pathogenesis of a pneumothorax in patients with COVID-19 is most likely due to severe lung injury leading to alveolar damage and cyst formation.⁴

Use of mechanical ventilation either invasive or non-invasive modality in patients with COVID-19 have been shown to be a contributing factor for pneumothorax.⁵

Patients with presence of lung disease and subsequent development of acute illness are at increased risk of developing pneumothorax. In our case study, the patient had no underlying lung disease as evidenced by previous imaging, and hence, the likely aetiology of pneumothorax is due to COVID-19 pneumonitis and bullous formation as a delayed complication.

Treatment strategies for pneumothorax vary according to its aetiology, that is, primary or secondary and symptoms at presentation.⁶ Pneumothorax due to COVID-19 is a new entity and, in this case, there was radiological evidence of subpleural bulla which likely preceded the pneumothorax, thereby classifying it as secondary. As the patient presented with chest pain, pneumothorax with mediastinal shift, chest drain thoracentesis was performed.

The pulmonary sequelae of patients with COVID-19 are not yet known. From a recently published observational study, 70% of the patients had residual parenchymal abnormalities at 3-month follow-up imaging.⁷ In another study where the patients were followed up at 4 weeks, CT scan showed considerable improvement in parenchymal lesions.⁸

Learning points

- ▶ Pneumothorax should be considered as a delayed complication in patients with COVID-19 with persistent symptoms.
- ▶ Implementation of patient education will enable early identification and interventions to deal with complications.
- ▶ A dedicated follow-up of patients with COVID-19 would facilitate the healthcare community to understand its long-term sequelae.

Our case study provides an insight into the development of pneumothorax as a delayed complication of COVID-19 and also illustrates a favourable outcome with complete resolution of parenchymal abnormalities.

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Contributors OB was involved in patient care, patient communication and conceived the idea of the manuscript. MAS was on-call respiratory registrar involved in acute management of patient and contributed to the manuscript. SB was the consultant involved in decision-making and contributed to the revision of manuscript and submission.

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