

## CASE REPORT

## COVID-19 Case Complicated with Organizing Pneumonia and Pneumothorax: A Case Report

Tammy E. Phillips<sup>1\*</sup>; Hammad A. Bhatti<sup>2</sup>; Minh Q. Ho<sup>2</sup>

<sup>1</sup>University of Central Florida College of Medicine, Orlando, FL, USA; <sup>2</sup>Orlando VA Medical Center, Orlando, FL, USA

\*tammyphillips@knights.ucf.edu

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### Abstract

Organizing pneumonia can be idiopathic or caused by multiple etiologies, including viral or bacterial pneumonia, drugs, and autoimmune disorders. It can rarely lead to cyst formation and pneumothorax with the exact mechanism remaining unclear. This case presents a previously healthy 50-year-old male who contracted COVID-19 with subsequent development of organizing pneumonia and pneumothorax. Patients

presenting with hypoxic respiratory failure due to COVID-19 should be screened for organizing pneumonia upon discharge. This case also illustrates the importance of following such patients radiologically to monitor interstitial lung disease and consider pneumothorax for patients re-presenting with acute symptoms.

### Introduction

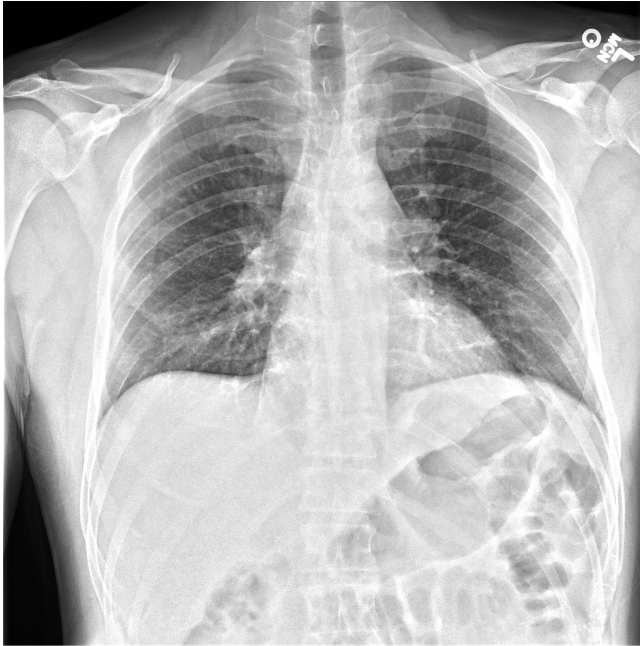
Organizing pneumonia can be idiopathic or caused by multiple etiologies, including viral or bacterial pneumonia, drugs, and autoimmune disorders.[1] It can rarely lead to cyst formation and pneumothorax (PTX). The exact mechanism is unclear. However, a possible explanation is check valve mechanism.[2] We report a case of COVID-19 pneumonia that was diagnosed with organizing pneumonia radiologically. The patient presented later with cyst formation and PTX.

### Case Description

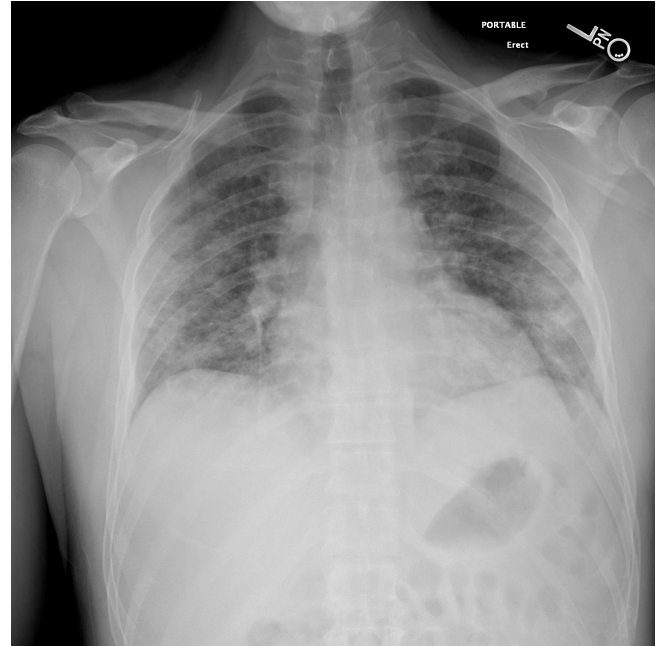
A 50-year-old man with a medical history of mixed hyperlipidemia and allergic rhinitis presented to the emergency department for complaints of fever and non-productive cough for 3 days. The patient was a lifelong non-smoker with a body mass index (BMI) of 28.2 and no known exposure to animals or toxic fumes. His temperature was 38.4 °C and oxygen saturation (SpO<sub>2</sub>) was 98% on room air. Remaining vitals and physical exam were unremarkable. Upon nasopharyngeal swab, the patient tested positive for COVID-19. The patient's chest X-ray (CXR) showed subtle patchy opacities at both lung bases suspected to be developing pneumonia (Figure 1). The patient's white blood cell count was normal (4,500 per mm<sup>3</sup>), and ferritin,

lactate dehydrogenase (LDH), and C-reactive protein (CRP) were slightly elevated (381.2 ng/mL, 315 U/L, and 4.486 mg/dL, respectively). The patient was recommended home isolation and discharged on antibiotics, a cough suppressant, and a short-acting inhaler.

The patient returned to the emergency department four days later due to worsening fever, cough, and new onset dyspnea. His blood pressure (BP) was 151/81 mmHg, heart rate (HR) 100 beats/minute, respiratory rate (RR) 28 breaths/minute, temperature 39.4 °C, and SpO<sub>2</sub> 86% on room air. Auscultation revealed bilateral wheezing, and CXR showed worsened patchy airspace opacities throughout bilateral lungs consistent with a diagnosis of COVID-19 pneumonia (Figure 2). Laboratory results showed elevated CRP 22.8, ferritin 1,477 nm/mL, LDH 526 U/L, and D-dimer 0.96 mcg/mL. The patient was admitted to the hospital and placed on supplemental oxygen with improvement of his SpO<sub>2</sub> to 96%. He was also started on steroids, antibiotics, and subcutaneous heparin prophylactically. Consent was obtained for emergency use of antiviral therapy and administration of convalescent plasma infusion. The patient's progressive decline in SpO<sub>2</sub> prompted transfer to the intensive care unit and placement on heated high flow nasal cannula. Over the next two days, he required flows as high as 50 L/min with SpO<sub>2</sub> fluctuating (82–98%). Inflammatory markers except D-



**Figure 1.** Patient's chest X-ray from initial emergency department visit, when he was first diagnosed with COVID-19 and showed subtle bilateral peripheral patchy opacities at both lung bases.



**Figure 2.** Patient's chest X-ray from hospital day 0 of the first admission, which showed bilateral peripheral patchy opacities consistent with COVID-19 pneumonia. This was 4 days after initial diagnosis.

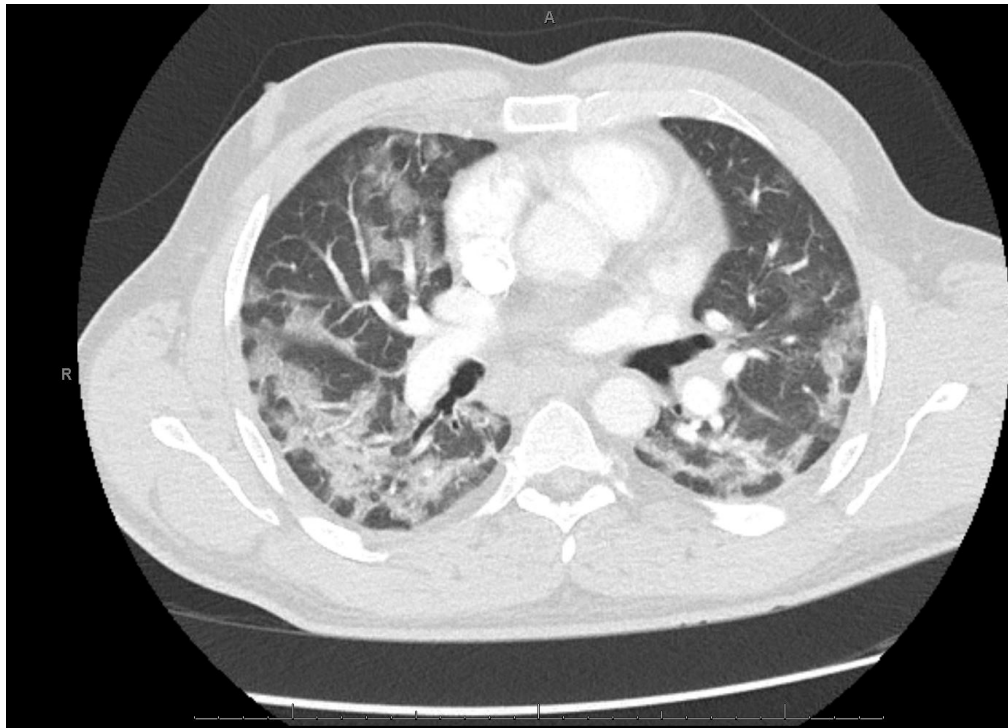
dimer improved on day 6 (CRP 7.5 mg/dL, ferritin 786 nm/mL, LDH 443 U/L, and D-dimer 4.45 mcg/mL). The patient's oxygen requirements steadily decreased over subsequent days, and the patient was transferred to the medical ward. Computed tomography (CT) of the chest on day 9 revealed persistent patchy mixed interstitial airspace opacities diffusely, with overall pattern consistent with organizing pneumonia (**Figure 3**). No discrete effusion or PTX was noted. On day 11, the patient was discharged home.

The patient returned to emergency department on day 22 with sudden right-sided chest pain. Vital signs were temperature 36.8 °C, HR 89 beats/minute, RR 15 breaths/minute, BP 181/82 mmHg, SpO<sub>2</sub> 99% on room air. Chest CT revealed a small right anterior PTX and bilateral multifocal ground glass interstitial opacities with no evidence of pulmonary embolism (**Figure 4**). Laboratory results showed persistently elevated ferritin, LDH, and D-dimer (523.9 ng/mL, 266 U/L, and 1.21 mcg/mL, respectively). He was placed on 15 L oxygen by non-rebreather mask with 100% fraction of inspired oxygen (FiO<sub>2</sub>). The patient improved clinically and was subsequently discharged. Follow-up imaging 81 days from initial diagnosis showed resolution of pneumothorax (**Figure 5**).

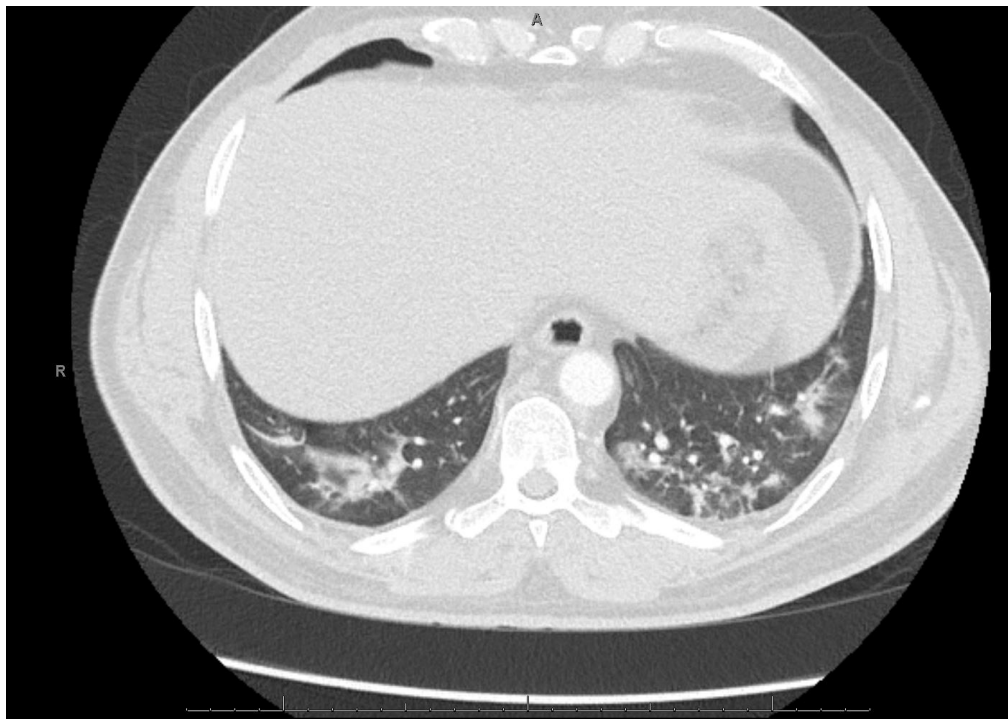
## Discussion

Our patient was initially treated for COVID-19 pneumonia and later discharged on a three-week steroid taper based on a radiological diagnosis of organizing pneumonia. We diagnosed this entity in the context of COVID-19 and managed it with short courses of steroids with good outcomes. In the current case, the initial chest CT showed bilateral lower lobe ground glass opacities consistent with acute COVID-19 pneumonia. His repeat chest CT obtained during readmission, in addition to PTX, also showed that the ground glass opacities seen on chest CT originally had organized into a patchy bilateral curvilinear consolidation pattern sparing the sub-pleural area, typical of organizing pneumonia.[3] A sizeable cyst was also seen.[4] It is important to note that the location of this cyst was peripheral, making it easy to rupture, which would introduce air into pleural space. Another important consideration is check valve mechanism in the context of organizing pneumonia. It is plausible that the location of the organizing pneumonia-type injury causing a peripheral cyst and check valve mechanism compromised the integrity of the pleura, leading to the formation of PTX.[5]

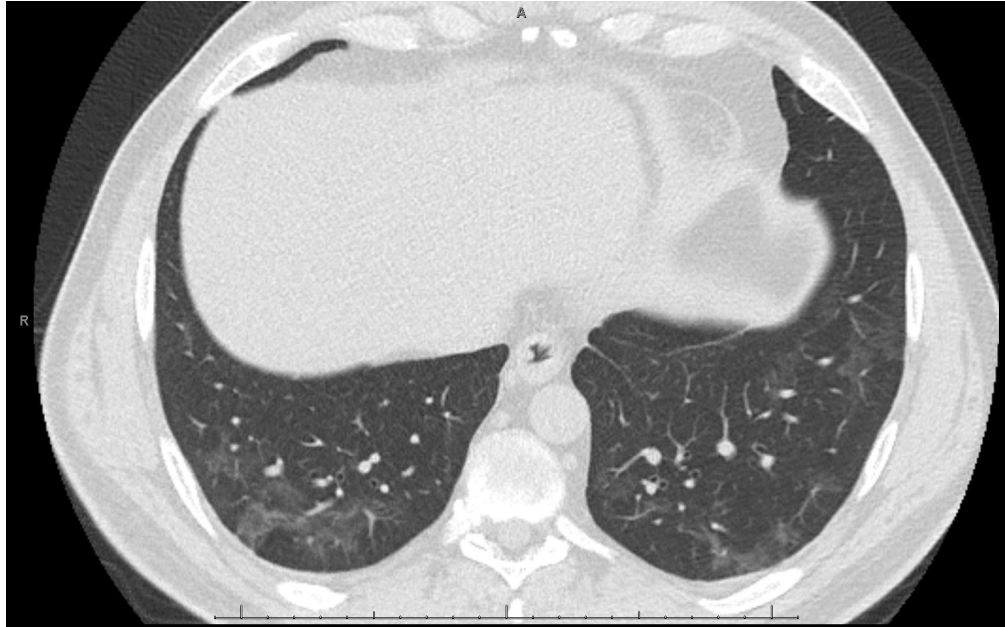
A literature search revealed a scant number of case reports exhibiting organizing pneumonia complicated by cyst formation and PTX.[4-6] It is hypothesized that there is obstruction of the bronchioles due to granulation plugs, which increases alveolar pressure during



**Figure 3.** Patient’s chest computed tomography from hospital day 0 of the first admission, which showed bilateral patchy curvilinear consolidation pattern with subpleural sparing consistent with organizing pneumonia post-COVID-19 infection.



**Figure 4.** Patient’s chest computed tomography from hospital day 0 of the second admission; a right lower lobe cyst can be seen adjacent to the pleura and area of fibrosis. Right pneumothorax is visible anteriorly. This was 22 days after initial diagnosis.



**Figure 5.** Patient's chest computed tomography showed resolved pneumothorax at post-hospital follow-up. Curvilinear patchy opacities in lower lobes suggest resolving organizing pneumonia. This was 81 days after initial diagnosis.

exhalation, resulting in over-inflation, which leads to the formation of a cyst. Due to check valve mechanism, air continues to enter the area of injury, resulting in air trapping and cyst formation. The cyst finally ruptures into the pleural space, causing PTX.[7]

Patients presenting with hypoxic respiratory failure

due to COVID-19 should be screened for organizing pneumonia upon discharge. This case illustrates the importance of following such patients radiologically to monitor interstitial lung disease and consider PTX for patients re-presenting with acute symptoms (**Figure 6—Appendix**).

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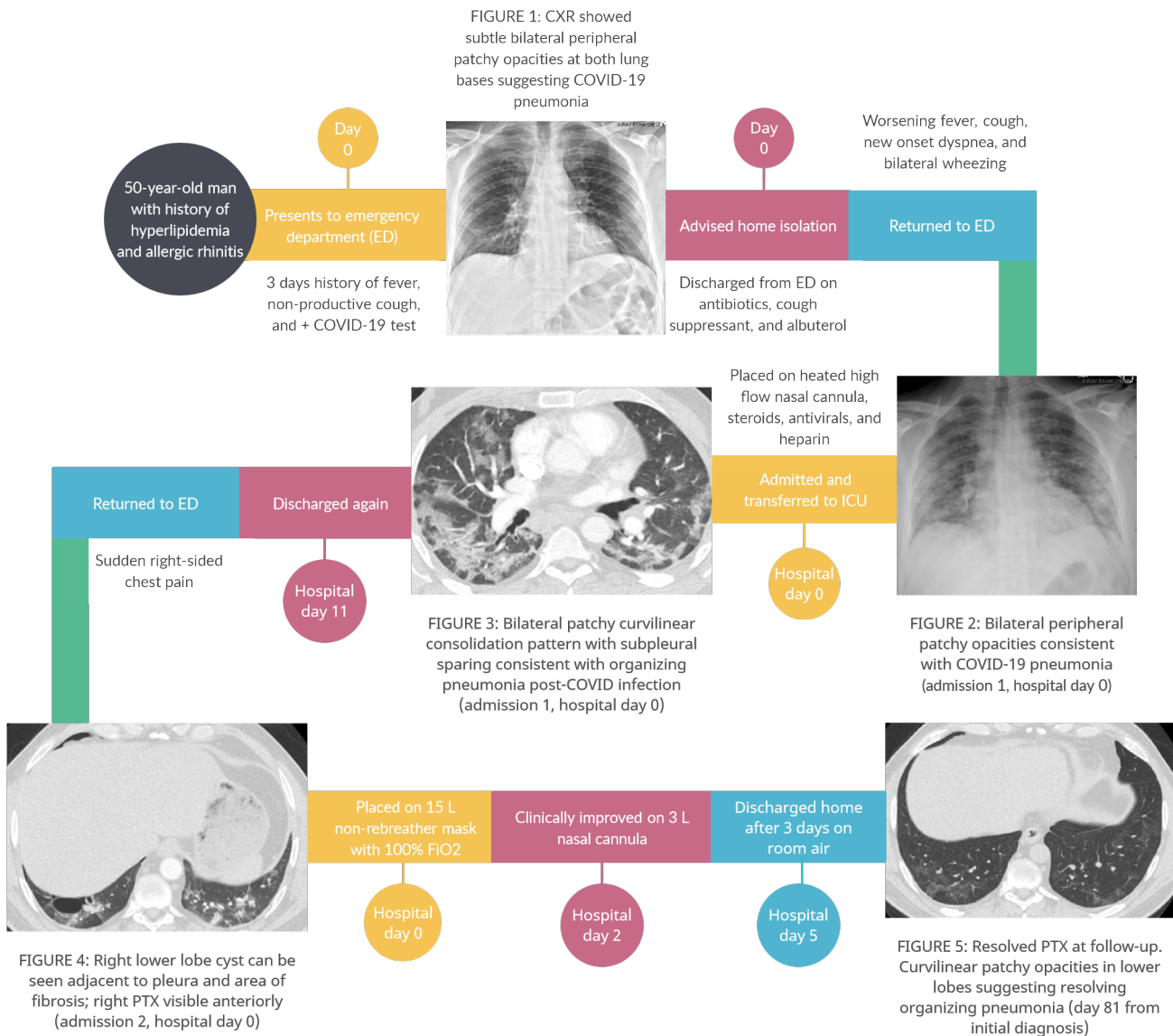
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## Appendix: Clinical Course

**Table 1.** Patient's progression of inflammatory markers.

Hospital day	C-reactive protein (mg/dL)	Ferritin (ng/mL)	Lactate dehydrogenase (U/L)	D-dimer (mcg/mL)
0	4.48	381	315	0.27
4	22.8	1,477	526	0.96
6	7.5	786	443	4.45
7	4.85	612	403	40.26
8	7.01	673	494	108.71
22	2.93	369	177	1.21



**Figure 6.** Radiological timeline of events from patient's initial presentation to final discharge.