

CASE REPORT

Phantom Tumors in COVID-19: A Case Report

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received 25 February 2022 Received in revised form 12 September 2022 Accepted 28 September 2022 Available online 30 September 2022</p> <hr/> <p><i>Keywords:</i> COVID-19, Infectious disease, Phantom tumor, Pleural effusion, X-ray.</p>	<p>Introduction: A phantom tumor, or vanishing lung pseudotumor, is an atypical type of pleural effusion in which fluid is accumulated in the pleural cavity. It is a transient and well-demarcated pleural fluid accumulation in the interlobar pulmonary fissures. In this study, we reported a rare case of a pleural effusion appearing as a phantom tumor in COVID-19 without congestive heart failure.</p> <p>Case: A 29-year-old man was presented with complaints of dry cough, sore throat, fever, and fatigue. He denied shortness of breath and loss of taste and smell. He had no smoking habit and did not have any past medical history. Physical examinations were within normal limits, except for a slight fever. The laboratory examination showed positive SARS-CoV-2 RT-PCR and an increased liver function test. His chest X-ray revealed findings suggestive of a phantom tumor accompanied by bilateral pneumonia. The patient received COVID-19 treatments. A follow-up chest X-ray revealed the complete resolution of the lesion.</p> <p>Conclusion: A phantom tumor is a rare case. It is caused by heart disease and other causes, one of which is COVID-19. The treatment for this condition is based on the underlying disease.</p>

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was first identified in Wuhan in 2019 and was declared as a global pandemic on 11 March 2020 by the World Health Organization (WHO). The disease has been rapidly spreading worldwide with various new emerging variants. Clinical manifestations vary from asymptomatic to acute respiratory distress syndrome (ARDS). Common symptoms include cough, fever,

myalgia, headache, nausea and vomiting, and fatigue. The severity is based on clinical findings from physical examinations and radiography. Chest radiography is essential in patients with COVID-19. The typical chest radiograph findings in patients with COVID-19 include ground-glass opacities and consolidation, pneumatoceles, and vascular enlargement. Isolated pleural disease in COVID-19 is rare, and published reports have been scarce. The feature of pleural abnormalities might include thickening (15%) and

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effusion (4%) based on a study comparing CT scan findings. The incidence of pleural effusion in patients with COVID-19 has been unclear. Several studies stated that it is rarely encountered in patients with COVID-19. However, the study by Chong, *et al.* in 2021 reported that the incidence of pleural effusion in COVID-19 was 7.3%, while the study by Yu, *et al.* reported 12.9%. Another study reported an incidence of 2.6%, which further showed that the precise prevalence is still unknown.¹⁻³

As an atypical pleural effusion with interfissural distribution pleural effusion, a phantom tumor (vanishing lung pseudotumor) refers to the transient well-demarcated accumulation of pleural fluid in the interlobar pulmonary fissures. Chest X-rays usually reveal homogenous spherical- or elliptical-shaped opacities. It is generally associated with congestive heart failure and other disorders such as hypoalbuminemia, renal failure, hepatic failure, pneumonia, and tuberculosis or pleuritis.^{4,5} The suggested disease mechanism is due to pleuritis, adhesion, and atelectasis. The location of phantom tumors is usually in the right-middle lung region, although they have also been reported on the left side or adjacent to the mediastinum.⁶⁻⁸ The transverse fissure is more involved than the oblique fissure.⁵

Phantom tumors are commonly found within the minor fissure but can occur in low frequency within the major fissure. Furthermore, several studies have reported that the condition may recur in acute exacerbation of congestive heart failure. This finding further supported that phantom tumors are recurrent during periods of cardiac decompensation.⁸ The correct diagnosis is important to avoid unnecessary and potentially harmful investigation and treatment (e.g., lung biopsy and/or surgery).^{9,10} Although considered a type of pleural effusion, the prognosis of phantom tumors is not in line with typical pleural effusions in COVID-19. Pleural effusions in COVID-19 are also considered uncommon; however, pleural effusion in COVID-19 may reflect a more severe state with more prominent symptoms and lower oxygen saturation. They also indicate a risk of progression into ARDS, septic shock, and death. In contrast, phantom tumors are resolved quickly with the appropriate treatment of the underlying disease.^{1-3,11}

In this study, we reported a case of a 29-year-old man with a phantom tumor in COVID-19. This case is interesting since the finding of phantom tumors is already

rare in patients without congestive heart failure, combined with the low prevalence of pleural effusion or pleural disease in patients with COVID-19. To our knowledge, this is the first study that reported a phantom tumor case in a patient with COVID-19.

CASE

A 29-year-old man was hospitalized at Udayana Army Hospital with 3 days history of dry cough, sore throat, fever, and fatigue. There was no shortness of breath and loss of taste and smell. He did not have a smoking habit and had controlled epilepsy. There was no other past medical history.

Physical examination on day one of admission indicated a blood pressure of 120/80 mmHg, a pulse of 90 beats/minute, a respiratory rate of 20 breaths/minute, a body temperature of 37.8°C, and oxygen saturation of 95%. Chest examination revealed normal lung sounds and normal heart sounds. ECG examination showed sinus rhythm with a pulse of 90 beats per minute. Laboratory examination showed a positive SARS-CoV-2 RT-PCR, a decreased lymphocyte level (13.6%), an elevated neutrophil/lymphocyte ratio (5.3%), and normal leukocyte levels. His liver function test demonstrated 2-fold elevation, while BUN, creatinine, albumin, serum electrolytes, troponin I and CKMB were still within normal limits.

Initial chest X-ray showed an oval-shaped homogenous opacity lesion in the middle of the right lobe (Figure 1). The lesion was suspected to be a phantom tumor accompanied by bilateral pneumonia.

The patient received oral favipiravir tablets 1600 mg twice daily (BID) on day 1 of admission, followed by 600 mg BID on day 2 to day 5, azithromycin 500 mg once daily (OD), N-acetylcysteine 200 mg three times daily (TID), vitamin C 500 mg BID, vitamin D 5000 IU OD, and paracetamol 500 mg whenever he had a fever.

After 5 days of treatment, the patient gradually began to recover, indicated by stable vital signs and physical examination. There was a blood pressure of 110/80 mmHg, a pulse of 87 beats/minute, a respiratory rate of 20 breaths/minute, a body temperature of 36.7°C, and oxygen saturation stable at 95%. Laboratory results were within normal limits, and a chest X-ray showed normal results on day 6 of admission (Figure 2).

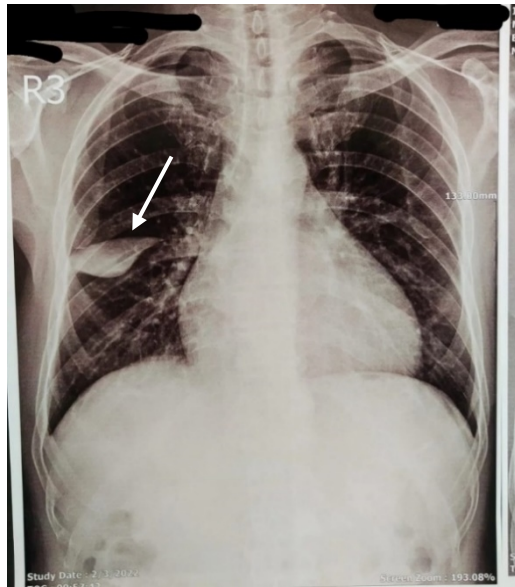


Figure 1: Initial chest X-ray showed a phantom tumor (arrow)

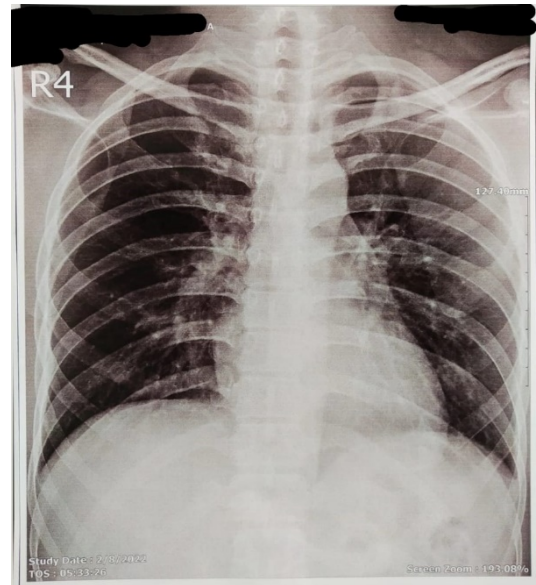


Figure 2 : Chest X-ray on day 6 of admission

DISCUSSION

The term “phantom tumor” is derived from its appearance that resembles a tumor on chest radiography and its tendency to quickly resolve (vanish) following the treatment. It was first reported by Geftter, *et al.* in 1950, in which the study reported a localized interlobar pleural effusion appearing in patients with congestive heart failure.^{11,12} In general, the phantom tumor was often found in patients with heart failure disorder. Nevertheless, in this case, we presented phantom tumors in patients with bilateral pneumonia in COVID-19, which are very rare.¹³ Currently, there are no studies that reported phantom tumor in COVID-19. Phantom tumor or vanishing lung pseudotumor is the first clinical manifestation of heart failure. Still, it can also be caused by other causes such as hypoalbuminemia, renal insufficiency, pleural infection, hepatic failure, pneumonia, and tuberculosis or pleuritis.^{4,5} This condition is considered an atypical pleural effusion with intrafissural distribution.

This accumulation gives a radiographic appearance of rounded opacity that is similar to a mass or infiltrates on a chest radiograph. Therefore, it has several differential diagnoses in which transudate interlobar pleural effusion can be differentially diagnosed with congestive heart failure and chronic renal failure. At the same time, there is exudate interlobar

pleural effusion from asbestosis-related disorders or parapneumonic process, hemothorax, chylothorax, malignant effusion, and pulmonary thromboembolism.^{14,15} A review by Chong, *et al.* in 2021 reported that the incidence of pleural effusion in COVID-19 was 7.3% and most commonly occurred unilaterally (66.8%). Pleural effusion in COVID-19 seems to reflect a radiographic evolution that is more severe and correlates with a longer course of the disease. It also reflects the progression to consolidations from the hallmark findings (ground-glass opacifications) commonly found in COVID-19.

The overall time-to-diagnosis for pleural effusions related to COVID-19 from chest imaging was approximately 5 ± 7 days, while the overall time from the onset of COVID-19 symptoms was 11 days. The patient in this case had felt his symptoms for three days before presenting to the hospital and was diagnosed with this atypical pleural effusion (the phantom tumor) on the third day of symptom onset. Compared to the data from the literature, the patient had an early onset of pleural effusion based on his symptoms. A study by Chong, *et al.* also stated that pleural effusions are likely to increase significantly from 12% to 38% on days five and twelve after symptoms of COVID-19. However, we found that the effusion in this case was quickly resolved within five days. Moreover, pleural effusions related to COVID-19.

are also more common in the elderly. This finding is in line with the cases reported by Lozo, *et al.*, Tesloianu, *et al.*, Argan, *et al.*, and Shaikh, *et al.*, which reported elderly patients with phantom tumors. This finding, however, is not in line with this case. The patient was a 29-year-old man without any cardiac or lung disease that might be the underlying cause other than COVID-19.²

The pathogenesis of phantom tumors consists of two proposed mechanisms: 1) The hydrostatic pressure on the right side is greater than the left side in congestive heart failure, resulting in impaired venous and lymphatic drainage causing loculation of fluid; 2) They are caused by obliterative pleuritis in connection with adhesion and obliterative pleural space around the edge of the gap. The phantom tumors occur when the resorptive ability of the pleural lymphatics is overwhelmed by the transudation from the pulmonary vascular space.¹²⁻¹⁴ The effusion in phantom tumors occurs between two pulmonary lobes, resulting in a similar appearance of pulmonary masses. When located in a fissure, the accumulated fluid forms a distinct lenticular shape on the lateral view. This results in differential diagnoses of atelectasis or condensation. In conditions where the lung has restricted elastic recoil, the retractability is altered, resulting in pleural fluid attracted in this fissure region.¹⁶

Phantom tumors are likely to develop in patients with congestive heart failure and a history of repeated pulmonary infections. These recurrent or long-lasting infections lead to pleural abnormalities such as pleuritis and pleural fibrosis. The pleural abnormalities make the lung prone to fluid collection during acute exacerbations, resulting in pleural effusions. However, the formation of the pleural effusion and the stretching of the pleura results in the tumor-shaped effusion, which is eventually shown in the chest radiography as resembling pulmonary masses.¹⁷ In COVID-19, pleural effusions occur due to the increased interstitial fluid content from leaking microvasculatures. The intense inflammation from the SARS-CoV-2 invasion of the lung parenchyma causes this condition. Due to the pressure gradient between the interstitial and pleura, the interstitial fluid enters the pleural space from the visceral pleura. Postmortem studies have also shown that positive PCR results have been obtained from the pleural fluid, which suggests a direct invasion by the virus.¹⁸

In this case, we assumed that the phantom tumor in the patient was caused by pleuritis due to COVID-19. Patients with pleural effusions related to COVID-19

often have abnormal laboratory results with elevated leukocytes, neutrophils, CRP, and procalcitonin. These conditions are also more commonly found in patients with more prominent COVID-19 symptoms, such as more severe cough, high fever, and dyspnea, often with significantly lower oxygen saturation. The low oxygen saturation in pleural effusions related to COVID-19 might be due to the disrupted respiratory function, which eventually worsens the condition and progresses into ARDS. The patient in this case, however, was presented with mild symptoms consisting of a dry cough, sore throat, and fever. He had no shortness of breath, and the oxygen saturation was 95%, which revealed no signs of severe COVID-19. This finding is not in line with the presumed prominent symptoms of patients with COVID-19 complicated by pleural effusion, which further supported the diagnosis of vanishing pseudotumor (phantom tumors).³

To facilitate clinicians in diagnosing and making different diagnoses for patients presenting with a pulmonary mass on chest radiograph, lateral views of chest X-rays should be obtained. These lateral views may facilitate localizing the pulmonary field. Chest ultrasound is also beneficial in differentiating effusions from masses. Currently, phantom tumors do not require more invasive or thorough imaging techniques for a definitive diagnosis. Rather, the diagnosis can be confirmed by a significant and rapid response to the treatment, particularly to diuretic therapies in patients with congestive heart failure and antivirals or antibiotics in patients with infectious diseases.¹¹

In general, the most common cause of a phantom tumor is heart failure. Thus, treatment with diuretics provides good radiological improvement that can be observed in less than 24 hours after diuretic administration.^{12,19} Phantom tumor or vanishing lung pseudotumor can rapidly disappear with the treatment of the underlying cause. Therefore, determining the correct diagnosis is very important.⁴ A study by Tesloianu, *et al.* in 2017 reported a case of phantom tumor in a 61-year-old man. The patient in Tesloianu's study had congestive heart failure and atrial flutter. The imaging investigation showed a delineated mass with a drop-like density in the right infrahilar region. Further right lateral chest X-ray showed an interlobar homogenous opacity, indicating pleural interlobar effusion. The patient was treated with conservative treatment and had a complete regression of lung opacities within ten days of treatment with diuretics

and ACE-inhibitor. As in other cases of phantom tumors and based on the literature, the patient in Tesloianu's study had congestive heart failure with associated cardiac disorders, showing the association of phantom tumors and congestive heart failure.

The rapid resolution of opacities resembling masses in the previous studies is considered the hallmark of phantom tumor or vanishing pseudotumor. These studies reported patients with underlying cardiac disease (mainly congestive heart failure), the main risk factor for phantom tumor. Moreover, the patients in these studies were considered elderly, with a greater tendency to experience severe complications from underlying cardiac diseases.^{8,11,12,20} Cardiac diseases, particularly congestive heart failure, may also cause phantom tumors to recur during an exacerbation, as stated by Shaikh, *et al.*¹⁷

However, in this case, the patient was a 29-year-old man with no history of cardiac disease and no risk factors, such as smoking or familial history. Phantom tumors associated with infectious lung disease are uncommon, and due to the rarity of the condition, literature on phantom tumors has been scarce. Furthermore, the phantom tumor in this case was not associated with congestive heart failure but with COVID-19 infection. Since the underlying cause in this case was not congestive heart failure, diuretic therapy was not administered; rather, favipiravir, azithromycin, multivitamins, and symptomatic treatments were administered for the COVID-19 infection. Within five days after the initial chest X-ray that showed mass-like opacity, the patient in this case had a complete resolution on the follow-up chest X-ray. This finding is in line with the nature of phantom tumors based on the previous studies, which is the rapidly resolving condition after appropriate treatment for the underlying cause.

CONCLUSION

A phantom tumor is a rare case and is caused by heart disease and other causes, one of which is COVID-19. The treatment of this disease is based on the underlying disease. Accordingly, the patient in this case received COVID-19 treatments such as antivirals, antibiotics, symptomatic treatments, and multivitamins. Appropriate treatment generally results in rapid radiological improvement. In addition, it is important to

be aware of this condition to avoid inappropriate, expensive, and potentially dangerous misdiagnosis and treatment, which might further harm the patient.

Consent

Written informed consent was obtained from the patient.

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Conflict of Interest

The authors declared there is no conflict of interest.

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Authors' Contributions

Writing the manuscript and collecting data of the patient: FF and WWS. Reviewing and revising: FF, WWS, VL, JM. All authors contributed and approved the final version of the manuscript.

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