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Pandoraea spp. infection in the course of post-COVID pulmonary fibrosis: a rare case report

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ABSTRACT

Pandoraea species are rare, Gram-negative, aerobic bacilli classified in the *Burkholderiaceae* family. They are increasingly recognized as pathogens in both cystic fibrosis (CF) and non-CF patients, frequently associated with chronic pulmonary infections and multidrug resistance. These organisms can cause significant inflammatory responses and exacerbate pre-existing structural lung diseases. A 32-year-old female with a history of allergic asthma presented with had worsening cough, shortness of breath, and fatigue following a COVID-19 infection. Chest computed tomography revealed bilateral fibrotic changes and cystic bronchiectasis, in addition to nodular lesions predominantly in the upper lobes. Bronchoscopy and bronchoalveolar lavage (BAL) were performed. In BAL culture, *Pandoraea* spp. exhibiting sensitivity to amikacin, cefepime, ciprofloxacin, gentamicin, piperacillin, aztreonam, and imipenem were identified. The patient was treated with ciprofloxacin for a month, resulting in significant clinical and radiological improvement and a reduction in inflammatory markers. Post-COVID pulmonary fibrosis can facilitate the proliferation of opportunistic bacterial infections. *Pandoraea* species can exacerbate chronic lung damage and inflammation thru biofilm formation and the induction of pro-inflammatory cytokines (IL-6, IL-8). This case highlights the importance of considering Pandoraea spp. as a potential cause of unresolved pulmonary infections, particularly in patients with pre-existing viral lung damage or bronchiectasis. Although rare, *Pandoraea* infections can complicate post-COVID pulmonary pathology and mimic chronic infection processes. Early microbiological identification and appropriate antimicrobial therapy are crucial for optimal patient outcomes.

Keywords: Bronchiectasis, opportunistic infection, *Pandoraea* species

INTRODUCTION

The genus *Pandoraea* is a Gram-negative, obligately aerobic, rod-shaped bacterium belonging to the *Burkholderiaceae* family.[1] *Pandoraea* species are a recently identified pathogen in patients both with and without cystic fibrosis. *Pandoraea* isolates have been detected in various clinical samples, including blood, sputum, urine, upper respiratory tract, and lung tissue, from patients both with and without cystic fibrosis (CF). These isolates may contribute to respiratory tract infections and other systemic infections, indicating a wide range of clinical presentations.[2] *Pandoraea* species can trigger inflammatory responses by activating the immune system when they encounter lung epithelial cells. Specifically, these bacteria can increase the secretion of interleukin 6 (IL-6) and interleukin 8 (IL-8) in lung tissue. This can lead to tissue damage and an extensive inflammatory response, increasing the infection's severity. Moreover, certain *Pandoraea* isolates possess the ability to traverse the monolayer barrier established by lung epithelial cells in vitro. This condition suggests that the bacteria exhibit a pathogenic property that can cause more serious damage to lung tissue.[3-5] Pandorea species have been shown to be resistant to many antimicrobials, including drugs such as penicillins, cephalosporins, cefoxitin, meropenem, aminoglycosides, and chloramphenicol. Their resistance to fluoroquinolones is inconsistent. This circumstance complicates the treatment of infections induced by *Pandoraea*.[6] This report concerns a patient who visited our clinic with dyspnea and cough resulting from post-COVID acquired bronchiectasis, with respiratory samples revealing the presence of *Pandoraea* spp.

CASE

A thirty-two-year-old female patient presented to our outpatient clinic with a cough, fatigue, and shortness of breath that had been ongoing for many years, particularly increasing in the last two months. The only known condition is allergic asthma, and the patient was not adhering to her medication regimen. There was no history of smoking. The patient's history revealed a COVID-19 infection in February 2022, and with symptoms persisting since that time.

Pulmonary function testing demonstrated mild airflow limitation, with a forced expiratory volume in one second (FEV_1) of 1.88 L, forced vital capacity (FVC) of 2.62 L, and an

FEV_1/FVC ratio of 72%. The bronchodilator reversibility test was negative.The chest X ray showed reticulary and nodullary infiltrations in bilateral lower zones (**Figure 1**).

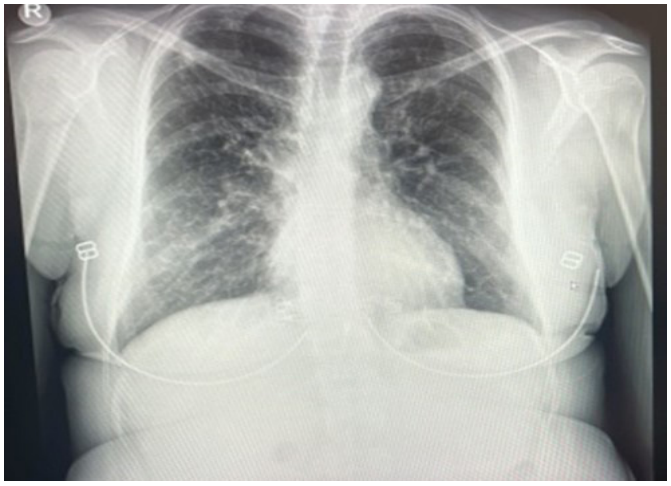

Figure 1. The chest X ray showed reticulary and nodullary infiltrations in bilateral lower zones, February 2022

Upon reviewing the patient's medical history, a CT scan conducted during her outpatient appointment in December 2022 revealed chronic reticular, fibrotic changes in both lung apices, tubular cystic cylindrical bronchiectasis in all lobes of the right lung and the lower lobe of the left lung. Additionally, several pleural-based irregular, limited nodular soft tissue density lesions located in the right lung apex and upper lobe posterior segment. The largest nodule's measures were approximately 27x17 mm (**Figure 2**, **3**).

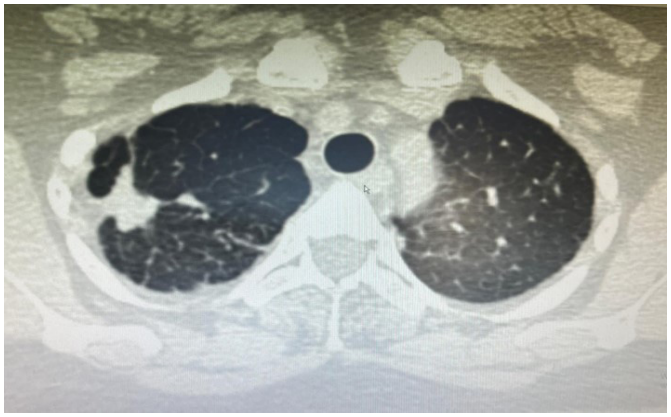

Figure 2. Irregular limited nodular lesions

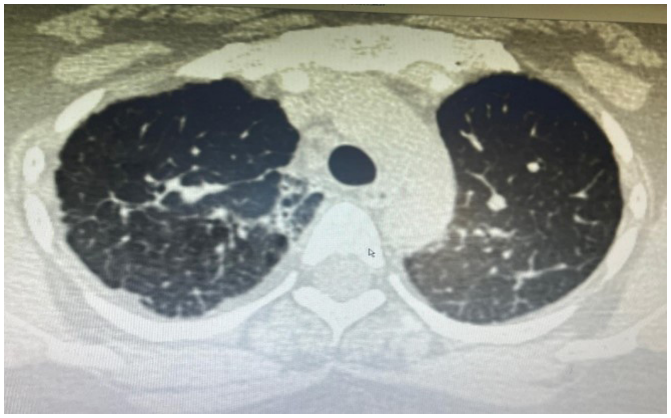

Figure 3. Cystic cylindrical bronchiectasis

There was a 9 mm diameter parenchymal nodule in the right lung lower lobe too. Given the presence of multiple nodular lesions on chest CT, positron emission tomography-computed tomography (PET-CT) was performed to further characterize the lesions and primarily to exclude an underlying malignancy. There were no pathological FDG uptake values in PET-CT report, and it was evaluated as post-COVID fibrosis. The patient was given bronchodilator treatment containing beclomethasone dipropionate and formoterol for mosaic perfusion patterns in parenchyma. An annual nodule follow-up scheduled. High-resolution lung tomography (HRCT) conducted in January 2024. The HRCT revealed that sequelae fibrotic changes in the apical segment of both upper lobes, widespread cystic cylindrical bronchiectasis in the right lung parenchyma, an irregular nodular lesion measuring 27x19 mm in the apical segment of the right upper lobe, and minimal pleural thickening. The patient underwent fiberoptic bronchoscopy (FOB). Chest computed tomography revealed bilateral fibrotic changes and cystic bronchiectasis with additional nodular lesions predominantly in the upper lobes. Because of persistent respiratory symptoms and suspicious radiological findings, bronchoscopy with bronchoalveolar lavage (BAL) was performed for microbiological evaluation and differential diagnosis, including tuberculosis/non-tuberculous mycobacterial infection, fungal infection, opportunistic bacterial pathogens, and malignancy. All bronchi and segments were open and subsegmental orifices were seen as open. No endobronchial lesions were detected. A BAL of right upper lobe was performed outpatiently. BAL samples were submitted for microbiological evaluation. The organism was identified as *Pandoraea* spp. by 16S rRNA gene sequencing, a molecular method widely used for accurate identification of non-fermenting Gram-negative bacteria. The identification was confirmed by the microbiology laboratory based on sequencing analysis. Given the high bacterial burden in BAL culture together with compatible clinical and radiological findings, the isolate was considered indicative of active infection rather than simple colonization. It was found to be sensitive to antibiotics containing amikacin, cefepime, ciprofloxacin, gentamicin, piperacillin, aztreonam, and imipenem. Based on antimicrobial susceptibility testing, the patient was started on oral ciprofloxacin (500 mg twice daily). During follow-up, the patient demonstrated significant improvement in respiratory symptoms, including decreased cough and sputum production, indicating a favorable clinical response to the treatment. A regression was observed in laboratory tests for infection parameters. There was no major differences between 2022 and 2025 chest X rays (**Figure 4**).

DISCUSSION

The literature has shown that respiratory diseases such as atypical pneumonia caused by viruses may damage to lung tissue, and this infection results in abnormal inflammatory responses, persistent lesions, and the development of fibrosis. Specifically, it has been observed that fibrotic lung infection following COVID-19 infection, as in this case, causes symptoms of dyspnea, cough, and fatigue. Studies on the interaction of the *Pandoraea* strain with lung epithelial cells and its in vitro biofilm formation capabilities have shown that it elicits a strong pro-inflammatory response,

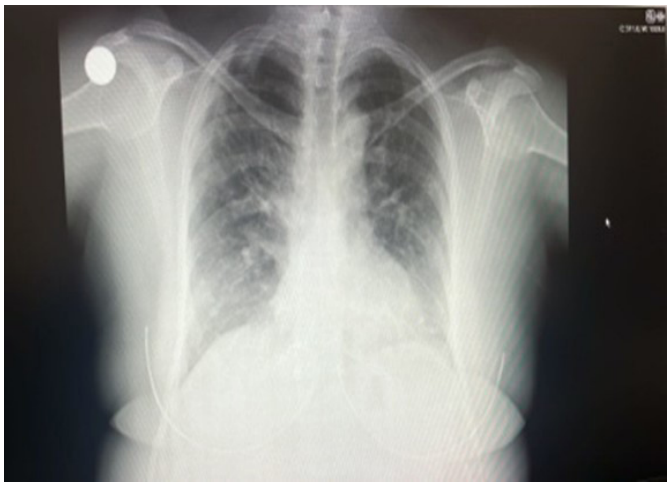

Figure 4. There was no major differences between 2022 and 2025 chest X rays, December 2025

and that *Pandoraea's* inflammatory effects likely exacerbate chronic inflammation resulting from infection with other pathogens, leading to lung damage.[7] This characteristic enables the bacterium to colonize structurally abnormal lung tissue and become resistant to antibiotics, leading to chronic infections. The genetic and phenotypic diversity observed within the *Pandoraea* population during chronic colonization can result in serious clinical consequences, such as evasion of host defenses and treatment failure.[8] In our patient, chronic inflammation after COVID-19 and sequelae changes observed on HRCT were also noted. In this case, in addition to lung pathology following COVID-19, we wanted to show that treating *Pandoraea*, which pathogenesis is not fully understood, is difficult in this group of patient. The pro-inflammatory effects of *Pandoraea*, combined with the inflammatory characteristics triggered by COVID-19 may worsen lung pathology.

CONCLUSION

This case is significant as it represents one of the rare reports of a *Pandoraea* infection developing on a background of post-COVID pulmonary fibrosis. The bronchiectasis and fibrotic changes that developed after the COVID-19 infection created a suitable environment for the proliferation of opportunistic pathogens like *Pandoraea*. Although co-infections with COVID-19 have been previously reported in the literature, our case demonstrates that a *Pandoraea* infection can also present as a condition that mimics or exacerbates the sequelae of structural lung damage occurring in the post-COVID period. This underscores the importance of considering rare bacterial agents in the differential diagnosis, particularly in patients with prolonged respiratory symptoms and radiological progression following a viral infection.

ETHICAL DECLARATIONS

Informed Consent

Written informed consent was obtained from the patient(s) included in this report. Signed consent forms are retained by the authors and are available upon request.

Peer Review Process

This report underwent external peer review.

Conflict of Interest

The authors declare no conflicts of interest.

Financial Disclosure

This case report did not receive any financial support.

Author Contributions

Concept: AY, HL; Design: AY, FİS, DÇ, ÖY; Control: HL, ÖY; Data Collection and/or Processing: AY, FİS, DÇ; Analysis and/or Interpretation: AY, FİS, DÇ, HL, ÖY; Literature Review: AY, FİS; Article Writing: AY, FİS, DÇ, HL; Critical Review: All Authors.

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