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Case Report

Invasive candidiasis presenting bronchiectatic cavity as chest radiological findings: A case report ☆,☆☆

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ABSTRACT

Invasive candidiasis is rare but is associated with high mortality in immunocompromised or critically ill patients. Here, we present a case of a 55-year-old man with untreated diabetes who was diagnosed with coronavirus disease 2019 and subsequently developed invasive candidiasis. The patient presented with fever, tachycardia, and tachypnea. Chest computed tomography revealed multiple consolidations mainly distributed around the bronchovascular bundles with bronchiectatic cavity formation, which initially raised suspicion for invasive pulmonary aspergillosis. However, subsequent testing confirmed *Candida albicans* infection; hence, we changed the antifungal agents effective for invasive candidiasis. This improved the patient's respiratory status, and he was then successfully weaned from mechanical ventilation. This case report highlights the importance of considering invasive candidiasis in the differential diagnosis of patients with bronchiectatic cavities on chest computed tomography, particularly in immunocompromised or critically ill patients with risk factors for invasive candidiasis.

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Introduction

Invasive candidiasis (IC) is rare but is associated with high mortality in immunocompromised or critically ill patients [1]. Radiological findings are necessary for differential diagnosis.

Here, we present a case of IC in a patient presenting with consolidation and bronchiectatic cavity formation on chest computed tomography (CT) that was difficult to differentiate from invasive airway aspergillosis. To the best of our knowledge, this is the first case report of an IC presenting with consolidation and bronchiectatic cavity formation.

Case presentation

A 55-year-old man with a history of untreated diabetes mellitus was diagnosed with coronavirus disease 2019 (COVID-19) at another hospital because of dyspnea. His respiratory condition worsened; he was intubated, mechanically ventilated, and transferred to our emergency department. On admission, the patient had unstable vital signs: febrile (40°C), hypotensive (74/39 mmHg), tachycardic (144 beats per minute), and tachypneic (35 counts per minute), with 95% oxygen saturation at a partial pressure of oxygen/fraction of inspired oxygen ratio of 114 mmHg. Laboratory tests revealed hyperglycemia (blood glucose level, 642 mg/dL; normal range, 65-110 mg/dL), with a hemoglobin A1c level of 15.2% (normal range, 4.6%-6.2%) and elevated C-reactive protein levels (47.8 mg/dL; normal range, <0.3 mg/dL). The initial diagnoses were COVID-19 pneumonia, sepsis, hypovolemic shock, and hyperglycemic hyperosmotic syndrome. Therefore, we initiated extracellular fluid infusion, broad-spectrum antibiotic therapy, continuous insulin infusion, and electrolyte correction. Subsequently, two sets of blood culture specimens drawn on the day of admission yielded *Candida* spp., and laboratory tests revealed elevated serum β-D-glucan (412 pg/mL; normal range, < 20 pg/mL). Therefore, we administered 100 mg/day micafungin (Micafungin Na, NIPRO, Osaka, Japan) as empiric therapy for IC on day 5. Chest CT on day 5 revealed consolidation along the bronchovascular bundle with cavity-like dilated bronchi (bronchiectatic cavity) and centrilobular nodules (Fig. 1). Since the imaging showed pneumonia with airway destruction, invasive pulmonary aspergillosis (IPA) was highly suspected. The antifungal drug was then shifted to the first-line drug, 400 mg/day voriconazole (Vfend, Pfizer, Japan Inc., Tokyo, Japan), on day 7. However, serum *Aspergillus* antigen was negative, and the patient's respiratory condition was not improving until day 13, along with worsening pneumonia on radiographic imaging. Follow-up chest CT on day 14 showed expansion of consolidation and progression of bronchiectatic cavities (Fig. 2). Sputum cultures were re-examined, revealing *Candida albicans* only. Thus, antifungal medication was changed to a combination of 200 mg/day micafungin and 800 mg/day fosfluconazole (Prodif, Pfizer, Japan Inc., Tokyo, Japan) on day 15 to treat the IC and its lung lesions. The patient's respiratory status and inflammatory response improved, and he was successfully weaned from the ventilator on day 23. The patient was transferred to a rehabilitation hospital on day 35 and is now back at work with no recurrences.

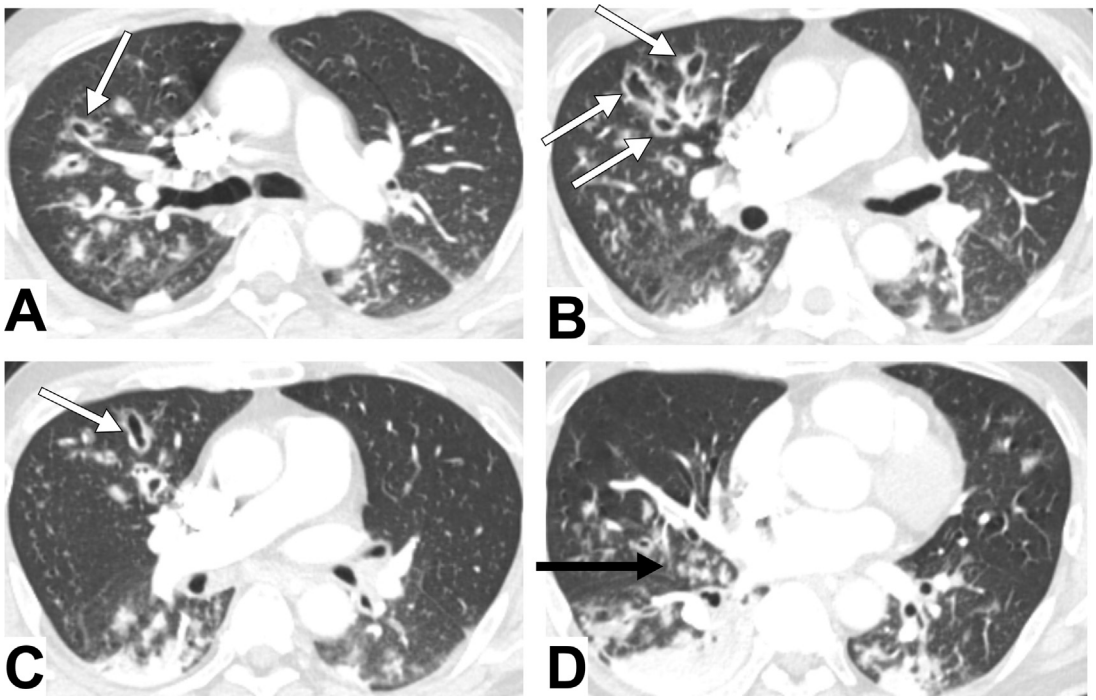

Fig. 1 – Chest computed tomography (CT) on hospital day 5 (A-D). Chest CT shows consolidation with bronchiectatic cavity formation (white arrow) and centrilobular nodules (black arrow).

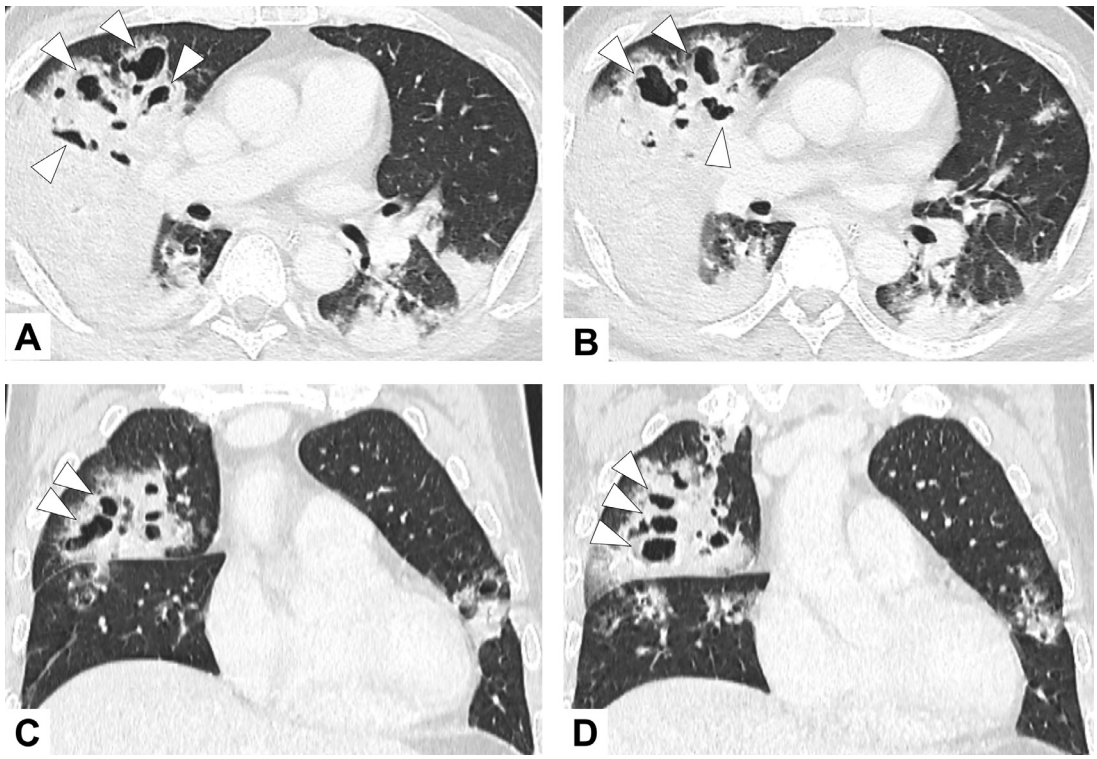

Fig. 2 – Axial (A, B) and coronal-reformatted (C, D) chest CT on hospital day 14. Chest CT shows that multiple bronchiectatic cavity formations have expanded and increased (arrowhead) and bilateral consolidations have exacerbated.

Discussion

This is the first case report on IC manifesting as consolidation and bronchiectatic cavity formation on chest CT. This case aids in identifying IC on chest CT findings.

Candida spp. exist as a normal flora of the human skin, oral cavity, and gastrointestinal tract. It is the fourth most common cause of nosocomial bloodstream infection and the most reported fungus [2,3]. IC is caused by the presence of *Candida* in the bloodstream and is fatal, with a mortality rate of 22%-52% [4–6]. Critical illness, immunocompromised status (eg, having diabetes and malignancy and undergoing chemotherapy), prolonged placement of central venous catheters, and use of broad-spectrum antibiotic agents are risk factors for developing IC [7].

IC presents with pulmonary lesions due to its hematogenous spread. Franquet et al. [8] conducted a multicenter, retrospective, observational study of 17 patients diagnosed with IC who underwent received hematopoietic stem cell transplantation. Chest CT findings were reviewed, revealing the presence of multiple consolidation nodules (15 patients, 88%) as the most common finding. Other findings included ground-glass opacity in six cases (35%), bronchial wall thickening in two cases (12%), and cavitation in one case (6%). They also reported that these findings are similar to those found in other infections (eg, *Staphylococcus aureus, Mycoplasma*, and *Nocardia*) and that it is particularly important to differentiate IPA and mucormycosis. However, bronchiectatic cavities were not described.

Aspergillus spp. can also cause bloodstream infections. *Aspergillus* spp. is usually cleared by airway mucociliary clearance and host immunity. However, this can progress to pulmonary aspergillosis depending on host predisposition, such as allergy, airway lesions, chronic cavitary lung lesions, and immunodeficiency. Findings on chest CT suggestive of IPA included the presence of cavitary lesions and an air-crescent sign.

Souza et al. [9] conducted an international retrospective observational study with a sample size of 54 immunosuppressed patients diagnosed with *Aspergillus* or *Candida* pulmonary infections. This included patients who have hematologic oncologic conditions, those receiving long-term steroids, and those who underwent organ transplants. All 54 patients had some form of immunosuppression; approximately 90% of them had hematological diseases. Chest CT findings were then compared to differentiate IC and IPA. The results showed that while centrilobular nodules and consolidation were more common in *Aspergillus* spp. (26/27 [96%] vs 11/21 [52%], $P < .001$; 27/32 [84%] vs 11/22 [50%], $P < .05$), the halo sign and cavity lesions were useless in differentiating between the 2 (12/32 [37%] vs 11/22 [37%], $P < .001$) (12/32 [37%] vs 7/22 [32%], $P = .7$, 5/32 [16%] vs 1/22 [4%], $P = .3$).

In the present case, chest CT findings of the pulmonary lesions associated with IC included a cavity-like dilated bronchus (bronchiectatic cavity). Considering that COVID-19-associated pulmonary aspergillosis occurs in approximately 10% of patients with COVID-19 and who were attached to ventilators [10], an antifungal drug for IPA was initiated first. However, the diagnosis was eventually revised to pulmonary le-

sions associated with IC based on serum *Aspergillus* antigen negativity and worsening clinical symptoms, which required a change in antifungal medication. Since the patient presented with bronchiectatic cavities, centrilobular nodules, and some tree-in-bud appearance, we added tuberculosis or non-*Mycobacterium tuberculosis* to the differential diagnosis. This was eventually ruled out because it was not detected on bacteriological examination. In previous reports, there have been no cases of IC with chest CT findings such as the present case, making a correct diagnosis based on the radiological findings challenging.

Here, we report a case of IC presenting with bronchiectatic cavities on CT in a patient with diabetes mellitus and COVID-19. Generally, IPA should be suspected first in patients with fungal infections presenting with invasive airway findings on chest CT. However, IC should also be considered when CT findings are observed in critically ill and immunocompromised patients with COVID-19 infection.

Ethical approval

No ethical approval is required.

Patient consent

Written informed consent was obtained from the patient to publish this case report.

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