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Case Report

Diffuse Pulmonary Lesions Due to Invasive Fungal Infection in an Immune-capable Male: A Case Report

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Abstract

Introduction: Invasive fungal pulmonary infection is a fungal illness caused by many species of fungi, including *Aspergillus*, generally presenting as life-threatening hazards to people with compromised immune systems. Although instances in immune-competent individuals are infrequent, a recently published report detailed active lung infection within an immune-competent patient at postmortem. We report a rare instance of invasive fungal infection (IFI) in an immune-capable male, exhibiting diffuse systemic lesions.

Case Report: A 33-year-old male approached our facility, complaining of chest discomfort and dyspnea lasting for 3 months. Upon clinical examination, he looked emaciated and presented with sinus symptoms. A radiographic examination showed indistinct lesions in the lower left lobe of the lung. Bronchoscopy as well as bronchoalveolar lavage (BAL) were conducted, before the commencement of oral antibiotic treatment. The lavage findings were negative for staining techniques (e.g., acid-fast bacilli (AFB)), and culture demonstrated many septate hyphae on the fungal screen. Histopathological analysis of lung tissue (via bronchoscopy) revealed persistent granulomatous inflammation with apical fungal hyphae, diagnostic of aspergillosis. Further cultures confirmed the presence of *Aspergillus fumigatus*, leading us to commence voriconazole treatment. The patient had a notable recovery, evidenced by gaining weight and a recovered appetite within a brief timeframe. His symptoms improved within three months of medication, allowing him to return to almost normal life.

Conclusion: This case underscores the identification of IFI in an immune-capable patient exhibiting extensive nodular lesions throughout the respiratory tract, mediastinum, and belly. Clinicians must uphold a heightened concern for aspergillosis in persistent pneumonia and diffuse nodular lesions, despite patients having no conventional risk factors.

Keywords: fungal infection, aspergillosis, histopathology, radiographic, treatment

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1. Introduction

A fungal infection caused by the *Aspergillus* species is called invasive pulmonary aspergillosis. It is linked to serious infections and complications, particularly in those with compromised immune systems [1]. People with immune deficiencies include individuals with profound neutropenia, recipients of transplants on immunosuppressants, as well as patients with critical illnesses undergoing extended steroid therapy. Invasive Fungal Infection (IFI) is prevalent in individuals who are immunocompromised [2]. Nonetheless, it infrequently manifests in immune-competent people. There are numerous new case reports of IFI in different anatomical regions of immunocompetent individual organs. An immune-competent patient was diagnosed with fulminant lung aspergillosis in an autopsy record from 2018 [1, 3, 4]. Nonetheless, there were no characteristics that could facilitate or exacerbate an infection with fungi in that patient. Researchers documented progressive mediastinal aspergillosis among an immune-competent adult [5]. A study of immune-capable adults with pneumonia revealed a prevalence of IFI at 3.0% [6]. We report an atypical case of numerous lung nodular lumps spreading to the mediastinum as well as abdomen. Illnesses unresponsive to medications should undergo further evaluation, and fungal infections must be considered in our differential diagnoses while managing those patients.

2. Case Report

A 33-year-old male suffered from chest pain and progressive dyspnea for 3 months, with facial pain, swelling, low-grade fever unresponsive to antibiotics, nasal congestion or obstruction, blood-tinged or dark nasal discharge, proptosis (bulging of the eye), and ulceration in the nasal passages. There were chest aches in the middle ribs bilaterally, exacerbated with deep inhalation. Previous healthcare history showed he had fungal sinuses infection. He had consulted several physicians and undergone several regimens of antibiotics. He additionally received two courses of 30 mg/day of prednisolone for a week, but there was no notable deterioration of his symptoms. Consequently, he was brought into our tertiary care healthcare facilities, where a comprehensive evaluation was conducted. The family background revealed no chronic diseases. He refutes any history of smoking or alcohol consumption, being exposed to biomass, pets in his house, dust allergies and seasonal variations, and had no record of tuberculosis or contact with a tuberculosis patient. He also had no other forms of addiction. The patient had no prior exposure to Coronavirus Disease 2019 (COVID-19) caused by the SARS-CoV-2 virus, part of the coronavirus family, and he was vaccinated. Upon assessment, he exhibited a gaunt, slender physique and an unpleasant complexion. His first blood pressure record (BP) was 136/74 mmHg, heart rate was 98 beats/min, as well as respiration rate was 25 breaths/min, body weight 85 kg, 175cm, and BMI was 27.8. He exhibited no fever. The general health checkup revealed pallor, and no lymphadenopathy. There was no cyanosis, diminished volume, or pedal swelling. Chest examination indicated normal vascular breath sounds bilaterally as well as normal heartbeats without any discernible murmurs. The

abdomen was soft, non-tender, and lacked visceromegaly. Examinations of smears revealed the presence of *Aspergillus*, characterized by hyphae and spores, within the lung tissue lesion (Figure **1**). Hyphal filaments are generally discernible using specialized fungal stains such as Gomori methenamine silver (GMS) (Figure **2**). The observed hyphae invaded tissue along with blood vessels, exhibiting septate characteristics, thereby confirming that the tested fungal pathogen is *Aspergillus* sp. (septate hyphae), as supported by published literature. The patient's laboratory findings are presented in Table **1**. The CT scan examination revealed distinctive characteristics attributable to the infection's severity (Figures **3** and **4**). Significant, irregular mucosal thickness across the paranasal sinuses, frequently affecting adjacent sinus pockets, was observed. Chest radiographs demonstrated aspergillosis in the left upper lobe of the lung (Figures **4**a and **4**b). The CT image reveals a thickly walled cavity in the left upper lung lobe, accompanied by pleural enlargement (Figures **4**c and **4**d). The CT scan of the mediastinum revealed a necrotic mass infiltrating the left pulmonary veins as well as left atrium. Asymmetric pleural effusion of fluid was observed (Figures **4**e and **4**f). The CT scan also revealed a thin-walled cavity in the center lobe containing a fungus mass with accompanying lucency. A substantial fluid accumulation with gas bubbles was present in the abdominal pancreatic bed, resulting from an abscess exacerbating acute pancreatitis, accompanied by an inflammation of peripancreatic fat along with gallstones (Figures **4**g and **4**h). These pulmonary lesions may result from the inhalation and ingestion of sinus fluids, potentially causing lower respiratory tract infections and complications associated with aspiration. Based on these results, the ENT and Ophthalmologists examined the patient and administered the amphotericin B rinses (100 µg/mL) two to three times daily for 2 weeks. Simultaneously, voriconazole medication was administered, resulting in marked improvement of the patient's symptoms as well as improved overall quality of life within 3 months, enabling the resumption of everyday activities and no recurrence of symptoms noted.

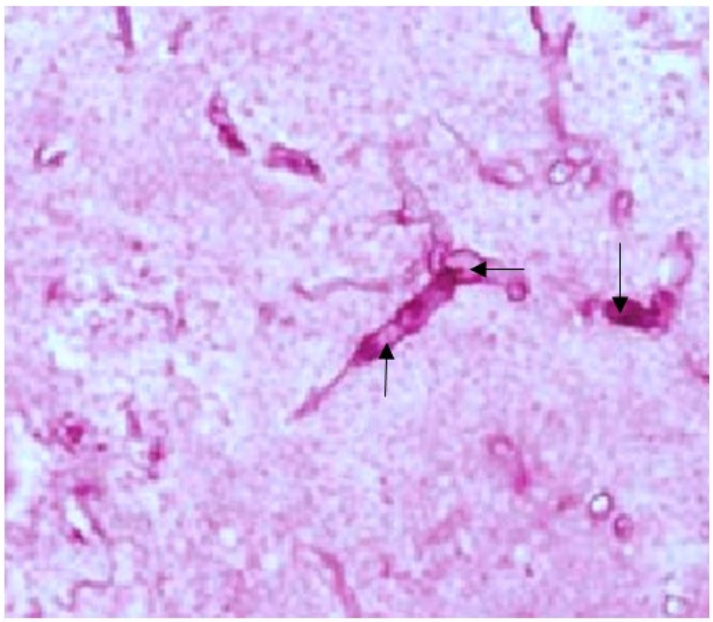

Figure 1: Bland infraction (arrow marks) due to invasive IFI.

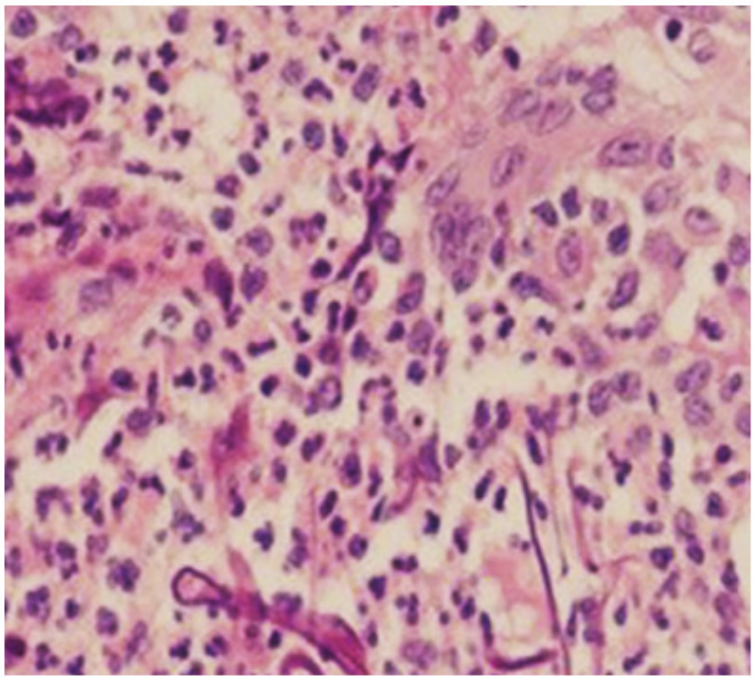

Figure 2: Identification of fungal elements (septate hyphae of *Aspergillus fumigatus*) within pathological tissue sections.

Table 1: Laboratory results for the admitted patient.

Studied parameters	Initial test result	Final test result (after a week)	Reference value (range)
Serum antibody A (IgA) (g/L)	2.31	1.9	0.8-3
Serum antibody G (IgG) (g/L)	9.23	7.2	6-16
Serum antibody M (IgM) (g/L)	1.31	1.1	0.4-2.5
Serum antibody E (IgE) (g/L)	3.95	12.5	1.6-145
Serum creatinine (mg/dL)	0.7	0.7	0.6-1
Serum galactomannan (mg/dL)	0.62	0.59	>0.7 positive
ALT (U/L)	33	29	<35
Hemoglobin (g/dL)	11.9	12.3	11-14
AST (U/L)	31	30	<35
Na (mmol/L)	141	132	135-145
Cl (mmol/L)	99	101	98-106
K (mmol/L)	4.1	3.9	3.5-5.0
White cell count (mmol/L)	15.2	6.9	4.10
β-D-Glucan (pg/dL)	85	76	>80 positive
C reactive protein (mg/dL)	31	11	0-14

Table 1: Continued.

Studied parameters	Initial test result	Final test result (after a week)	Reference value (range)
HCO_3^- (mmol/L)	25	21	20-31
Platelets (mmol/L)	190	196	155-433
HbA1c (%)	5.9	5.6	-
ANA, HIV-ELISA, COVID-19 PCR, ASMA, and AMA	Negative		-

IgA: Immunoglobulin alpha, IgG: Immunoglobulin gamma, IgM: Immunoglobulin mu, IgE: Epsilon, ALT: Elanine aminotransferase, AST: Espartate aminotransferase, Na: Sodium, Cl: Chloride, K: Potassium, HCO_3^-: Bicarbonate, HbA1c: Glycated hemoglobin, ANA: Antinuclear antibody, HIV-ELISA: Human immunodeficiency virus - enzyme-linked immunosorbent assay, COVID-19 PCR: Coronavirus Disease 2019 - Polymerase chain reaction, ASMA: Anti-smooth muscle antibody, and AMA: Anti-mitochondrial antibody.

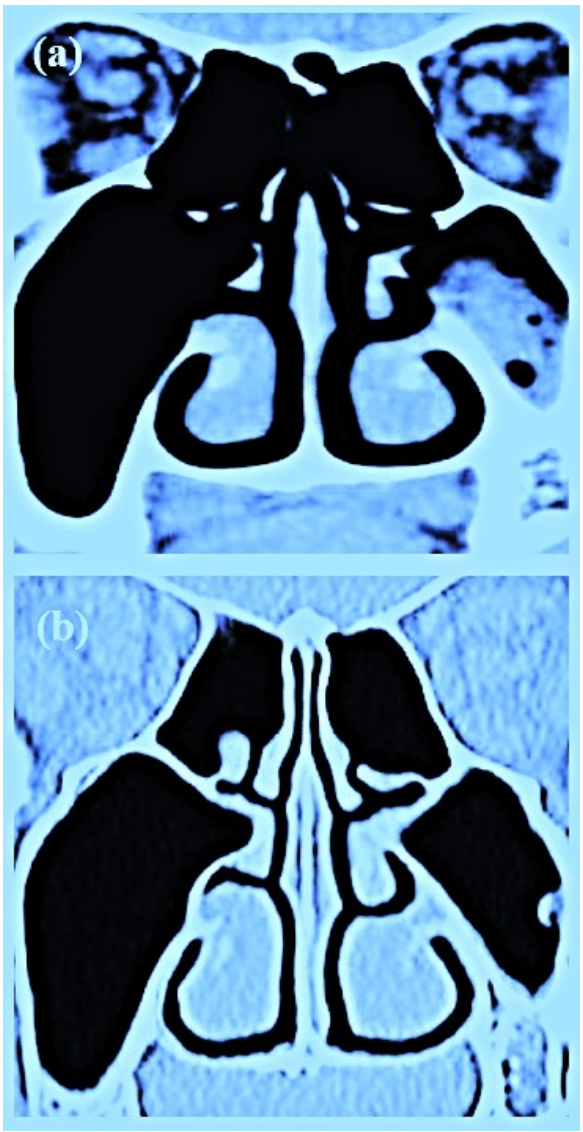

Figure 3: CT scan of invasive IFI of skull sinuses (a) before treatment (b) after treatment.

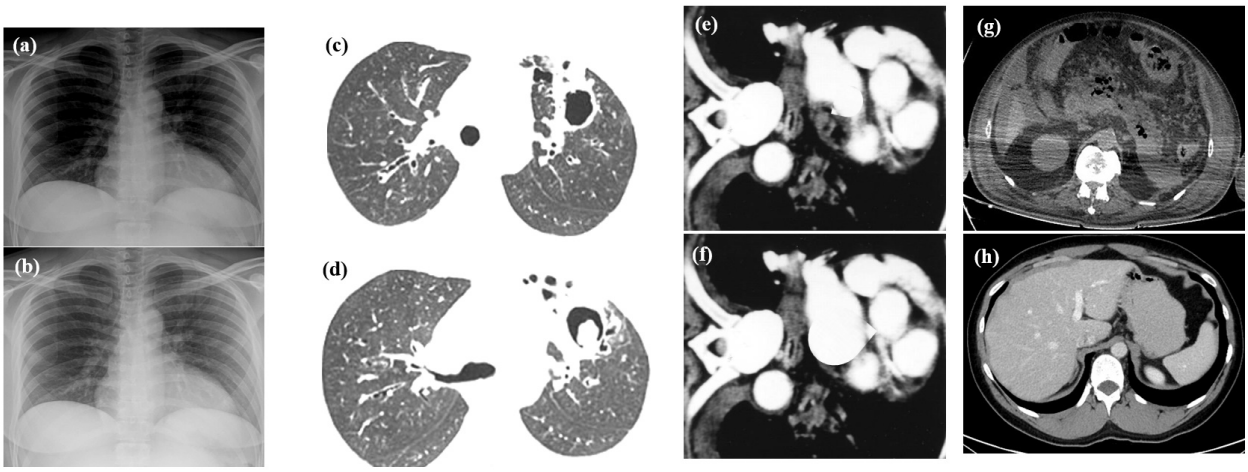

Figure 4: Chest X-ray and CT scan analyses of patient (a) before treatment (CXR) (b) after treatment (CXR) (c) CT scan of lungs before treatment (d) CT scan of lungs after treatment (e) CT scan of mediastinum before treatment (f) CT scan of mediastinum after treatment (g) CT scan of abdomen before treatment (h) CT scan of abdomen after treatment.

3. Discussion

This case report illustrates a young male diagnosed with IFI, marked by many nodules in the lungs (Figures **4**c and **4**d) and invasion of the mediastinal (Figures **4**e and **4**f) as well as abdominal areas (Figures **4**g and **4**h). Although IFI generally manifests in immunocompromised patients, this person exhibited just a short history of corticosteroid usage, rendering immunosuppression an improbable risk factor [7]. The condition can swiftly advance and frequently resemble bronchopneumonia, confounding diagnosis [8]. Principal diagnostic techniques encompassed image processing, mycological cultures, as well as bronchoscopy, which validated the existence of septate hyphae [9]. Voriconazole medication resulted in the complete remission of symptoms within three months. CXR and CT imaging results indicate diffuse transparency and expansion into soft tissue. Microbiological evidence of an invading fungal infection, likely caused by *A. fumigatus*, is more prevalent in immunocompromised people but may also occur in immunocompetent individuals, especially when medical conditions such as diabetes and trauma are present. The occurrence of abrasive invasive fungal lesions in an immunocompetent individual is an uncommon yet critical condition necessitating immediate diagnosis and intervention [10].

4. Conclusion

This case demonstrates the diagnosis of IFI (aspergillosis) in an immunocompetent patient presenting with disseminated nodular lesions in the lung, mediastinum, and belly, underscoring the possibility of IFI arising outside conventional immunocompromised contexts. Clinicians must uphold a heightened suspicion for IFI in instances of persistent pneumonia and diffuse nodular lesions, regardless of patient's conventional risk factors.

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Statement of Ethics

The study was planned, conducted, and reported in accordance with the World Medical Association (WMA) Declaration of Helsinki.

Ethical Statement

The patient provided written informed consent for the publication of this case report. No ethical issues emerged during the study, as it complied with established protocols. A written statement was obtained from the institute's ethical committee.

Patient Informed Consent Statement

Written patient informed consent was obtained from the patient to publish their case and any accompanied images.

Conflict of Interest

The authors declare that there is no conflict of interest.

Artificial Intelligence (AI) Disclosure Statement

AI-unassisted work.

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None.

Author Contribution

N. Radhakrishnan: investigation, data analysis, and writing and reviewing the manuscript. Mathiyazhagan Narayanan: writing and reviewing the manuscript.

Data Sharing Statement

All data generated during this report have been included in the article.

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