ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 8, Issue – 5, October – 2023 , Page No. : 44 – 48

Fungal Co-Infection Due to Invasive Aspergillus fumigatus and Cutaneous Rhizopus Arrhizus in an Immunocompetent Patient with Presentation as Acute Multiorgan Failure and Recurrent Pneumothorax: An Instructive Case

[1]Swapnil Kanire, [2]Anand Malani,[3]Nikhil Akude,

Department of Critical Care, UAIMS, Sangli, Maharashtra, India.

Corresponding Author: Swapnil Kanire, Department of Critical Care, UAIMS, Sangli.

Citation this Article: Swapnil Kanire, Anand Malani, Nikhil Akude, "Fungal Co-Infection Due to Invasive Aspergillus fumigatus and Cutaneous Rhizopus Arrhizus in an Immunocompetent Patient with Presentation as Acute Multiorgan Failure and Recurrent Pneumothorax: An Instructive Case", IJMSIR- October - 2023, Vol – 8, Issue - 5, P. No. 44 – 48.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

We present a case report of a 65-year-old patient with an acute presentation involving multiple organ dysfunction and acute pulmonary disease, diagnosed as a co-infection of invasive aspergillosis and cutaneous rhizopus. The only risk factor for invasive fungal disease was de novo diabetes. He had a rapid progression of illness, leading to a life-threatening situation upon presentation to our casualty. To the best of our knowledge, this is the first reported case of a rapidly fatal dual infection with Aspergillus and Rhizopus presenting with hepatitis, AKI, recurrent pneumothorax due to cavitatory lung disease, and osteomyelitis. Our case highlights the role of de novo diabetes as a risk factor for invasive fungal disease in patients without traditional risk factors like hematological malignancies, solid organ transplantation, or uncontrolled diabetes. We successfully managed the case with aggressive antifungal therapy, an intercostal chest tube with negative suction pressure for recurrent pneumothorax, and surgery for cutaneous Rhizopus Arrhizus.

Conclusion: Invasive fungal infections must be considered as emergent infections in critical patients, including previously immunocompetent hosts. They are associated with high mortality despite adequate and timely therapy. The present case illustrates the need for timely diagnosis of invasive fungal coinfections and supportive multidisciplinary tertiary care measures to limit the morbidity and mortality associated with this rare but potentially life-threatening condition.

Keywords: Invasive Aspergillus, Rhizopus Arrhizus, Multiorgan Failure, De Novo Diabetes, Recurrent Pneumothorax.

Introduction

Mucormycosis and invasive aspergillosis infections are aggressive fungal infections with a high mortality rate. These infections generally affect patients with risk factors such as immunosuppression, untreated diabetes mellitus, kidney diseases, hematological malignancies, or major trauma [1–3]. Invasive aspergillosis most commonly involves the lungs. In the presence of angio-invasive disease, Aspergillus spp. can disseminate beyond the respiratory tract to multiple different organs, including the

skin, brain, eyes, liver, and kidneys. The most common clinical form of mucormycosis is rhinocerebral, and Rhizopus is the etiological agent in 70% of reported cases [2,7]. Invasive disease is most frequent when there is a high amount of airway exposure, for instance, in the setting of construction [8]. Cutaneous mucormycosis accounts for less than 10% of cases [9] and remains a rare infection in the immunocompetent population [10]. In ICU patients, invasive aspergillosis may potentially affect multiple organs and evolve into disseminated disease, which remains largely underdiagnosed and is associated with poor outcomes [11]. We report a case of invasive aspergillosis and cutaneous mucormycosis co-infection in a male patient with no obvious predisposing factors presenting with life-threatening multiorgan failure.

Case

A 65-year-old male patient with no prior comorbidities presented to the emergency room in February 2023 with an 8-day history of febrile illness, jaundice, and decreased appetite. The patient reported repeated inhalation of soil particles while working on a farm. Upon arrival, the patient was in shock and a drowsy state, with hypoxia, and was started on oxygen. The provisional diagnosis was tropical illness and sepsis. After resuscitation in the emergency room, the patient was shifted to the ICU. In the ICU, the patient exhibited blackening of his right thumb, with lab reports revealing neutrophilic leukocytosis, creatinine of 2.2 mg/dl, bilirubin at 10.2mg/dl, procalcitonin at 2.7 ng/ml, and a raised INR of 1.7. Tropical infection workup was negative, and HbA1c was at 7.2%. The patient was started on empirical antibiotics and received supportive care. Nephrologist and hepatologist opinions were sought.

During the patient's stay in the ICU, there were multiple episodes of mild hemoptysis. An HRCT of the chest revealed bilateral extensive cavitatory lung disease. Blood culture was negative, urine culture grew pseudomonas, and fungal candida was identified in sputum. The patient experienced another massive hemoptysis episode. A repeat HRCT showed no new changes. A chest medicine opinion was obtained, bronchoscopy was performed, and a BAL sample was sent for analysis. BAL culture revealed Aspergillus fumigatus. IgE and aspartate levels were checked and found to be highly elevated.

Routine lab tests were conducted regularly. AKI and jaundice improved slowly. Autoimmune, vasculitis, and Doppler studies of the blackened right thumb revealed normal results. Sepsis gradually resolved, initially managed with cefoperazone-sulbactam and later escalated to meropenem based on procalcitonin and TLC levels.

Fluconazole was initiated initially due to the presence of candida in the sputum and was later changed to IV voriconazole for 7 days, followed by oral voriconazole for 4 weeks.

The patient's clinical condition improved, and he was hemodynamically stable. He was shifted to a step-down ICU where he experienced a sudden onset of breathlessness. Chest radiography revealed pneumothorax, and an emergency ICD was placed.

After further improvement, the patient was shifted to a private room, where he experienced a second pneumothorax. A causative factor was identified on a repeat HRCT, showing a peripheral cavity. An ICD was kept in place for an extended duration with home-assisted constant negative suction pressure, which led to significant resolution. A follow-up HRCT performed in the outpatient setting revealed complete resolution of the pneumothorax.

At the patient's first outpatient follow-up, a plastic surgeon's opinion was obtained for the blackened right thumb. An X-ray of the hand revealed osteomyelitis in the same area. Debridement and amputation were performed,

and the culture revealed Rhizopus Arrhizus. The patient was treated with oral is valconazole for four weeks, resulting in overall improvement.

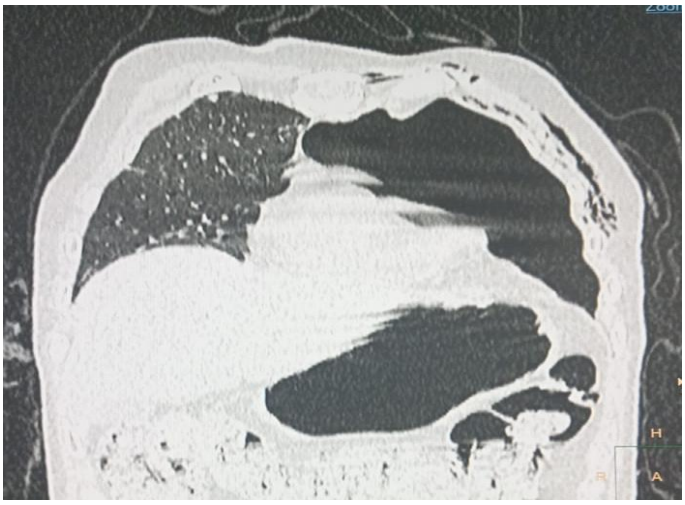

Figure 1: Left sided Massive Pneumothorax.

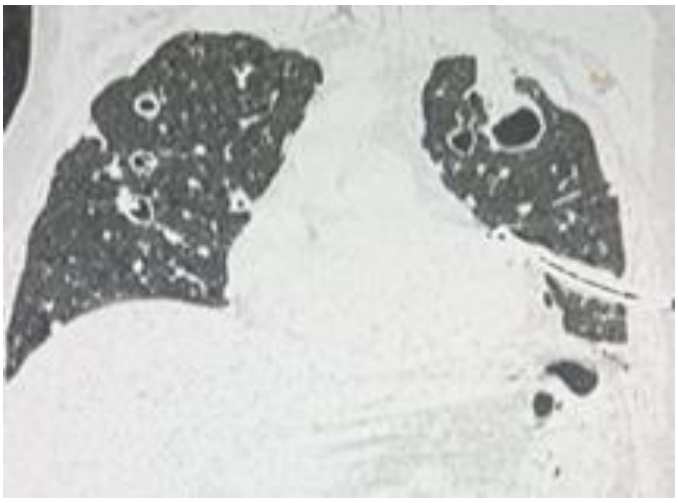

Figure 2: Resolution of pneumothorax, ICD in situ .

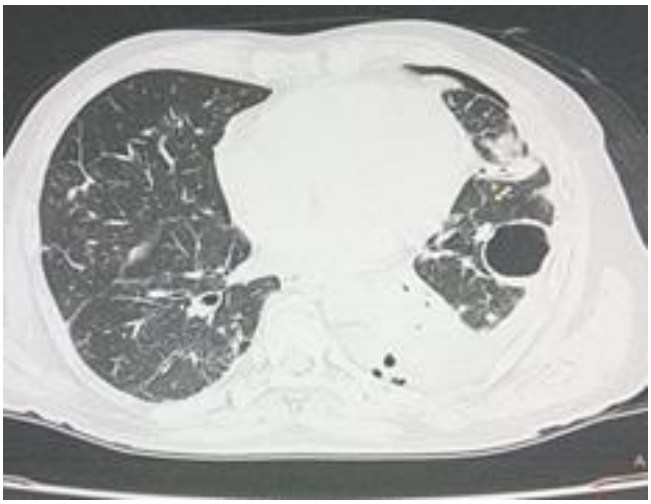

Figure 3:Peripheral located cavity.

Discussion

Aspergillus and Rhizopus species are soil inhabitants. Human infection occurs via the respiratory tract by inhaling spores. The development of invasive disease depends on the inoculating dose, host immunity, and the virulence of the organism [12-13]. Sputum or tissue from patients with invasive Aspergillus infection reveals narrow (2–5 micron diameter) septate hyphae branching at 45° angles. Aspergillus fumigatus accounts for approximately 90% of human Aspergillus infections. Invasive Aspergillosis almost always occurs in patients with seriously compromised immune systems, such as those with hematological malignancies, transplant recipients, or congenital immunodeficiency. However, there have been increasing reports of cases of invasive pulmonary aspergillosis (IPA) in patients in the ICU without any of the above risk factors [14-17].

CNS and pulmonary mucormycosis are aggressive fungal infections in humans and carry a very high mortality risk [18]. It is most commonly associated with diabetic ketoacidosis. Rhizopus is the most common genus associated with mucormycosis [19].

Invasive fungal infections typically have a nonspecific and insidious disease course. The gold standard for diagnosis involves histopathological demonstration via tissue biopsy. However, newer testing modalities, such as serum biomarkers galactomannan and beta-D-glucan assays, and sputum, blood, and bronchoalveolar lavage (BAL) specimens for fungal staining and culture, are widely used now. The diagnostic value of both Fungitell and galactomannan has been studied in various meta-analyses and has been shown to have high negative predictive value and specificity with low sensitivity [20]. Therefore, the results of these biomarkers should be interpreted in conjunction with clinical and radiographic findings.

The principal risk factor for mucormycosis in India is uncontrolled diabetes mellitus [21]. As the epidemiology of invasive fungal disease is changing, our case illustrates that new-onset diabetes is an emerging risk factor for invasive fungal disease.

It should be noted that infections in soil-inhaler farmers are often polymicrobial, with most patients suffering from bacterial infections. Mycoses could be underdiagnosed due to their similarity to bacterial infections, particularly during the early stages of infection.

Our patient was successfully managed with a new chest drainage system with automatic constant negative suction pressure for recurrent pneumothorax.

Our case presentation in a life-threatening situation in the casualty initially raised the suspicion of tropical illness or bacterial sepsis, as the patient's family denied any prior medical comorbidities. However, the diagnosis was confirmed as invasive fungal coinfection of Aspergillus fumigatus and Rhizopus Arrhizus. The patient responded well to in-hospital treatment with oral voriconazole and isavuconazole during outpatient follow-up.

We believe our case is unique as it highlights the potential for multiple organ failure to mask advanced invasive pulmonary.

Conclusion

Invasive fungal infections must be considered emergent infections in critical patients, even in those who were previously immunocompetent. These infections are associated with high mortality despite adequate and timely therapy. Our case illustrates the need for timely diagnosis of invasive fungal coinfections and the importance of supportive multidisciplinary tertiary care measures to limit the morbidity and mortality associated with this rare but potentially life-threatening condition.

References

1. Bouza, E.; Muñoz, P.; Guinea, J. Mucormycosis: An emerging disease? Clin. Microbiol. Infect. 2006, 12, 7–23.
2. Farmakiotis, D.; Kontoyiannis, D.P. Mucormycoses. Infect. Dis. Clin. N. Am. 2016, 30, 143–163.
3. Chermetz, M.; Gobbo, M.; Rupel, K.; Ottaviani, G.; Tirelli, G.; Bussani, R.; Luzzati, R.; Di Lenarda, R.; Biasotto, M. Combined Orofacial Aspergillosis and Mucormycosis: A Fatal Complication of a Recurrent Pediatric Glioma—Case Report and Review of Literature. Mycopathologia 2016, 181, 723–733.
4. Alcazar-Fuoli, L.; Mellado, E.; Alastruey-Izquierdo, A.; Cuenca-Estrella, M.; Rodriguez-Tudela, J.L. Aspergillus Section Fumigati: Antifungal Susceptibility Patterns and Sequence-Based Identification. Antimicrob. Agents Chemother. 2008, 52, 1244–1251.
5. Lamoth, F. Aspergillus fumigatus-Related Species in Clinical Practice. Front. Microbiol. 2016, 7, 683.
6. Walther, G.; Wagner, L.; Kurzai, O. Updates on the Taxonomy of Mucorales with an Emphasis on Clinically Important Taxa. J. Fungi 2019, 5, 106.
7. Roden, M.M.; Zaoutis, T.E.; Buchanan, W.L.; Knudsen, T.A.; Sarkisova, T.A.; Schaufele, R.L.; Sein, M.; Sein, T.; Chiou, C.C.; Chu, J.H.; et al. Epidemiology and Outcome of Zygomycosis: A Review of 929 Reported Cases. Clin. Infect. Dis. 2005, 41, 634–653.
8. Invasive disease is most frequent when there is a high amount of airway exposure, for instance, in the setting of construction.
9. Verma R, Nair V, Vasudevan B, et al. Rare case of primary cutaneous Mucormycosis of the hand caused by Rhizopus microsporus in an immunocompetent patient. Int J Dermatol 2014;53:66–9.

10. Lineberry KD, Boettcher AK, Blount AL, et al. Cutaneous mucormycosis Of the upper extremity in an immunocompetent host: case report. J Hand Surg Am 2012;37:787–91.
11. Dimopoulos G, Piagnerelli M, Berré J, Eddafali B, Salmon I, Vincent JL.Disseminated aspergillosis in intensive care unit patients: an autopsy study.J Chemother. 2003;15:71–5.
12. Meersseman W, Vandecasteele SJ, Wilmer A, et al. Invasive aspergillosis in critically Ill patients without malignancy. Am J Respir Crit Care Med 2004;170:621–5.
13. Petrikkos G, Skiada A, Lortholary O, et al. Epidemiology and clinical manifestations Of mucormycosis. Clin Infect Dis 2012;54(Suppl 1):S23–34.
14. Rello J, Esandi M, Mariscal D, et al. Invasive pulmonary aspergillosis in patients With chronic obstructive pulmonary disease: report of eight cases and review. Clin Infect Dis 1998;26:1473–5.
15. Muquim A, Dial S, Menzies D. Invasive aspergillosis in patients with chronic Obstructive pulmonary diseases. Can Respir J 2005;12:199–204.
16. Ader F, Nseir S, Le Berre R, et al. Invasive pulmonary aspergillosis in chronic Obstructive pulmonary disease: an emerging fungal pathogen. Clin Microbiol Infect 2005;11:427–9.
17. Bulpa P, Dive A, Sibille Y. Invasive pulmonary aspergillosis in patients With chronic obstructive pulmonary disease. Eur Respir J 2007;30:782–800.
18. McCarthy M, Rosengart A, Schuetz AN, et al. Mold infections of the central Nervous system. N Engl J Med 2014;371:150–60.
19. Ibrahim A, Spellberg B, Walsh T, et al. Pathogenesis of mucormycosis. Clin Infect Dis 2012;54(Suppl 1):S16–22.
20. Patterson TF, Thompson GR 3rd, Denning DW, et al. Practice Guidelines for the Diagnosis and Management of Aspergillosis: 2016 Update by the Infectious Diseases Society of America. Clin Infect Dis 2016; 63:e1.
21. Chakrabarti, A.; Das, A.; Mandal, J.; Shivaprakash, M.R.; George, V.K.; Tarai, B.; Rao, P.; Panda, N.; Verma, S.C.; Sakhuja, V. The Rising trend of invasive zygomycosis in patients with uncontrolled diabetes mellitus. Med. Mycol. 2006, 44, 335–342.