**Mucormycosis - The deadly fungus – A case report with dental perspective**

**Rakashree Chakraborty¹, Divya Pandya², Priyanka Dausage³, Ashmita K. Chawla⁴**

¹Department of Oral Medicine and Radiology, Maharishi Markandeshwar College of Dental Sciences and Research, Maharishi Markandeshwar (Deemed to be University), Ambala, Haryana, ²Department of Oral Medicine and Radiology, Kusum Devi Sundarlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal, ³Department of Pedodontics and Preventive Dentistry, Hitkarini Dental College and Hospital, Medical University Jabalpur, ⁴Department of Oral Medicine and Radiology, Sri Aurobindo College of Dentistry, Medical Science University (MPMSU), Indore, Madhya Pradesh, India

**Abstract**

Mucormycosis is a fungal infection caused by members of Mucorales and zygomycotic species. These are saprophytes known as Mucormycotina that grow from rotten matter or soils during the decomposition of soil. It has been seen affecting many COVID-19-affected patients recently in India. Mucormycosis can be diagnosed in six different sites depending on the immunological status and the site of the body affected. The six manifestations are rhinocerebral, pulmonary, cutaneous, gastrointestinal, and central nervous system or disseminated forms. Here, we present a dental case of mucormycosis or black fungus disease that has affected an immune-compromised patient who had suffered from COVID-19 2 months ago. Surgical debridement was done and the histopathologic study revealed fungal hyphae. Systemic antifungal therapy was administered that helped the patient to recover in 7-week time.

**Keywords:** Antifungal drugs, black fungus, diabetes mellitus, immunocompromised condition, mucormycosis, non-septate hyphae

**Introduction**

The first case of mucormycosis was described as Mycosis Mucorina in 1885 by German pathologist Paltauf.¹ There has been an exponential rise in the number of cases of mucormycosis during 1980 and 1990 and were observed in immuno-compromised patients.² A prevalence study reported that infection amplification was 7.4% per year.³ The most common type is rhinocerebral mucormycosis accounting for 30% to 50%.⁴

*Etiopathogenesis:* Mucorales cause disease by ingestion or inhalation of spores and percutaneous injection of spores into deep tissues. When the spores penetrate, initially the first line of defense in the healthy host is capable of destroying the spores via oxidative metabolites and cationic peptides.⁵ Risk factors include uncontrolled diabetes mellitus, steroid use, extremes of age, neutropenia, AIDS, renal insufficiency, organ or stem cell transplantation, iron overload, and malnutrition.⁶

The aim of this case report was to present a patient with mucormycosis with intraoral findings to emphasize the need...
Case Report

A 38-year-old woman residing in Kolkata, West Bengal, reported to the dental outpatient department (OPD) with a chief complaint of tooth mobility in the upper left posterior region of the jaw with pain in the left eye for 5 days. Further history revealed that she suffered from COVID-19 2 months back and was admitted for the same for 6 weeks is now recovering. The patient gave a history of nasal stuffiness and breathing obstruction since then. The patient was a diabetic for 14 years and is under regular medication. On general examination, the patient was well oriented to time, place, and person. All the vital signs were within normal limits.

On extra-oral examination, there was a diffused swelling on the left side of the face extending anteroposteriorly from ala of the nose to the tragus of the ear and superoinferiorly from the inferior orbital margin to the upper lip line, measuring approximately 3 × 4 cm with a smooth surface, ill-defined margins with an erythematous overlying surface. On palpation, all inspector’s findings were confirmed. Consistency was soft and tender with no bleeding or pus discharge extra orally.

On intra-oral examination, multiple irregular ulcers were present on the hard palate and the buccal vestibule bilateral of size 1.5 by 1 cm approximately [Figure 1]. Pus discharge on manipulation was present. Tooth mobility, grade II was present from 23 to 27 regions. On palpation, the patient experienced pain on the left buccal vestibule. On intra-nasal examination, there was no evidence of any ulcers or any blood crustrations.

Based on the history and clinical examination, a provisional diagnosis of lethal midline granuloma was given. The patient was advised for blood examination, biopsy, and computed tomography (CT) of mid-face.

The blood examination revealed random blood glucose levels of 17 mmol/L, white blood cell count of 29 × 10⁹/L, neutrophil count of 82%, and a platelet count of 521 × 10⁹/L. The sodium level was 138 mmol/L and the potassium level was 4.4 mmol/L. The renal function test revealed that the urea concentration was 5.2 mmol/L and the creatinine value was 120 μmol/L. The total serum protein was 64 g/L.

The CT scan of the patient showed soft tissue opacification in the left maxillary sinus along with mucosal thickening of the right maxillary sinus. There was marked soft tissue obliteration of the maxillary sinuses with bony destruction of the medial wall of the maxillary sinuses and nasal septum. The chest radiograph was not significant [Figure 2].

After the biopsy, the histopathological report revealed non-septate hyphae, which are consistent with mucormycosis [Figure 3].

The patient was then admitted immediately and was placed on intravenous antibiotics and intravenous fluid to prevent dehydration. Then, surgical debridement of necrotic tissues of the hard palate and an obturator was then delivered.

The management was a combined effort of the maxillofacial surgeon, the prosthodontic team, doctors from the department of ophthalmology, and the plastic surgery team. This was followed by the administration of systemic antifungals (ketoconazole) and amphotericin B. There has been much improvement observed in the patient in 7 weeks and is under regular check-ups.

Discussion

Mucormycosis is an opportunistic fulminant fungal infection caused by saprophytic fungi. Rhizopus is the chief pathogenic mycotic organism in cases with rhinocerebral mucormycosis. According to Brown, mucormycosis ranked third among opportunistic deep fungal infections, after candidiasis and aspergillosis.
It is transmitted by air-borne asexual spores and invades the tissue of patients with reduced host defenses via the respiratory tract, injured skin, or percutaneous route. They proliferate in the walls of blood vessels particularly paranasal sinuses (as was seen in our case), lungs, or gut, and cause infarction and necrosis of the tissue distal to the blocked vessels. Increased levels of free iron present in diabetic patients assist the growth of these organisms.\[7,9\]

The clinical presentations of mucormycosis are classified on the basis of anatomic localization, such as rhino-orbital-cerebral (ROCM), pulmonary, gastrointestinal, cutaneous, renal, and disseminated mucormycosis.\[10\]

Rhino-orbital-cerebral mucormycosis originates in the paranasal sinus and gets extended to the brain. Extension to the eyes is possible leading to complete blindness. From the eyes, it can progress toward the central nervous system resulting in cranial neuropathies or cerebral abscesses.\[7,8\]

Oral mucormycosis without any other systemically compromised organs is quite uncommon. In our case, the patient had both a debilitating condition resulting from type-I diabetes and an acute inflammatory immune response due to COVID-19.\[9\] Cytopathology, histopathology, and cultures were done to confirm the diagnosis with contrast-enhanced CT, which is useful in defining the extent of the disease. Sinus CT is the preferred imaging modality, bony destruction is often seen only late in the course of the disease. Magnetic resonance imaging (MRI) is useful in identifying the intradural and intracranial extent of the disease, cavernous sinus thrombosis, or thrombosis of the cavernous portion of the internal carotid artery. Perineural spread of the disease can also be demonstrated with a contrast-enhanced MRI scan.\[7\]

Aggressive medical treatment with conventional antifungals is the cornerstone for successful treatment. Polymyxins such as amphotericin-deoxycholates are the primary therapeutic agents for mucormycosis. Close monitoring of serum electrolytes, such as polyenes, is essential.\[7\] Non-conventional therapeutic agents such as antidiabetics, iron-chelating agents, statins, granulocyte transfusions, cytokines, and hyperbaric oxygen have increased the survival rates up to 94%.\[9,11\] Prevention always remains the gold standard.\[12,13\]

**Conclusion**

Co-infections in patients with COVID-19 are an emerging concern, especially because of their complex diagnosis, severity, and increased mortality. Early diagnosis is the best way to manage oral mucormycosis, along with the reversal of the underlying predisposing risk factors and systemic disorders. Surgical debridement and prompt administration of antifungal agents give a better prognosis.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Mohammadi R, Nazeri M, Sayedayn SM, Ehteram H. A successful treatment of rhinocerebral mucormycosis due to Rhizopus oryzae. J Res Med Sci 2014;19:72-4.
2. Roden MM, Zaoutis TE, Buchanan WL, Knudsen TA, Sarkisova TA, Schaufele RL, et al. Epidemiology and outcome of zygomycosis: A review of 929 reported cases. Clin Infect Dis 2005;41:634-53.
3. Bitar D, Van Cauteren D, Lanternier F, Dannaoui E, Che D, Dromer F, et al. Increasing incidence of zygomycosis (mucor- mycosis), France, 1997-2006. Emerg Infect Dis 2009;15:1395-401.
4. Mallis A, Mastronikolis S, Nasakis S, Papadas A. Rhinocerebral mucormycosis: An update. Eur Rev Med Pharmacol Sci 2010;14:987-92.
5. Waldorf AR. Pulmonary defense mechanisms against opportunistic fungal pathogens. Immunol Ser 1989;47:243-71.
6. Rammers B, Lanternier F, Poirié S, Kania R, Lortholary O. Diabetes and mucormycosis: A complex interplay. Diabetes Metab 2012;38:193-204.
7. Pandey A, Kaur G. Mucormycosis revisited: Case report with review of literature. J Dent Spec 2020;8:39-44.
8. Santosh ABR, Muddana K, Bakki SR. Fungal infections of oral cavity: Diagnosis, management, and association with COVID-19. SN Compr Clin Med 2021;3:1373-84.
9. Skiada A, Lass-Floerl C, Klimko N, Ibrahim A, Rollides E, Petrikkos G. Challenges in the diagnosis and treatment of mucormycosis. Med Mycol 2018;56(Suppl 1):S93-101.
10. Prakash A, Chakrabarti A. Epidemiology of mucormycosis in India. Microorganisms 2021;9:523.
11. Selarka L, Sharma S, Saini D, Sharma S, Batra A, Waghmare VT, et al. Mucormycosis and COVID-19: An epidemic within a pandemic in India. Mycoses 2021;64:1253-60.
12. Bhatt K, Agolli A, Patel MH, Garimella R, Devi M, Garcia E, et al. High mortality co-infections of COVID-19 patients: Mucormycosis and other fungal infections. Discoveries (Craiova) 2021;9:e126.

13. Mitaka H, Kuno T, Takagi H, Patrawalla P. Incidence and mortality of COVID-19-associated pulmonary aspergillosis: A systematic review and meta-analysis. Mycoses 2021;64:993-1001.
Multiple tuberculomas and cavitating pulmonary tuberculosis in an infant

Rachel Ranitha Peterson¹, R. Ramya¹, Asha Kuruvilla², K. S. Lakshmi¹

Departments of ¹Pediatrics and ²Radiology, Bangalore Baptist Hospital, Bengaluru, Karnataka, India

Abstract

A five-month-old infant presented with fever and cough for 3 weeks. She was diagnosed with multiple tuberculomas and cavitating pulmonary tuberculosis. She was a household contact of an open case of tuberculosis (TB) and developed severe disease, although she had received the Bacillus Calmette–Guérin (BCG) vaccine and had no primary or secondary immunodeficiency. In infants, due to low levels of cell mediated immunity, tuberculosis can be severe and dissemination of tuberculosis to the central nervous system (CNS) can occur very early without following the usual time frame. CNS TB may not have symptoms in the early stages in infants and may require neuroimaging for diagnosis. This is the youngest child that has been reported with multiple CNS tuberculomas.

Keywords: Cavitary tuberculosis, CNS tuberculosis, infant, miliary tuberculomas, tuberculomas

Introduction

Multiple tuberculomas and cavitating pulmonary tuberculosis are rarely seen in infancy. We report the youngest child with multiple tuberculomas in the brain and discuss some less-known aspects of TB in infants.

Case History

A five-month-old infant was admitted to our hospital with fever and cough for 3 weeks. She was treated for left upper lobe pneumonia with intravenous antibiotics in a local hospital with minimal improvement.

She was the only child born to non-consanguineous parents and was exclusively breastfed. She received the BCG vaccine at birth; however, BCG vaccine scar was absent. Her paternal grandfather was on treatment for open pulmonary TB.

Investigations revealed hemoglobin at 6.9g%, TC at 15,300 cells/cu mm (N 20%, L 62%), CRP at 62.8 mg/L, and ESR at 55 mm at 1 hour. Liver function tests and serum creatinine were normal. Chest X-ray showed left upper lobe consolidation with a cavity and bilateral miliary infiltrates. Computed tomography (CT) of the chest confirmed left upper lobe and lingular consolidation with multiple cavities in the left upper lobe and diffuse miliary tubercles [Image 1]. Ultrasound abdomen showed moderate hepatosplenomegaly. TB-PCR on the gastric aspirate was positive. Bone marrow biopsy was normal. She was diagnosed with disseminated TB.

In view of disseminated TB, magnetic resonance imaging (MRI) of the brain was done which revealed multiple small enhancing nodules in bilateral cerebral hemispheres, pons, and cerebellar...

Upon examination, she was pale, febrile and in respiratory distress, requiring two liters of oxygen. Liver was palpable 6 cm below right costal margin and spleen 5 cm below left costal margin. Other systemic examination was unremarkable. With a provisional diagnosis of severe pneumonia, she was started on intravenous antibiotics.

Keywords: Cavitary tuberculosis, CNS tuberculosis, infant, miliary tuberculomas, tuberculomas

How to cite this article: Peterson RR, Ramya R, Kuruvilla A, Lakshmi KS. Multiple tuberculomas and cavitating pulmonary tuberculosis in an infant. J Family Med Prim Care 2022;11:1536-8.