Review Article

Mucormycosis: Devouring the Compromised

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Abstract

Rhino-orbital-Cerebral-mucormycosis (ROCM) has posed as a common post COVID fungal infection in India. It is a lethal, opportunistic, angio-invasive infection affecting the brain and paranasal sinuses caused by fungi of the order Mucorales. Even though this fungus is ubiquitous, the immune system usually prevents the disease. But in the covidien and post covidien period, Mucormycosis has become prevalent among immunocompromised individuals with systemic pathosis like Diabetes, HIV, predominantly due to the massive use of steroids in combating SARS-CoV-2 infection.This review aims to put forward an insight into post-Covid Mucormycosis and our role as Oral Physicians to combat this deadly fungus. [2025, 6(1): 37-39]

Keywords: Mucormycosis, Phycomycetes, Rhino-orbital-cerebral mucormycosis, Sporangiospores.

Introduction

This disease may actually be caused by numerous Phycomycetes organisms of the Eumycetes (true fungi) class characterized by lack of septation (coenocytic). The three most important types causing infection in man are Rhizopus,Mucor and Absidia. Worldwide in distribution, the organism is found in soil,manure,fruits and in decaying matter. These organisms are present in the nasal passages and oral cavities of normal persons. This is an opportunistic infection associated with debilitation and is becoming more frequently recognized as a secondary occurrence in cancer patients, especially those with any of the malignant lymphomas and in patients having renal failure, organ transplant, AIDS, and cirrhosis. It is also especially common in patients with diabetes mellitus, especially those with diabetic ketoacidosis; almost 75% of the patients with the rhino cerebral form of mucormycosis have ketoacidosis. As might be expected, immunosuppressed patients are prone to develop this infection as well as patients with burns or open wounds (1).

Clinical Types

The clinical types include superficial (external ear, nails, skin) and visceral which is further subdivided into pulmonary, gastrointestinal and rhino cerebral. Of these Rhino cerebral is of greater interest in this context (2).

The clinical features of rhino-orbital-cerebral mucormycosis are as follows:

Fever, purulent discharge with or without epistaxis, nasal ulceration and necrosis, periorbital or retroorbital pain, headache, greyish or reddish mucosa which may progress to black areas of

eschar as the necrosis ensues, nausea and generalised weakness (3).

Predisposing factors

The different risk factors that account for these are Hyperglycaemia at presentation (83.3%), Cancer (3%) and History of Corticosteroid intake (76.3%). Apart from these several organism factors (virulence properties, number of microorganisms, adherence properties) medications (Antibiotics, steroids) and patient factors (immature immune defences, moist skin surface, skin/ mucosal breakdown, fungal dermatitis, hyperglycaemia, invasive catheters, tubes) also contribute as the aetiology (2).

Pathogenesis

The infection begins with the inhalation of sporangiospores through the nasal cavity. In normal hosts, macrophages prevent initiation of infection by phagocytosis. However, in immunocompromised patients spores evade the oxidative metabolites secreted by cells and reach the endothelial lining. Spores and hyphae act with endothelial cells causing angioinvasion. This further leads to dissemination into the body, elaboration of lytic enzymes, mycotoxins augment extensive fungal invasion. Spores have the ability to adhere to basement membrane proteins causing extensive damage to blood vessels leading to vessel thrombosis and tissue necrosis (1).

Diagnosis

The diagnosis of Mucormycosis is challenging and should start early so as to reduce mortality. Microscopic examination of the sample will demonstrate broad fungal hyphae. The basic staining methods include Haematoxylin and Eosin Stain and Lactophenol cotton blue stain. However, when the hyphae are fragmented, definitive diagnosis by direct microscopy becomes difficult and culture is required. The tissue can be stained with special stains like Grocott Gomori Methanamine Stain or Periodic Acid Schiff Stain (4).

Histopathological Features

The organisms appear as large, non-septate hyphae with branching at obtuse angles. Round or ovoid sporangia are also frequently seen in the tissue sections. The organisms can be cultured. Histopathologically mucormycosis should be differentiated from aspergillosis in which the former has an acute angulating branched hyphae of smaller width and latter has septate branched hyphae. A special stain like Grocott's silver methenamine stain may be used to confirm the diagnosis (1).

Recent advancements

Apart from these, the recent advancements in diagnosis are DNA Probes targeting the 18S Subunit, ITS 1 Sequencing after PCR and Real time PCR targeting Cytochrome B gene. Effective Imaging modalities for the diagnosis of Mucormycosis are CT scan and MRI (5).

Treatment

Mucormycosis can be managed both by surgical and non-surgical methods. However, as Mucormycosis is an Angio invasive infection it can progress rapidly to being fatal, and antifungal therapy alone is often inadequate to control the infection. Hence surgical debridement of the infected and necrotic tissue must be carried on an urgent basis. Coming to the medical management of the same, the different antifungal agents used in its treatment are: Liquid Complex Amphotericin B (5mg/kg/day dilute in 200 cc 5% dextrose over 2-3 hours infusion) or Posaconazole (300 mg twice a day on 1st day and 300 mg once a day) or Amphotericin B Deoxycholate (1 mg/kg/day in 5% dextrose over 6-8 hrs). Also, as Iron is needed for the growth of Mucor, Iron chelators (except for deferoxamine) can be helpful in the management. Hyperbaric oxygen therapy can also be used as other adjunctive treatment modality as it improves the ability of neutrophils to kill the organism (3,5)

Conclusion

In conclusion, mucormycosis is a rare but highly invasive fungal infection that poses a significant risk to individuals with compromised immune systems, particularly in the context of uncontrolled

diabetes, immunosuppressive therapy, or post-transplantation. Early identification of symptoms, timely diagnostic measures, and aggressive treatment, including antifungal therapy and surgical intervention, are crucial in improving outcomes. While the prognosis remains poor in many cases, advancements in diagnostic techniques and treatment options offer hope for better management of this life-threatening disease. Increased awareness among healthcare providers, as well as the public, is essential for early detection and improved survival rates. Continued research into better therapeutic strategies and preventive measures remains vital in combating mucormycosis effectively.

This conclusion ties together the major aspects of mucormycosis while emphasizing the need for continued vigilance and research.

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