

## An Overview of Mucormycosis

Sujaritha.J\*, Deepa.N, Madhivadhani.K, Lokeshvar.R

\*Department of Pharmaceutical Chemistry, Saveetha College of Pharmacy, Chennai.

Date Of Submission: 01-06-2021

Date Of Acceptance: 14-06-2021

**ABSTRACT:** In this review article the global pandemic diseases COVID-19 can range from mild to life threatening to pneumonia associated with bacterial and fungal infection. Zygomycosis is a rare invasive fungal infection that affects person with immunosuppressive immunity and subjected to corticosteroid therapy patients, there are different types of Mucormycosis and affects the different organs such as lungs, brain, intestine, spleen, heart, kidney and skin, the diagnosis of Mucormycosis is difficult in early stages and the treatment of Mucormycosis is Amphotericin B.

**KEY WORD:** COVID-19, Mucormycosis, Types & Treatment.

### I. INTRODUCTION

Zygomycosis (Mucormycosis (MCM)) is caused by the fungi belonging to the order mucormycetes (Mucorales). *Rhizopus arrhizus* is the most common agent isolated in worldwide, *Apophysomyces variabilis* is predominant in Asia and *Lichtheimia* species in Europe. The new causative agents, *Rhizopus homothallicus*, *Mucor irregularis*, and *Thamnostylum lucknowense* are reported from Asia. Rare mucormycete agents such as *Apophysomyces variabilis* and *Rhizopus homothallicus* are found in India soils. The fungi under Mucorales are ubiquitous, and morphologically appear as broad, aseptate or sparsely septate ribbon-like hyphae. The infection is increasingly reported in patients with diabetes

mellitus, haematological malignancy (acute leukemia), organ transplants, and corticosteroid therapy. It is the third most common cause of fungal infection after candidiasis and aspergillosis. Early medical and surgical treatment could prevent further spreading. People get mucormycosis by coming in contact with the fungal spores (sporangiospores) in the environment, occasionally by ingestion of contaminated food or traumatic inoculation. The lung or sinus forms of the infection can occur after someone breathes in spores. Mucormycosis can also develop on the skin after the fungus enters the skin through a cut, scrape, burn, or other type of skin trauma.

The diagnosis of zygomycosis is rarely suspected and ante-mortem diagnosis is made in only 23–50% of cases. The patients with uncontrolled diabetes mellitus is susceptible with high incidence of mucormycosis among India and China.

Zygomycosis has a high mortality of 70–100%, but some patients may be cured by surgical excision and amphotericin. Early diagnosis, and prompt treatment can reduce the mortality and morbidity of this lethal infection. Mucormycosis can't spread between people or between people and animals.

**ORDER:** Mucorales

**CLASS:** Zygomycet

**SPECIES (27):** *Apophysomyces* in Asia, *Lichtheimia* in Europe, *Rhizopus homothallicus*, *Mucor irregularis*, and *Thamnostylum lucknowense* from Asia

### TYPES OF MUCORMYCOSIS & CLINICAL MANIFESTATION

SL. NO	TYPES OF MUCORMYCOSIS	EFFECTS	REASON	SYMPTOMS	COMMON REASON
1	Rhinocerebral (sinus and brain) mucormycosis	brain	uncontrolled diabetes	<ul style="list-style-type: none"> <li>● One-sided facial swelling</li> <li>● Headache</li> <li>● Nasal or sinus</li> </ul>	● Diabetes,

				congestion <ul style="list-style-type: none"> <li>● Black lesions on nasal bridge or upper inside of mouth that quickly become more severe</li> <li>● Fever</li> </ul>	especially with diabetic ketoacidosis <ul style="list-style-type: none"> <li>● Cancer</li> <li>● Organ transplant</li> <li>● Stem cell transplant (low number of white blood cells)</li> </ul>
2	<b>Pulmonary (lung) mucormycosis</b>	LUNG	people with cancer who have had an organ transplant or a stem cell transplant.	<ul style="list-style-type: none"> <li>● Fever</li> <li>● Cough</li> <li>● Chest pain</li> <li>● Shortness of breath</li> </ul>	<ul style="list-style-type: none"> <li>● Long-term corticosteroid use</li> <li>● Injection drug use</li> <li>● Too much iron in the body (iron overload or hemochromatosis)</li> <li>● Skin injury due to surgery, burns, or wounds</li> </ul>
3	<b>Gastrointestinal mucormycosis</b>	INTESTINE	antibiotics, surgery, or medications that lower the body's ability to fight germs and sickness.	<ul style="list-style-type: none"> <li>● Abdominal pain</li> <li>● Nausea and vomiting</li> <li>● Gastrointestinal bleeding</li> </ul>	<ul style="list-style-type: none"> <li>● Prematurity and low birthweight (for neonatal gastrointestinal mucormycosis)</li> </ul>
4	<b>Cutaneous (skin) mucormycosis</b>	skin (after surgery, a burn, or other type of skin trauma)	weakened immune systems	<ul style="list-style-type: none"> <li>● Blisters or ulcers, and the infected area may turn black.</li> <li>● Pain, warmth, excessive redness, or swelling around a wound.</li> </ul>	
5	<b>Disseminated mucormycosis</b>	Brain, spleen, heart, and skin.	preads through the bloodstream to affect another part of the body	<ul style="list-style-type: none"> <li>● Brain can develop mental changes or coma.</li> </ul>	

**IDENTIFICATION OF MUCORMYCOSIS**

TYPES OF IDENTIFICATION TEST	STAIN	RESULT
Cytopathology	Chitin binding stains, such as Calcoflour, Fungi-flour, or Blancoflour, may be used with a flfluorescent microscope	Hyphal elements
Histopathology	Acid Shiff and Gomori methenamine silver stains	Mucorales organisms in tissue
Culture	Sabouraud’s dextrose agar, and incubated at room temperature and 37°C	To optimize growth, clinical specimens
Radiography/ Imaging Techniques	1. Pre operative contrast-enhanced computed tomography (CT)  2. Magnetic Resonance Imaging (MRI)	1. Edematous mucosa, fluid filling the sinuses and destruction of the peri-orbital tissue and bony margins  2. Identifying the intradural and intracranial extent of the disease, cavernous sinus thrombosis, or thrombosis of the cavernous portion of the internal carotid artery

**POST COVID-19 DISEASE MUCORMYCOSIS**

Coronavirus disease 2019 (Covid-19) is an infection caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). The Covid-19 symptom spectrum has expanded since the first days of the disease’s presentation, which initially included only a dry cough and high grade fever, to additionally include various multisystem problems such as shortness of breath, anosmia, ageusia, diarrhoea, generalised malaise, acute cardiac injury and secondary infections. Covid-19 patients can develop further fungal infections during the middle and latter stages of this disease, especially severely ill individuals. Recently, we have observed another association between ENT and coronavirus. Without early diagnosis and treatment, there may be rapid progression of the disease, with reported mortality rates from intra-orbital and intracranial complications of

50–80 per cent. Recently, we have observed another association between ENT and coronavirus

**TREATMENT**

The use of steroids, monoclonal antibodies, and broad-spectrum antibiotics for the management of COVID-19 illness can increase the chances of new-onset fungal infection. All patients in our series had received intravenous dexamethasone for COVID-19 disease as per The National Institute of Health recommendations and Liposomal Amphotericin B, posaconazole, or isavuconazole. These medicines are given through a vein (amphotericin B, posaconazole, isavuconazole) or by mouth (posaconazole, isavuconazole). Other medicines, including fluconazole, voriconazole, and echinocandins, for mucormycosis. successful treatment of mucormycosis requires four steps  
1) early diagnosis;

- 2) reversal of underlying predisposing risk factors, if possible;
- 3) surgical debridement where ever applicable
- 4) prompt antifungal therapy

Non- conventional therapeutic agents like anti diabetics, iron chelating agents, statins, granulocyte transfusions, cytokines, and hyperbaric oxygen have increased the survival rates to 94%

## II. DISCUSSION:

Mucormycosis or zygomycosis, also called phycomyosis, initially described in 1885 by Paltauf, is an uncommon and aggressive fungal infection that usually affects patients with alteration of their immunological system. In Covid-19 and increased fungal infections can now be clearly seen. There are various possible reasons for this association, including the immunosuppression caused by Covid-19 infection and disease process, or the extensive use of steroids and broad spectrum antibiotics in the management of Covid-19, leading to the development or exacerbation of a pre-existing fungal disease

## III. CONCLUSION

Mucormycosis is a life-threatening fungal infection characterized by host tissue infarction and necrosis that occurs mostly in immunocompromised patients and is associated with an increasing incidence and mortality despite the availability of therapeutic tools. The use of steroids, monoclonal antibodies, and broad-spectrum antibiotics for the management of COVID-19 illness can increase the chances of new-onset fungal infection or exacerbate a preexisting one. We are learning more about the new and long-term manifestations of the Covid-19 infection. Its association with invasive mucormycosis sinusitis is dangerous. Patients receiving dialysis who are treated with the iron chelator deferoxamine are also uniquely susceptible to a deadly form of mucormycosis. Over the past few months a change in the incidence of mucormycosis infection of the sinuses has been observed, with more cases being diagnosed much more frequently. The difficult management decisions associated with co-infection of SARS-CoV2 and Rhizopus. These diseases share risk factors, have independently high mortality

rates, but currently have conflicting management principles.

## REFERENCE:

- [1]. Ravani SA, Agrawal GA, Leuva PA, Modi PH, Amin KD. Rise of the phoenix: Mucormycosis in COVID-19 times. *Indian Journal of Ophthalmology*. 2021 Jun 1;69(6):1563-8.
- [2]. Sarkar S, Gokhale T, Choudhury SS, Deb AK. COVID-19 and orbital mucormycosis. *Indian Journal of Ophthalmology*. 2021 Apr;69(4):1002.
- [3]. Zurl C, Hoenigl M, Schulz E, Hatzl S, Gorkiewicz G, Krause R, Eller P, Prattes J. Autopsy proven pulmonary mucormycosis due to *Rhizopus microsporus* in a critically ill COVID-19 patient with underlying hematological malignancy. *Journal of Fungi*. 2021 Feb;7(2):88.
- [4]. Ferguson BJ. Definitions of fungal rhinosinusitis. *Otolaryngologic clinics of north America*. 2000 Apr 1;33(2):227-35.
- [5]. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clinical Infectious Diseases*. 2012 Feb 1;54(suppl\_1):S16-22.
- [6]. Walsh TJ, Bloom BE, Kontoyiannis DP. Meeting the challenges of an emerging pathogen: the Henry Schueler 41&9 Foundation International Forum on Mucormycosis. *Clinical Infectious Diseases*. 2012 Feb 1;54(suppl\_1):S1-4.
- [7]. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clinical Infectious Diseases*. 2012 Feb 1;54(suppl\_1):S16-22.
- [8]. Sarkar S, Gokhale T, Choudhury SS, Deb AK. COVID-19 and orbital mucormycosis. *Indian Journal of Ophthalmology*. 2021 Apr;69(4):1002.
- [9]. Maini A, Tomar G, Khanna D, Kini Y, Mehta H, Bhagyasree V. Sino-orbital mucormycosis in a COVID-19 patient: A case report. *International Journal of Surgery Case Reports*. 2021 May 4:105957.
- [10]. Ballester DG, González-García R, García CM, Ruiz-Laza L, Gil FM. Mucormycosis of the head and neck: report of five cases with different presentations. *J Craniomaxillofac Surg* 2012;40:584–91
- [11]. Prakash, H.; Ghosh, A.K.; Rudramurthy, S.M.; Singh, P.; Xess, I.; Savio, J.; Pamidimukkala, U.; Jillwin, J.; Varma, S.; Das, A.; et al. A

- prospective multicenter study on mucormycosis in India: Epidemiology, diagnosis, and treatment. *Med. Mycol.* **2018**.
- [12]. Bitar, D.; Van Cauteren, D.; Lanternier, F.; Dannaoui, E.; Che, D.; Dromer, F.; Desenclos, J.C.; Lortholary, O. Increasing incidence of zygomycosis (mucormycosis), France, 1997–2006. *Emerg. Infect. Dis.* **2009**, 15, 1395–1401.
- [13]. 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.
- [14]. Song G, Liang G, Liu W. Fungal co-infections associated with global COVID-19 pandemic: a clinical and diagnostic perspective from China. *Mycopathologia* 2020;185:599–606
- [15]. Gangneux JP, Bougnoux ME, Dannaoui E, Cornet M, Ralph ZJ. Invasive fungal diseases during COVID-19: we should be prepared. *J Mycol Med* 2020;30:10097.
- [16]. Lin, E.; Moua, T.; Limper, A.H. Pulmonary mucormycosis: Clinical features and outcomes. *Infection* **2017**, 45, 443–448.
- [17]. Salehi M, Ahmadikia K, Badali H, Khodavaisy S. Opportunistic fungal infections in the epidemic area of COVID-19: A clinical and diagnostic perspective from Iran. *Mycopathologia* 2020;185:607-11