



Mucormycosis: Black Devious Wanderer

Sindhu Ravindra¹, Karthik D Yadav^{2*}, Praveen Kumar Varma³, Chritson⁴ and Sindhe J Raghunand⁵

¹Senior Lecturer, Department of Oral Medicine and Radiology, The Oxford Dental College, Bangalore, India

²Senior Lecturer, Department of Oral Medicine and Radiology, K.G.F College of Dental Sciences and Dental Enclave, Bangalore, India

³Professor, Department of Orthodontics, Vishnu Dental College, Vishnupur, Bhimavaram, India

⁴Department of Conservative and Endodontics, K.G.F College of Dental Sciences and Dental Enclave, Bangalore, India

⁵Senior Lecturer, Master of Dental Surgery, Department of Oral Medicine and Radiology Oxford Dental College, Bangalore, India

***Corresponding Author:** Karthik D Yadav, Senior Lecturer, Department of Oral Medicine and Radiology, K.G.F College of Dental Sciences and Dental Enclave, Bangalore, India.

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Abstract

The treatment of COVID-19 has burdened the health infrastructure to its limit and beyond. Among the various complications that are seen post COVID, mucormycosis is one of the most dangerous condition seen which has devastating effects on the already immunocompromised patient with a very poor prognosis. It would mean that the patient who might win the war against COVID-19 may lose the battle against mucormycosis. The various organs affected are dependent on the route of transmission of the virus. A well-planned approach with preventive as well as other timely management of the disease process is highly beneficial and should be done to achieve a better prognosis.

Keywords: Mucormycosis; COVID-19; Fungi; Opportunistic; Immunocompromised

Introduction

Currently, the world is facing the brunt of COVID-19 (also known as coronavirus). COVID-19 has not spared any individual has spread at a rapid rate with its mutative forms being more cumbersome to treat. The treatment of COVID-19 has burdened the health infrastructure to its limit and beyond. However, even after the completion of treatment there are always complications which hound around the patient for a long time.

Among the various complications that are seen post COVID, mucormycosis is one of the most dangerous condition seen which has

devastating effects on the already immunocompromised patient with a very poor prognosis. It would mean that the patient who might win the war against COVID-19 may lose the battle against mucormycosis.

Mucormycosis is a rare fungal infection seen most commonly in immunocompromised patients, caused by a group of molds called mucormycetes. They are also called as black fungus and these fungi live all over the environment, especially in soil and in decaying organic matter, like leaves, compost piles, or rotten wood [1].

Mucormycosis is transmitted when the person comes in contact with the fungal spores in the environment. Even though the person may come in contact with mucormycosis it is not easy for the person to get infected as the organism is not capable of mounting an infection on the person as an immune individual may easily fend off the fungi. Only individuals who have are immunocompromised by other medical conditions or on medications responsible for decreasing the immunity levels are susceptible for infections [2,3].

Various routes of transmission of mucormycosis include the skin after the fungus enters the skin through a cut, scrape, burn, or other type of skin trauma. The various organs affected are dependent on the route of transmission of the virus.

Types of mucormycosis [4,5]:

- **Rhinocerebral mucormycosis:** Affects sinus and brain.
- **Pulmonary mucormycosis:** Affects lungs, especially seen in cancer and organ transplant or a stem cell transplant individuals.
- **Gastrointestinal mucormycosis:** Affects GI tract, seen in young children than adults, especially premature and low birth weight infants less than 1 month of age [6,7].
- **Cutaneous mucormycosis:** Affects skin especially at the site of entry with compromised immune systems.
- **Disseminated mucormycosis:** Infection spreads through the bloodstream to different parts of the body.

Characteristics of Mucormycosis [2-9]			
Types of Mucormycosis	Organ affected	Route of entry	Symptoms
Rhinocerebral mucormycosis	Sinus and Brain	Respiratory	<ul style="list-style-type: none"> • One-sided facial swelling • Headache • Fever • Nasal or sinus congestion • Black lesions on nasal bridge or upper inside of mouth
Pulmonary mucormycosis	Lungs	Respiratory	<ul style="list-style-type: none"> • Fever • Cough • Chest pain • Shortness of breath
Gastrointestinal mucormycosis	GI tract	Oral route	<ul style="list-style-type: none"> • Abdominal pain • Nausea and vomiting • Gastrointestinal bleeding
Cutaneous mucormycosis	Skin	Through environment especially soil	<ul style="list-style-type: none"> • Appears as blisters or ulcers, and the infected area may turn black. • Other symptoms include pain, warmth, excessive redness, or swelling around a wound.
Disseminated mucormycosis	Many other organs	Spreads through bloodstream	<ul style="list-style-type: none"> • Medically compromised patients. • Patients with disseminated infection in the brain can develop mental status changes or coma.

Diagnosis

Sample collection in case of lungs or sinus infections should be collected and sent to a laboratory.

Tissue biopsy may also be required in which a small sample of affected tissue is analyzed in a laboratory for evidence of mucormycosis under a microscope or in a fungal culture.

Early detection of pulmonary or sinusal lesions by CT has been a key advance over conventional sinus and chest radiographs. Imaging tests include a CT scan of your lungs, sinuses, or other parts of your body [10].

For immunocompromised patients, who are at high risk for invasive pulmonary mucormycosis, early CT findings may reveal pulmonary or sinusal lesions, in the absence of radiological findings in conventional radiographs, even before localizing symptoms [11].

CT scans are able to detect lesions of angioinvasive filamentous fungi which include nodules, halo signs, reverse halo signs, cavities, wedge-shaped infiltrates, and pleural effusions associated with pleuritic pain. Invasive pulmonary mucormycosis may show bronchopneumonia, especially in nonneutropenic, immunocompromised patients [11].

Treatment

- Assessment of risk factors
- Detailed history
- Preventive measures
- Pharmacological aspects
- Surgical care
- Palliative/restorative care.

Assessment of risk factors

Individuals should be assessed for risk factors involving immunocompromised individuals with/ without any underlying medical condition which includes diabetes, patients on steroids, cancer, transplant patients, premature and low birth individuals [12-14].

Detailed history

No clinical history is completely specific for the diagnosis of invasive mucormycosis. A complete history with any underlying medical condition, COVID treated patients, diabetes and patients on steroids should be highly anticipated in patients during diagnosis. We should also include them as a part of diagnosis to reach a conclusive diagnosis.

Individuals working in farms especially in a soil environment should be more careful as any cuts, abrasions will be able to provide the path for the entry of the microorganism into the body [1].

Preventive measures [15,16]

- Try to avoid areas with a lot of dust like construction or excavation sites. If you can't avoid these areas, wear an N95 respirator (a type of face mask).
- Avoid direct contact with water-damaged buildings and flood water after hurricanes and natural disasters [17].
- Avoid activities that involve close contact to soil or dust, such as yard work or gardening. If this isn't possible.
- Wear shoes, long pants, and a long-sleeved shirt when doing outdoor activities such as gardening, yard work, or visiting wooded areas.
- Wear gloves when handling materials such as soil, moss or manure.
- To reduce the chances of developing a skin infection, clean skin injuries well with soap and water, especially if they have been exposed to soil or dust.

Pharmacological aspects

Liposomal amphotericin B at a dose of 5 - 10 mg/kg per day is given. In the absence of central nervous system involvement, a dose of 5 mg/kg is suggested [18]. In a randomized controlled trial of 201 patients with invasive mold disease, liposomal amphotericin used at 3 mg/kg/day was equally effective but safer and better tolerated than 10 mg/kg/day dose amphotericin [19].

Surgical care

Complete excision of the lesion along with wide margins of about 1 cm is recommended. Further, after that restoration to its form and function would be vital and should be carried out as per patient's needs and health condition.

However, the prognosis with the disseminated form of mucormycosis may be cumbersome and may be supported only with palliative care. The prognosis in such cases is poor and non-favorable.

Palliative/restorative care

After excision of the lesion, restoration of the functional structures not involving the non-accessible is vital and should be carried out with the help of a group of different specialty physicians.

Conclusion

A well-planned approach with preventive as well as other timely management of the disease process is highly beneficial and should be done to achieve a better prognosis. Even though there is no standard protocol that is available for the treatment of the disease process, it becomes very important to formulate one as we are already in COVID pandemic and would not require a "Black Fungus Pandemic".

Source(s) of Support

Nil.

Conflicting Interest

Nil.

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