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The Review on Mucormycosis (Black Fungus)

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Abstract
The presentation aims at overview of Mucormycosis, its basic introduction, sign & symptoms, present perspective of disease through the way of progressive research. Recent therapeutic advances have the potential to improve outcomes of mucormycosis. Lipid formulations of amphotericin B (LFAB) have evolved as the cornerstone of primary therapy for mucormycosis. Posaconazole may be useful as salvage therapy, but it cannot be recommended as primary therapy for mucormycosis on the basis of available data.A definitive trial is needed to confirm these results. Combination therapy with LFAB and the iron chelator, deferasirox, also improved outcomes in animal models of mucormycosis. Early initiation of therapy is critical to maximizing outcomes; recent developments in polymerase chain reaction technology are advancing early diagnostic strategies. Prospective, randomized clinical trials are needed to define optimal management strategies for mucormycosis. Also the presentation focuses on the treatment, the target area prevention and the precaution measures with respect to disease.

Keywords: Mucormycosis, Blank Fungus

INTRODUCTION

Mucormycosis (previously called zygomycosis) is a serious but rare fungal infection caused by a group of molds called mucormycetes. These molds live throughout the environment. Mucormycosis mainly affects people who have health problems or take medicines that lower the body's ability to fight germs and sickness.It is spread by spores of molds of the order Mucorales, most often through inhalation, contaminated food, or contamination of open wounds.These fungi are common in soils, decomposing organic matter (such as rotting fruit and vegetables), and animal manure, but usually do not affect people. It is not transmitted between people. Risk factors include diabetes with persistently high blood sugar levels or diabetic ketoacidosis, low white blood cells, cancer, organ transplant, iron overload, kidney problems, long-term steroids or use of immunosuppressants, and to a lesser extent in HIV/AIDS.

Diagnosis is by biopsy and culture, with medical imaging to help determine the extent of disease. It may appear similar to aspergillosis. Treatment is generally with amphotericin B and surgical debridement. Preventive measures include wearing a face mask in dusty areas, avoiding contact with water-damaged buildings, and protecting the skin from exposure to soil such as when gardening or certain outdoor work. It tends to progress rapidly and is fatal in about half of sinus cases and almost all cases of the widespread type.

Mucormycosis is usually rare, affecting fewer than 2 people per million people each year in San Francisco, but is now ~80 times more common in India. People of any age may be affected, including premature infants. The first known case of mucormycosis was possibly the one described by Friedrich

Küchenmeister in 1855. The disease has been reported in natural disasters; 2004 Indian Ocean tsunami and the 2011 Missouri tornado. During the COVID-19 pandemic, an association between mucormycosis and COVID-19 has been reported. This association is thought to relate to reduced immune function during the course of the illness and may also be related to glucocorticoid therapy for COVID-19. A rise in cases was particularly noted in India.

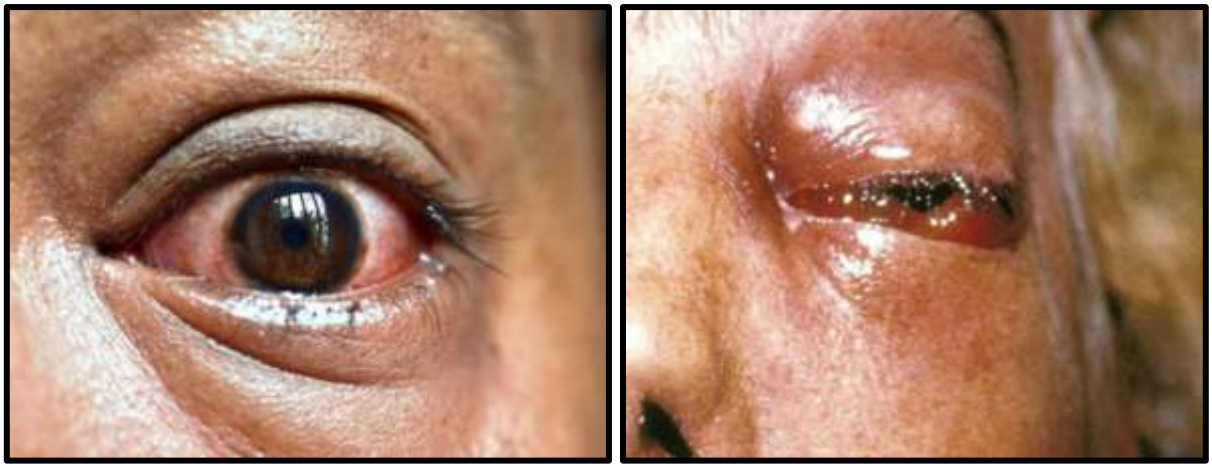
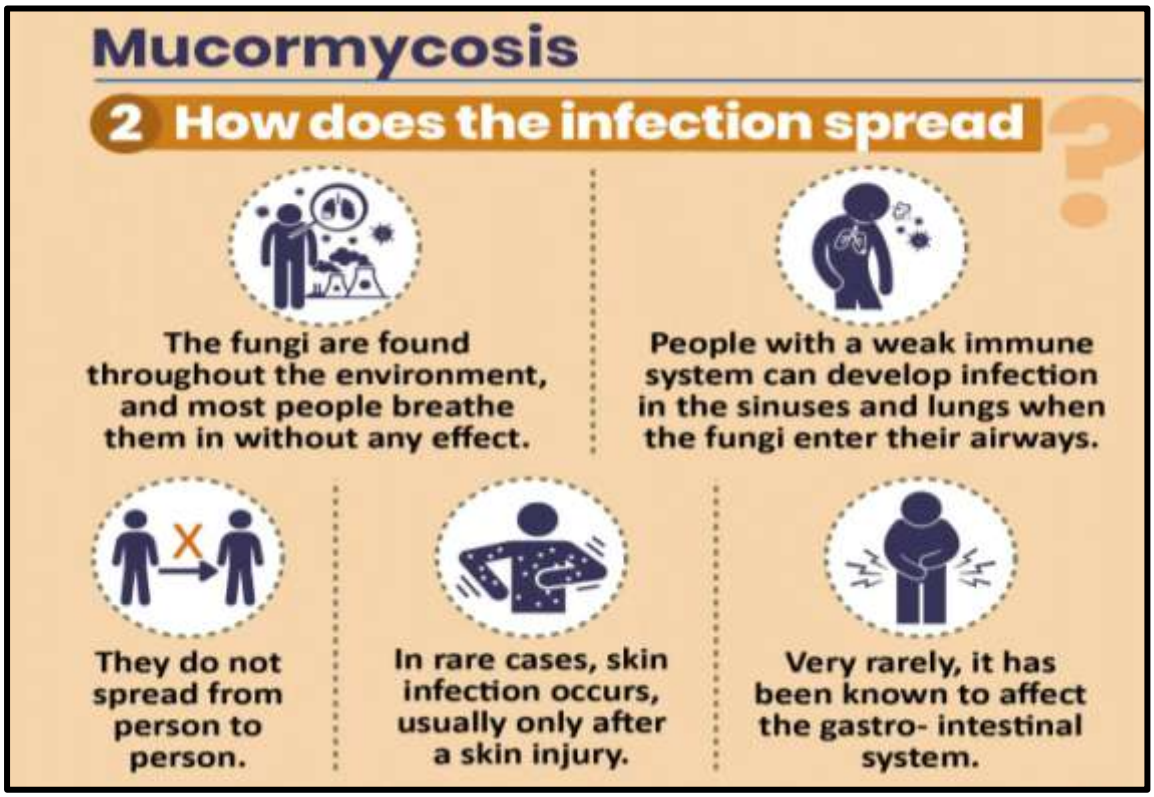


Fig.1 Mucormycosisinfection

How does the infection spread

- The causative agent of mucormycosis is **R. Rizodoformis**.
- Mucormycosis is caused by group of mold known as mucormycytes.
- It often affects the sinuses, lungs, skin, and brain



Symptoms:

Symptoms of mucormycosis depend on the location in the body of the infection. Infection usually begins in the mouth or nose and enters the central nervous system via the eyes.

If the fungal infection begins in the nose or sinus and extends to brain, symptoms and signs may include one-sided eye pain or headache, and may be accompanied by pain in the face, numbness, fever, loss of smell, a blocked nose or runny nose. The person may appear to have sinusitis. The face may look swollen on one side, with rapidly progressing "black lesions" across the nose or upper inside of mouth. One eye may look swollen and bulging, and vision may be blurred.

Fever, cough, chest pain, and difficulty breathing, or coughing up blood, can occur when the lungs are involved. A stomach ache, nausea, vomiting and bleeding can occur when the gastrointestinal tract is involved. Affected skin may appear as a dusky reddish tender patch with a darkening centre due to tissue death. There may be an ulcer, and it can be very painful.

Invasion of the blood vessels can result in thrombosis and subsequent death of surrounding tissue due to a loss of blood supply. Widespread (disseminated) mucormycosis typically occurs in people who are already sick from other medical conditions, so it can be difficult to know which symptoms are related to mucormycosis. People with disseminated infection in the brain can develop changes in mental status or lapse into a coma.

History

The first case of mucormycosis was possibly one described by Friedrich Küchenmeister in 1855. Fürbringer first described the disease in the lungs in 1876. In 1884, Lichtheim established the development of the disease in rabbits and described two species; Mucor corymbifera and Mucor rhizopodiformis, later known as Lichtheimia and Rhizopus, respectively. In 1943, its association with poorly controlled diabetes was reported in three cases with severe sinus, brain and eye involvement.

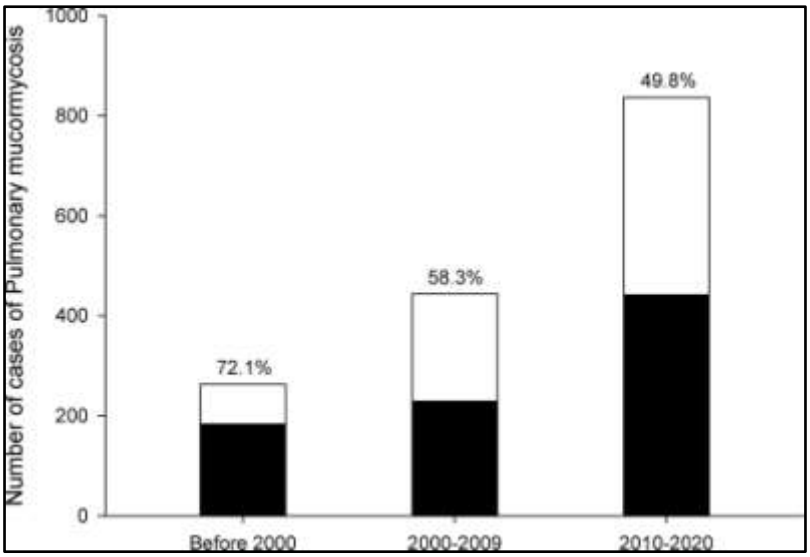
In 1953, Saksenaeavasiformis, found to cause several cases, was isolated from Indian forest soil, and in 1979, P. C. Misra examined soil from an Indian mango orchard, from where they isolated Apophysomyces, later found to be a major cause of mucormycosis. Several species of mucorales have since been described. When cases were reported in the United States in the mid-1950s, the author thought it to be a new disease resulting from the use of antibiotics, ACTH and steroids. Until the latter half of the 20th century, the only available treatment was potassium iodide. In a review of cases involving the lungs diagnosed following flexible bronchoscopy between 1970 and 2000, survival was found to be better in those who received combined surgery and medical treatment, mostly with amphotericin B.

Treatment

Treatment involves a combination of antifungal drugs, surgically removing infecting tissue and correcting underlying medical problems, such as diabetic ketoacidosis.

Medication

Once mucormycosis is suspected, amphotericin B at an initial dose of 1 mg is initially given slowly over 10–15 minutes into a vein, then given as a once daily dose according to body weight for the next 14 days. It may need to be continued for longer. Isavuconazole and Posaconazole are alternatives.



Graph.1: No. of cases of pulmonary mucormycosis

Surgery

Surgery can be very drastic, and, in some cases of disease involving the nasal cavity and the brain, removal of infected brain tissue may be required. Removal of the palate, nasal cavity, or eye structures can be very disfiguring. Sometimes more than one operation is required.

Other considerations

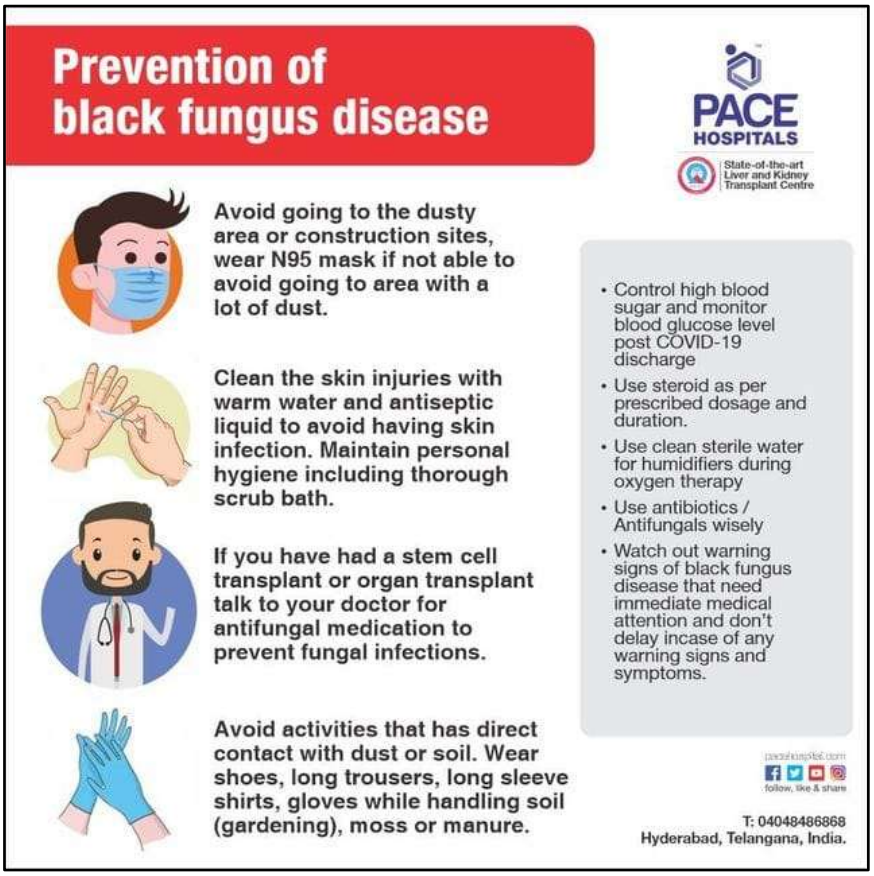
The disease must be monitored carefully for any signs of re-emergence. Treatment also requires correcting sugar levels and improving neutrophil counts. Hyperbaric oxygen may be considered as an adjunctive therapy, because higher oxygen pressure increases the ability of neutrophils to kill the fungus. The efficacy of this therapy is uncertain.

Prevention

Preventive measures include wearing a face mask in dusty areas, washing hands, avoiding direct contact with water-damaged buildings, and protecting skin, feet, and hands where there is exposure to soil or manure, such as gardening or certain outdoor work. In high risk groups, such as organ transplant patients, antifungal drugs may be given as a preventative.

The true incidence and prevalence of mucormycosis may be higher than appears. Mucormycosis is rare, affecting fewer than 1.7 people per million population each year in San Francisco. It is around 80 times more prevalent in India, where it is estimated that there are around 0.14 cases per 1000 population, and where its incidence has been rising. Causative fungi are highly dependent on location.

Diabetes is the main underlying disease in low and middle-income countries, whereas, blood cancers and organ transplantation are the more common underlying problems in developed countries. As new immunomodulating drugs and diagnostic tests are developed, the statistics for mucormycosis have been changing. The figures change as new genera and species are identified, and new risk factors reported such as tuberculosis and kidney problems.



CONCLUSION

- Early diagnosis means early treatment and leading to less mortalityrates
- Reversal of underlying factors, Surgery and Liposomal amphotericin B increases cure rates
- Duration of treatment is highly individualized

- Posaconazole, Isuvaconazole can also be tried
- Salvage therapy in refractory or intolerant pts
- Adjunctive therapies need to proved in large trials and standardized
- More common in immunocompromised
- Suspected in patients already on anti-aspergillustreatment
- No specific clinical or radiological features makingdiagnosis more difficult and challenging
- Diagnostic options are limited with variable results
- Invasive diagnostics have more yield which is notpossible in some patients

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