

Pathophysiology, Diagnosis, and Treatment of Mucormycosis, in Relation to COVID-19

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DESCRIPTION

Mucormycosis, very commonly known as black fungus is very rare yet highly dangerous. Mucormycosis (chronic and/or severe immunosuppression) is characterized by infarction and necrosis of host tissues, resulting by the invasion of the vasculature by hyphae. There are two types of mucormycosis where one is acquired through inhalation (usually begins in the nasal turbinate or the alveoli) and the other through an enzyme. This study deals to elaborate the cause of the disease, explaining about its diagnosis and treatment

The incidence of mucormycosis is difficult to estimate since it is not a reportable disease and the risk varies widely. Black Fungus infects a COVID-19 patient easily and it can be fatal, if it reaches the brain. According to researchers and doctors, black fungus begins with a distinct facial disfiguration which is easy to spot. Early diagnosis and treatment using antifungal agents is essential, as a delay can be associated with rapid and high mortality rate.

Clinical progression

Stage 1: Infection of nasal mucosa and sinuses

Stage 2: Orbital Involvement-Superior orbital fissure syndrome; and Orbital Apex Syndrome

Stage 3: Cerebral Involvement-spread through Ophthalmic artery; Superior Orbital Fissure/Cribriform plate.

Cause of the disease

The major underlying cause for mucormycosis is a group of molds called “mucormycetes” (*Rhizopus* organisms) which often affects the sinuses, lungs, skin, and brain.

It is observed that, it affects when a person inhales the mould spores which come in contact with soil, rotten bread pieces, etc. During inhalation process, cilia transport these spores to the pharynx and they are cleared through the gastrointestinal tract. Additionally, mucormycosis has been observed among Diabetes mellitus patients, especially among ketoacidosis patients.

Rhizopus organisms are responsible for dwelling an enzyme, namely “ketone reductase”, which is responsible for conversion of aldoses and ketones. Serum from individuals stimulates growth in diabetic ketoacidosis.

Whereas Serum from healthy individuals inhibits growth of *Rhizopus*, there by leading to the prevention of disease.

Pathophysiology

Infection in a susceptible host starts with entry of sporangio spore through nasal cavity. In normal and healthy patients, macrophages prevent the initiation of infection by phagocytosis and by oxidative killing of spores but in immune compromised patients' spores evade the oxidative metabolites and defense secreted by cells and reaches the endothelial lining. Spores and Hyphae interact with (Endothelial Cell Derived Growth Factor) EDGF on endothelial cells causing angiogenesis (penetration through endothelial cells lining blood vessels).

Symptoms of mucormycosis include pain and redness around the eyes and nose, fever, headache, coughing, shortness of breath, bloody vomits and altered mental status.

Treatment and cure

Successful management of mucormycosis requires early diagnosis, risk factors, prompt administration of active antifungal agents. Currently, there are only 4 drugs which can be used as first-line treatment for mucormycosis

- Amphotericin B
- Lipid amphotericin B
- Posaconazole
- Isavuconazole
- Echinocandins

During some highly infectious stage, mucormycosis requires surgery to cut away the infected tissue.

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CONCLUSION

Use of corticosteroid during COVID-19 appears to increase mucormycosis. So, all efforts should be made to maintain optimal glucose and only judicious use of corticosteroids. Invasive procedures, such as serology-based point of care

hopefully will be evaluated and used in the near future. Additionally, new fungal genetic targets newer tools like molecular methods should be developed in order to decrease mucormycosis. Moreover studies should concentrate to find out a solution for the underlying risk factor for developing this disease.