Management of COVID-19 Associated Mucormycosis (CAM)

Mucormycosis is an aggressive, rapidly fatal fungal infection caused by a group of filamentous fungi belonging to order Mucorales.

Major risk factors

- Prolonged or profound neutropaenia
- Diabetes mellitus (type I and II)
- Metabolic acidosis
- Malnutrition
- Steroid usage
- Treatment with iron-chelating agents
- Iron overload (hemochromatosis)
- HSCT recipients
- Solid organ transplant recipients
- Patients with haematological malignancies
- Patients with burn injuries
- Injection drug users
- Widespread use of voriconazole

Rarely, patients without apparent immunological defects may be infected.

Patients with Covid-19 illness (**active/ recovering / post-discharge**) who are known diabetics and treated with systemic steroids are at higher risk of mucormycosis.

Clinical presentations

- Rhino-orbito-cerebral mucormycosis (ROCM) – commonest presentation

Signs and symptoms - Nasal blockage or congestion, nasal discharge (bloody or brown /black), unilateral facial pain or numbness or swelling, headache, fever, necrotic black ulceration of hard palate or nasal turbinate, diplopia, blurred or loss of vision, proptosis, lethargy, seizures, slurred speech, partial paralysis, mental confusion and neurological symptoms due to frontal lobe necrosis and abscess formation

- Pulmonary mucormycosis

Signs and symptoms - Fever, cough, chest pain, pleural effusion, hemoptysis, worsening of respiratory symptoms

Commonly in neutropenic patients with underlying haematological malignancies on treatment, allogeneic haemopoetic stem cell transplant (HSCT) recipients, solid organ transplant (SOT) recipients

- Gastrointestinal mucormycosis

Signs and symptoms - abdominal pain, nausea and vomiting, gastrointestinal bleeding

- Cutaneous mucormycosis

Signs and symptoms – raised, indurated lesions with central necrotic area or ulcer covered with black eschar.

- Disseminated mucormycosis

In people who are already sick from other medical conditions, which makes it difficult to identify which symptoms are related to mucormycosis. Patients with disseminated infection in the brain may develop mental status changes or coma

*Suspected mucormycosis is a **medical emergency** – start amphotericin B (conventional deoxycholate preparation or liposomal preparation) without delay pending investigation results.

Diagnosis

Urgent radiological studies

Rhino-orbito-cerebral mucormycosis: CT /MRI- Para nasal sinuses with brain

CT – involvement of several sinuses (ethmoid and sphenoid commonly), clear unilateral predilection, no air-fluid levels, thickening of sinus linings and destruction of surrounding bone

MRI – better than CT. Detects extension of infection to adjacent soft tissues of the orbit and brain.

Pulmonary mucormycosis: HRCT thorax

Difficult to diagnose, signs overlap with COVID-19 pneumonia and COVID-19 Associated Pulmonary Aspergillosis (CAPA). May see thick walled / multiple pulmonary cavities, infiltrates, reverse halo sign and multiple nodules.

Laboratory diagnosis

- **Please send all samples to the Department of Mycology, Medical Research Institute, Colombo**
- One sample in sterile screw capped container with sterile saline for fungal studies (microscopy and culture)
- Another sample in sterile screw capped container with formal saline for fungal histopathology
- Transport to the laboratory in room temperature ASAP

Specimens

Rhino-orbito-cerebral mucormycosis – endoscopic collection of debrided tissue (urgent sampling)

Pulmonary mucormycosis – BAL, Mini BAL, non- bronchoscopic lavage, Trans bronchial biopsy, CT guided biopsy from lung

Other forms of mucormycosis – tissue samples of debrided tissue (urgent sampling)

Treatment

Team approach (Mycologist / Microbiologist, Physician, ENT Surgeon, Radiologists etc.)

1. **Start IV liposomal amphotericin B on suspicion**: Liposomal Amphotericin B initial dose of 5mg/kg body weight (10 mg/kg body weight if CNS is involved)
   (Annexure – instructions on administration)

2. **Repeated and adequate surgical debridement and send all samples to the laboratory**: Urgently to remove **all** necrotic material; if eye involved, exenteration of eye; in pulmonary, if the lesion is localized or in one lobe
3. **Tight glycaemic control**
4. **Reduce steroids** (if patient is still on) with aim to discontinue rapidly
5. Reduce or omit all other immunosuppressive treatment if possible
6. Examine for black coloured eschar formation on nasal turbinates or hard palate during active/ recovering / post-discharge
7. Educate on patients regarding clinical features before discharge

Duration of treatment depends on clinical, radiological and mycological cure

References

1. WHO: Mucormycosis: Key facts https://www.who.int/india/emergencies/ coronavirus -disease-%28covid-19%29/mucormycosis
2. Global guideline for the diagnosis and management of mucormycosis: an initiative of the European Confederation of Medical Mycology in cooperation with the Mycoses Study Group Education and Research Consortium. Cornely, O.A., *et al*. *The Lancet Infectious Diseases* 19, e405–e421. https://doi.org/10.1016/S1473-3099(19)30312-3
3. Mehta, S., Pandey, A., 2020. Rhino-Orbital Mucormycosis Associated with COVID-19. Cureus. https://doi.org/10.7759/cureus.10726
4. Fungal Infection Diagnosis and Management. Fourth Edition. Malcolm D. Richardson, David W. Warnock. Wiley – Blackwell publishers 2012

Prepared by Department of Mycology
Medical Research Institute, Colombo
Telephone: 0112698725