

## Mucormycosis in Context of the COVID-19 Pandemic

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While the coronavirus 19 pandemic continues to be a world-wide healthcare crisis, we might be heading towards an era of post covid complications of near pandemic proportions.

Rhino-orbital Mucormycosis is a well-known deadly, acute and aggressive infection affecting patients in Otolaryngology practice. This disease particularly affects immunocompromised patients and those with diabetes mellitus. It is caused by inhalation of spores of fungi in the order Mucorales, most commonly from the genera *Rhizopus*, *Mucor* and *Rhizomucor* which are ubiquitous in nature in soil, growing rapidly with spores that can become airborne. The enzyme Ketone reductase enables these organisms to thrive in glucose rich, acidic environments. Two out of three cases of Mucormycosis are sinonasal.

There has been a spurt, in recent months, in literature of cases of bacterial and fungal co-infection with COVID-19 [1,2]. Over the best of last month, with India reporting more than 4 lakh new cases every day, there has been a manifold rise in the number of cases of Mucormycosis at primary, secondary and tertiary levels of health care. These cases are being seen approximately 2.5 to 3 weeks after recovery. This rise is unprecedented, and a few reasons have been cited for it namely immunocompromise due to COVID-19 itself [3], indiscriminate use of systemic steroids, atypical presentation of early Mucormycosis and tocilizumab therapy [4]. While COVID-19 has consumed our healthcare resources, making already scarce specialist care even scarcer, Mucormycosis cases are being diagnosed late. This is an even bigger problem in patients being treated from home with mild-moderate COVID-19 infections in whom systemic steroids are started on an outpatient basis from the first day that patient is seen. Even after diagnosis, with most

hospitals having shut down OT services, the delay in debridement is costing patients dearly.

The way forward should be based on the following key principles. Judicious use of systemic steroids, strict blood sugar control, monitoring for early signs of Mucormycosis in COVID-19 patients and timely administration of antifungals and debridement.

Judicious steroid use refers to the prescription of systemic steroids only in severe COVID-19 infections and treatment of mild-moderate infections without the use of systemic steroids. Furthermore, steroids should be prescribed to patients only after day 9 of symptom onset when viral replication has ceased, and patient is in the second stage of infection. Administration of systemic steroids during the phase of viral replication can cause persistent viremia. Blood glucose monitoring is a must for patients not only during hospital admission but also following discharge as patients are most prone to uncontrolled hyperglycemia post discharge. Preferably, all patients with symptoms of nasal/ facial pain, facial numbness, vision abnormality following COVID-19 recovery should be investigated by nasal endoscopy and guided swabs for gram stain, culture and KOH mount. KOH mount showing broad based hyphae which are aseptate/with incomplete septations is suggestive of Mucormycosis. Such patients should be started on liposomal/lipoidal/colloidal Amphotericin B as early as possible after diagnosis, with regular monitoring of renal function tests. Deoxycholate Amphotericin B can be used if the former drugs are unavailable, but it is more nephrotoxic. This drug also causes hypokalemia which is compounded by Insulin as most of these patients are diabetic. Injectable Posaconazole or Isavuconazole can be used as second line drugs if Amphotericin is not tolerated. Radiology is then per-

formed to evaluate the extent of the disease and diagnosis of complications. In CT, careful attention should be paid to fat stranding in the premaxillary, retromaxillary fat, orbital fat and altered fat in pterygopalatine fossa. These are important pointers towards invasive fungal infection. CEMRI is useful in the diagnosis of complications like orbital cellulitis, cavernous sinus thrombosis and ICA thrombosis [5]. Therefore, CT and MRI are complimentary to each other and must be selected as per the clinical scenario. Radiology should be interpreted in light of clinical findings and microbiological examination. Early surgical debridement of devitalized tissues is a must to ensure reach of the systemic antifungal. This is particularly challenging in COVID-19 positive patients due to risk of exposure of surgeon and OT staff. Moreover, these patients often have comorbidities in addition to poor lung function making them poor candidates for anesthesia.

These are challenging times which demand that keeping evidence as a guideline, we innovate and improvise according to our own resource scenarios to provide best possible care to our patients. It is equally important to keep abreast with evolving evidence and modify our course so that we may be able to steer our ship through the storm of COVID-19.

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