Review Article

Mucormycosis of maxillofacial region and it's management: a review

Abstract: Mucormycosis is a rare fungal infection with high morbidity and mortality but nowadays it is observed in many covid -19 patients therefore it is identified as a complication after covid-19. It is most commonly seen in patients with systemic illness such as Diabetes Mellitus ,Neutropenia, Corticosteroid use, Organ transplantation, advanced age and also seen in patients who have stayed prolonged in ICU. This review article includes etiology, risk factors, site specificity, oral manifestations of Mucormycosis, diagnosis based on oral and maxillofacial symptoms and also management of the complications.

Key words : Dentistry, COVID-19, Diabetes Mellitus, Mucormycosis, Amphotericin B, Mandible, Maxillary Sinus, Palate, Necrosis.

Introduction :

Mucormycosis, also known as black fungus is a serious fungal infection is common in patient with Covid-19. It is an invasive fungal infection caused primarly by fungi from subphylum *Mucormycotina* and the order *Mucorales. Rhizopus* is predominant pathogen accounting for 90% cases of the Rhinocerebral mucormycosis.[1] It is caused by fungi that can be found in decomposing feed in the soil or other organic materials such as animal faeces. Rhinocerebral and pulmonary infections are caused by inhalation of spores and cutaneous infections are caused by spores entering the skin. It can also infiltrate the blood vessels and spread to brain and other organs resulting in disseminated infections.[2] According to epidemiology of mucormycosis in India reported in 2021 the estimated prevalence of mucormycosis was established at an alarming rate of nearly 70 times higher than the global data.[3] Dentists should be aware of the increased incidence of mucormycosis in post covid patient especially in immunocompromised individuals because of symptoms such as atypical facial or sinus pain, blackish discharge and unexpected toothache. A thorough intraoral examination is recommended in all post covid patient visiting the dental OPD. Herein we describe etiology, spread, risk factors, site specificity also diagnosis and treatment for Mucormycosis.

Comment [D1]: Check grammar

Comment [D2]: Reframe the sentence

Comment [D3]: Reframe the sentence

Comment [D4]: Grammar mistake

Etiology, Spread, risk factors and site specification :

It is caused by fungi which may be found in decaying food in soil or other organic matter such as animal excreta.[4] It is spread through environmental factors and released of spores that are easily aerosolized and dispersed.[5]

Comment [D5]: Reframe the sentence. Avoid using It multiple times.

Table no.1: Risk factors and site specification of mucormycosis.[3]

Risk factors	Site specification
Uncontrolled Diabetes Mellitus	Maxillary sinus
Immunocompromised individuals	Orbit and brain
Prolonged ICU stay patient	Maxillary alveolar ridge
Solid organ transplant patient	Lips
Hematopoietic stem cell transplant	Tongue
Neutropenia and Malignancies	Mandible (Rare)
Additional risk factors: -Iron overload or chelation with Desferrioxamine -Breach of skin or mucosa due to trauma and burns or surgical wounds	

Comment [D6]: Specifications

Relation of Covid-19 and Mucormycosis :

There is increase incidence of Mucormycosis recently in Covid-19 infection due to diabetic patients treated with steroids, oxygen therapy and prolonged intensive care admission develop Mucormycosis.

Comment [D7]: Reframe the sentence, grammatical error

Dental implication :

Comment [D8]: Implications

Mucormycosis presents in various forms:

1. Rhino-orbito-cerebral
2. Pulmonary
3. Gastrointestinal
4. Cutaneous .[6]

Oral form of mucormycosis is relatively rare, the main affected area in oral and maxillofacial region is maxillary sinus and it can be present with invasion and necrosis of palate.[7] Besides maxillary sinus mucormycosis in the alveolar bone of maxilla, lip, tongue and mandible has been reported. However cases involving mandible are very rare. [8]

Table 2. Reported cases of Mucormycosis involving the maxilla.

Authors and Year	Age,years	Sex	Predisposing diseases or risk factors
Kulendra et al (2010)[9]	59	Male	Oral hypoglycemic drugs
Ourania et al(2015)[10]	72	Female	Chronic myelomonocytic luckemia
Shastry et al(2020)[11]	52	Male	Type II diabetic and chronic smoker
Fanny M.L et al (2015)[1]	46	Female	Post extraction
Nikolaos P. et al(2010)[12]	22	Female	Type I diabetic
Dogan et al (2007)[13]	7	Male	Acute myeloid leukemia
Antonetti et al(2009)[14]	10	Male	Burns

In the post extraction case due to immunocompromised state the fungus begins to grow on spread through blood vessels leading to formation of mucor thrombus through fibrin reaction causing vascular occlusion ischemia and infarction. This explains the formation of black necrotic eschers that form on nasal or palatal mucosa which are characteristics of Mucormucosis.[11] The symptoms presenting in Rhino-orbito-cerebral mucormycosis are facial pain, paraesthesia, headache, periorbital and nasal swelling, eyelid drooping, proptosis, external and internal opthalmoplegia, visual loss and blackish necrosis of palatal and nasal mucosa.[15]

Comment [D9]: Why explanation only about post extraction mucormycosis ?- irrelevant , no continuity.

Diagnosis:

The diagnosis of mucormycosis requires an in depth clinical history and an assessment of the underlying medical illness. Radiographic evaluation benefits to reveal bony erosions, extent of sinus involvement as well as presence of orbital infiltrations and intracranial involvement. CBCT shows – bony erosion, involvement of sinus and nasal cavity, mucosal thickening.[11] MDCT (multidetector computed tomography) or MRI – this imagning of choice is applicable if infection has been invaded in orbit or intracranial space.

Comment [D10]: Spell check

Confirmatory diagnosis – it is based on demonstration of organism in the tissue of biopsy specimen which reveal presence of broad non septate hypae with branching at 90^0 in KOH stain.[16]

Management:

Antifungal therapy with control of predisposing risk factors and surgical management are main treatment for Mucormycosis. First line of treatment involves liposomal amphotericin B and amphotericin B lipid complex; also posaconazole and liposomal amphotericin B as a combination therapy is also useful which is considered as second line of treatment. Antifungal treatment should be continued for atleast 4 to 6 weeks and guided by the resolution of all associated symptoms and findings.[4] Surgical approach is crucial and it should involve excision and debridement of all infected and necrotic tissue based on disease progression.[4] In

some cases referral to maxillofacial surgeon is mandatory as radical resection may be required which can include partial or total maxillectomy and mandibulectomy.[4] Therefore, surgical debridement and antifungal treatment can be considered the key to controlling and eliminating mucormycosis.

Conclusion:

To conclude, mucormycosis is a disease which usually shows aggressive and an alarming mortality rate. However the actual etiopathogenesis remains varied throughout the world diagnosis of this disease remains a challenge for the dental practitioner. Due to its high mortality rate, early and prompt diagnosis, recovery from predisposing factors, early intervention with surgical debridement and therapeutic drugs are the only hopes to improve the condition from this devasting disease.

Comment [D11]: Meaning not conveyed properly

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