

RESEARCH ARTICLE

THE ROLE OF PROSTHODONTICS IN VARIOUS CLINICAL SCENARIOS OF MUCORMYCOSIS: A **REVIEW ARTICLE**

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Abstract

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Coronavirus disease 2019 (COVID-19) is a new disease thing caused by a unique coronavirus (SARS-CoV-2) first documented in China in December 2019 and subsequently causing a worldwide pandemic. COVID-19 caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been sweeping across the globe. During the current pandemic of COVID-19, acountless of manifestations and complications have emerged and are being reported on. There is anincidence of patients with COVID-19 who are at increased risk of acute cardiac injury, arrhythmias, thromboembolic complications like pulmonary embolism and acute stroke), and secondary infection to name a few. The frequency of fungal infections is increasing due to immunodeficiency viruses and immunosuppressive drugs. Candidiasis is the most common fungal infection of the oral cavity.Mucormycosis is an invasive fungal infection, often acute and extremely severe. occurring in patients with an underlying condition. Mucormycosis isproduced by saprophytic fungi of the order Mucorales. The estimated prevalence of mucormycosis is about70 times greater in India than that in global data. Diabetes mellitus is the most common risk factor, followed by hematological malignancy and solid-organ transplant.

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Introduction:-

In December 2019, a cluster of patients with pneumonia of unknownsource was observed in Wuhan, China. A novel coronavirus was identified the causative pathogen, 1-6 temporarily named as 2019 novel coronavirus (2019- nCoV) by the World Health Organization (WHO). On 11 February 2020, WHO named this novel coronavirus pneumonia "COVID- 19" (coronavirus disease 2019)¹. Recently emerged human-to-human transmission of COVID-19, a novel lethal strain of coronavirus, caused a global pandemic burden, affecting thousands of individuals, having life-threatening outcomes, not only in medically compromised people but also in perfectly healthy young individuals with immunocompetent system². TheCOVID-19 infection caused by the novel

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severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) may be related with a wide range of disease patterns, ranging from mild to life-threatening pneumonia³.

The Covid-19 symptom spectrum has expanded since the first days of the disease's presentation, which initially included only a dry cough and high-grade fever, to additionally include various multisystem problems such as shortness of breath, anosmia, ageusia, diarrhea, generalized malaise, acute cardiac injury, and secondary infections⁴. The most common symptoms are fever and dry cough and in some cases shortness of breath, dysosmia, and dysgeusia (Guan et al. 2020; Lechien et al. 2020⁵. It is responsible for lower respiratory infection and can cause Acute Respiratory Distress Syndromes (ARDS)¹. Besides, the diffuse alveolar damage with severe inflammatory exudation, COVID-19 patients always have immunosuppressionwith a decrease in CD4 + T and CD8 + T cells⁶.

Many studies of hospitalized patients with COVID-19 note the empiric use of antibiotics in a majority of patients⁷; however, there is evidence that the inflammatory serological markers that are usually associated with bacterial infection, such as raised procalcitonin and CRP, may appear in patients with COVID-19 without a conforming bacterial co-infection occurring⁸. The patients who were admitted to the intensive care unit (ICU) and required mechanical ventilation, or had a lengthier duration of hospital stays, even as long as 50 days, were more probable to develop fungal co-infections⁹. Henceforth, it is significant to notice that COVID-19 patients can develop encourage fungal infections during the middle and latter stages of this disease, mainly severely ill ones¹⁰.

Mucorales infections are emerging as a matter of concern in COVID-19¹¹. Recently, mucormycosis, also recognized as black fungus, made severe chaos in India during the second wave of the tragical COVID-19 epidemic by its sudden¹². It is associated with angio-invasion and high mortality. The infection is increasingly reported in patients with diabetes mellitus, hematological malignancy, solid organ transplants, and corticosteroid therapy. Due to the aggressive and invasive nature of the disease, extensive surgical resection is required which results in large complex maxillofacial defects¹³.

The spores of the fungus are inhaled through the mouth and nose, but infection infrequently occurs in a person with an intact immune system because macrophages phagocytize the spores. However, an immunocompromised individual is unable to mount an effective immune response against the inhaled spores; thus, germination and hyphae formation occurs and infection develops, most commonly in the sinuses and lungs¹⁴.

When the fungus invades the paranasal sinus mucosa, it may spread directly to the orbital apex and, from there, gain intracerebral access. Mucormycosis is difficult to diagnose early, as patients often present with nonspecific symptoms. By the time signs of orbital apex involvement develop, it is often too late to save the patient's vision, or even the patient's eye or life. The presentation is typically a rapidly progressive infection, and the disease is associated with a high mortality rate¹⁴.

This article will briefly describe the possible treatment options available, according to the area affected (i.e. maxillary, facial, orbital).

Incidence of Mucormycosis:

The incidence of mucormycosis is rising globally¹⁵but the rise is very high in India and China among patients with uncontrolled diabetes mellitus¹⁶.

Risk Factors:

Not all people who have contracted coronavirus infection and are on treatment for COVID-19 obtain mucormycosis. Certain individuals are more prone to getting affected by the fungal infection, such as

- 1. People with uncontrolled diabetes mellitus are the major risk factor in 54-76% ¹⁷
- 2. Hematological malignancy (HM) is a risk factor in 1–9% of mucormycosis patients in India^{17,18}
- 3. Persons with comorbid conditions taking immunosuppressant steroid medications to manage pre-existing illnesses as well as COVID-19, over an extended length of time⁷
- 4. Being treated in the Intensive Care Unit i.e. ICU wing of hospitals for a prolonged interval of time⁸
- 5. Solid-organ transplantation (SOT) is a risk factor in 2.6–11% of mucormycosis cases from Indianprocedures^{19,20,21}
- 6. Already taking prescription antifungal drugs to combat infections

7. Other predisposing factors associated with mucormycosis in India are chronic kidney disease (CKD), pulmonary tuberculosis, and chronic obstructive pulmonary disease (COPD)²²

Role of prosthodontics in India:



Fig. 1:- Maxillofacial defects and related prosthesis.

Small maxillary defects

In small defects (Fig.2 a)with adjacent teeth or adequate supporting alveolar ridges, one-piece maxillary obturator prosthesis is often all that is needed. Retention and comfort are superior by making it lightweight, hollowing out the obturator section, and extending it only a few millimeters into the defect(Fig.2 b). Full extension is not advocated as the tissues neighboring the defect often lack bone and can be tender and friable, providing no further support or retention for the prosthesis, but adding to the potential complications of tissue irritation. It is crucial to ensure a good seal around the opening of the defect by taking a functional impression or using a tissue conditioner to record fine details and tissue movement²³.



Fig. 2:- a. Small maxillary.



Fig. 3:- b. Small maxillary.

Large maxillary defect

Larger maxillary defects require to be obturated to address the various complications. This usually includes a twopart prosthesis consisting of a hollow, flexible glove/ bulb obturator attached to a solid denture base (Fig.3). The glove section is made from a rubber material, which can be compressed to permit for easy insertion and removal (these patients often have trismus which makes it difficult to insert large appliances). The denture clips into the bulb for additional retention and to confirm a complete seal. The complete prosthesis is easy to insert and remove for oral hygiene purposes and to permit the clinician to examine the defect intermittently for any signs of tumor recurrence or other complications²³.



Orbital defect

Orbital rehabilitation is a complex process that needs specificity in a technique according to a certain patient. An orbital prosthesis is made to reconstruct a more typical anatomical structure and cosmetic defect produced by these circumstances in a person. The prosthesis is generally fabricated after complete healing (usually 2 to 4 months). The orbital prosthesis comprises artificial eyes, lids, lashes, and skin²⁴(Fig.4).

Fig. 4 Large maxillary Obturator



Fig. 5:- Orbital Prosthesis.

Ocular defect

A effective ocular prosthesis depends on the patient having a deep, healthy socket with proficient functioning eyelids. Final adjustments and polishing is done at the chair side to perfect the eye position, contour, lid support and to optimize movement²³. A prosthetic eye (Fig.5) is beneficial in patients with scleral defects and helps reestablish esthetics. It also goes a long way in effecting psychological rehabilitation in conditions where the loss of vision is permanent²⁵. The success of an ocular prosthesis depends largely on the precise orientation of the iris disk assembly²⁶.



Fig. 6:- Ocular prosthesis.

Orbital defect with maxillectomy

The success of rehabilitative treatment in a patient with widespread resections involving the hard palate, soft palate, and orbital exenteration is directly related to the quality of the prosthesis. 10 One of the significant problems professionals encounter when constructing these prostheses is the absence of retention. 3 In addition, the edges of the facial prosthesis do not always adapt perfectly to the patient's face because of the movement of bordering tissues. Retentive elements, apart from conventional adhesives, are normally required. The use of magnets in multiple/sectional maxillofacial prostheses is an excellent means to bond them together (Fig.6). However, to assure proper retention and effective stability of the prosthesis each section should be sufficiently extended and the magnets positioned properly²⁷.



Fig. 7:- Palatal obturator attached with facial extension using magnet.

Facial defect

Facial transplantation is becoming an option for the reconstruction of facial defects following severe facial injury including burns. The face is the unique identifier, providing both familial characteristics and information about identities. The reconstruction of the donor's face post-operatively is of some importance (Fig.7), due to

recommendations that the donor body should be restored to an acceptable aesthetic appearance following organ harvesting²⁸.



Fig. 8:- Facial prosthesis.

Mandibular defect

Discontinuity of the mandible after surgical excision disturbs the equilibrium and symmetry of mandibular functions, which leads to altered mandibular movements and deviation of the residual segment towards the defect side, resulting in loss of occlusion on the unresected side. The deviation of the mandible is secondary to muscle imbalance and compromised proprioception, and is easily resolved with mandibular guidance therapy²⁹. Once the continuity of the mandible can be restored surgically, prosthodontic rehabilitation (Fig.8) can be the same as that for the continuity defect³⁰.



Fig. 9 Mandibular Prosthesis

Nasal defect

Nasal defects (Fig. 9a) are difficult to treat surgically and usually necessitate the fabrication of a prosthesis. This involves taking a moulage impression of the affected site as well as of the contra-lateral facial structure. The latter is copied (in a mirror image) to fabricate a closely matched wax replica. This is carved de nova using casts, old photographs, and a general knowledge of anatomy and facial dimensions as a guide (Fig.9b). Alternatively, a "donor- nose" may be used²³.



Fig.9:- a. Nasal Defect.



Fig. 9:- b. Nasal Peosthesis.

Auricular defect

Auricular defects (Fig.10a) are challenging to treat surgically and usually necessitate the fabrication of prosthesis. This consist of taking a moulage impression of the affected site as well as of the contra-lateral facial structure. The latter is copied (in a mirror image) to construct a closely matched wax replica. This is carved de nova using casts, old photographs, and general knowledge of anatomy and facial dimensions as a guide (Fig.10b). Alternatively, a "donor-ear" may be used²³.



Fig.10:- a. Auricular Defect.



Fig. 10:- b. Auricular prosthesis.

Conclusion:-

Successful prosthodontic rehabilitation of patients with head and neck defects depends on a multidisciplinary approach where members from all the associated disciplines work in close consultation and cooperation with each other and with the patient during all the stages of treatment. This remains an area of dentistry that is often neglected, not only in under and postgraduate training, but also in private practice. As a profession we owe these patients our full involvement and commitment. We, therefore, need to become involved with our medical and dental colleagues who treat oral cancer and other patients requiring such rehabilitation, to improve the quality of life, not only of the patients themselves but of the immediate family members as well.

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