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Prosthodontic Rehabilitation of Maxillary Defect with An Open Bulb Obturator in A Patient with Post COVID Mucormycosis.

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Abstract

Maxillofacial rehabilitation after accidents, surgical removal due to malignancy or congenital deformity is challenging, since its not only affects the patient function and esthetics but also impairs the patient confidence in the society. Prosthodontic rehabilitation restores patient confidence, comfort along with function and esthetics. Various prosthodontic treatment options are available. Selection of adequate prosthesis that suits the patient is of utmost importance. Fixed or removable prosthesis are selected based on the supporting structures.

The rehabilitation gets questionable when patients are exposed acquired maxillary defect caused by extensive debridement of oral and facial structures due to the post covid mucormycosis.

Keywords: mucormycosis, oroantral communication, prosthodontic rehabilitation, open bulb obturator.

Introduction

Mucormycosis, most generally found in immuno compromised patients, is an opportunistic fungal infection. The mode of infection is through the inhalation route and infection starts initially with subsequent invasion into the vascular tissue in the nose and paranasal sinuses, leading gradually to thrombosis and necrosis of nearby hard and soft tissues.

The fungus may spread to invade the palate, sphenoid sinus, cavernous sinus, orbits or cranially to invade the

brain. Pain and swelling precede oral ulceration and the resulting tissue necrosis can result in palatal perforation. Infection can sometimes extend from the sinuses into the mouth and produce painful, necrotic ulcerations of the hard palate. Surgical treatment includes the resection of involved tissues of the face, including skin and muscle, any skin of the nose that is involved, maxillary and ethmoid sinuses, necrotic tissue of the temporal area and infratemporal fossa, and orbital exenteration.[1]

Maxillectomy often results in a high level of morbidity with significant psychological and functional implications for the patient. Such disabilities include inability to masticate, deglutition, and speech disturbance.[2]

A successful prosthetic design for functional restoration of the maxillectomy defect utilizes the remaining palate and dentition to maximize the support, stability, and the retention of an obturator. Fabricating a successful obturator prosthesis used for the prosthetic rehabilitation of congenital or acquired defects in the maxilla depends on making a detailed impression and constructing the prosthetic parts compatible with the oral tissues. [3]

According to GPT -9 an obturator is defined as a maxillofacial prosthesis used to close, cover, or maintain the integrity of the oral and nasal compartments resulting from a congenital, acquired, or developmental disease process, such as cancer, cleft palate, osteoradionecrosis of the palate; the prosthesis facilitates speech and deglutition by replacing those tissues lost because of the dis ease process and can, as a result, reduce nasal regurgitation and hyper nasal speech, improve articulation, deglutition, and mastication; an obturator prosthesis is classified as surgical, interim, or definitive and reflects the intervention time period used in the maxillofacial rehabilitation of the patient.[4]

In patients where implant placement is questionable, remaining undercuts along the anterior nasal aperture, velum, lateral scar bands, maxillary sinus, floor of the orbit and lateral pterygoid plate can be utilized in retaining the obturator. Utilizing undercuts for obturator retention is a well discussed topic in literature but even with meticulous use of remaining hard and soft tissue, the weight of the obturator prosthesis is often a displacing factor. The following case report shows the fabrication of open bulb obturator for a patient with deep intraoral defect communicating with orbital cavity.[5]

Case History

A 55-year-old male patient reported to Department of Prosthodontics, crown and Bridge, Government Dental college and hospital, Ahmedabad, Gujarat, India, with chief complaint of difficulty in mastication, and nasal regurgitation,

Patient had undergone maxillectomy as a therapeutic treatment caused by post covid mucormycosis fungal infection six months before. Patient had history of uncontrolled diabetes mellitus and Covid 19 infection which led to the development of rhino orbital mucoromycosis. Surgical treatment plan was formulated comprise of subtotal maxillectomy and exenteration of left orbit and patient reported to department of prosthodontics for rehabilitation after 6 months of surgery.

Figure 1(a)

Figure 1(b) Figure 1(c)

Figure 1:

Intra oral examination [figure: 1(a)] after 6 months revealed maxillary defect in communication with the orbital cavity due resected infra orbital floor and collapsed cheek on left side post maxillectomy. Maxillary defect extends mesiodistally from palatal midline to left vestibule and Antero posteriorly from the anterior region of palate extending posteriorly to soft palate. The ap proximate size of the defect was 5 x 8 cm. The defect comes under Aram any class IV classification. Maxillary defect shows healthy margin favorable for retention and no granulation tissue, redness or fragile margin were present. [figure 1(b)] In maxillary arch the remaining teeth were 15, 16,17 which were periodontally sound. [figure 1(c)] Full dentate mandibular arch was present with no occlusal abnormalities.

Treatment plan

Due to lack of supporting tissues, bone, and adequate number of teeth an acrylic definitive open bulb obturator was planned for the patient.

Step 1: Primary impression of both maxillary and mandibular arches were made perforated stock tray using alginate impression material (DPI imprint Alginate). The primary casts were fabricated with dental stone (Type III, Kal dent, India) (figure 2 and 3)

Figure 2: Occlusal and lateral view of maxillary impression and mandibular impression

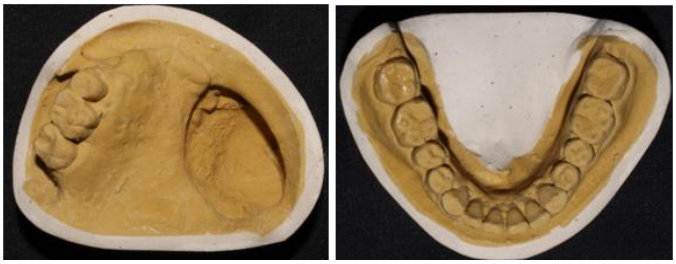

Figure 3: Maxillary and mandibular primary casts

Step 2: Custom tray was fabricated 2mm short of the sulcus depth using polymethylmethacrylate self-cure resin (DPI, India). To record the functional depth of the defect, border molding was done in incremental manner using low fusing green stick compound (DPI Pinnacle, India). Patient was instructed to do neck movements including flexion and left and right turn, during border molding to attain proper seal [figure 4 (a)]

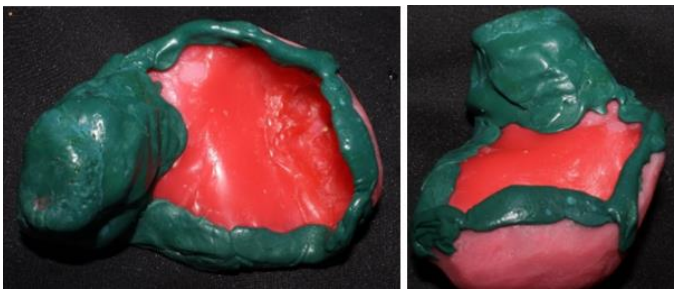

Figure 4: (a) Occlusal and lateral view border molded custom tray

Step 3: Then wax spacer was removed and coltene adhesive was applied over the tray and allowed to dry for five minutes before making the final impression with President light body poly vinyl siloxane impression material (President, coltene). [Figure 4 (b)] Type III dental stone (Kal dent, India) was used for the fabrication of master cast. (Figure 5)

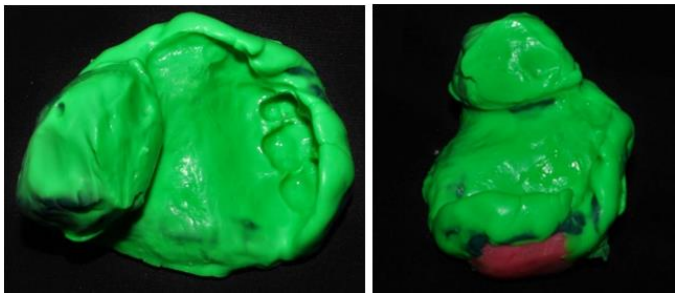

Figure 4: (b) Occlusal and lateral view of maxillary final impression

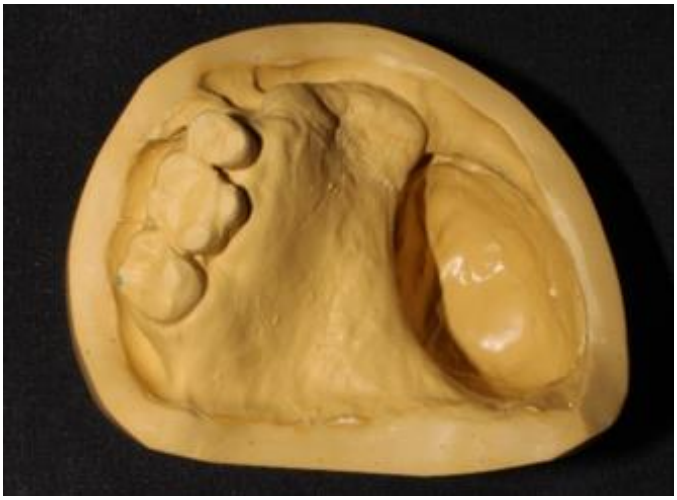

Figure 5: Master maxillary cast

Step 4

All the undesirable undercuts were blocked, and a temporary denture base record was made on master cast using auto polymerizing resin and occlusion rim was fabricated. Jaw relation record at correct vertical dimension and horizontal relation was made and transferred to the mean value articulator (Figure-6)

Figure: 6 Jaw relation

Step 5

Teeth arrangement was completed using semi-anatomic teeth (Acryrock, Ruthinium, India). The maxillary anterior teeth were arranged with minimal overjet and overbite. The occlusion was decided by the opposing arch and wax try-in was done, the patient approval for a esthetics was taken. (Figure-7)

Figure: 7 try in

Step 6

Dewaxing was done by conventional method after which 2 mm thickness of wax was adapted around the defect area except the superior surface and a putty spacer was fabricated. After dewaxing of flask DPI heat cure acrylic was packed in dough stage along with putty spacer and was processed at 74 °C for approximately 2 h and increasing the temperature of the water bath to 100 °C and processing for another 1 h. After deflasking the obturator was finished and polished. (Figure 8)

Figure 8: Open bulb maxillary obturator

Figure 9: (a) and (b)

(a) The posteromedial extension must extend vertically about 1 cm to minimize leakage (arrows). (b) Extension up the lateral wall of the defect improves retention and

stability (arrow). In some patients support can be enhanced by engaging the superolateral portion of the orbital floor (oval).

Figure 10: Intra oral post-operative front, right and left lateral views

Figure 11: Pre and Post-operative occlusal view showing obturator in place

Discussion: A definitive obturator is not indicated until the surgical site is healed and dimensionally stable and the patient is prepared physically and emotionally for the restorative care that maybe necessary. The obturator maybe displaced superiorly with the stress of mastication and will tend to drop without occlusal contact. The degree of movement will vary with the number and position of teeth, the size and configuration of the defect, the amount and contour of the remaining palatal area, height of the residual alveolar ridge, the size, contour, and lining mucosa of the defect, and the availability of undercuts. Lack of retention, stability, and support are common problems of treatment for patients who have had a maxillectomy.

Height and contour of the residual alveolar ridge and the depth of the sulcus are important in both the edentulous and the dentulous patient. A large, broad ridge or a ridge with a square or ovoid shape usually provide better retention, stability, and support than the small, narrow ridge with a tapering contour. The teeth are the greatest asset for providing retention of the obturator prosthesis. If sound natural teeth remain, the bracing components of the prosthesis framework can be used to minimize movement in all three directions. The number, position, and periodontal status of the remaining teeth are the most critical factors in evaluating the amount of stress that the remaining teeth maybe able to absorb.[6]

The bulb as it obturate the defect, it must also add up the retention and stability by extending adequately into the defect to achieve a seal[7]. On the other hand, more extension increases the weight of the prosthesis and with the gravitational force as a dislodging factor, that is going to be a real issue affects the prosthesis stability hence, the idea of making prosthesis with hollow bulb to make the prosthesis lighter became a crucial matter.[8]

Weight reduction is especially important when the obturator prosthesis is suspended without bone or posterior tooth support on the defect side as in the case of most maxillary resection prosthesis. Wu and Schaaf found that a hollow maxillary obturator prosthesis reduced the weight of the prosthesis by 7% to 33%, depending on the size of the maxillary defect.[9]

Advantages of a hollow bulb obturator[10]

- Weight of the obturator is reduced, making it more comfortable and efficient.
- Light weight improves one of the fundamental problems of retention and increases physiological function so that teeth and supporting tissues are not stressed unnecessarily.

• Decrease, in pressure on the surrounding tissues, aids in deglutition and encourages the regeneration of tissue.

• Light weight reduces the self-consciousness of wearing a denture.

• Light weight does not cause excessive atrophy and physiological changes in muscle balance.

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