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**Modified Two Unit Oral Characterized and Hollow Detachable Definitive Obturator
Fabrication Technique for Rehabilitation of Post Mucormycosis Bilateral Maxillectomy Patient:
A Clinical Case Report**

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ABSTRACT

Maxillary defects are created by surgical treatment of benign or malignant neoplasms, congenital malformation, trauma and recently because of post covid mucormycosis. The size and location of the defects influence the degree of impairment and difficulty in prosthetic rehabilitation. Lack of support, retention, and stability are common prosthodontic treatment problems for patients who have had a maxillectomy. A prosthesis used to close a palatal defect in a dentate or edentulous mouth is referred to as an obturator. The obturator prosthesis is used to restore masticatory function and improve speech, deglutition and cosmetics for maxillary defect patients. The weight of the maxillary obturator is a dislocating factor because the prosthesis often acts as a cantilever. The laboratory procedure generally used in the construction of a hollow obturator is rather complicated. A more simple and accurate method which facilitates the processing of an obturator will be described. This article discusses about a modified technique to fabricate a two unit oral characterized and hollow detachable definitive obturator for rehabilitation of patient undergone bilateral maxillectomy after post covid mucormycosis.

Keywords: *Maxillary Defect; Support; Retention; Stability; Hollow Obturator Prosthesis; Post Covid; Maxillectomy; Mucormycosis.*

1.0 Introduction

Mucormycosis is a rapidly progressive, fulminant and life-threatening infection. Paltauf was the first to describe it in 1885. After candidiasis and aspergillosis, it is the third most prevalent opportunistic fungal infection. Mucormycosis, also known as black fungus, caused havoc in India during the catastrophic COVID-19 epidemic's second wave (between April and June 2021) by a rapid and deadly surge with up to a 50% fatality rate [1].

Based on clinical presentation and involvement of a particular anatomic site mucormycosis is divided into six types: (i) rhino cerebral, (ii) pulmonary, (iii) cutaneous, (iv) gastrointestinal, (v) disseminated, and (vi) miscellaneous. Rhino cerebral type is the most common form of the disease [2].

Eye or facial pain and numbness are the first signs of rhino cerebral mucormycosis, followed by conjunctival suffusion, hazy vision, and soft tissue swelling. If left untreated, the infection progresses into the sinuses and oral cavity and produce painful, necrotic ulcerations of the hard palate [3]. Treatment includes local or systematic antifungal medications and surgical debridement. Surgical excision and debridement of the affected areas results in defects of varied sizes which affects the functions, esthetics, morbidity and quality of life.

So, it is necessary to discuss and understand the current trends for the reconstruction techniques present and prosthetic rehabilitative procedures associated with it. The separation of the oral and nasal cavities to allow adequate swallowing and speech, support for the orbital contents to prevent

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enophthalmos and diplopia, support of the soft-tissue to restore the midfacial contour and aesthetic, are all part of the prosthodontic rehabilitation of total or partial maxillectomy inpatients [4]. Selection of adequate prosthesis that suits the patient is of utmost importance. Fixed or removable prosthesis are selected based on the supporting structures. If the teeth or underlying bone are of poor quality or quantity, removable prosthesis is advised. Conventional complete denture therapy results in inadequate denture retention, stability & patient satisfaction. [4] However, the hybrid dentures could overcome the shortcomings of conventional complete dentures. Problems like loose dentures, loss of proprioception & bone resorption can be resolved with hybrid dentures & hence it is the last line of defense that successfully keeps patients from becoming edentulous. Neil's Brill (1955) classified the dentures supported by the existing natural teeth that had characteristics of both a removable partial denture and a complete denture, were termed as Hybrid Prosthesis. [5] This case report describes the prosthodontic rehabilitation of a patient after undergoing bilateral maxillectomy due to mucormycosis. The basic principles of any prosthetic design include preservation of the remaining natural tissues along with retention, stability, support, and aesthetics. This clinical report describes maxillary rehabilitation with hybrid removable prosthesis in a compromised hard tissue support.

2.0 Description of the Case

A forty-seven year old man was surgically operated for post covid mucormycosis of bilateral maxilla and was referred for the prosthodontic rehabilitation with the chief complains of difficulty in chewing and swallowing due to missing teeth and oroantral communication along with poor aesthetics. The patient was very conscious of his appearance and was expecting a prosthesis which will improve his appearance along with function[6]. Medical and dental history revealed surgical resection of the bilateral maxillary alveolar bone due to post covid mucormycosis 6 months ago. The patient had used an interim obturator (without teeth incorporation) for the past 3 months. Intraoral examination revealed well healed surgical defect in the maxillary right and left buccal vestibule creating an oro-antral communication (Fig.1). maxillary right molar and

complete mandibular dentition were examined clinically as well as radiographically (panoramic) and found to be caries-free with no significant gingival/periodontal problems. Masticatory and phonetic functions of the patient were severely affected due to missing maxillary structures. The patient was diagnostically classified as 'Class IV (severely compromised) clinical situation' according to the Prosthodontic Diagnostic Index (PDI) described by McGarry et. al. [7]. Prosthetic rehabilitation was planned with two unit oral characterized and hollow detachable definitive obturator a closed hollow definitive obturator.

Figure 1: Intraoral Bilateral Maxillectomy View



3.0 Technique

Deep surgical defects were blocked out with a gauze pack and a perforated stock tray was selected for making the preliminary impression. The stock tray was modified using modelling wax corresponding to the area of the defect. Primary impression of the maxillary and mandibular arch was made by using alginate (zhermack; tropicalgine).

The primary casts were obtained from the impression and an interim obturator was fabricated by using self-cure clear acrylic was given to patient for 3 months. After 3 months use of interim obturator (fig.2) patient was called for fabrication of definitive prosthesis. after tray adjustments final impression was recorded using green stick compound (DPI pinnacle, tracing sticks) and c silicon light body impression material (zhermack indurant g and oranwash L) (fig.3). Impression was poured in type 3 dental stone and final cast was obtained (fig.4).

Figure 2: Interim Obturator used Asa Tray for Final Impression



Figure 3: Final Impression



Figure 4: Final Cast



Figure 5: Jaw Relation of the Patient Recorded



After blocking sever undercuts the denture base was fabricated using cold cure acrylic resin. Wax rims were fabricated using modelling wax. After evaluating the lip and cheek support the jaw relation of the patient recorded (fig.5).

Figure 6: Try in Done



Recorded jaw relation was then transferred to three point articulator and teeth arrangement was done. During try in stage lip and cheek support was again re-evaluated (fig. 6).To improve esthetics, the waxing and carving was done to simulate it to the natural dentition (Fig.7).

Figure 7: Characterization



all over the matrix side. To measure the space between the template and the adapted putty an endodontic file with a rubber stopper was used to check for equal amount of 2mm space left (fig 10,11). Now for fabrication of 3D heat cure acrylic resin shim wax of 2 mm thickness was adapted over all surfaces of putty spacer^{9,10,11}(fig;12).

Figure 7: Staining of Lower Portion

4.0 Processing

Light weight, cleanliness, and simplicity of construction are important considerations in constructing a prosthesis to obturate the defect after a maxillary resection. Since the weight of a maxillary obturator is often a dislocating force, it must be as light as possible. Cleanliness and retention of a high polish are desirable, although they are difficult to achieve with some of our former methods of constructing the hollow extension section⁸ hence, in this technique the oral part is fabricated in two portions 1) characterized lower portion and 2) hollow upper portion.



Figure 8: Denture Base

The obturator is cut into two parts and lower portion is characterized by root carving, gingival contouring and acrylic stain⁸ (fig 6,7). 2mm thickness modelling wax was adapted on the cast to fabricate denture base and then this denture base was separately fabricated in heat cure acrylic resin by flasking, dewaxing, packing and curing and then adjusted according to cast.



Figure 9: Upper Portion Duplicated using Putty and Stent Prepared using Hard Thermoplastic Sheet

Indexing was done on the cast using marker for orientation. Duplication of the upper portion was done in C silicon putty(zeta plus zhermack) and poured in type 3 dental stone (Gold stone).A template of the duplicated upper portion was made by adapting 1 mm hard thermoplastic sheet on the recovered cast using vacuum heat pressed machine Biostar (fig 9). Now the clear template was placed on the definitive cast (fig;10). Condensation silicon putty (zeta plus zhermack) was mixed and adapted on final cast and shaped to the approximate contours of the matrix. The polymerized putty was cut by scalpel blade in such a way to leave 2mm of space between the putty and the cervical portion of the clear template and also



Figure 10: Template Adaptation using Orientation Marks

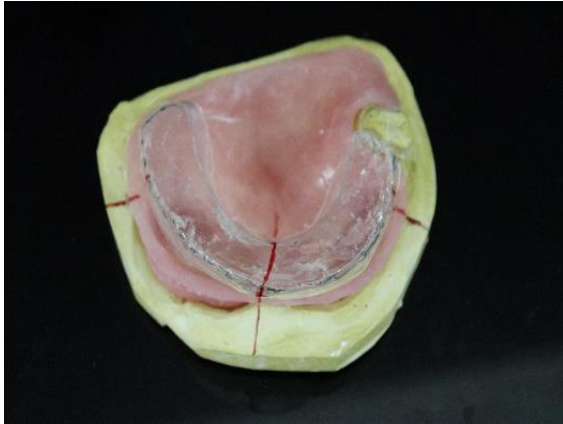
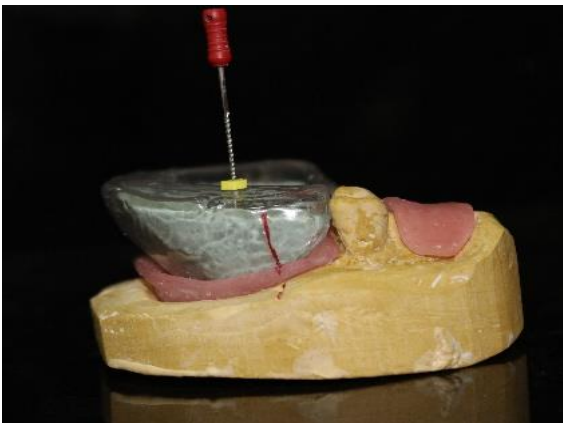


Figure 11: Putty Adapted



And these parts were fabricated in heat cure acrylic resin material (DPI Heat cure acrylic resin material) by conventional method (fig.13,14). This acrylic shim and denture base, joined firstly by wax and again flasking, dewaxing, packing and curing

was done in conventional manner (DPI heat cure acrylic resin material) (fig.15). This hollow heat cure acrylic resin 3D shim is tested by immersing in the beaker of water.

Figure 12: Modelling Wax Adapted



Figure 13: Dewaxing and Packing of Hollow Part



Figure 14: 3D Acrylic Shim and Denture Base in Heat Cure Acrylic Resin



Figure 17: Magnets Incorporated in Prosthesis



Figure 15: Shim and Denture Base Joined by Wax



Figure 18: Final Prosthesis



Tooth portion of obturator prosthesis is fabricated by using heat cure acrylic resin (DPI Heat cure acrylic resin material) and pigments were added to give natural appearance. Trimming, finishing, and polishing procedures were performed.

Figure 19: Pre and Post Operative Patient



Figure 16: Two Parts Fabricated



Then a pair of commercially available magnets (cobalt-samarium, Ambika Corporation, New Delhi,

India), 5 mm in diameter and 2 mm in thickness was employed with final prosthesis. Provision for placement of magnets in both the parts of prosthesis as shown in fig 17 was made and positioned with the help of auto-polymerizing resin. Complete polymerization was ensured by placing in a pressure pot and finishing and polishing was then carried out¹². The prosthesis along was then checked in the patient's mouth for comfort, function and esthetics.

The patient was educated about the insertion, positioning and maintenance of the prosthesis. The patient's demands were fulfilled. He was called for regular check up to evaluate any soreness or looseness of dentures.



Figure 20: Intraoral View



5.0 Discussion

The method described in this article is to fabricate a definitive obturator in two unit oral characterized and hollow detachable portion for rehabilitation of post mucormycosis bilateral maxillectomy patient. hollow denture by processing a separate customized heat cure acrylic resin shim to incorporate it in conventional packing method of fabrication of complete denture. Most of the

techniques described earlier used some materials which were incorporated inside and retrieved after denture by making holes at the end and sealing with autopolymerizing resin which created problem like leakage of fluid, some fabricated two parts of denture and joined with autopolymerizing resin causing discoloration later, some used two flask technique which is a cumbersome job. But in this technique the hollow space of the obturator is fabricated previously in heat cure acrylic resin shim (3D) and then incorporated in the packing stage. In spite of being technique sensitive this technique offers several advantages like:

- 1) Polymerized two portions when joined by polymerizing heat cure resin there and very little chances of leakage.
- 2) Upper oral portion can be used as obturator or feeding plate.
- 3) As it is fabricated in detachable two portions it is easy for patient to insert and remove from mouth.
- 4) As the whole assembly is very bulky so making it hollow reduced the weight and making it in two portions made it easy to use for patient.
- 5) As lower portion which was of esthetic concern is characterised patient get the feeling of natural dentition.
- 6) Increased confidence and socialization of patient because of improved aesthetics and phonetics.
- 7) The technique is easy to carry out and requires little more time in the laboratory than a usual denture technique.
- 8) It is accurate.

Disadvantages

- 1) Technique sensitive.
- 2) May require additional magnets to improve attachment.
- 3) Initially the patient may feel discomfort to use as it is bulky.

6.0 Summary

A technical description of the fabrication of a hollow obturator is presented in an attempt to improve the retentive and stabilizing characteristics of an obturative prosthesis. An outline of the technical construction is proposed which reduces the total weight of the appliance and improves the aesthetics and phonetics of patient and make it comfortable to use for patient.

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