

## An Innovative Technique for Complete Maxillectomy Rehabilitation

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### Abstract

Mucormycosis is life-threatening and rapidly progressing fungal infection. The commonly used treatment protocol for such conditions includes surgical debridement including resection of maxillofacial structures like orbit, nose, and maxilla.

**Aim:** The primary aim of this innovation was to enhance the retention and stability of a prosthesis during rehabilitation of complete maxillectomy defects.

**Materials and Method:**

In this novel technique, aid of extra-oral anchorage was taken to overcome the lack of retention in complete maxillectomy defects.

**Result:** The prosthesis provides improved functional and esthetic rehabilitation of the patient.

### 1. Introduction

Mucormycosis is prevalent mostly in patients with medical comorbidities and lowered immune status. Immediate surgical reconstruction in such patients is not advisable as there are chances of development of further complications.<sup>1</sup>

Prosthetic rehabilitation entails two treatment types, implant supported prosthesis, removable prosthesis.<sup>2</sup> Implant supported prosthetic rehabilitation involves placement of implants such as zygomatic implants or pterygoid implants. Surgical reconstruction or implant placement can be performed in after prolonged time

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after patient shows clinical stability and after considerable follow up appointments.

On the other hand, if the facial structures are not reconstructed immediately, they will suffer desiccation, and in some cases, even necrosis, leading to atrophy and contraction that will hinder any subsequent reconstructions. Besides, we consider it unnecessary to submit these patients to the visual impact generated by the disfiguring postoperative deformities. Hence, immediate prosthetic rehabilitation by means of removable prosthodontic appliances can be carried out to restore the defects till the patient becomes clinically stable. Well-fabricated prosthesis offering good retention and functional viability can be used even as a permanent rehabilitative option.

The various removable appliances mentioned in literature are the use of orbital prosthesis for different orbital defects and obturators for maxillary defects.<sup>3</sup> Hollow-bulb obturators or two-piece obturators are used to reduce weight and add resonance to speech. These prostheses are fabricated using heat polymerized polymethyl methacrylate. The hollow bulb in the obturator is formed by use of sugar, salt, alum, argon gas, using plaster index as matrix. Two-flask technique is utilized to fabricate the two-piece obturator. In case of orbito-maxillary defects, a combination of both orbital prosthesis and obturator is employed. Various methods used for retention of such prosthesis include spectacle frame<sup>4</sup>, anatomic retention using acrylic conformer relined by a soft liner<sup>5</sup>, adhesives<sup>6</sup>, stud attachments, magnets<sup>7</sup>.

Limitations of adhesives include possible allergic reactions, decreased efficacy with use, and need for daily application and removal. Their use increases the maintenance of the prosthesis. Some denture adhesives contain zinc which can precipitate zinc toxicity. The major problem associated with magnets as retentive devices are corrosion by oral fluids, which limits their use.

Although various attempts are made before, for providing various devices for prosthetic rehabilitation of maxillectomy, there exist many drawbacks in the existing devices. Hence the present invention develops a prosthetic rehabilitation of complete maxillectomy with extra-oral anchorage.

## 2. Methodology

For rehabilitation of complete bilateral maxillectomy, we have fabricated a device with a novel concept.

In this device, to compensate for lack of intra-oral support and retention, we have taken the aid of extra-oral anchor to stabilize the prosthesis. The prosthesis was connected to an extra-oral orthodontic facebow or customized rigid metal framework. The two ends of the facebow were connected to two vertical rigid medical grade stainless steel rods. These two rods were connected to a rigid headband that can be worn around the head.

This forms the basic framework of this prosthesis. Thus, during mastication, stability of the prosthesis will be achieved through cranial support from the frontal, temporal and occipital bones.

The orbital defect was replaced by the aid of an orbital prosthesis. The orbital prosthesis was connected intra-orally to the denture by means of magnet incorporated in acrylic extension which joins with magnets incorporated in intraoral acrylic prosthesis.

## 3. Discussion

Mucormycosis is a fungal infection caused by a group of molds called mucormycetes.

Mucormycosis mainly affects people with existing medical comorbidities and in recent times, on the backdrop of Covid-19, an ideal environment is created for the fungal spores to germinate. Globally, the prevalence of mucormycosis varied from 0.005 to 1.7 per million population, while its prevalence is nearly 80 times higher in India as compared to developed countries, in a recent estimate of the year 2019-2020.

It most commonly infects the nose, paranasal sinuses, eye and brain and causes tissue death in these parts. Mucormycosis of the rhino-orbital region is the most common. Necrosis of the nasal, orbital or maxillary regions often necessitates surgical debridement of the necrotic tissue which results in communication between the oral and nasal cavity that causes difficulty in swallowing and speech, nasal regurgitation, and unesthetic facial appearance.<sup>8</sup> Food lodgment in the areas of the defect is another major problem. Areas of the defect are difficult or nearly impossible to clean. Food lodgment in these areas, can lead to further bacterial growth putting the patient at risk of further deterioration of the facial structures.

Management of Mucormycosis in terms of Rehabilitation:

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After surgical debridement of the necrotic tissue, rehabilitation of the defect can be done in two different ways:

- 1) Surgical rehabilitation
- 2) Prosthetic rehabilitation

Prosthetic rehabilitation entails two treatment modalities:

1. Implant supported prosthesis
2. Removable prosthesis

Implant supported prosthetic rehabilitation involves placement of implants such as zygomatic implants or pterygoid implants. Placement of implants is not recommended in patients with uncontrolled diabetes and other medical conditions.

Hence, surgical reconstruction or implant placement can be performed after prolonged time after patient shows clinical stability and after considerable follow up appointments.

On the other hand, if the facial structures are not reconstructed immediately, they will suffer desiccation, and in some cases, even necrosis, leading to atrophy and contraction that will hinder any subsequent reconstructions. Besides, we consider it unnecessary to submit these patients to the visual impact generated by the disfiguring postoperative deformities.

Hence, immediate prosthetic rehabilitation by means of removable prosthodontic appliances can be carried out to restore the defects till the patient becomes clinically stable. Well-fabricated prosthesis offering good retention and functional viability can be used even as a permanent rehabilitative option.

The various removable appliances mentioned in literature are the use of orbital prosthesis for different orbital defects and obturators for maxillary defects which can be exercised in cases of partial maxillectomy where retention can be obtained from the remaining intraoral structures. In cases of complete bilateral maxillectomy, use of such appliances is complicated as there are no means to achieve acceptable retention from any intra-oral structure. The prosthesis in such cases, will have less support and thus reduced functional viability.

Hence for rehabilitation of complete bilateral maxillectomy, we have fabricated a device with a novel concept.

In this device, extra-oral anchorage was used for stabilization of the prosthesis and to compensate for lack of intra-oral support and retention.

The basic framework of the prosthesis was as follows:

1. The prosthesis was connected to an extra-oral orthodontic facebow or customized rigid metal framework.
2. The two ends of the facebow were connected to two vertical rigid medical grade stainless steel rods.
3. These two rods were connected to a rigid headband that can be worn around the head.

During mastication, stability of the prosthesis will be achieved through cranial support from the frontal, temporal and occipital bones.

The orbital defect was replaced by the aid of an orbital prosthesis. The orbital prosthesis was connected intra-orally to the denture by means of magnet incorporated in acrylic extension which joins with magnets incorporated in intraoral acrylic prosthesis.

Stability in all planes:

In this device, the two vertical rods connected the denture to the headband. The length of the two rods was adjusted so that the distance between the headband and the denture is maintained equally at all points. The two rods were fixed to the headband with the help of screws. Due to this the denture is held in place and movement in all the three planes is restricted.

The two vertical rods were soldered to the facebow as well. The intra-oral part of the facebow was connected to the denture. Thus, a fixed angle was maintained of the intra-oral facebow within the denture. The extra oral part of the facebow was additionally soldered to the intra oral part of the facebow to improve rigidity.

For further reinforcement and stability, a small piece of wire was soldered between the vertical rods and the extra-oral facebow. This will enhance the stability of the entire framework and aid in reducing any flexibility present within the wires.

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A fixed connection between the headband and the vertical rods will help in maintaining a rigid vertical angle and any forward displacement of the denture will be avoided.

The entire appliance can be disassembled while not in function. The vertical rods are removable and we have kept the intra oral part of facebow acrylised but it can be made removable as well. The patient can assemble the appliance and wear it during mastication.

The main advantage of this appliance is that it uses extra-oral anchorage, which is helpful when patients do not have any remaining support and undercut areas intra-orally to give retention.

Occlusion between the maxillary and mandibular teeth can be adjusted so that minimum damaging forces are exerted on the maxillary denture. Thus, functional viability of this appliance can be maintained.

Limitations:

Certain gaps may be present around the maxillary denture through which food can get regurgitated or redirected into nasal cavity. These gaps can be filled by recording the borders of the denture by soft liner or soft thermoplastic sheet building up the flanges with acrylic resin. By this method the prosthesis will better adapt to the cheek or soft tissues.

The extra-oral framework of the appliance was fabricated with stainless-steel rods and wires which can have a displeasing appearance. Further study of more aesthetic as well as rigid materials can be done to resolve this issue.

Thus, in a patient who has undergone complete bilateral maxillectomy, immediate rehabilitation can be provided by this device to help the patient in basic functions like mastication, deglutition, phonetics and prevention of regurgitation of food.



**Figure 1**



**Figure 2**



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