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A CASE REPORT

Restoring Functionality and Aesthetics: A spectacle retained silicone orbital prosthesis and a hollow bulb obturator in a post-mucormycosis patient

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ABSTRACT

Post-COVID mucormycosis was a bane that had an impact on the lives of individuals. The challenging endeavour of rehabilitating patients with rhino-orbital defects centers on their social, psychological, and emotional demands and calls for the creation of prosthetic devices. Rehabilitation aims to cover the defect, shade matching with the overlying skin, iris centering for fabrication of orbital prosthesis and to separate the oral and nasal cavity and maintain anatomy while also assisting the patient with mastication, maintaining occlusion, supporting the mandible and facial tissues, and re-establishing speech and aesthetics for the maxillectomy defect. This case report describes the prosthetic rehabilitation of patient who had undergone Aramany class 1 maxillectomy resulting in communication with nasal fossae along with exenteration of eye using a spectacle retained silicone orbital prosthesis and a closed hollow bulb obturator.

Key words: COVID-19,Maxillofacial prosthesis, Mucormycosis, Obturator, Orbital prosthesis, Rhino-orbital defect

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INTRODUCTION

The second wave of COVID-19 has seen an unusual number of reports of mucormycosis, a rare and lethal fungal infection, particularly in India. Its treatment included antifungal medications, surgical exenteration, and surgical resection.[1] Mucormycosis-related exenteration of the orbital contents and the removal of a portion of the maxilla during an ablative procedure can have a profound negative impact on a person's function, appearance, and psychological health.[2] An ocular prosthesis reintegrates a person back into society, as it plays an important role in human relations and regaining self-esteem and confidence.[3]

Even though it does not restore the function of the lost organ, it does play a role in the form and facial contour of the patient. To obtain good retention and aesthetics, a defect should have proper healing, anatomical undercuts, healthy underlying tissue, and eyebrow position. Shade matching and retention of the prosthesis play a pivotal role in treatment's success.[4] Various methods of retention are reported in literature such as use of adhesives, osseointegrated implants, anatomical undercuts, and magnets[5]. Each option has certain advantages and disadvantages, and fixed options such as implants are a costly affair for the patient.

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Ocular prosthesis falls under the domain of maxillofacial prosthetics. Our eye is a critical sensory organ that not only enables us to function optimally but also plays a role in our psychosocial and physical well-being. The synchronous aim of all those involved in the fabrication of the intended prosthesis should be to fabricate a prosthesis that looks and feels as close to our natural eye as possible. The pigmentation of the surrounding counterparts of the prosthesis should mimic the skin of the host, the artificial iris must resemble the adjacent eye and should be aligned precisely; which plays a major role in the fabrication process. The aesthetics of the ocular prosthesis depend on the amount of lost tissue and the existing anatomy of the host patient, which includes the integrity of their orbital margins.[5,6]

Intraoral defects in the maxilla cause communication with the nasopharyngeal complex. The surgically removed palate has a devastating effect on the appearance and speech of the patient.[7] The obturator allows patients to eat and drink without letting food enter the oroantral cavities or pharynx during mastication. Obturator fabrication techniques, rely on providing patient comfort, ease of use, and complete coverage of the defect. Open bulb obturators are simple to maintain, but the main disadvantage is mucus accumulation, which necessitates the placement of vents in the hollow section to prevent mucus, food, and fluid accumulation, which leads to foul odour and taste.[8] Whereas, closed bulb obturators extend to the superior extent of the defect and reduce air space and mucus accumulation, reducing the weight of the prosthesis by around 30%–35%, which is an added benefit in these prostheses.[8,9,10]

A well-retained and indiscernible prosthesis allows the patient to be accepted in society without being a victim of unwanted empathy.

CASE REPORT

A 35-year-old male patient reported to the outpatient department of the Department of Prosthodontics, SGT Dental College, Gurugram, Haryana. On the basis of information obtained from the patient, he was affected by post COVID mucormycosis (rhino-cerebral type), which resulted in exeneration of his right eye and hemisectomy of the maxilla (figure 1). He further complains of regurgitation of food from the affected site and shows a lack of confidence. In extraoral examination, the overlying skin of the exenterated area was healthy but no overlying bone or soft tissue undercut was present for the retention of the prosthesis. The resected maxillary defect was classified as Aramany Class I. (figure 2). Both prostheses can't be combined together as there was no internal communication between the two defects.

Figure 1: (a) Frontal view (b) Lateral view

Figure 2: Intraoral photograph of the Aramany Class I defect

PRODEDURE FOR FABRICATION OF OCULAR PROSTHESIS

A) Patient preparation for impression making

Patient's eyebrows and eyelashes were lubricated with petroleum jelly to minimize discomfort to the patient while making an impression for an orbital prosthesis. Certain guidelines were marked over the patient's face with an indelible pencil, a vertical midline was marked considering the stable anatomical landmarks and prominent points on the face, the medial & lateral canthus of the normal eye (figure 3).

Figure 3: Marking of anatomical landmarks

B) Facial moulage preparation

The impression of the defect and the contralateral eye was made with irreversible hydrocolloid (GC Impreceed dust-free alginate, GC America), ortho splint pop bandage (Prekare, India) was utilized as the matric for impression material and then poured with Type 4 dental stone.

C) Positioning of iris using graph grid on spectacle

The transparent grid was pasted over the spectacle frame for iris centring, and the marking was made for the inner canthus and outer canthus of the eye according to normal eye and same was transferred to the left eye. The patient was asked to look straight at an object kept 4 feet away. The operator then marked the vertical lines coinciding with the medial and distal extremities of the iris of natural eye. Similarly, the position of pupil was marked with the position of the eyelid (Figure 4). These markings were then transferred to the cast. Photographs were taken for proper shade matching of iris.[6]

Figure 4: Landmarks positioning on Graph Grid

D) Wax pattern fabrication

A foil paper was adapted over the defect on the model and wax pattern was fabricated for the ocular prosthesis, a stock eye (without iris) was inserted and iris was painted over it.

E) Trial of prosthesis

Final orientation of the prosthesis was first refined on the working model with the help of recorded facial measurement and then tried on patients face (figure 5).

Figure 5: Wax pattern fabrication

F) Polymerization, characterization, & prosthesis insertion

The flasking, dewaxing, and packing of the prosthesis was done with room temperature vulcanizing (RTV) silicone (Multisil- Epithetik; bredent GmbH & Co. KG), intrinsic color pigments (Intrinsic coloring kit, Factor II Inc.) were added to obtain a base shade matching to that of the patient. The retrieval of orbital prosthesis was characterized with staining and prefabricated eyelashes were pasted over the upper and the lower eyelids (figure 6). Acrylic rims were made on the distal portions of the spectacles, and eye prosthesis was pasted with medical grade silicone adhesive, which was then delivered to the patient (figure 7).

Figure 6: Characterization on ocular prosthesis

Figure 7: Ocular prosthesis with spectacle

METHODS FOR FABRICATION FOR HOLLOW BULB OBTRUATOR

A) Primary impression

A wet guaze piece knotted with suture thread was placed in the defect to prevent inadvertent flow of impression material into unwanted anatomical structures. Diagnostic impression of maxillary and mandibular arch was made and poured with type 3 gypsum product (Kalstone; Kalabhai Karson, Mumbai, India).

B) Secondary impression

Custom tray was fabricated on the primary cast and the extent of borders was recorded with green stick. Wash impression of the defect was made with Light body impression material which was then picked up in alginate. A secondary cast was poured in Type 4 impression material and unwanted undercuts were blocked (figure 8). Record base was made using self-cure acrylic resin and an occlusal rim was fabricated.

Figure 8: Final impression for obturator

C) Jaw relation and trial

Jaw relation and try-in was done to check to occlusion, esthetics and phonetics. Claps were made in 23 and 26 region for retention of the prosthesis and wax up of the prosthesis was done on the master cast.

D) Flasking and curing

Flasking procedure of the obturator was done, which was followed by dewaxing. During the packing procedure, the defect area was first loaded and packed with heat cure polymerizing acrylic resin, over which a foil paper was adapted to convert the obturator into two-piece (Figure 9).

Figure 9: (a) Investment of the master cast with prosthesis (b) After dewaxing (c) Foil placement after filling the defect region

E) Fabrication of hollow bulb of obturator

Deflasking was done and two piece were separated, the inside portion of the defect part was removed using a acrylic trimming bur keeping the margins intact (Figure 10). Afterwards, the two portions were joined together using self-cure acrylic sealing the margins (Figure 11).The obturator was finished and polished and final insertion of the prosthesis was done.

Figure 10: Two parts of obturator separated by a tin foil

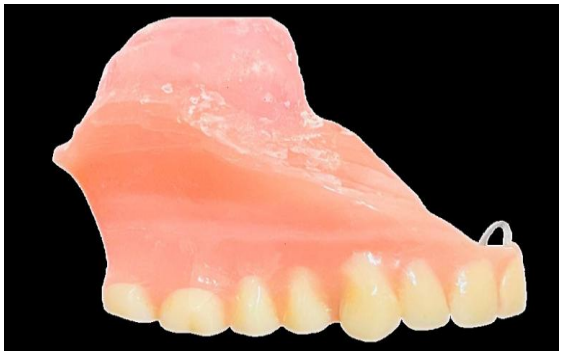

Figure 11: Prosthesis after finishing and polishing

Figure 12: Post-operative photograph after insertion of both prosthesis

DISCUSSION

For rhinocerebral mucormycosis, orbital exenteration combined with hemimaxillectomy causes a continuous maxillary and orbital defect that significantly impairs essential activities like speech, swallowing, deglutition, mastication, and facial aesthetics. Removable maxillofacial prostheses with sufficient retention and stability during function, as well as good aesthetics, are required for prosthodontic rehabilitation of such abnormalities. Throughout the course of the aim of the clinician is to assist a patient's emotional, mental, and psychological needs in addition to their physical and functional elements through prosthetic rehabilitation.

A prosthesis retained with spectacle provides retention as well as aesthetics to the patient and a hollow bulb obturator aids in speech, deglutition and reduces the weight of the prosthesis. The weight of the prosthesis, the finish of the margins of the final product, and the nature of the adhesives used, play an important role in the comfort of the finished product.

Though in fabrication of ocular prosthesis iris positioning is the most important and technique sensitive procedure. Various methods have been described for iris positioning such as Roberts invented the instrument pupilometer in 1969 for iris positioning in prosthetic eyes.[11] The window light was utilized by Joneja et al. to modify the iris.[12] Ocular locator was utilized by McArthur.[13] Supriya *et al*.[14] used boleys gauge to accurately orient iris in a prosthetic eye. In 2010, Pai et al. used glasses that had a graph grid affixed to the glass lens. Outline of the normal eye was made and the graphic cutout of the healthy eye was rotated over the defective eye's eyeglasses lens to create a mirror image.[15] Shetty et al.[16] used Hanau Spring bow to orient iris by reversing the U shaped metal frame of the spring bow in a manner that orbital pointer was secured at the lower border of the left ala of the nose which also acted as third references point. Bi *et al*.[17] utilized a 3-dimensional scanning system to record patients' faces to form a 3D facial model. This present study utilized a combination of anatomical landmarks and spectacle grid for iris positioning, which is an inexpensive and non-invasive methods and materials used for this are readily available that are the pros of this technique, Whereas, inability of eye movement, loss of silicone retention with acrylic framework attached to the frame due to selective adhesive property of RTV silicone, discoloration of the prosthesis are the possible cons.

For the fabrication of a hollow bulb obturator, a single flask method was used, in which the bulb portion was separated from the palatal portion by using aluminium foil. This is a simple process and cuts down on lab time. By this method it is possible to regulate the hollow bulb's thickness and create a closed hollow bulb prosthesis that is lightweight. Additionally, it reduces the likelihood of discoloration, bacterial infection, and water leakage—all drawbacks associated with closed hollow bulb obturators.[18] In order to create a hollow obturator, other methods were also described by some authors. Patil and Patil[19] described inserting a preshaped wax bolus during the packing of heat-cured material. Elangovan and Loibi.[20] demonstrated how to create a hollow bulb obturator using attachments.

Any which ways, a fixed maxillofacial prosthesis is better than the removable one whether it is an ocular prosthesis or an obturator. But with the possible restrictions of financial aid and without any invasive

methods a spectacle retained ocular prosthesis and a hollow bulb obturator is the best treatment option.

CONCLUSION

This case described here was rehabilitated with an orbital prosthesis retained with spectacle and a hollow bulb obturator which is a cost-effective, non-invasive treatment modality. This kind of prosthesis boosts confidence of the affected patient and helps leading them a normal life.The method used is less demanding, simple and a stable method for fabrication of ocular prosthesis as well as fabrication of obturator.

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