Case Report

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Dentistry Section

Prosthetic Rehabilitaion of an Exenterated Defect with a Magnet Retained, Customised Stock Eye Two-piece Hollow Orbital Prosthesis: A Case Report

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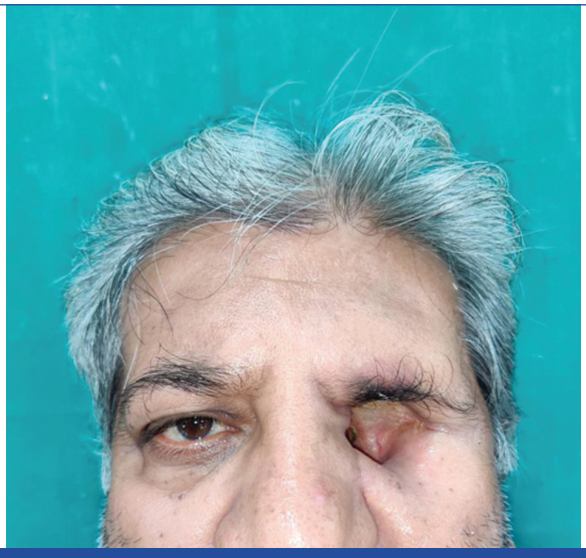
ABSTRACT

Loss of the eye results in a functional impairment, disfigurement of the face and long-term psychological effects on the patient. Coronavirus Disease-2019 (COVID-19) pandemic was accompanied by an increase in the number of patients reporting with mucormycosis. The treatment often involves widespread excision of the involved area, leading to gross facial deformity. Rehabilitation of the orbital defect is a complex task and requires a thorough treatment planning. It has always been challenging for a prosthodontist to create an orbital prosthesis for an exenterated defect brought on by post-COVID mucormycosis because it is difficult to meet the patient's expectations. It is a time-consuming process requiring multiple appointments with every appointment being an important one. The advent of Computer-Aided Design/Computer-Aided Manufacturing (CAD-CAM) technology has made the fabrication simple, but not all have access to the required infrastructure. The conventional and economical silicone prosthesis still is a popular choice among clinicians. A 52-year-old male patient reported to the Department of Prosthodontics for an artificial substitute of his missing left eye, which was exenterated in the surgical treatment of mucormycosis. The present case report describes the fabrication of a two-piece magnet retained hollow orbital prosthesis with a "customised stock eye". The prosthesis is designed in such way that, it utilises the natural undercut in the defect and a magnet between the conformer and the prosthesis. This yields in better maintenance and limiting the contact of silicon with the body fluids, thereby, enhancing the long-term use.

Keywords: Coronavirus disease-2019, Mucormycosis, Orbital defect, Orbital prosthesis

CASE REPORT

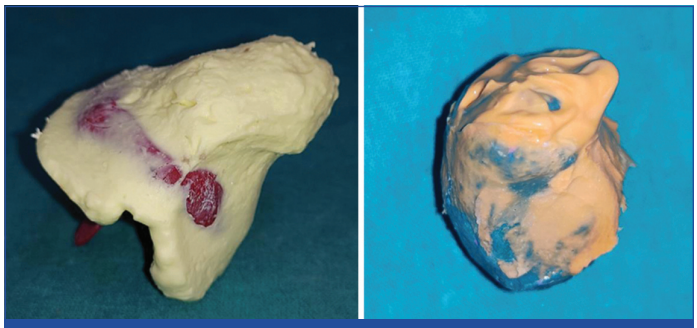
A 52-year-old male patient reported to the Department of Prosthodontics for the prosthetic rehabilitation of the left eye. The eye was exenterated in the surgical treatment of mucormycosis in September 2021. The patient then reported to the Department of Prosthodontics for rehabilitation. Examination revealed a well-healed large orbital defect on the left-side measuring 3.8 cm medio-laterally, 4 cm supero-inferiorly, and had a depth of 3.2 cm. The defect healed completely without any inflammation or nasal communication [Table/Fig-1]. A single piece prosthesis would have been heavy compromising retention and stability. A two-piece orbital prosthesis retained by anatomic undercuts and magnets was planned.



[Table/Fig-1]: Preoperative photograph.

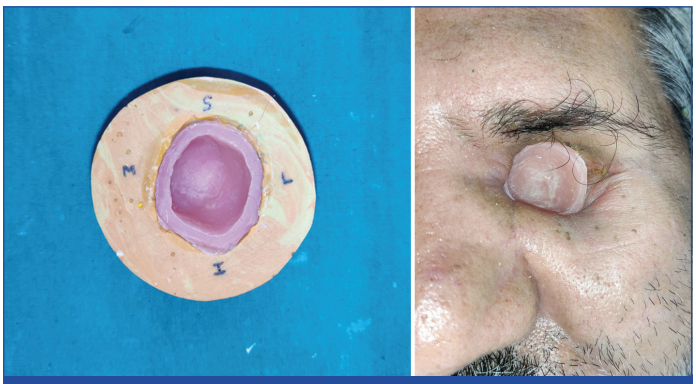
The face of the patient was coated with petroleum jelly and the deep undercuts were blocked with betadine-soaked gauze. Impression compound (Y-Dents; MDM Corporation) was used to record the preliminary impression. This was used as a tray for irreversible hydrocolloid to record the finer details of the defect (Tropicalgin; Zhermack) [Table/Fig-2]. The primary cast was poured in Type IV dental stone and an impression tray was fabricated using self-cure acrylic resin (Cold cure; DPI). The final impression was subsequently made [Table/Fig-3]. The anatomic undercuts were recorded using low fusing impression compound (Pinacle; DPI). The final wash was made using a light body addition silicone impression material (Perfit; HUGE). Retention was assessed by having the patient look down and shake his head. The master cast was prepared using Type IV die stone (Ultrarock; Kalabhai) for conformer fabrication. A 2 mm thick saucer shape layer of modelling wax (ProDent) was adapted and processed using compression moulding technique with heat cure acrylic resin (Heat cure; DPI) [Table/Fig-4].

The conformer was placed in the defect and was evaluated for retention and stability [Table/Fig-5]. The facial impression was

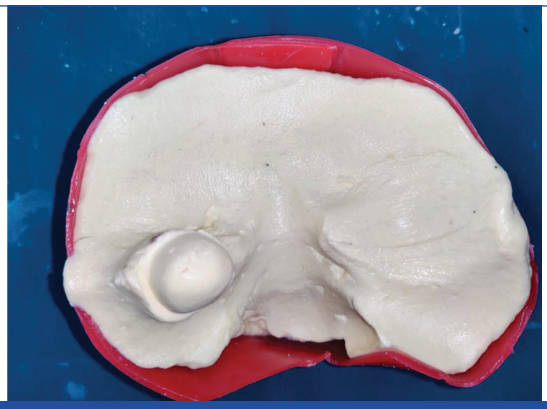


[Table/Fig-2]: Primary impression.
[Table/Fig-3]: Final impression. (Images from left to right)

recorded with the conformer still in place, using irreversible hydrocolloid [Table/Fig-6] (Chromalgin; Piscium) and the moulage was fabricated in Type IV die stone.

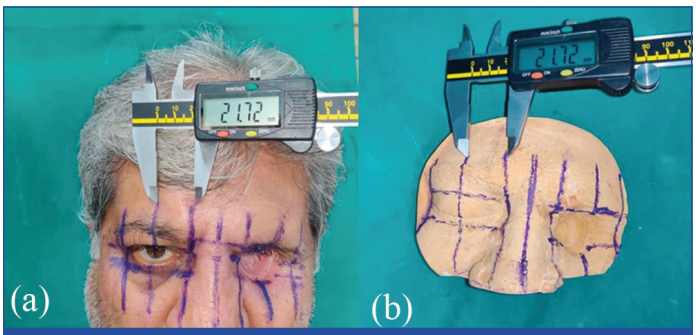


[Table/Fig-4]: Acrylic conformer.
[Table/Fig-5]: Acrylic conformer tried for retention and stability. (Images from left to right)



[Table/Fig-6]: Facial moulage.

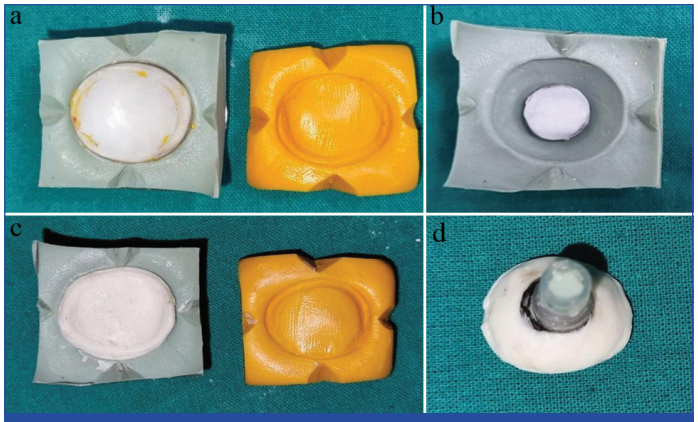
Reference lines marked on the patient's face were the facial midline, medial canthus, pupillary midline, lateral canthus and two horizontal lines at the superior and the inferior border of the eye. With the help of digital Vernier calliper markings were transferred on the side of the defects and later on to the facial moulage [Table/Fig-7a,b]. The anatomic tracing of the right eye was made and mirrored on to the defect. Iris positioning was done using the reference lines. A closely matched stock eye was selected.



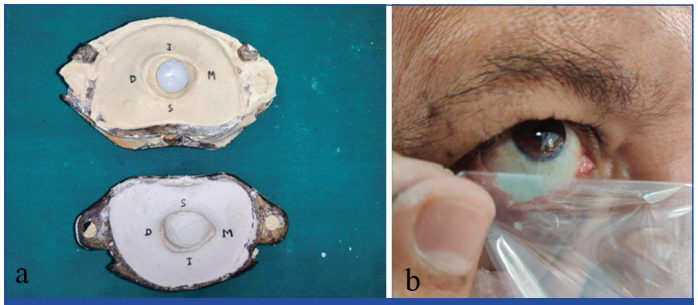
[Table/Fig-7a,b]: Transfer of markings.

The sclera of the stock eye was customised as closely matched sclera could not be obtained on the stock eye. The index of the stock eye was made in a heavy body silicone impression material (Elite HD+, Zhermack). The sclera part of the stock eye was trimmed and the iris was stabilised using the cap of a needle. Mock-up wax (MAARC) was then used to get the contours similar to the stock eye using the index [Table/Fig-8]. This was subsequently flasked and dewaxed. Shade matching was done to match the shade to the sclera [Table/Fig-9a,b].

The defect area on the moulage was covered with 2 mm thick modelling wax, and the customised eye was placed using the markings as a guide. Using anatomical tracings and a mirrored



[Table/Fig-8]: Customisation of the sclera: a) Index of the stock eye; b) Sclera of the stock eye trimmed and repositioned in the index; c) Mock-up wax applied around the trimmed pupil and iris; d) Waxed-up stock eye ready for customisation.

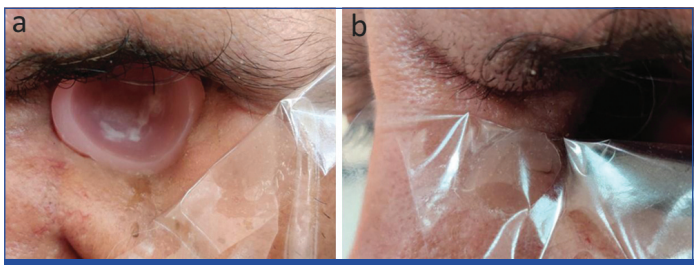


[Table/Fig-9a,b]: Shade matching of the sclera.

image of the right eye, the upper and lower eyelids as well as other periorbital structures were carved. The patient's iris positioning and anatomical contours were examined during the wax trial [Table/Fig-10]. After wax trial the cover of the needle was used to stabilise the iris position. The wax pattern was flasked and wax elimination procedure was carried out to obtain the mould space for the silicone.

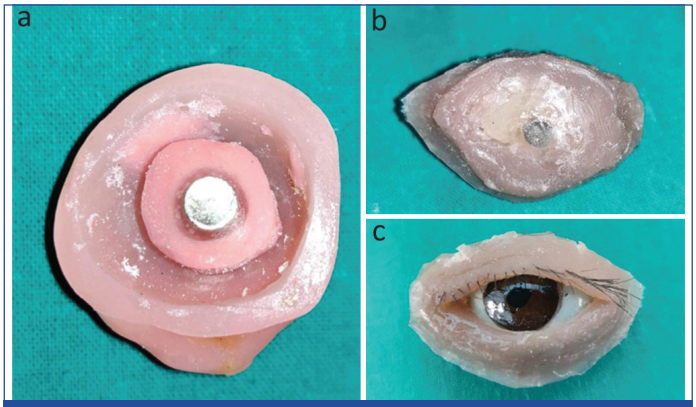
[Table/Fig-10]: Wax trial.

Room Temperature Vulcanised (RTV) silicone (S-25 Techsil silicone rub; Technovent) was mixed with intrinsic stains (MP Sai Enterprise) to match the shade over the patients face [Table/Fig-11a,b]. The colour-matched RTV silicone was then packed into the mould cavity and was allowed to polymerise at room temperature for 24 hours. The prosthesis was retrieved, tried on the patient's face, and any extra was carefully cut-off with a sharp blade.



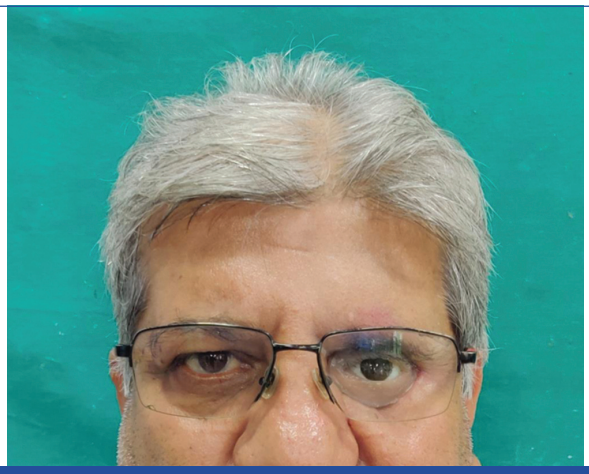
[Table/Fig-11a,b]: Silicone shade matching.

The heat cured acrylic conformer and the silicone prosthesis was checked for close fit. The first ferritic stainless steel magnet was attached in the centre of the conformer with self-cure acrylic resin (Cold cure; DPI). The second magnet was positioned according to the first magnet at the backside of the silicone prosthesis [Table/Fig-12a,b,c]. The whole assembly was then tried together.



[Table/Fig-12a-c]: Attachment of magnets.

The patient was trained to position the conformer in the proper position. The silicone prosthesis was placed over it. The patient was already a spectacle user and was advised to continue the same [Table/Fig-13].



[Table/Fig-13]: Final prosthesis.

DISCUSSION

Eyes are often considered the windows to the soul and they are generally the first features of the face to be noticed however the natural eye can either be lost because of malignancy, trauma or infection. The COVID-19 pandemic witnessed a spike in the number of patients reporting with a lethal and a devastating opportunistic fungal infection, mucormycosis [1]. The management of mucormycosis includes early and widespread surgical debridement of the affected area along with systemic antifungal therapy [2]. Following surgical treatment and elimination of the fungal foci of infection these patients are left with gross anatomical and functional defects that require prosthetic rehabilitation [3]. This results in a facial deformity which has a debilitating psychological impact on the patient. The social stigma that is associated with facial abnormality is a common factor that is seen, whatever may be the cause. The rhino orbital type of mucormycosis mostly leads to the surgical removal of the eye resulting in an anatomic defect [4].

The rehabilitation of the orbital defect is a prosthetic challenge as each patient presents with own set of anatomic peculiarities and aesthetic demands. It is also very important to manage patients' expectations with simultaneously achieving function. There are numerous modifications of the conventional silicone orbital prosthesis. Pruthi G et al., fabricated a three-piece prosthesis for the rehabilitation of a continuous maxillary and orbital defect [5]. Fabrication of an orbital prosthesis can be a tricky task because of the expressive nature of the eye. Hatamleh MM et al., fabricated a closed-eye orbital prosthesis. This method of fabrication was quicker and less complex than the standard approach and made the prosthesis less "staring" [6]. Jauregui Ulloa J et al., used a photograph of the normal eye along with colour calibration. This technique allows for the creation of a personalised ocular prosthesis using a photograph of the patient's eye, obviating the factor of manual error and shortening the chairside time [7].

The prosthetic rehabilitation of the orbital defect is more challenging than the ocular one and requires a close interplay between the commonly used maxillofacial materials. Silicone along with poly methyl methacrylate are the two most common materials used to fabricate maxillofacial prosthesis. Silicone has a more realistic appearance and better marginal adaptation, thus it has been used to create orbital prostheses [8]. The major drawback of silicone is its lack of adhesion to the skin. It also is unable to mechanically or chemically bond to the spectacle framework in case where glasses are to be used for retention [9].

The end goal of rehabilitation for an orbit deformed by trauma, tumour removal or fungal infection is to restore facial symmetry. Replacement or repositioning of the orbital walls and/or the creation of a sophisticated orbital prosthesis may be necessary for successful rehabilitation [10]. A major factor that determines the success of maxillofacial prosthesis is retention. Special adhesives and implants are the two most popular retention techniques, but implants are more expensive and are subject to anatomical constraints. Some patients are allergic to adhesives and complain of skin irritation. They can also have deleterious effects on the silicon of the prosthesis [11]. Goel S et al., used cord-based spectacle to retain a oculo-orbital prosthesis as it is a simple and an economical approach to obtain adequate retention and camouflage [12]. Magnets have also been proven to be an economical and satisfactory means of retention in maxillofacial prosthetics [11,13].

A two-piece hollow magnet retained orbital prosthesis is a simple and an economical method to rehabilitate an orbital defect. Not only do magnets help with prosthesis retention, but they also make placing and removing the prosthesis much simpler [13]. The patient can also wear this conformer part of the prosthesis at his ease without the silicon portion. Such a prosthesis also avoids the need of placement of implants and only engages the natural anatomic undercuts for retention. A disadvantage of such a prosthesis is that it may come loose when the patient bends over because only the natural undercut is resisting the dislodgement. After a while, it's reasonable to anticipate that the silicon shade will fade and the magnets will start to wear out. The importance of regular follow-ups should be notified to the patient so as to rectify minor faults at its inception.

The construction of maxillofacial prosthesis is a time-consuming process but with the advent of computer aided manufacturing processes the time taken to construct a maxillofacial prosthesis has decreased significantly but not all have access to such equipment. Conventional and cost-effective silicones although time consuming, are still a popular choice among clinicians.

CONCLUSION(S)

The fabrication of an orbital prosthesis is a tedious task and even a minute error can result in a gross facial aesthetic deformity. Such cases require thorough treatment planning to deliver and a scientifically sound and an aesthetically acceptable prosthesis. A systematic and meticulous approach has to be followed which is dictated by the soft and hard tissue makeup, the materials used, and retentive aids deployed as per the patient's expectations and affordability. The method discussed in the case report uses an economical method providing plausible retention with magnets and natural anatomic undercuts.

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