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Case Report

Prosthetic rehabilitation of an orbital defect post-COVID, mucormycosis – A case report

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ABSTRACT

Maxillofacial defects compromise appearance and function making individuals incapable of leading a relatively normal life. It is always not possible to rehabilitate all these defects using plastic surgery. Although remarkable advancements have evolved in this field, the patient's financial constraints make the prosthodontist think about the basic concepts and techniques in the fabrication of these prostheses. Hence an acceptable replacement of such defects becomes a challenge to maxillofacial prosthodontists. Hence an acceptable replacement of such defects becomes a challenge to maxillofacial prosthodontists.

This case report describes a simplified method of fabrication of an orbital silicone prosthesis retained with medical grade adhesive for the rehabilitation of the left eye using inverted anatomic tracing followed by fabrication and processing of the wax pattern. Hence it is the responsibility of the maxillofacial prosthodontist to deliver an esthetically acceptable prosthesis that improves the patient's morale and help them to lead a normal life.

1. Introduction

The field of maxillofacial prosthesis deals with the science of restoration of congenital or acquired defects by mechanical means. Disfigurement of the face due to exenteration of an eye is a very traumatic event in a person's life not only physically but also psychologically and emotionally as the face and eyes are essential identities of a person. It is then necessary to replace these structures using artificial substances so that these patients will be able to lead their lives normally. This case report explains in detail about the afflicted by replacing anatomic and physiologic functions, improving esthetics, and building the patient's morale. [1,2]

2. Case Report

A 49-year-old, female patient reported to the Department of Prosthodontics and Maxillofacial Prosthetics, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, with the chief complaint of unaesthetic appearance due to a huge defect on the right side of her face which involved loss of the right eye and associated structures. The patient gave a history of COVID-19 infection in May 2021 and mucormycosis after the infection. The patient gave a history of diabetes and hypertension for 4 years and is on medication for the same.

On extraoral examination ($) there was an evident facial asymmetry, average lip mobility, tapered facial form, and affected masticatory muscles. On examination of the defect, the left globe of the eye and both the eyelids were not present. The defect was huge and saucer-shaped with a significant depth, wherein the movement of the uvula was

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Fig. 1: Extraoral photograph.

Fig. 2: Depth of theorbital defect

Fig. 3: Grid scale

Fig. 4: Grid scale tracing

Fig. 5: Wax pattern fabrication

Fig. 6: Wax try in

Fig. 7: Retentive stainless steel wire

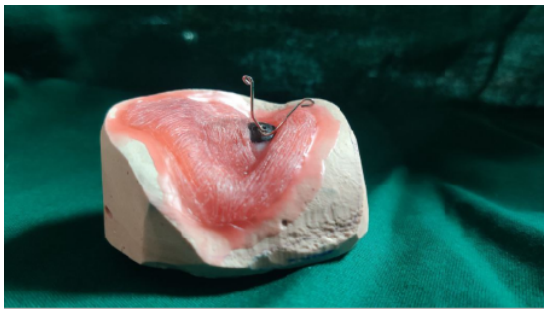

Fig. 8: Retentive wire attached to stock eye

Fig. 9: Intrinsic Stains

Fig. 10: Shade palettes

Fig. 11: Intrinsic stains mixed with Silicone

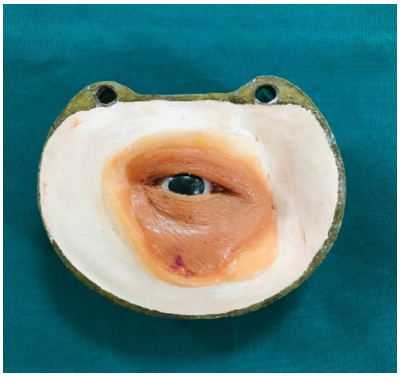

Fig. 12: Final prosthesis

Fig. 13: Final Prosthesis with eyebrows stitched

Fig. 14: Final prosthesis delivered

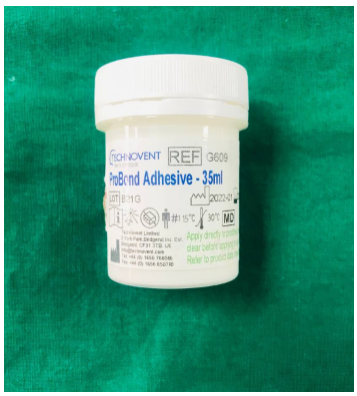

Fig. 15: Water based adhesive

Fig. 16: Water based adhesive application

Fig. 17: Final prosthesis with spectacle

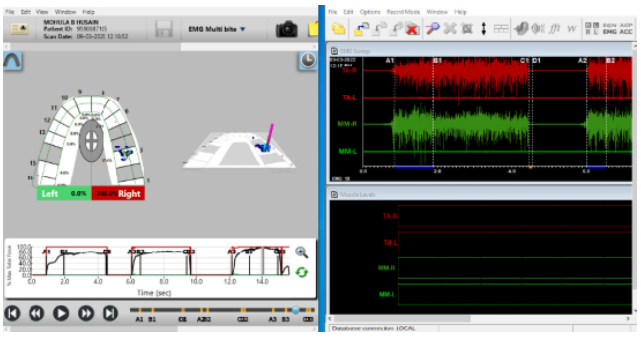

Fig. 18: T scan and EMG results

visible through the defect.

On intraoral examination, there was a through-and-through opening present such that the movement of the soft palate (uvulae) was visible through the orbital defect (Figure 2). Loss of facial muscle function and tonicity was observed. The patient's neuromotor and neurosensory function in the defect area was found to be inadequate. Thus, the greatest challenge faced while rehabilitation of the defect was to deliver an aesthetic prosthesis with a blend of the margins with good retention using the favorable undercuts of the defect. Thus, the challenge faced while rehabilitation of the defect was to deliver an aesthetic prosthesis with a blend of the margins with good retention using the favorable undercuts of the defect.[3] Intra-oral examination revealed a class I molar relation on the right side and a unilateral posterior overbite on the left side with an overjet of 4 mm and an overbite of 3 mm, root stumps at about 15 and 17, and missing teeth at about 14 and 26. The patient also showed a loss in muscle tonicity and mobility near the defective side. A T-scan and an electromyographic analysis were performed to examine the occlusal force and muscle activity respectively, and an occlusal splint was fabricated and provided to the patient. This showed a significant change in muscle activity after a week.

Based on the history and clinical examination, a diagnosis of the left orbital defect due to exenteration was found. The treatment plan involved the fabrication of a customized silicone orbital prosthesis retained using adhesive and favorable undercuts as mechanical aid. The treatment plan was discussed in detail and informed written consent was taken.[4]

2.1. Fabrication of the Prosthesis

Facial markings were made before an impression was made. The facial landmarks, such as facial the midline, inner canthus of the eye, pupil, outer canthus of the eye, and horizontal plane through the pupil of the eye were marked using a customized Grid Scale (Figure 3) that was made using a 5x5 OHP sheet. The customized Grid scale was used for the verification of the mediolateral, anteroposterior, and superio-inferior positioning of the eye with that of the normal eye.[3] A facial moulage was obtained from an irreversible hydrocolloid (Algitex, India) reinforced with dental plaster (Neelkanth, India) impression.[5] Once the impression was made, a cast was poured using Type IV gypsum, die stone (Goldstone, India), and a working model with the transferred facial markings (Figure 4) was transferred onto the cast. With help of these markings, the symmetry with the contralateral normal eye was achieved.

Stock eye of an appropriate size, shape, iris shade, and scleral color, matching that of the normal eye was selected.[3] The stock ocular prosthesis was placed on the cast as well as on the patient and its size and shape were confined to the markings. The periphery of the stock shell was trimmed to ensure proper fit and the stock shell was positioned on the defect using modeling wax. A trial was done for the positioning of the eyeball with that of the patient's eye on the normal side at the conversational gaze. The periorbital tissues were carved and sculpted using the modeling wax (Figure 5). The final wax pattern was tried (Figure 6) on the patient and checked for the symmetry, position, and border extension of the wax pattern to merge with the margins of the defect.[3] After an acceptable aesthetic, symmetry, and extensions were achieved, the wax pattern was invested. The orientation of the stock eye was maintained during the investment procedure by incorporating a retentive, 1.024 mm stainless steel, wire (Figure 7) bent into a loop that was attached to the scleral part of the stock eye and dewaxing was carried out (Figure 8).[6]

A room temperature vulcanizing silicone (RTV-Silicones) was used which was a translucent and colorless material (Technovent Ltd, South Wales, UK).[7] Different shade palettes were made by mixing different primary colors (Figure 9) and the shade matching was done under natural daylight (Figure 10).[8] Once the appropriate shade was matched, closest to the patient's skin shade, the RTV silicone was packed into the mold space (Figure 11) and was left 24 hours for bench curing.[9] Cured/ vulcanized silicone prosthesis was retrieved, trimmed, and finished (Figure 12). Eyelashes and eyebrows were attached and stitched using the patient's natural hair (Figure 13).

The final prosthesis (Figure 14) was tried on the patient and checked for aesthetics, color matching, and blending with the facial contours and margins. The final prosthesis was attached to the defect using water-based adhesive (Figure 15) (Technovent, Ltd, South Wales, UK) that was painted onto the tissue surface of the prosthesis using a brush (Figure 16).[7,10] A pair of spectacles was provided to the patient to camouflage the borders of the prosthesis (Figure 17).

3. Discussion

One of the most important complications post COVID-19 infection is mucormycosis which is commonly called the "Black Fungus". Mucormycosis is a fungal infection caused by ubiquitous mold mucor myocytes, found in the environment soil/decaying organic matter.[11,12] The spore counts in the hospital air due to the humid weather in the tropical climatic conditions were rampantly observed in India. Individuals that are vulnerable to this fungal infection are prone to critical illnesses and could be subjected to emergency invasive procedures, mechanical ventilation, CRRT, ECMO, poor nursing ratios, prolonged ICU stays, and breaches in asepsis, COVID-19 infection with uncontrolled diabetes/high dose, long duration steroids. Exenteration of the eye is the removal of all the content of the eye socket, including the globe, eyelids, conjunctiva, and entire orbital content including the periorbital structures.

The classical hallmark of mucormycosis is the rapid onset of tissue necrosis (manifested as a necrotic lesion, eschar, or black discharge in the nasal and oral cavity) with and without fever and is associated with features involving the blood vessels, causing thrombosis. Depending upon the extent of the defect orbital prosthesis is fabricated which replaces the eyelids, periocular structures, eyelashes, and the globe of the eye. The inverted markings were transferred onto the cast to mimic the size, shape, and orientation of the eye similar to that of the normal side. The rehabilitation of the orbit using silicone prosthesis is an economic and less invasive procedure. A common method for the fabrication of such orbital prosthesis is using medical-grade room temperature vulcanizing silicones (RTV silicones).[8] They have a better marginal adaptation, and ease of fabrication, are cost-effective, are biocompatible, and have a natural appearance.

The retention of the orbital prosthesis is generally achieved using a spectacle frame, paint-on adhesives, double-sided adhesive tapes, magnets, and implants. Spectacle helps to camouflage the defect area whereas implants and magnets provide better retention when compared to the other modes of retention.[13,14] But considering factors such as the systemic condition, financial constraints of the patient, and the reluctance of the patient for any other invasive procedure, a paint-on adhesive was the mode of retention for the prosthesis.

After the exenteration of the eye, cicatrization and pain in and around the defect were observed. The patient's inability to chew and eat from the defective side lead to disuse atrophy of the muscles, loss of muscle tone, function, and proprioception, on the defective side. With EMG and T-Scan analysis, there was only a single-point occlusion on the normal side and no occlusion was observed on the defective side. An intraoral occlusal hard-splint was provided to improve the function and proprioception of the affected muscles and the T-scan and EMG analysis showed a significant improvement in muscle activity after a week. (Figure 18).

4. Conclusion

The maxillofacial prosthetic advancements for the rehabilitation of patients with congenital or acquired defects have been a boon to patients with maxillofacial defects. This helps such individuals to lead their lives normally and with much comfort. Despite the advent of various cosmetic surgeries and implants, the need for a less invasive technique, and owing to patient acceptance, this technique of fabrication has provided a satisfactory outcome, in terms of retention and aesthetics.

5. Conflict of Interest

The authors declare no relevant conflicts of interest.

6. Source of Funding

None.

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