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Prosthodontic rehabilitation of mid facial defects secondary to Sino-orbital mucormycosis associated with SARS Covid-19 - A case report

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Abstract

Mucormycosis, a rare fungal infection seen in diabetes, is now very frequent owing to the deadly triad of COVID-19 infection, diabetes, and rampant use of corticosteroids. Immediate management revolves around therapeutic drugs like antifungals, antibiotics, and aggressive surgical debridement leading to large extraoral and intraoral defects. Such defect is more pronounced when the affected part is the eye and all orbital contents, resulting in gross mutilation. Patients who undergo maxillectomy with orbital exenteration require complex prosthetic rehabilitation due to the anatomic and functional characteristics that must be restored. The basic objective in prosthetic restoration of confluent maxillary and orbital defects is to achieve a comfortable, cosmetically acceptable prosthesis that restores speech, deglutition, and mastication. It is a challenging task complicated by the size and shape of the defects. This paper presents case report about prosthodontic rehabilitation of hemi maxillectomy and left orbital exenteration defect with intraoral obturator prosthesis and extraoral orbital prosthesis retained by magnetic attachment.

Keywords: Post covid Mucormycosis, Midfacial defects, Combination prosthesis, obturator, orbital prosthesis, Magnets.

Introduction

Mid-facial defects are defects located in the middle third of the face in horizontal plane with intraoral communication[1]. Midfacial defects are classified as:

midline midfacial defects, which include the nose and/or upper lip; and lateral defects, which include the orbital contents and cheek[2]. Mucormycosis, a rare fungal infection seen in diabetes which is now very frequent leading to the deadly triad of COVID-19 infection, diabetes, and rampant use of corticosteroids[3]. Around 80% of cases of Covid Associated Mucormycosis (CAM) were related to patients with pre-existing diabetes while 88.9% cases were Mucormycosis of nose and sinuses and 56.7% of cases were Rhino-orbital[4].Reconstruction of the defect can be completed via surgical reconstruction, prosthetic rehabilitation or a combination of the two, with retention of prostheses posing a major challenge[5]. The basic objective in restoring confluent maxillary and orbital defects prosthetically is to achieve a comfortable and cosmetically acceptable prosthesis that restores speech, deglutition, and mastication.

This paper presents a case report about prosthodontic rehabilitation of hemi maxillectomy and left orbital exenteration defect with intraoral obturator prosthesis and an extraoral orbital prosthesis retained by magnetic attachment.

Case report

A 60-year-old male patient reported to Department of Prosthodontics, for replacement of missing teeth and rehabilitation of lost left facial structures. Patient gave a history of post covid Sino-orbital Mucormycosis. Surgical treatment included orbital exenteration with orbito maxillary palatal debridement. The patient revealed no systemic diseases, or any other relevant dental conditions. Extra oral examination showed orbital exenteration of the left orbit. (Fig 1)

Fig 1: Post-Surgical extra oral view

Intraoral examination revealed Kennedy's class 1 partial edentulism with maxillary arch with teeth present 11, 12, 13, 21, 22 with intraoral defect on left side secondary to left hemi maxillectomy and Kennedy's class 1 modification 2 partial edentulism with mandibular arch with teeth present 31, 32, 33, 35, 41, 42, 43, 45. (Fig 2, Fig 3)

Fig 2 - 3: pre-operative intraoral view, maxillary and mandibular arch.

Treatment plan

Considering the patient's psychological condition after post covid Mucormycosis and functional and aesthetic requirement it was planned for a Magnet retained intraoral cast partial denture with hollow obturator and an extraoral orbital prosthesis.

Treatment plan was explained to the patient in detail and an informed consent was obtained.

Fabrication of prosthesis

Intraoral prosthesis

1. A preliminary impression of remaining maxillary arch along with the palatal defect and remaining mandibular arch was made in an irreversible hydrocolloid impression material and a diagnostic cast was retrieved out of it. A layer of wax spacer was adapted and an auto polymerizing resin tray was fabricated. Surveying of the diagnostic casts was done and necessary mouth preparations were undertaken. (Fig 4, Fig 5)

2. Definitive impression was made using a medium viscosity poly (vinyl siloxane) impression material and poured in Type IV gypsum to get the master cast. (Fig 6, Fig 7). Altered cast technique was carried out for mandibular arch. (Fig 8).

3. A wax pattern for framework was fabricated and casting was contemplated. After finishing and polishing the framework was tried in patient's mouth. (Remove-after). (Fig 9)

4. A sheet of modelling wax was adapted and contoured over the framework and jaw relations were recorded. (Fig 10)

5. Arrangement of teeth and wax contouring were completed. (Fig 11)

6. After try-in, the waxed-up obturator was made hollow and processed in heat-polymerizing acrylic resin. Hollowing of the bulb was done by caramel technique. After processing an aperture was made on the superior aspect of the bulb to remove the caramel, thus making the obturator hollow. Neodymium-Iron-Boron magnet was attached on the supero-lateral aspect of the bulb with autopolymerising resin so that it can contact the magnet on the extraoral prosthesis for mutual retention. (Fig 12)

7. The prosthesis was delivered to the patient and final occlusal adjustments were completed. With the maximal distribution of the occlusal force in centric and eccentric jaw positions, prosthesis movement was minimized. (Fig 13)

Fig 4: Primary impression

Fig 5: Primary cast

Fig 6: Secondary impression

Fig 7: Secondary cast

Fig 8: Altered cast technique

Fig 9: Maxillary and mandibular cast metal framework

Fig 10: Jaw relation

Fig 11: Try In

Fig 12: Processed prosthesis

Fig 13: Post-operative intraoral view

Extra oral prosthesis

8. An impression of extraoral defect was made with irreversible hydrocolloid to record the facial defect on the left side along with surrounding normal structures. The impression was removed and a primary cast was obtained. (Fig 14)

9. A layer of wax spacer was adapted and an auto polymerizing resin tray was fabricated. Definitive impression was made using a medium viscosity poly (vinyl siloxane) impression material and poured in Type III gypsum to get the master cast. (Fig 15)

10. The conformer substructure was fabricated using heat-polymerized polymethyl methacrylate resin. (Fig 16)

11. Donor eye impression was made and (Remove-was) pattern of the same was obtained (Fig 17)

12. The wax pattern was fabricated and ocular prosthesis was positioned by comparing to the right side of the face and 3-dimensional orientation of the iris position was determined.

13. The facial wax pattern was carved and characterization of skin details was created, including wrinkles, grooves and surface texture on the facial surface, and facial wax pattern was tried on the patient. (Fig 18)

14. Shade selection was done using graph grid (Fig 19)

15. Extraoral prosthesis was processed using medical grade room temperature vulcanization silicone with

intrinsic staining colours comparing to the adjacent skin. Eyelashes and eyebrows were customised according to the right side eye and was incorporated in silicone prosthesis and Silicone prosthesis was attached to the conformer substructure (Fig 20, Fig 21)

Fig 14: Primary impression and cast

Fig 15: Secondary impression and master cast

Fig 16: Orbital Conformer

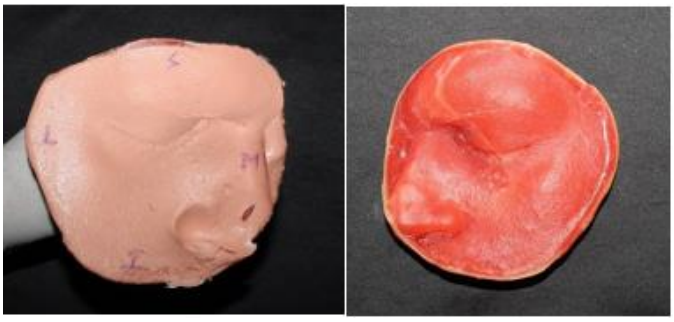

Fig 17: Donor eye impression and wax pattern

Fig 18: Try In

Fig 19: Shade matching

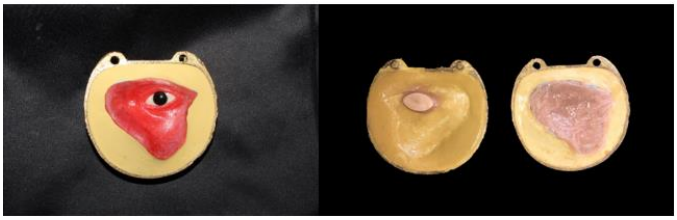

Fig 20: Processing of silicone prosthesis

Fig 21: Silicone prosthesis attached to the conformer

Attaching intraoral and extraoral prosthesis

1. Extraoral orbital prosthesis was positioned on the defect and checked for proper orientation and fit of the prosthesis.
2. Neodymium-Iron-Boron magnet was attached to the tissue surface of the orbital conformer exacting the position of the magnet attached to the obturator part and picked up with autopolymerising acrylic resin. (Fig 22)
3. Prosthesis was inserted on the patient. (Fig 23)

Fig 22: Combination Prosthesis

Fig 22: Post prosthetic extraoral View

Discussion

Mucormycosis also known as phycomycosis or zygomycosis is an angioinvasive fungal infection, caused by a saprophytic aerobic plant life, of the order Mucorales. Mode of transmission is either by inhalation of aerosolized spores (3–11 mm) or by direct inoculation as a result of trauma. One of the major predisposing factor for this fungal infection is an immuno compromised medical status of an individual. It is a rapidly progressive infection invading the adjacent fat, muscle, fascia, and bone. Treatment is multimodal together with surgical debridement, use of antifungal drugs (liposomal amphotericin B and posaconazole), and use of hyperbaric oxygen therapy.[6]

Extensive orofacial defects will lead to serious functional and cosmetic deformity which often has a significant impact on the psychological aspect of the patient. Rehabilitation of patients with maxillofacial defects has always remained a challenge for the prosthodontist.[7] Restoration of midfacial defects can be accomplished surgically, prosthetically or a combination of both methods, selection of which depends on many factors including size, location of the defect and age of the patient. Acceptable cosmetic results usually can be obtained with a facial prosthesis.[8] However, retention of a large prosthesis can be challenging. By proper examination and understanding of the remaining anatomic structures, intraoral and extraoral prostheses that mutually retain one another can be constructed. Various methods of auxiliary retention for facial prostheses have been described in the literature; they include eyeglasses, extensions from the denture that engage tissue undercuts, magnets, adhesives, combinations of the above, and osseointegrated implants. Although osseointegrated implants may provide the most reliable prosthesis retention; additional

surgeries, expenses, inadequate bone, and prior radiation to the area may contraindicate this type of treatment.[8] Methods for attaching and holding facial prostheses have to be as invisible as possible to make them Esthetically pleasing.[9]The prosthetic rehabilitation of a patient with a combined intraoral-extraoral defect has been presented in this case report. Intra orally maxillary cast partial denture with hollow bulb obturator and mandibular cast partial denture was carried out.

The cast-metal framework improves retention, stability, support and bracing of the prosthesis and, thus, increases the longevity of both prosthesis as well as supporting tissues.[10] Extra orally silicone orbital prosthesis was fabricated.

The extraoral orbital prosthesis was made in two separate parts which were assembled together. The conformer substructure was fabricated using heat - polymerized polymethyl methacrylate resin. Room temperature vulcanizing silicone was used to fabricate the orbital superstructure. Objectives of this unique design of the prosthesis were to keep up the biological health of the underlying postsurgical tissue bed, ensure longevity of the prosthesis, achieve optimal esthetics, and attain adequate retention of the prosthesis. Life-like appearance to the prosthesis was provided by silicone superstructure. Whereas, heat-polymerized conformer substructure minimized the tissue contact of silicone, minimizing the risk of tissue irritation and recurrence of infection (Mucormycosis)[6].

Magnets can be used to achieve mutual retention of the intra- and extra- oral prosthesis. Magnet attachments not only provide the retention for the facial prosthesis but also enable the patient to self-align the prosthesis in the exact position with ease.[11] The breakaway load is the force needed to separate magnets expressed in terms of grams. The value of breakaway load is inversely proportional to the distance of separation and inclination between the magnets. These magnets are wholly biocompatible in the human body as they exert no deleterious effects in human tissue. Inert magnetic field property of magnets is harmless to human body which can be safely used for patients with cardiac pacemaker. There may be a gradual decrease in retentive force upon usage, hence replacement of magnets on the first sign of corrosion is necessary.[10]

The advantages of this combination prosthesis is that the technique is non-invasive, tissue tolerant, Esthetic, comfortable to use, easy to clean and cost effective. Maxillofacial rehabilitation of large midfacial defects frequently involves the compromise of functional adequacy versus Esthetic.

Conclusion

Reconstruction of a large mid-facial defect by surgical mode of treatment is a challenging procedure. However, Prosthetic rehabilitation of such defects by giving a magnet-retained extra-oral facial and intra-oral obturator prostheses can be fabricated, designing facial prostheses for such patients with complicated conditions is a significant challenge too. Unilateral mid-facial defects including the orbit and the left cheek forming part of moving structures are expected to be unstable unless highly retentive elements are used. This precisely designed combined prosthesis can significantly reduce weight and enhance retention and stability with ease for patients and no more surgery.

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