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Case Report

Prosthetic rehabilitation of a midfacial defect with magnet-retained intraoral–extraoral combination prosthesis

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ABSTRACT

It may not be possible to treat large maxillofacial defects by surgical reconstruction alone. Prosthetic rehabilitation is invariably required to restore esthetics and function. Achieving adequate retention, stability, and support in these maxillofacial prostheses is a challenging task. This clinical report describes prosthetic rehabilitation of a midfacial defect following surgical resection of squamous cell carcinoma. The intraoral defect was restored with a maxillary obturator prosthesis with salivary reservoir, and the extraoral defect was restored with magnet-retained facial prosthesis having an acrylic resin framework and an overlying silicone facial prosthesis.

Key Words: Artificial saliva, magnets, maxillofacial prosthesis, palatal obturator

INTRODUCTION

Restoration of extensive midfacial defects invariably requires prosthetic rehabilitation following surgical correction. These defects may result from pathological conditions, malignancies, burns, radiation, trauma, fungal infections or surgical intervention.[1] Marunick *et al*.[2] broadly classified midfacial defects as midline defects which include the nose and may also include the upper lip and lateral defects which include the orbital and the cheek parts. The mix of both is termed as a combination defect. Postsurgical management of combination defect often poses a challenge to prosthetic rehabilitation owing to limited hard and soft tissues, critical location of the defects, inadequate number and alignment of abutment teeth, and the compromised quality of the soft tissues.[3]

Large defects require auxiliary means of retention such as magnets, eyeglasses, adhesives, implants, and combination of the above.[4,5] Although implants provide the most efficient prosthesis retention, owing to deficient bony supporting structures, inferior mucosal quality, additional surgeries, and increased expenses, its long-term prognosis is questionable.[1]

Patients with carcinomas of the oral and facial region are treated by radiotherapy which attributes to oral dysfunctional changes. Xerostomia is one of the most common complications and its severity is directly proportional to the volume of radiation dose and exposure of the salivary gland. It results in difficulty in speech and swallowing, changes in taste acuity, and decreased dietary intake.[6]

Most of the patients require symptomatic treatment such as psychological counseling, alteration in dietary pattern, lifestyle modifications, salivary stimulants, and salivary substitutes. A salivary

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reservoir prosthesis is an effective solution to deliver the salivary substitute constantly into the patient's mouth without affecting the daily routine. This case report describes the rehabilitation of a large midfacial defect with a two-piece prosthesis that consists of an intraoral obturator with a salivary reservoir and a magnet-retained extraoral facial prosthesis.

CASE REPORT

A 36-year-old male patient was referred to the Department of Prosthodontics, Goa Dental College and Hospital, for maxillofacial rehabilitation. The patient gave a history of squamous cell carcinoma of the left buccal mucosa infiltrating the left maxillary sinus and the overlying skin. He underwent total maxillectomy and left hemimandibulectomy with wide local excision and left modified radical neck dissection with bipedal pectoralis major myocutaneous flap reconstruction, followed by radiotherapy. This resulted in an orofacial communication and restricted mouth opening. The frontal and left lateral view is shown in Figure 1. The intraoral view is shown in Figure 2. On clinical examination, the patient revealed radiation-induced xerostomia. Henceforth, treatment plan designed for the patient was a hollow maxillary obturator containing salivary substitute and a magnet-retained extraoral facial prosthesis.

Procedure

Fabrication of the intraoral prosthesis

The defect was packed with wet gauze and a dental floss was tied to facilitate its removal. The primary impression was made using irreversible hydrocolloid impression material (Tropicalgin, Zhermack, Badia Polesine, Italy). A heat cure permanent record base (DPI Heat Cure, Denture Base Material; Dental Products of India) was fabricated on the gypsum master cast [Figure 3a]. With the help of the permanent record base, border molding was carried out and impression of the defect area was recorded with low fusing impression compound (DPI Pinnacle, The Bombay Burmah Trading Corporation Ltd., Mumbai, India). The final wash impression of the defect was made with polyvinyl siloxane monophase impression material (Aquasil Ultra Monophase Regular Set, Dentsply, USA) [Figure 3b].

Vertical jaw relation was recorded and the interocclusal record was obtained in centric relation. Try-in of the waxed denture was performed. Deviation of the mandible to the left side was observed as a sequel

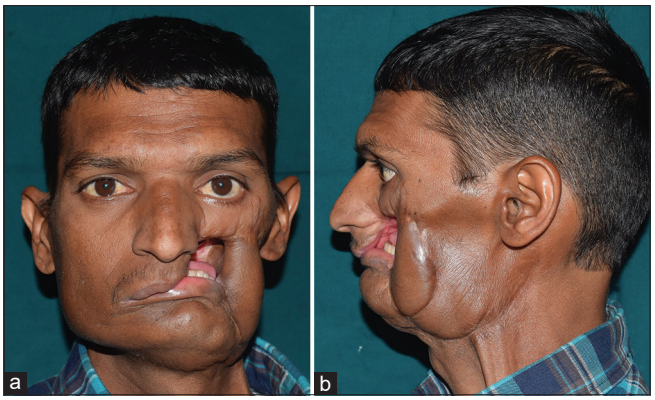

Figure 1: (a) Frontal view, (b) Left lateral view.

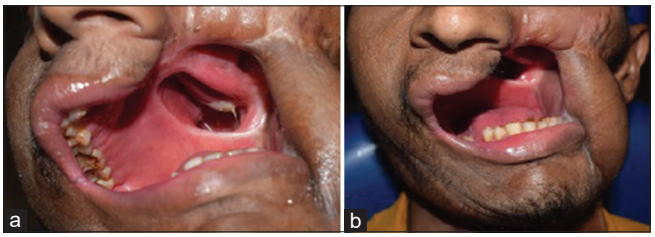

Figure 2: (a and b) Intraoral view.

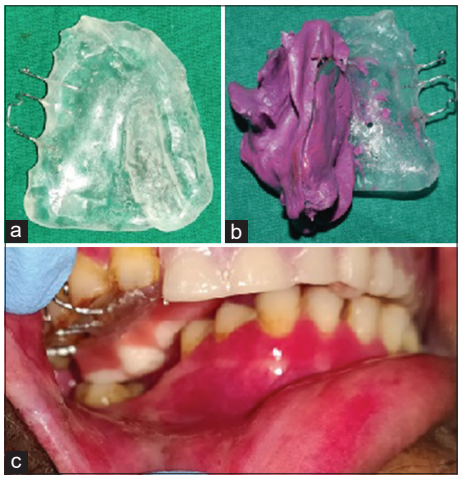

Figure 3: (a) Heat cure permanent record base, (b) Final impression, (c) Additional row of teeth added over the palatal region to provide occlusion with the lower teeth.

to left hemimandibulectomy. To overcome occlusal discrepancies, an additional row of teeth was added with a ramp over the palatal region on the right side to provide occlusion with the lower teeth [Figure 3c]. The walls of salivary reservoir pattern were built with sprue wax (3 mm YETI Dentalprodukte GmBH, Germany). A slight undercut was created on its inner aspect and a groove on the external surface to facilitate attachment for the flexible lid of the reservoir.

The trial denture was waxed up and invested in the conventional manner. A hollow maxillary obturator

was obtained using the lost salt technique. A small opening was made on the palatal aspect of the denture base to retrieve salt, and this also served as the primary opening for the salivary reservoir prostheses. The obturator was finished and polished. It was later duplicated with irreversible hydrocolloid to obtain a second working cast made of Type III dental stone (Kalstone, Kalabhai Pvt., Ltd., Mumbai, India). The reservoir lid was fabricated with a 2-mm flexible thermoplastic sheet (BIOPLAST; Scheu-Dental GmbH, Iserlohn, Germany) [Figure 4a]. A 0.8-mm release hole was made on the most dependent portion, using a straight fissure bur so as to permit the slow and continuous release of the salivary substitute. The reservoir volume was assessed to be 2 ml by injecting a known quantity of liquid with a calibrated syringe [Figure 4b].

The reservoir was filled with a salivary substitute (methylcellulose – Wet Mouth, ICPA, India) through the release hole with a calibrated syringe. The reservoir lid was snapped to close the reservoir [Figure 4c]. The pressure created by the tongue over the palate would release salivary substitute and provide relief to the patient suffering from radiation-induced xerostomia.

Fabrication of the extraoral prosthesis

With obturator in the place, the facial defect was recorded with a complete facial moulage using irreversible hydrocolloid impression material which was reinforced with fast-setting dental plaster [Figure 5a]. The moulage was boxed and poured with dental stone (Kalstone, Kalabhai Pvt., Ltd., Mumbai, India) [Figure 5b]. A wax pattern for the acrylic resin base framework of the facial prosthesis was fabricated on the working model using modeling wax (Modeling Wax No. 2; Hindustan Dental Products, Hyderabad, India) and tried on the patient's face. A hollow heat-polymerizing acrylic resin substructure was processed with the lost salt technique so as to reduce the weight of the prosthesis. The resin substructure obtained was trimmed, finished, and was then tried on the patient's face for complete seating.

Two cobalt-samarium magnets (Jobmasters, Randallstown, MD, USA) with 2-mm thickness and 10-mm diameter were embedded in the acrylic substructure and their counter magnets were embedded on the buccal surface of the obturator [Figure 6a and b]. A wax pattern was sculpted on the working model using the patient's previous photographs as a reference [Figure 6c]. Adaptation of the wax pattern on the patient's face was assessed in lateral, frontal, and axial views, particularly at the margins, and necessary adjustments were accordingly made [Figure 6d]. The wax pattern was then invested and dewaxed in the conventional manner. A thin layer of A-330G Primer (Factor II Incorporated, USA) was applied using a camel hairbrush and allowed to dry for 30 min as per the manufacturer's instructions.

The base and catalyst components of A-2000 Silicone Elastomer (Factor II Incorporated, USA) were mixed in a ratio of 1:1 by weight as per the manufacturer's instructions and packed into the mold cavity. The laminar intrinsic staining technique was performed using intrinsic color pigments to match the patient's skin shade. The silicone material was allowed to set overnight, and the prosthesis was retrieved, trimmed, and finished. Extrinsic staining was done once the final prosthesis was tried on the patient's face. During the delivery of prostheses, the patient was asked to perform various facial movements such as smiling, opening, and closing the mouth to assess the retention and stability of the prosthesis. A spectacle frame and an artificial moustache finally succeeded in masking the borders of the prosthesis [Figures 7 and 8]. Postdelivery instructions with respect to prosthesis

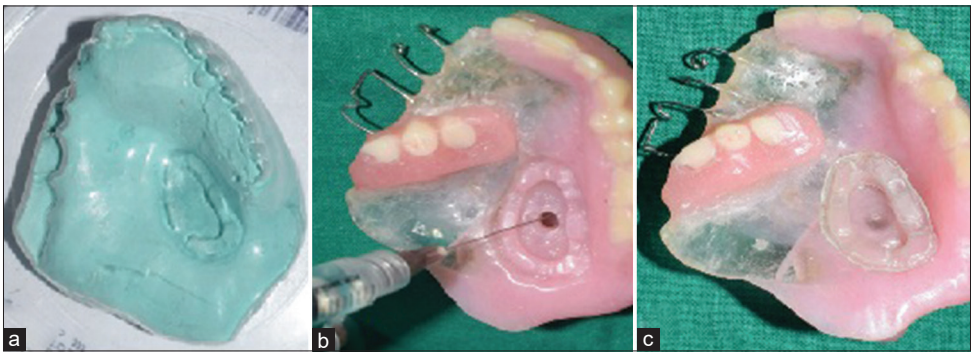

Figure 4: (a) Flexible thermoplastic sheet, (b) Volume of reservoir assessed using a calibrated syringe, (c) Reservoir lid in place.

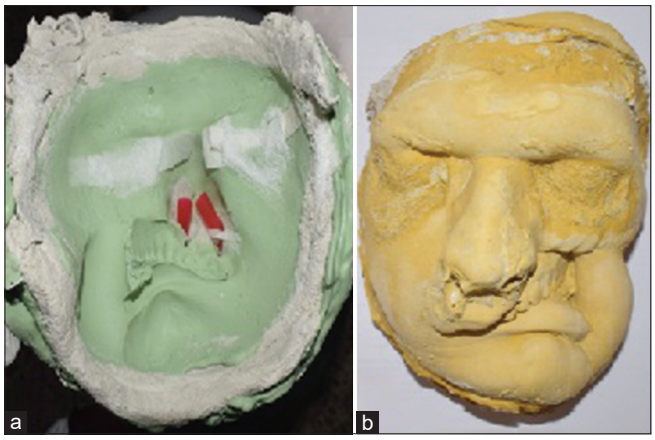

Figure 5: (a) Facial moulage, (b) Working model.

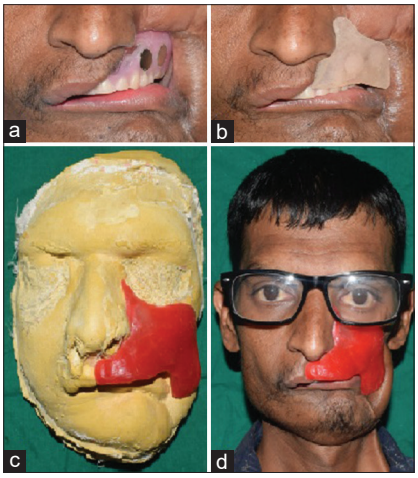

Figure 6: (a) Two magnets embedded on the buccal surface of the obturator, (b) Counter magnets embedded on the acrylic substructure, (c) Wax pattern fabrication, (d) Try-in of wax pattern.

hygiene protocol were given and follow-up appointment was scheduled at 1 week, and after 1, 3, and 6-month time interval.

DISCUSSION

Prosthetic rehabilitation of large midfacial defects is often cumbersome as the size and weight of the prostheses determines its retention which is obtained from the anatomical structures of the defect. In this case report, the obturator was attached to the extraoral prostheses by means of coated rare-earth magnets. This resulted in a better prognosis as it prevented dislodgement of the obturator during various functional facial movements. However, slight vertical movement of the facial prosthesis was still noticed during mastication due to the rigid connection between the intraoral and the extraoral prostheses.

Figure 7: Obturator in place.

Figure 8: Extraoral prosthesis in place.

Retention of the prosthesis was further enhanced by making a lightweight hollow acrylic resin substructure in which the magnets were embedded. Several problems associated with combination prostheses (acrylic and silicone prostheses) have been reported such as delamination, degradation of the silicone, and reduced marginal integrity. Meticulous planning of the prostheses helped in combating most of the shortcomings. The problem of delamination was overcome by bonding silicone to the acrylic framework with a primer. The problem of degradation of silicone was expected to be minimal since medical grade silicone material and intrinsic stains with layering technique were used. Furthermore, the contact of the silicone prosthesis with the tissues was minimal due to the acrylic substructure except at the margins, thus reducing contact with skin secretions.

The hollow maxillary obturator containing salivary substitute served as a salivary reservoir providing an

alternative means for treating patients suffering from xerostomia. This allows for a sustained and continuous release of salivary substitute (carboxymethyl cellulose-based saliva substitutes, e.g., Wet Mouth). The patient was reviewed periodically to assess the efficacy and survival of the prosthesis.

A large defect of this magnitude has a psychological and social detriment on the patient. Patients often experience depression and anxiety associated with problems such as unemployment and poor social support. Patients often use a mask on a regular basis to hide the defect which may lead to social withdrawal and isolation. Rehabilitation helps the patient overcome social stigma and enhances the quality of life.

CONCLUSION

Rehabilitation of large midfacial defects requires a critical understanding of the available anatomic structures to achieve maximum retention, stability, function, and esthetics. Extensive midfacial defects are seldom treated only by surgery. A prosthodontist plays a major role in orofacial rehabilitation of debilitated patients by reasonably meeting their functional and esthetic needs. In this case, the patient was satisfactorily managed with a hollow maxillary obturator with salivary reservoir and a magnet-retained extraoral prosthesis. The prosthesis was designed to be user-friendly and allow proper cleaning of the defect and the prostheses themselves. Such combination prosthesis enhanced the cosmetic result and functional acceptability of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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