

CASE REPORT

Technique to fabricate a Hollow Facial Prosthesis for Lateral Midfacial Defect

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ABSTRACT

Midfacial defects developed due to partial or total maxillectomy surgeries performed to remove tumors in the oral or nasal cavity. Large midfacial defects usually restored with a facial prosthesis to restore esthetics, form and function. Retention of a large facial prosthesis is a major concern to the prosthodontist because of its size and weight. This clinical report describes magnet retained intraoral-extraoral combination prosthesis for a large midfacial defect. This article also describes a technique to fabricate a hollow light-weight acrylic resin framework supporting an overlying silicone layer for the facial prosthesis.

Keywords: Extraoral surgical defects, Midfacial defects, Intraoral-extraoral combination prosthesis, Magnet retained prosthesis, Prosthetic rehabilitation, Silicone facial prosthesis.

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INTRODUCTION

Midfacial defects may result from congenital or developmental abnormalities, accidental traumas, or acquired disfigurements resulting from maxillectomy surgery to remove tumors in the oral or nasal cavity. Midfacial defects occur in the horizontal plane of the middle third of the face, and they include two main categories: midline and lateral defects. Midline defects refer to the complete or partial involvement of the nose, and/or upper lip, along with intraoral maxillary defects.^{1,2} A lateral defect may include complete or partial contents of the cheek and/or orbit, and may include an intraoral defect of the maxilla.¹⁻³ Acquired midfacial defects may affect speech, mastication, quality of life, psychology and social behavior.^{4,5} Large defects that result from cancer treatment are rarely rehabilitated by surgical reconstruction alone; they usually require a facial prosthesis to restore function and

appearance.⁶ In addition, an intraoral prosthesis, such as an obturator, is often needed to restore speech and swallowing. Fabrication of an extraoral facial prosthesis challenges the artistic ability of the prosthodontist. Retention of the prosthesis is also a difficult problem because of its size and weight. This clinical report describes the rehabilitation of a patient with a large midfacial defect with intraoral-extraoral combination prosthesis (IECP) that included an intraoral obturator and an extraoral facial prosthesis mutually retained with a pair of magnets.

CASE REPORT

Outline of the Case

A 48-year-old man was referred to the department of prosthodontics for definitive prosthetic rehabilitation. Extraoral examination revealed a large midfacial defect on the right side involving orbital, zygomatic and maxillary anatomic structures (Fig. 1A). Intraoral examination revealed an extensive surgical defect on right side (Fig. 1B). computed tomography scan report clearly revealed missing osseous structures of orbital floor, zygomatic bone and maxilla (Fig. 2). The hard palate and teeth were intact on the left side. All teeth were present in the mandible with generalized mild attrition and healthy periodontium. Medical and dental history revealed surgical resection of the right maxilla along with sinus, right zygoma and the right orbit due to T4N3M0 squamous cell carcinoma of the same region 2 years back. The patient received a postoperative course of 7200 cGy external beam radiation to limit the metastasis. The patient has utilized an interim obturator for the past 1 year. Due to the extensive size of the defect, radiation to the area, poor mucosal quality and minimal bony supporting structures, prosthetic rehabilitation was planned with a magnet retained IECP instead of an implant-retained prosthesis.

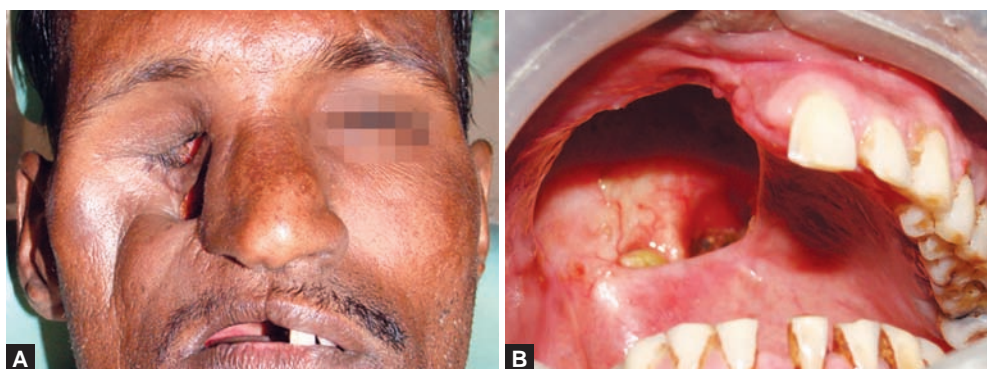
Fabrication of Intraoral Prosthesis

Preliminary impressions of the dentulous mandibular arch and remaining maxillary arch along with the intraoral defect were made using high viscosity irreversible hydrocolloid (Dentalign; Prime Dental Products, Mumbai, India). The impressions were poured in type III gypsum material (Kalstone, Kalabhai Karson, Mumbai, India) to make a diagnostic working cast. Diagnostic

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Figs 1A and B: (A) Extraoral surgical defect and (B) intraoral surgical defect

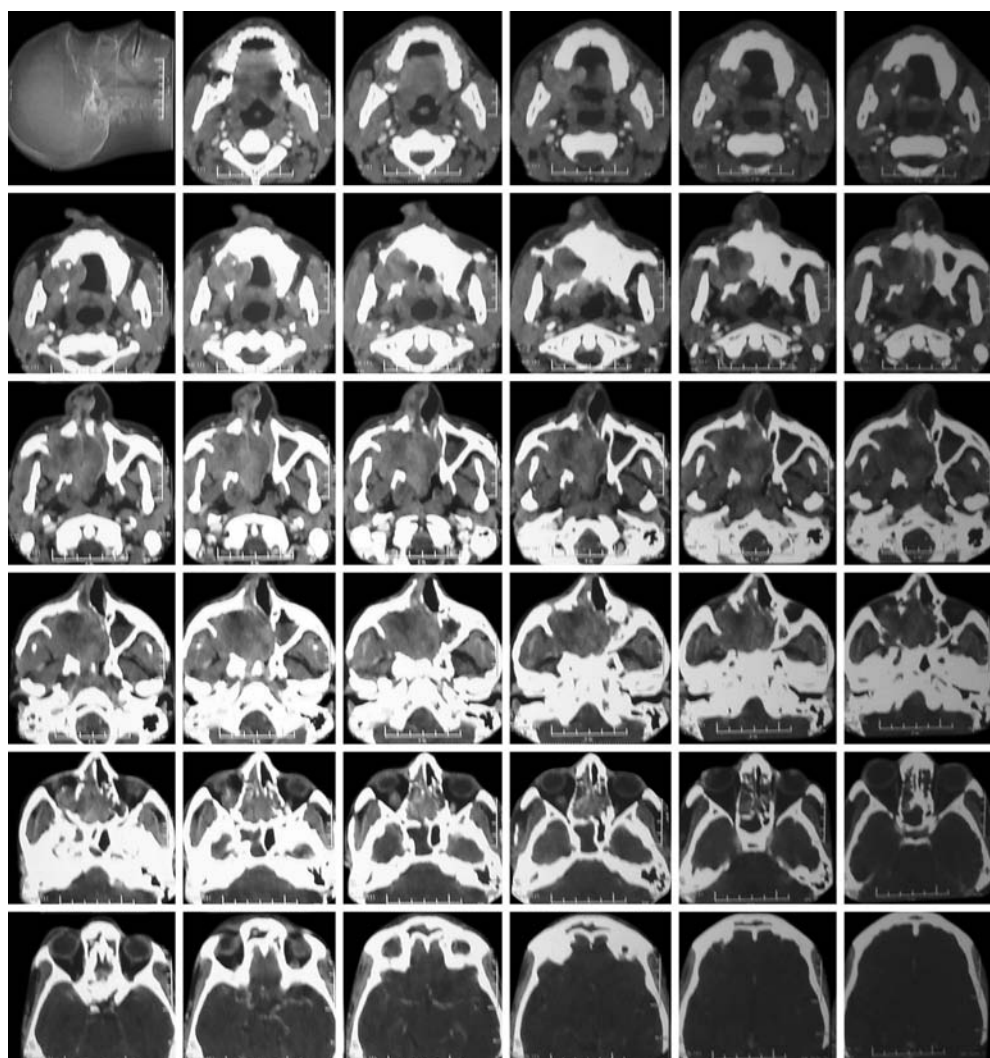


Fig. 2: Sequential axial CT sections showing hypodense defect in right zygomaticomaxillary complex and missing orbital floor

surveying and designing procedures were carried out. Mouth preparations like rest seats and guiding planes were prepared. Maxillary custom impression tray was fabricated with autopolymerizing acrylic resin (DPI Cold Cure, Dental Products of India, Mumbai, India) and evaluated and adjusted for proper extensions. The impression tray was border molded including the palatal defect with green stick impression compound (DPI Pinnacle, Dental Products of India, Mumbai, India). The

impression compound was relieved and a physiologic definitive impression was made of the palatal defect using a medium viscosity polyvinyl siloxane impression material (Reprosil, Dentsply DeTrey GmbH, Konstanz, Germany) (Fig. 3). The cast was fabricated with type III gypsum material using conventional prosthodontic protocols of boxing and pouring. The final cast was duplicated in refractory material and wax pattern was prepared and processed for casting to make the final metal framework

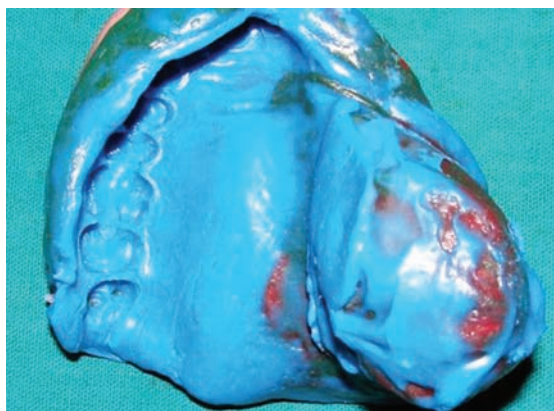


Fig. 3: Final impression of intraoral surgical defect



Fig. 4: Maxillary definitive obturator prosthesis in place



A



B

Figs 5A and B: (A) Magnets attached to the obturator and (B) obturator magnets attached at the site of communication of intraoral and extraoral defects

in usual manner. Finishing and polishing of the metal framework was carried out. Metal framework was tried intraorally and adjusted for complete seating. A temporary record base was fabricated over the metal framework in the defect area with autopolymerizing acrylic resin in conventional manner⁷ (Morrow RM et al 1986). The record base was evaluated intraorally to allow complete seating. An occlusal rim was fabricated with a baseplate wax (Modeling wax; Deepti Dental Products, Ratnagiri). A maxillomandibular jaw relation record was made. The record base was resealed on to the definitive cast and the cast was transferred on an articulator (Hanau H2, Teledyne Technologies, Los Angeles, CA) with the help of Facebow. Denture teeth (Acry Rock, Ruthinium, Badia Polesine, Italy) were arranged for a wax tryin. Dentolabial relation, lip support, and horizontal and vertical jaw relations were evaluated and verified intraorally. The waxed-up obturator was processed in heat polymerizing acrylic resin with a processing technique.⁸ To make it hollow. The prosthesis was finished and polished in conventional manner (Fig. 4)⁷. The prosthesis was adjusted intraorally for complete seating and final occlusal refinement was carried out. Two pairs of Cobalt-Samarium magnets 10 mm in diameter and 1.5 mm in thickness (Jobmaster,

Randallstown, MD) were selected for mutual retention between obturator and extraoral prosthesis. One pair of the magnets was embedded in the superior-lateral aspect (portion which was exposed extraorally) of the obturator by using autopolymerizing acrylic resin thus completing the intraoral section of the IECP (Figs 5A and B).

Fabrication of Extraoral Prosthesis

The patient was instructed to close in maximum intercuspal position with obturator was placed in mouth and the second pair of the magnets was placed over the obturator magnets. An irreversible hydrocolloid mouldage was made to record the facial defect along with surrounding normal extraoral structures and the extraorally exposed portion of the obturator with the second pair of magnets in place. A cast was formed from type III gypsum. A single thickness modeling wax was first adapted over the cast and then checked over the extraoral defect of the patient (Fig. 6A). The wax sheet was separately flaked and processed in heat polymerized clear acrylic resin (Trevalon clear, Dentsply, York, PA) with a conventional technique.⁷ The acrylic resin framework was tried over the patient's extraoral defect by placing obturator and second pair of magnets in position. An indentation for the second pair of magnets was formed on the tissue surface of the acrylic



Figs 6A to F: (A) A wax sheet adapted on extraoral defect site, (B) inner acrylic resin framework in place retained with the magnets, (C) eye globe positioned on the inner framework, (D) outer contoured wax sheet, (E) outer acrylic resin framework sealed with inner framework and (F) final wax sculpture

resin framework. Cellophane paper (DPI, Mumbai, India) was placed in between the obturator magnets and the second pair of magnets to act as a separating medium. Autopolymerizing clear acrylic resin was mixed and placed in the indentation of the second magnet formed inside the tissue surface of the acrylic resin framework and the framework was seated over the defect area. After completion of polymerization, the second magnet was embedded in the acrylic resin framework (Fig. 6B). An artificial eye globe was selected to match size, shape and color of the normal left eye. The resin framework was placed over the extraoral model. The eye globe was positioned on the acrylic resin framework in reference with normal left eye and fixed it with autopolymerizing clear acrylic resin (Fig. 6C).

A sheet of baseplate wax was contoured over the acrylic resin framework in such a way that it would provide uniform (2-3 mm) thickness of the silicone for future facial contour over the defect area (Fig. 6D). The contoured wax sheet was separated from the underlying acrylic resin framework without distortion and separately flaked for processing in heat polymerized acrylic resin. The processed top layer acrylic resin framework was secured in position with processed acrylic resin framework with autopolymerizing acrylic resin thus completing hollow acrylic resin framework (Fig. 6E).

Over the completed hollow acrylic resin framework the final portion of the facial prosthesis was sculpted with baseplate wax. The wax sculpture was evaluated by positioning it on the patient's face (Fig. 6F). The wax sculpture



Fig. 7: Processed silicone prosthesis in the flask



Fig. 8: Post-treatment view of the patient

of the prosthesis was invested in type IV gypsum material (Ultrarock, Kalabhai Karson, Mumbai, India) to form a mold for packing the silicone. Dewaxing was carried out. The prosthesis was packed with MDX4-4210-base silicone (Dow Corning Corp, Midland, Michigan) and colored using intrinsic stains (KT-699, Silicone Coloring Kit, Factor II, Lakeside, Arizona) selected according to the patient's skin color. The packed silicone was heat polymerized for 2 hours at 90°C and the prosthesis was deflashed (Fig. 7). The prosthesis was trimmed, cleaned, and bonded to the underlying framework with medical adhesive type A (Factor II) under vacuum as described by Lemon et al 1992.⁹ Polyurethane lining was applied to the margins to increase the tear resistance of the marginal silicone thus completed the extraoral portion of the IECP.

Appliance Delivery and Recall

A spectacle frame was selected in order to mask some of the facial prosthesis margins. The maxillary obturator was placed intraorally and the facial prosthesis was positioned extraorally against the obturator magnet (Fig. 8). The patient was given hygiene instructions in cleaning the IECP. The patient attended recall visits every 5 to 6 months. During these visits, the obturator and facial prosthesis were thoroughly cleaned. A cosmetic improvement, the ability to speak more intelligibly, improved deglutition and improved mastication was achieved for this patient with this IECP.

DISCUSSION

Large orofacial defects result in serious functional (impairment of speech, mastication and deglutition) as well as cosmetic deformity. The cosmetic deformity often has a significant psychological impact upon the patient. Acceptable cosmetic results usually can be obtained with a facial prosthesis. However, retention of a large prosthesis can be challenging. With ingenuity and an 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 eyepatches,¹⁰ eyeglasses,^{11,12} extensions from the denture¹³ that engage tissue undercuts,^{12,14} magnets,¹² adhesives¹⁵ combinations of the above,^{12,14-16} and osseointegrated implants.^{12,14,17} 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^{18,19} (Arcuri M et al, 1993; Roumanas E et al, 1994).

The prosthetic rehabilitation of a patient with a combined intraoral-extraoral defect has been presented in this article. A two piece (intraoral obturator and facial) combination prosthesis was fabricated. Magnets provided mutual retention of the IECP. This was an esthetic option as there was sufficient space to utilize magnets without hindering the external appearance of the prosthesis.²⁰ Several authors have reported different problems that compromise the serviceability of facial prostheses made of a combination of acrylic resin and silicone. Increased bulk of the resin framework was always a worry for the prosthodontists. There has been increased interest in using a fiber-reinforced composite as a dental and medical biomaterial for the fabrication of a facial prosthesis framework which would be light-in-weight³ (Kurunmäki H et al, 2008). This requires more sophisticated techniques and expensive materials than acrylic resin. This article describes a technique to make a light-weight acrylic resin framework by making it hollow. Marginal integrity and tear resistance of silicone can be enhanced by applying polyurethane lining to the marginal silicone⁶ (Brignoni R and Dominici JT, 2001).

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