

An intraoral-extraoral combination prosthesis using an intermediate framework and magnets: A clinical report

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Midfacial defects are facial defects that have an intraoral communication. Marunick et al¹ classified midfacial defects into 2 major categories: midline midfacial defects, which include the nose and/or upper lip; and lateral defects, which include the cheek and orbital contents. Combinations of these 2 categories also exist. Acquired midfacial defects often present with severe disfigurement and functional impairment. Large defects that result from cancer treatment rarely are rehabilitated by surgical reconstruction alone; they usually require a facial prosthesis to restore function and appearance. 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; securing it in place can be a formidable task. This clinical report describes the rehabilitation of a large midfacial defect with a 3-piece prosthesis that included a sectional intraoral obturator–extraoral facial prosthesis and an intermediate retentive acrylic framework with the use of magnets.

CASE HISTORY

A 55-year-old man was referred for definitive prosthetic rehabilitation 6 months after the surgical resection of a T₄N₃M₀ combination basal cell, squamous cell, and melanoma facial lesion. The patient received a postoperative course of 7200 cGy external beam radiation to the negative marginal defect. The face, neck, and supraclavicular area were boosted with 2400 cGy. Three unsuccessful surgical reconstructive procedures were attempted over a 3-month period beginning 8 weeks after the completion of the radiation therapy. No preoperative or postoperative hyperbaric oxygen was given.

The extent of the defect, which included the upper lip, maxilla, cheek, nose, and orbit, presented major

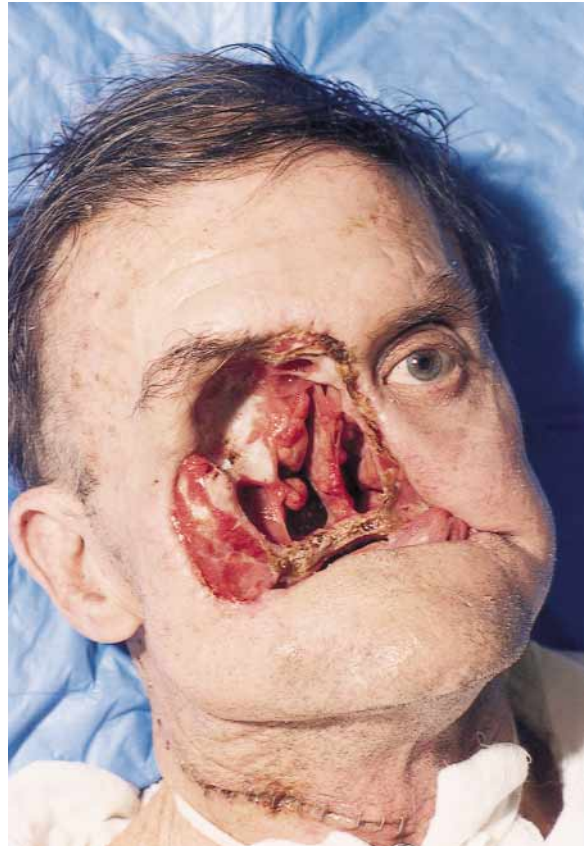


Fig. 1. Midfacial defect after surgery and radiation therapy.

esthetic and retention challenges when considering treatment with a facial prosthesis (Fig. 1). The patient was edentulous, and a major portion of the hard palate had been resected. The remaining palate provided minimal denture-bearing area for support, retention, and stability of an edentulous maxillary obturator. The exposed mucous membrane was tender to pressure, and the residual maxillary sinus, concha, and nasal septum were poorly suited to support the prosthesis or provide anatomic undercuts for retention of the obturator prosthesis. Swallowing and speech were not possible postoperatively, and the patient required a nasogastric tube for nutrition.

The prognosis was poor for prosthetic rehabilitation because of the extensive size of the defect, radiation to the area, poor mucosal quality, minimal bony supporting structures, and lack of natural dentition.

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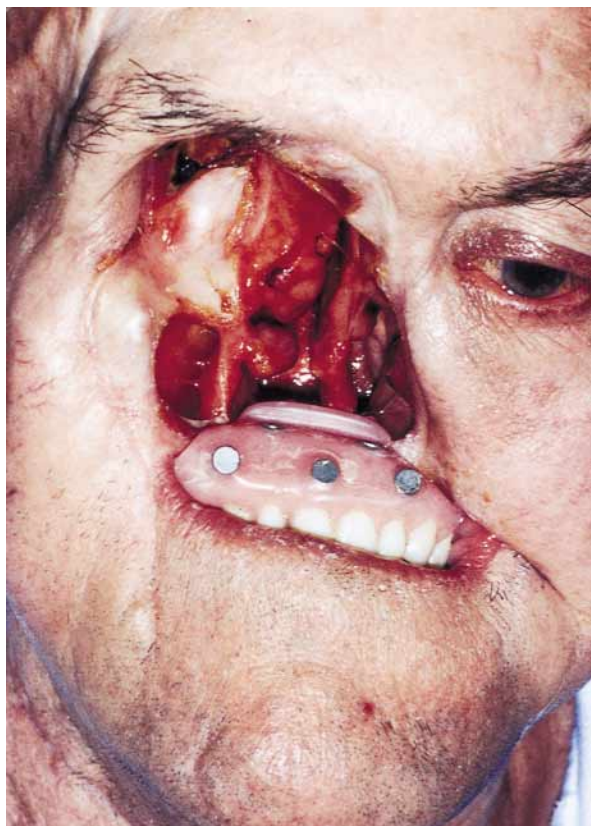


Fig. 2. Edentulous obturator in place. Note magnets, which were designed to oppose immediate framework, incorporated facially and superiorly.

PROCEDURE

Intraoral prosthesis

Prosthetic treatment began with the fabrication of an edentulous maxillary obturator and mandibular complete denture. Impressions were made to form working casts of the mandibular arch, remaining maxillary arch, and intraoral defect. The intact mandibular arch was used as the primary reference to establish the occlusal plane and lower lip contour of the mandibular occlusion rim. The maxillary occlusion rim was subsequently contoured to correspond to the mandibular occlusal plane, lower lip, and lip contour. The casts were articulated, the teeth arranged in wax, and the intraoral prostheses (dentures) fabricated. The anterior extension of the maxillary denture had a modified obturator separating the oral cavity from the nasal cavity. An improvement in speech and swallowing was noted after the placement and adjustment phases of the maxillary/mandibular complete denture. The patient remained on a gastric feeding tube throughout the prosthetic rehabilitation.

Intermediate framework bar

Five cobalt samarium magnets 5 mm in diameter and 1.5 mm in height (Jobmasters, Randallstown, Md.) were embedded in the anterior flange of the obturator and the superior aspect of the obturator by using autopolymerizing acrylic (Perm, Hygienic Corp, Akron, Ohio) (Fig. 2).

Two alginate mouldages were made of the defect and surrounding area. The first mouldage was used to record the facial defect as well as the extraoral structures and their relationship to the denture. The maxillary and mandibular prostheses were inserted, and the patient was guided into centric relation and instructed to close with light occlusal pressure. Before the mouldage impression, autopolymerizing resin extensions were formed around the countermagnets (opposing the magnets placed into the obturator) to form a key. The countermagnet/key assemblies were placed onto the obturator magnets (Fig. 3). The acrylic extensions of the countermagnets assisted in retaining the countermagnets in the impression material of the mouldage. After the mouldage was recovered, new magnets embedded in acrylic, as previously described, were seated on top of the countermagnets in the mouldage. The master cast was formed with an improved stone (Die-Keen, Whip Mix Corp, Louisville, Ky.). Magnets were positioned in the master cast in positions identical to those on the obturator.

The cast was lubricated, and countermagnets were seated on top of the magnets in the obturator cast (Fig. 4). A light-cured resin (Triad, Dentsply Corp, York, Pa.) was used to embed these countermagnets and construct an intermediate framework along the outer edge of the facial defect and flange of the obturator. The framework was 4 to 5 mm thick and approximately 10 mm wide to incorporate the countermagnets and provide adequate strength and rigidity but not compromise the magnetic retention. Additional countermagnets were placed in the framework facing externally to aid in the retention of the facial prosthesis (Fig. 5).

With the denture seated in the patient's mouth, the intermediate resin framework was positioned along the outer edge of the facial defect and the magnets of the obturator (Fig. 6). Opposing magnets with acrylic extensions, as previously described, were placed on the magnets of the intermediate framework, and a second mouldage was made. After the impression material set, the framework was removed from the impression, the opposing magnets were retained in the impression material, and new countermagnets were seated onto those in the mouldage (Fig. 7). A second working cast was fabricated from this mouldage.

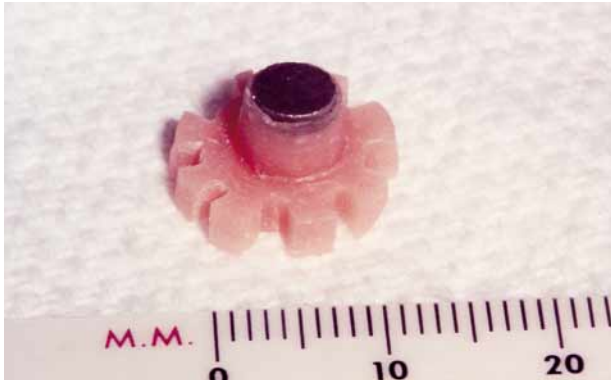


Fig. 3. Transfer magnet with acrylic key extension for retention in impression material.



Fig. 4. Countermagnets being positioned opposite location of magnets on obturator. Countermagnets were incorporated into intermediate framework.

Facial prosthesis

The ocular prosthesis was fabricated and indexed on its backside with a No. 8 round bur to aid in orientation during processing. The master cast was lubricated in the defect area, and the ocular prosthesis was embedded in utility wax placed in the defect area. Its position was approximated and then transferred to the patient. With the aid of an ear face-bow and another clinician, the proper 3-dimensional orientation of the ocular prosthesis was determined. The ocular prosthesis was placed back on the master cast, and the orbital segment of the facial prosthesis was sculpted to completion. A final try-in reconfirmed the ocular alignment in the defect.

The prosthesis was processed with MDX4-4210-base silicone (Dow Corning Corp, Midland, Mich.). The magnets were retained in the silicone prosthesis with nylon hose as described by Lemon et al.² The

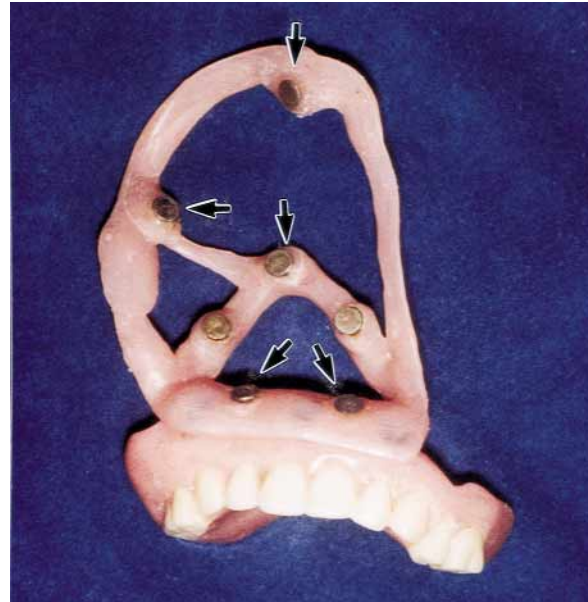


Fig. 5. Completed intermediate framework in place on obturator. Magnets in framework opposed magnets processed in facial prosthesis to aid in retention (arrows).

prosthesis was processed at room temperature for 48 hours and then deflashed, trimmed, cleaned, and bonded to a polyurethane lining with medical adhesive type A (Factor II, Lakeside, Ariz.) under vacuum as described by Lemon et al.¹⁴ Applying polyurethane lining increased the tear resistance of the prosthesis margin. The prosthesis was trial fit and extrinsically colored with trichlorethane, medical adhesive type A, oil pigments, and rayon flocking (Factor II) (Fig. 8).

The completed 3-piece prosthesis then was inserted (Fig. 8, B). Denture adhesive was used to help retain the obturator, which was seated first. The intermediate framework was positioned against the obturator magnets. Double-sided tape (3M Surgical Tape Biface, Factor II) was used to secure the framework to the periphery of the defect. The facial prosthesis was retained on the face with medical adhesive (Hollister Medical Adhesive, Factor II), and the magnets were positioned in the intermediate framework.

DISCUSSION

Large orofacial defects can result in serious functional impairment of speech, mastication, and swallowing. The cosmetic deformity often has a significant psychological impact. Acceptable cosmetic results usually can be obtained, but retention of such a large prosthesis can be challenging. With ingenuity and an understanding of the remaining anatomic structures, intraoral and extraoral prostheses that mutually retain



Fig. 6. Intermediate framework and obturator placed on patient for second facial mouldage. Countermagnets and keyways positioned on magnets of intermediate framework (arrows).

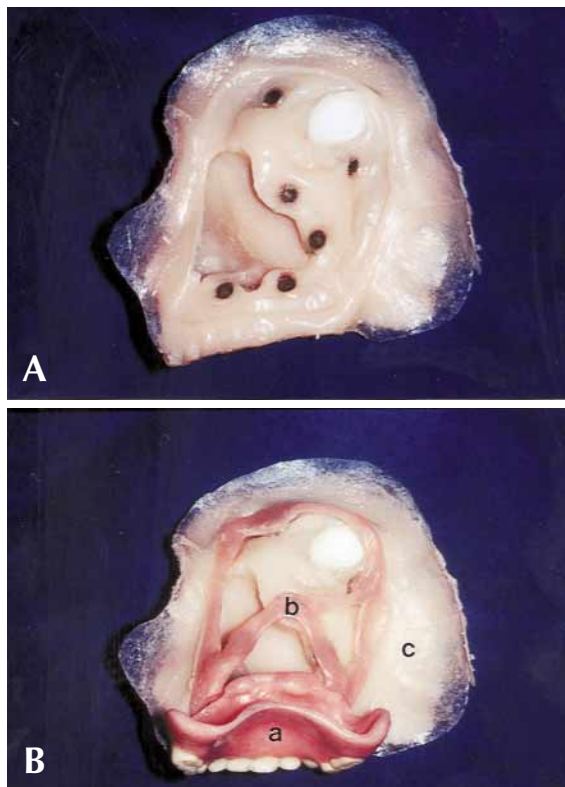


Fig. 7. A, View of prosthesis from tissue-bearing surface. Magnets and ocular prosthesis in position. Magnets contacted intermediate framework magnets to aid in retention. **B,** View of prosthesis from defect side shows relationship of obturator (a), intermediate framework (b), and facial prosthesis (c).



Fig. 8. A, Facial prosthesis; **B,** final prosthesis in place.

one another can be constructed. Various methods of auxiliary retention for facial prostheses have been described in the literature; they include eyepatches,³ eyeglasses,^{4,5} extensions from the denture⁶ that engage tissue undercuts,^{5,7} magnets,^{5,8} adhesives,⁵ combinations of the

above,^{5,7-9} and osseointegrated implants.^{5,7,10,11} 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.^{12,13}

SUMMARY

The prosthetic rehabilitation of a patient with a combined intraoral-extraoral defect has been presented. A 3-piece prosthesis that included a denture obturator, a facial prosthesis, and an intermediate framework was fabricated. Magnets were incorporated into each unit and, in conjunction with the intermediate framework, helped retain each segment of the prosthesis. Although it has been shown that osseointegrated implants can restore dentition and aid in the retention of extraoral prostheses, radiation to the area precluded their use in this patient, and an alternative method for retention was required. The intermediate framework and magnets provided satisfactory retention for the prosthesis.

The patient remained on a gastric feeding tube for 8 weeks after the completion of the prosthodontic treatment. Otolaryngologists and speech and swallowing therapists approved the removal of the feeding tube. The patient was able to maintain 100% of his weight with a soft diet and liquid nutritional supplement ingested by mouth. Cosmetic improvement as well as the ability to speak, swallow, and to a lesser degree, chew, were achieved for this patient.

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