Intraoral–Extraoral Combination Prosthesis: Improving Retention Using Interconnecting Magnets

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Osseointegrated implants have been well documented for retaining an obturator prosthesis as well as a facial prosthesis. However, when the defect extends to both the facial area and the maxilla, it is difficult to rehabilitate those defects to the satisfaction of the patient, especially in cases where implants cannot be placed on both sites. This case report describes the use of magnets to connect two prostheses, thereby increasing retention and patient comfort. *Int J Prosthodont 2014;27:279–282. doi: 10.11607/ijp.3849*

Acquired facial defects often present with severe disfigurement and functional impairment. 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.[1] In severe cases, due to the magnitude of the original tumor, an intraoral defect may also be present. In preventing liquid, air, and food from escaping into the maxillary sinus or nasal cavity, such an obturator restores speech and swallowing.

To fill up extensive maxillary defects, the obturator becomes thick and bulky, leading to increased weight, thus compromising its retention.[2] Furthermore, total or subtotal absence of the maxilla results in little or no residual maxillary structures for support, retention, and stability. In such cases, the fit of the obturator can only be increased by extending the obturator maximally up the lateral wall of the defect, thus, filling up the defect optimally and preventing leakage. The upper part of such a prosthesis also provides support to the cheek and lips. In addition, missing teeth can be placed in the appropriate position for lip support, esthetics, speech, and articulation.[3] All in all, a defect prosthesis is relatively bulky, which hinders its retention. To decrease its weight, the obturator can be made hollow.

In short, retention is a challenge in the fabrication of both the facial and obturator prosthesis. Various methods of retention for facial prostheses have been described in the literature, such as eye patches, prosthesis fastened to the spectacle frame, extensions from the denture, magnets, and adhesives.[4] Obviously, since the introduction of endosseous implants, their use is also advocated for supporting a facial and obturator prosthesis.[4] In cases where the defect extends to both the facial area and maxilla, it is a challenge to rehabilitate both regions simultaneously.[5]

This clinical report describes two patients wearing both an intraoral obturator and an extraoral facial prosthesis. In both cases, insufficient bone volume was present to place implants in both sites. The retention of the nonimplant-supported prosthesis could be increased by connecting it to the implant-supported prosthesis using magnets.

Clinical Report

Patient 1

A 63-year-old man was referred to Radboud University Nijmegen Medical Centre because of a squamous cell carcinoma of the nasal cavity. Treatment included a complete rhinectomy in combination with resection of the anterior part of the hard palate. The remaining teeth were extracted during ablative surgery. In the same session, both in the maxilla and mandible, two implants (Mark III Groovy, Nobel Biocare) were placed in the canine region. Unfortunately, a lack of bone volume around the nasal cavity hindered perinasal implant placement. Postoperatively, radiotherapy was conducted.

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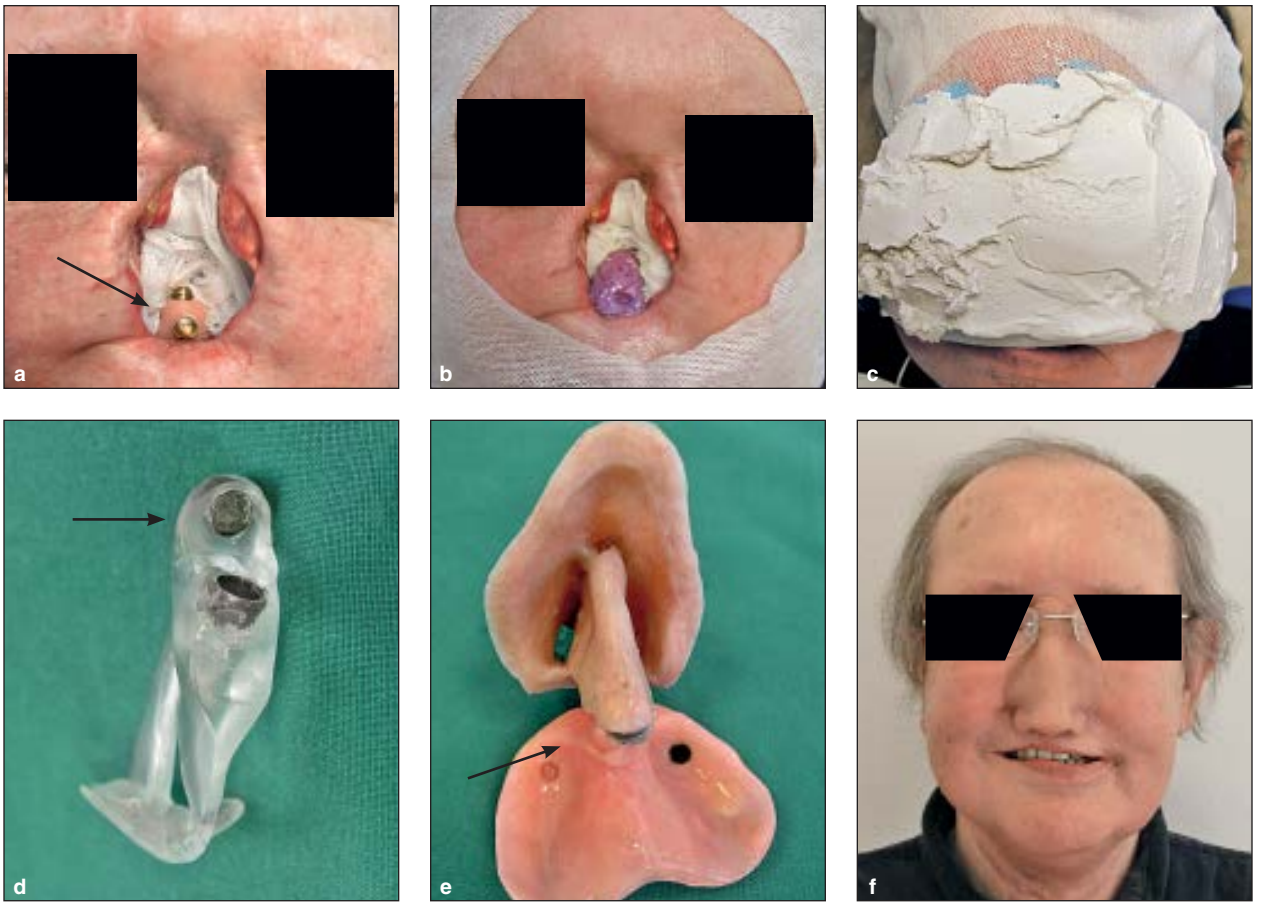

Fig 1 **(a)** Preparation for impression. Arrow points to the acrylic extension. **(b)** Impression taking with Impregum. **(c)** Full impression using alginate and plaster. **(d)** Acrylic carrier with countermagnets *(arrow)*. **(e)** Nasal prosthesis connected to the overdenture. **(f)** Patient wearing both prostheses.

In the maxilla as well as in the mandible, overdentures retained on two locator (Zest Anchors) abutments were made. The fabrication of the maxillary obturator started with an irreversible hydrocolloid impression. To prevent the hydrocolloid from entering into the nasal cavity, the palatal defect was covered with a gauze soaked in petroleum jelly. The impression was poured in gypsum material and a custom impression tray was fabricated. At its palatal part, using plastic impression compound (ISO Functional, GC Europe), an extension into the nasal cavity was modeled.

On top of the palatal side of the impression tray, in advance, an extension was manufactured into the nasal cavity, facilitating the impression procedure.

The final impression was performed using a high viscosity impression material (Impregum, 3M ESPE). After fabrication of the final gypsum cast, provisional record bases were prepared with autopolymerizing acrylic resin and wax, allowing for an inventory of the maxillary-mandibular relationship. According to standard procedures,[6] both the maxillary and mandibular dentures were fabricated and delivered to the patient 1 week later. After 2 weeks, the fabrication of the nasal prosthesis was started. First, to decide the most favorable position of the connection between obturator and nasal prosthesis, the optimal location on the palatal extension was marked (Figs 1a and 1e). Two Magnacap abutments (Vista Fix Cochlear Maxi), 5.1 mm in diameter and 2.1 mm in height, were embedded at the marked position onto the anterior palatal extension, using autopolymerizing acrylic (Fig 1a).

The patient was draped for the impression procedure, and his eyebrows and eyelashes were lubricated with petroleum jelly to facilitate removal of the impression material and to minimize discomfort (Fig 1b). An impression of the nasal cavity was made while the transfer magnets (height, 3.2 mm and diameter, 5.5 mm) were positioned onto the Magnacap abutments using silicone precision impression

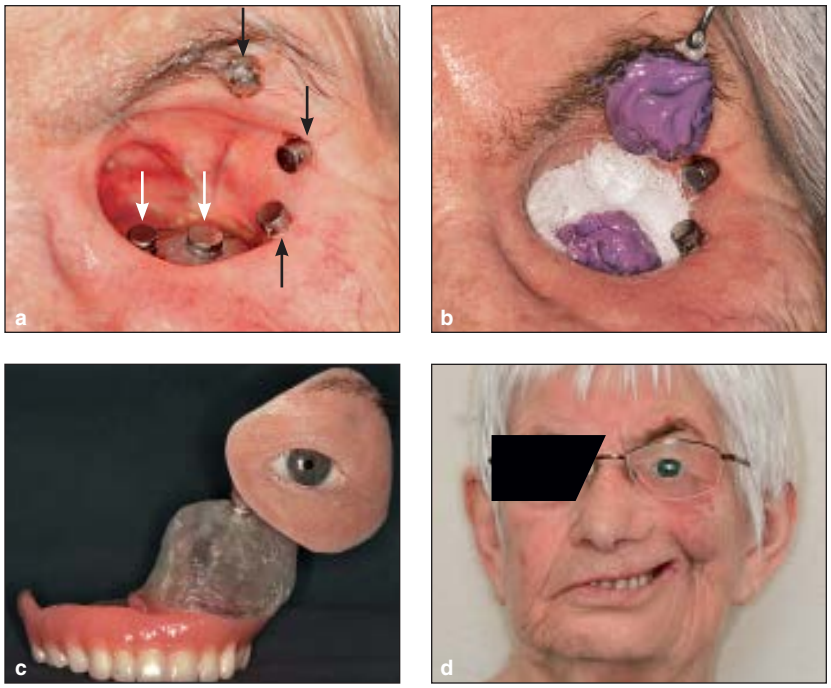

Fig 2 **(a)** Obturator with magnets in situ seen through the orbital defect *(white arrows point to the magnets, black arrows indicate abutments fixated onto the orbital rim implants)*. **(b)** Impression taking with Impregum. **(c)** Both prostheses connected using magnets. **(d)** Patient wearing both prostheses.

material (Flexitime, Heraeus) using both irreversible hydrocolloid (Cavex Holland) and Snow White Plaster (Kerr) (Fig 1c). This resulted in a cast with analog abutments (Maxi: height, 2.1 mm and diameter, 5.1 mm), the surroundings of the nasal cavity and obturator included.

The cast was lubricated, and countermagnets (Maxi Lip Magnet: height, 3.9 mm and diameter, 5.5 mm) were seated on top of the magnets in the obturator cast. The counter magnets were enfolded in acrylic resin using a carrier (Fig 1d) and embedded in the silicone nasal prosthesis (Fig 1e).

Patient 2

An 80-year-old woman presented with a long history of recurrences of squamous cell carcinoma of the hard and soft palate. She endured multiple surgeries, radiotherapy, and hyperbaric oxygen therapy. She suffered from a large postsurgical defect that included the left part of the soft and hard palate, loss of her eyeball, and excision of the lateral and lower wall of the left orbit. Due to insufficient bone volume in the maxilla, no implants could be placed in this area. However, three implants (Mark III Groovy, Nobel Biocare) were placed in the lateral and supraorbital margin. In the course of time, in the edentulous mandible, two interforaminal implants (Mark III Groovy, Nobel Biocare) were inserted. Initially, separate eye and obturator prostheses had been fabricated. This resulted in good function of the eye prosthesis but a lack of retention for the obturator, compromising the patient's ability to eat and speak. Therefore, it was decided to make a connection between the maxillary obturator and the implant-supported eye prosthesis using magnets.

Two magnet implant abutments (Steco System Technik), 3.75 mm in diameter and 3.5 mm in height, were embedded into the obturator prosthesis (Fig 2a). Subsequently, onto the three orbital implants, titanium implant abutments (Steco, 3.3 mm in diameter and 6.5 mm in height) were placed. Hereafter, accompanying impression copings (Steco System Technique) were made using silicone precision impression material (Flexitime, Heraeus): irreversible hydrocolloid (Cavex Holland) and Snow White Plaster (Kerr), respectively (Fig 2b). This resulted in one cast that combined the analog abutments of the orbital implants (facial prosthesis) and the obturator abutments in situ. Next, the cast was lubricated and countermagnets were seated both on top of the magnets in the obturator cast (Steco Z-line prosthetic magnet) and on top of the magnets in the orbital margin cast (Steco X-line prosthetic magnet). Countermagnets were embedded in the silicone eye prosthesis (Cosmesil Series Materials) using an adequate primer (Cosmesil, Technovent) (Fig 2c).

Discussion

Large orofacial defects result in serious functional impairment of speech, mastication, and swallowing. Obviously, the absence of an eye or nose and the resulting facial disharmony are important psychologic and physical handicaps for the patient. Therefore, rehabilitation of such defects needs careful attention and requires an intimate knowledge of the facial anatomy.

The placement of endosseous implants offers marked benefits in the prosthetic rehabilitation of orbital and nasal defects, when compared with conventional adhesive retention designs, because enhanced retention can be obtained regardless of adverse defect anatomy or size. Furthermore, retention is not degraded by unfavorable environmental factors, such as perspiration.

Some patients suffer from both an intraoral as well as an extraoral defect. Patient 1 wore a conventional nasal prosthesis and a maxillary overdenture supported by two implants. Ideally, the nasal prosthesis is also supported by two implants. However, to allow implant placement, an adequate osseous support is needed, and, in this specific patient, the premaxillary area was resected. By positioning an extension on the palatal part of the overdenture and by using magnets, a connection could be made between the conventional nasal prosthesis and the implant-supported maxillary overdenture. The psychologic effect for the patient was significant. In making contact, the patient was more confident knowing that, due to the magnet connection, his nasal prosthesis was securely fastened (Fig 1f).

Patient 2 suffered from a lack of retention of her maxillary denture. No sufficient bone volume was present to place implants in the maxilla, although a sinus floor elevation procedure using iliac crest bone is a viable solution to create a sufficient support to allow implant placement. However, the patient refused this option because she had already endured multiple surgeries. In this patient, the placement of the orbital implants also offered retention for the conventional maxillary obturator by connecting both prosthesis types. During fabrication of the eye prosthesis, a lack of space was encountered during placement of both magnets and countermagnets. Therefore, the glass eyeball could not be placed as far backwards as planned, making the upper eyelid look thicker than preferred (Fig 2d). Specifically, the implant in the supraorbital margin caused this problem. Therefore, thorough implant planning is advocated, creating sufficient space to allow for the placement of a magnet-based interconnection.

Since silicone has good marginal adaptation and a life-like appearance, it has been used for the fabrication of facial prostheses. A limitation of silicone, however, is its lack of chemical/mechanical bonding with other materials. Therefore, in both cases, an acrylic carrier was made to be embedded with the silicone.

Both patients had some difficulty with control and manipulation of their prostheses. However, for patient 1, the combination of obturator and nasal prosthesis lead to better control and manipulation. When the overdenture was in position, the first patient could easily position the nasal prosthesis, because the magnet guided the prosthesis in the right direction. The volume of the obturator in patient 2 lead to problems because the mouth opening was decreased. An obturator in two pieces, also connected by magnets, might have been a better alternative.

Conclusion

Osseointegrated implants are well documented for retaining an obturator prosthesis as well as a facial prosthesis. However, when defects extend both to the facial area as well as the maxilla, it is difficult to rehabilitate these defects to an acceptable level of patient satisfaction, especially when implants cannot be used at both sites. This case report describes a method to connect both prostheses to increase their retention and patient comfort.

Acknowledgments

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