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CLINICAL REPORT

Subway Mandibular Buccal Defect Blocked with Two Part Prosthesis Unified by Earth Magnets

Shikha Punjani · Aman Arora · Viram Upadhyaya

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Abstract This clinical report describes the fabrication of a two-piece obturator used to close the mandibular buccal defect. Two-piece obturator prosthesis was fabricated with clear heat cure acrylic resin to be used during the healing period following the marsupialization of odontogenic keratocyst which had lead to the loss of portions of the mandibular buccal region. The prosthesis fabricated in two parts was joined by the rare earth magnets. Retention was increased by lining the prosthesis with tissue conditioner material engaging the undercut.

Keywords Buccal defect · Magnets · Prosthesis · Two-piece obturator

Introduction

Creating prostheses to restore mandibular buccal defect involves many challenges, including the achievement of reliable retention and marginal fit. Adhesives, mechanical devices, tissue undercuts, and implants all have been used to retain prostheses. Soft tissues around defects may not be ideal for adhesive retention. Adhesives tend to damage the fine margins of silicone prosthesis that are used daily and induce material deterioration. Tissue undercuts can be used for retention if surgeons prepare the residual soft tissues to create undercut. Undercuts often provide insufficient retention and they may cause soft tissue irritation [1].

Opposing or conflicting undercuts may be used to provide positive retention for an obturator without the use of conventional clasps if the obturator is designed in two parts, each with a different path of insertion. Once the two sections of the obturator are placed in the mouth, they may be held rigidly in position by some form of locking mechanism. They may be entirely separate, or they may be attached with a mechanical device [2]. This article describes a technique to fabricate a prosthesis attached with rare earth magnets to obturate the mandibular buccal defect caused by enucleation of odontogenic keratocyst.

Clinical Report

A 35 year old female with a mandibular buccal defect of the left side was referred to the Department of Prosthodontics. Patient had a history of odontogenic keratocyst in the left mandibular region. The lesion involved the parasymphysis and the body of mandible. Left mandibular second pre-molar and first molar were endodontically treated. The left second molar was extracted followed by enucleation and marsupialization of the defect and was packed with iodoform gauge. After the surgery, the defect was cleaned and packed with iodoform gauge pack every week. The Oral and Maxillofacial surgeons wanted a prosthesis to cover the defect, so that no debris entered the defect and the iodoform pack stayed in place for a week till the pack was changed. Examination revealed the defect involving buccal wall of the mandible in the region behind the first molar with a passage exposing the roots of the apical third of the buccal roots of posterior teeth (Fig. 1).

S. Punjani (✉)
House No: 458-A, Sec-15, Faridabad, Haryana, India
e-mail: drshikhapunjani@yahoo.in

S. Punjani · A. Arora · V. Upadhyaya
Department of Prosthodontics, Crown & Bridge and Oral Implantology, Sh. J.N. Kapoor D.A.V. (C) Dental College and Hospital, Yamuna Nagar, Haryana, India

Fig. 1 Defect involving the mandibular buccal region exposing the apical third of roots of the posterior teeth

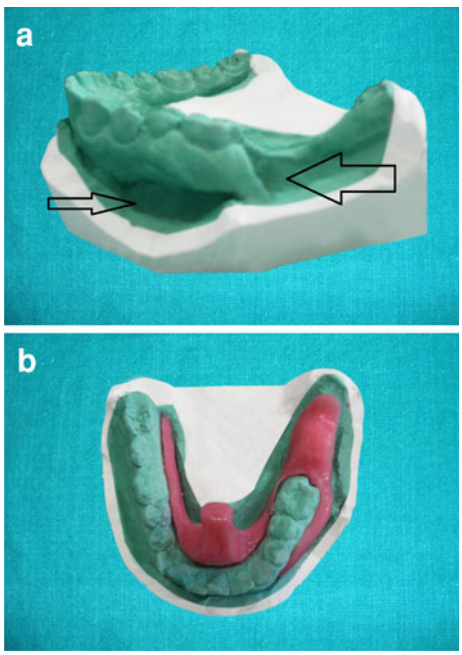

Fig. 2 **a** Primary cast showing the subway mandibular buccal defect. **b** Custom tray fabricated in autopolymerizing resin by blocking the defected area

The patient complained of impaired mastication and the seepage and accumulation of fluids into the defect. To improve the patient's cosmetic appearance and enhance her quality of life, prosthesis was designed.

A preliminary irreversible hydrocolloid impression was made in a stock disposable dentulous tray and a cast was poured in dental stone (Fig. 2a). After surveying, it was concluded that one piece prosthesis with adequate seal was not possible to fabricate. Hence a two-part prosthesis with different path of insertions was planned.

A custom tray was fabricated in autopolymerizing resin by blocking the defect area (Fig. 2b). Border molding and secondary impression of the defect area was done using tissue conditioner (GC Tissue Conditioner, GC

Fig. 3 Pick-up alginate impression showing the secondary impression of the defect with tissue conditioner

Fig. 4 Two parts of temporary denture base

Corporation Limited) incrementally. A pick-up impression was made with alginate (Fig. 3) and was poured in die stone (Kalrock, Kalabhai Co.) to obtain a master cast. Temporary denture bases of autopolymerizing resin were made in two parts (Fig. 4). First part involved the alvelolingual sulcus and the retromolar pad area covering the defect. The second part of the denture base covered the defect of the buccal area of exposed roots of the posterior teeth. First part of the denture base was placed in the mouth and a bite with wax was registered. Both the parts were seated on the cast and a tooth (second molar) was placed followed by trial. Before wax up, the denture base width on the buccal surface was measured, so as to make the magnets meet at a point of their intersection.

For the retention of the final prosthesis, rare earth magnets of neodymium were used. The magnets in ring form and diameter of 5 mm were chosen (Fig. 5). Two pairs of the magnets were used and placed at a distance of 5 mm.

The prosthesis was then waxed up. Additional layer of wax was placed on the site of magnet placement. Flasking was done separately of the two parts followed by the dewaxing. After the dewaxing procedure, two marks with a permanent marker were placed on the position of the magnets on the buccal surface of the cast (Fig. 6a). The

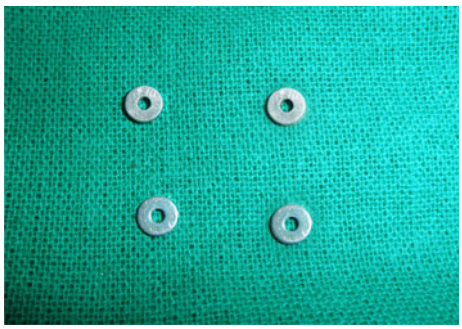

Fig. 5 The magnets in ring form with a diameter of 5 mm

magnets were retained on the site with the help of cyanoacrylate (Fig. 6b). The magnets were placed on the buccal region. The counter magnets were placed on the second part of the obturator. The alignment of the magnets over each other was of the utmost importance and significantly affected the repulsive force between the magnets. Packing of the prosthesis was done with heat cure clear acrylic resin (Fig. 7), so that the positions of the magnets were clearly visible. During bench press, the pressure exerted on the flask was less, to avoid the magnets getting displaced from its position. Curing was done followed by deflasking and finishing of the prosthesis (Fig. 8a, b).

The prosthesis was inserted into the patient's mouth. To increase the retention of the second part of the prosthesis, it was lined with a tissue conditioner. The defect was packed with iodoform gauge and prosthesis was finally placed. Patient was recalled after a week for the modification of the tissue conditioner material and to change the iodoform pack. The defect was closed by the two-part prosthesis and

Fig. 7 Packing done with the clear heat cure acrylic resin

packed with iodoform gauge followed by the prosthesis insertion (Fig. 9a, b). There was no movement of the prosthesis in lateral excursions (Fig. 9c).

Discussion

The two part prosthesis was easy for the patient to place it in the mouth. The two parts had different paths of insertion

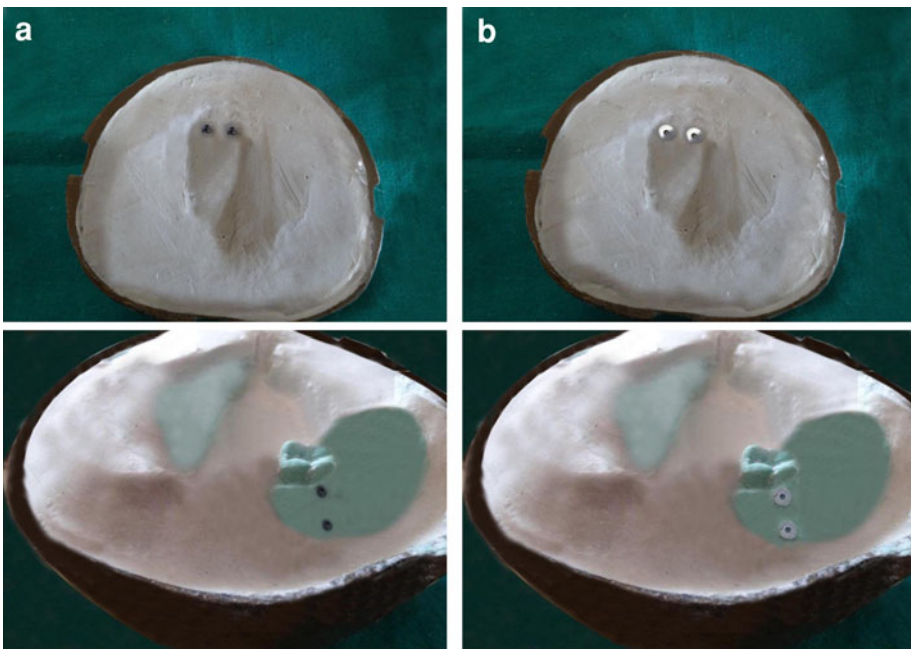

Fig. 6 **a** Marks made on the cast at the site of magnet placement. **b** Magnets placed on the cast

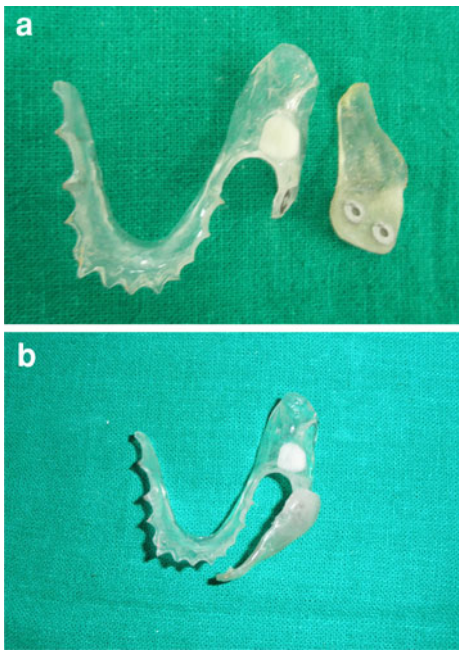

Fig. 8 **a** The final prosthesis. **b** The two part prosthesis unified by rare earth magnets

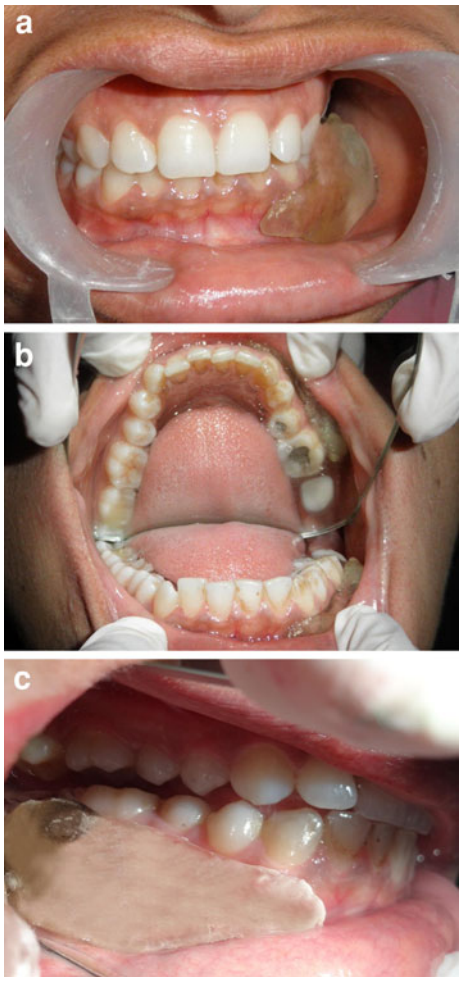

Fig. 9 **a** Post-rehabilitation intraoral view. **b** Post-rehabilitation intraoral occlusal view. **c** Post-rehabilitation intraoral lateral view

which made the placement of both the parts of prosthesis easier. The two parts attached by the magnets improved the retention of the prosthesis. As the defect involved large undercut area, it was impossible to fabricate prosthesis with a single path of insertion, so two part prosthesis was made. The retention of the prosthesis was improved enhancing the patient's cosmetic appearance by increasing its efficiency in speech and mastication. The prosthesis movement was minimized while performing the lip movement. The prosthesis prevented the seepage of oral fluids into the defect, which could have triggered the infection. Retention was best achieved by the use of rare earth magnets.

Rare-earth magnets are strong permanent magnets made from alloys of rare earth elements. The magnetic field typically produced by rare-earth magnets can be in excess of 1.4 teslas, whereas ferrite or ceramic magnets typically exhibit fields of 0.5–1 tesla. Rare earth magnets are extremely brittle and also vulnerable to corrosion, so they are usually plated or coated to protect them from breaking and chipping. There are two types: neodymium magnets ($Nd_2Fe_{14}B$) and samarium–cobalt magnets (chemical formula: $SmCo_5$). In this case, the neodymium magnets were used. The neodymium magnets have the highest magnetic field strength as compared to Samarium–cobalt magnets. The neodymium alloy is made of neodymium, iron and boron. In this case, smallest size of the magnets in ring form was used.

Magnetic attachments have most commonly been used for the retention of mandibular overdentures, maxillofacial prosthesis and implant. Many authors have described procedures for the use of magnets in this application and patients have reported a high degree of satisfaction with their dentures. The main problem associated with the use of magnets as retentive devices is corrosion by oral fluids. Both Sm–Co and Nd–Fe–B are extremely brittle and susceptible to corrosion, especially in chloride-containing environments such as saliva. Therefore, magnetic materials must be securely separated from the oral fluids before use in dental applications. Titanium and stainless steel are the most common materials used for encapsulation of dental attachments, but polymeric materials also have been used in both prosthodontic and orthodontic applications. However, continual wear of the encapsulating material leads to exposure of the magnet. This has been shown to occur clinically. The wear takes the form of deep scratches and gouges on the surface caused by wear debris and other particles that become trapped between the two surfaces. The excessive wear of the magnet may be due to the

abrasive nature of the titanium-nitride-coated soft magnetic root keeper that is used with some implant systems [3]. To avoid corrosion of the magnets and come in direct contact with the saliva, the magnets were coated with a thin layer of heat cure clear acrylic resin.

This device extends past the margins of the defect and is fabricated from clear acrylic resin to allow for visual and tactile sensory input during prosthesis placement. To increase the retention of the prosthesis, it was lined with tissue conditioner material engaging the undercut. The patient was recalled for the change of the tissue conditioner material and the iodoform gauge pack after 7 days.

Conclusion

Fabricating two part prosthesis with the use of rare earth magnets increased the retention and the ease for the patient. Rare earth magnets are beneficial in creating a locking mechanism between the prosthesis. These magnets help in increasing the stability of the prosthesis. The magnets on the labial surface of the prosthesis ensured adequate retention of the prosthesis, which adapted well to functional movements. The soft liner prevents the food material from going inside the defect.

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