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CLINICAL REPORT

Rehabilitation of a Patient with an Intra Oral Prosthesis and an Extra Oral Orbital Prosthesis Retained with Magnets

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Abstract This clinical case report deals with a rehabilitation of a patient with an extensive maxillary and orbital defect using an intra oral prosthesis obturating the maxillary defect and extra oral orbital prosthesis retained with rare-earth magnets for secondary retention; primary retention was derived by snug fit of the prosthesis to underlying and adjacent tissues. The rehabilitation resulted in improved function, esthetics and comfort to the patient thus enabling him to lead a normal life.

Keywords Magnets · Orbital prosthesis · Obturator

Introduction

Rehabilitation of facial defects is generally required in patients who have undergone tumor ablative surgery for head and neck cancers as well as in few trauma cases. The option for prosthesis should be considered in patients with facial defects, whenever the surgical reconstruction especially economics play an important role or is difficult. A well-retained, user-friendly, removable maxillofacial prosthesis is the key to successful prosthetic rehabilitation in such cases. Besides providing comfort and protection to the remaining soft and hard tissues, it also provides good esthetics, allowing the patient to go about life without drawing attention to his facial defects. The present article explains a method of rehabilitating a patient with orbital and oro-nasal defect using rare-earth magnets as a retention tool.

This case is attributed to Department of Prosthodontics, Nair Hospital Dental college, Mumbai

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Case Report

A 72 year-old male patient reported to the department of Prosthodontics with a gross disfigurement of middle third of the face on left side with a large surgical defect subsequent to radical surgery involving subtotal maxillectomy (left) and enucleation of the left eye 7 years back due to carcinoma of left maxilla followed by reconstruction with forehead flap (Fig. 1).

Intra-oral examination showed a post surgical defect on left side extending from midline to the left cheek. The palatal defect was in continuation with the orbital defect. The margins of the defects and tissues within were normal and healthy. The patient was completely edentulous with a hyper mobile flabby tissue in the anterior region (Fig. 2). Treatment objectives were limited to rehabilitation of the ocular defect using an esthetically pleasant, natural looking flexible material, along with closure of the intraoral defect to separate the oral cavity from the nasal cavity for facilitating swallowing, phonetics. It was decided to provide magnet-retained silicone eye prosthesis and a heat cured polymethyl-methacrylate hollow-bulb obturator.

Treatment Procedure

Treatment was carried out as follow: Preliminary impressions of maxillary arch along with the palatal defect and

Fig. 1 Extraoral pre-treatment. **a** Frontal view, **b** lateral view

Fig. 2 Intra-oral view of the defect

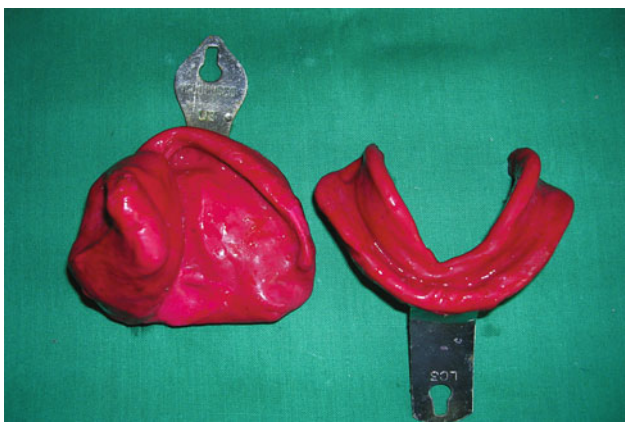

Fig. 3 Preliminary mandibular and maxillary impression with palatal defect

mandibular arch were made with the medium fusing impression compound (Y-Dent, MDM Corporation, New Delhi, India) in a stock metal tray (Fig. 3). Care was taken to record the defect to its maximum extent. Preliminary casts were made in dental plaster (Kaldent; Kalabhai Pvt. Ltd., Mumbai, India.) and custom tray was fabricated by providing relief in the anterior region where flabby tissue was present. Border molding was carried out in low fusing impression compound (DPI, Mumbai, India.). The palatal defect was molded with low fusing impression compound so as to record sufficient depth and extent of defect. A step was made at superior surface of the molded low fusing impression compound by cut-back method. This was to incorporate magnets in the step of the obturator, to provide precision in attaching intra-oral prosthesis with extra-oral prosthesis. Petrolatum gel was applied on the superior surface of molded low fusing impression compound (where step was provided). To replicate the step in the orbital impression, preliminary impression of the orbital defect was made with the medium fusing impression compound by keeping maxillary impression in situ. Final impression of maxillary arch along with intra-oral defect was made with light body polyvinyl siloxane impression material (Affinis, Coltne/whaledent Inc, Feldweisenstrasse, Switzerland) by keeping orbital impression in situ (Fig. 4). On the definitive working cast, permanent heat cured acrylic denture base (Lucitone 199, DENTSPLY, York division,Pa) with hollow bulb obturator was fabricated by lost sugar technique 1 (Fig. 5). Jaw relation was recorded and try-in was carried out by keeping orbital impression in situ (Fig. 6). After evaluation of final dentures in patient's mouth, the orbital defect was molded with the low fusing modeling plastic impression compound and final impression was made keeping the final denture in patient's mouth in occlusion with the medium body additional silicon impression material so as to control the flow of the material

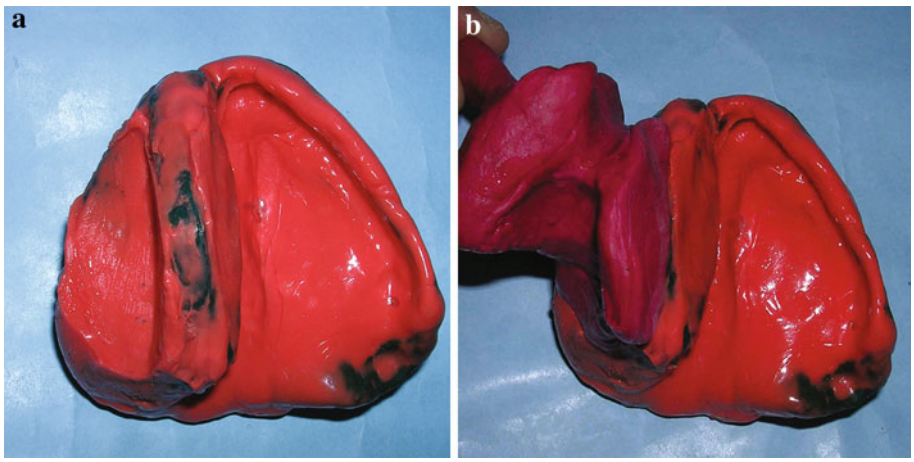

Fig. 4 **a** Maxillary final impression with palatal defect and **b** assembled maxillary final impression and preliminary record of orbital defect

Fig. 5 Hollow bulb obturator fabrication by lost sugar technique

Fig. 6 Denture try-in along with preliminary record of orbital defect

and to capture detail (Fig. 7). Impression was poured in dental stone, wax-up was done and orbital template was fabricated by using heat cured polymerizing resin (Lucitone 199, DENTSPLY, York division,Pa.). Four nickel-coated permanent, rare earth Nd–Fe-B (Neodymium-Iron-Boron) round magnets (Sonal magnets, Ahemmdabad, India) of 5 × 1.5 mm were selected for placement in the

Fig. 7 Final impression of orbital prosthesis

superior-lateral surface of the obturator with the help of autopolymerize resin. The counter position of the magnet in the extended orbital prosthesis was traced by using indelible pencil. Magnets with the opposite pole were incorporated in the inferio-medial surface of the orbital prosthesis with the help of autopolymerized resin (Fig. 8).

A separating medium (Vaseline) was applied on the eyelashes and eyebrows of the patient. A wax frame was fabricated defining the area of the face to be included in the impression to limit the flow of alginate. One inch plastic tube was placed in the mouth to facilitate respiration during

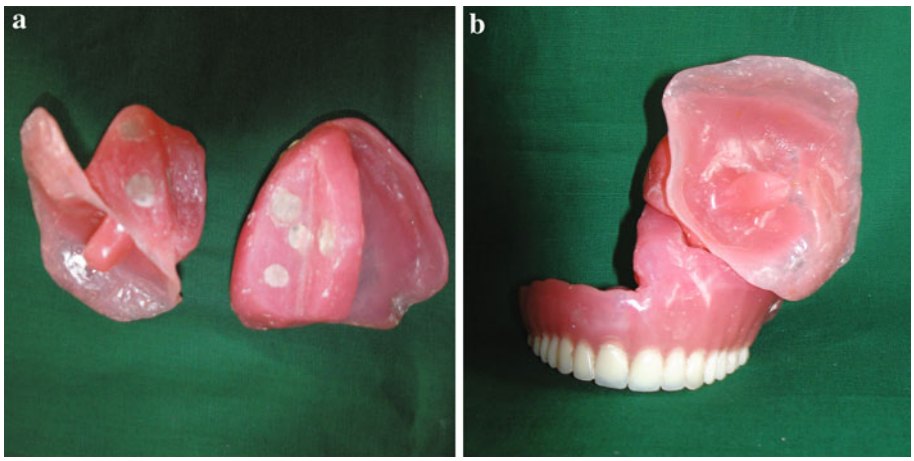

Fig. 8 **a** Magnets incorporated, **b** Assembled prosthesis (frontal view)

Fig. 9 Facial moulage

the impression procedure. By keeping orbital acrylic template prosthesis in situ, facial moulage was made with irreversible hydrocolloid (Tropicalgin; Zhermach Inc. products, California) (Fig. 9). A layer of gauze was placed on the alginate before it completely sets and a fast setting plaster was poured over it (0.25 inch thick) so as to provide adequate support and to avoid tearing and distortion of the alginate impression during removal.

The left ocular prosthesis was carved in modeling wax, using a selected prefabricated eye shell button matching to the patient's right eye. During the try-in stage, the fit of the wax pattern were evaluated, along with the orientation of pupil, color, size and volume of sclera visible as compared to the contra-lateral eye (Fig. 10). The pattern was then flasked. After dewaxing procedure, a thin layer of medical adhesive type A silicone (Silastic Medical Adhesive Silicone, Type A; Dow Corning Corp) was applied onto the acrylic resin backing to enhance the bond between acrylic and silicon. Shade matching was done in natural day light. Mold was packed with the medical grade silicone (Silastic MDX4-4210; Drow Corning Corp.) with added intrinsic colors to achieve the appropriate characterization. The

Fig. 10 Try-in of the wax pattern

manufacturer's instructions for silicon processing were followed. Once the final prosthesis was retrieved, the flash was trimmed using a sharp blade and the final finish was accomplished using fine sand paper. External characterization was done in the presence of the patient.

The patient was given training regarding how to wear the prosthesis. The obturator was fitted first followed by the eye prosthesis so that both the magnets could attach to each other at the same height and position. While removing the prosthesis, the patient was advised to remove the eye prosthesis first for easy removal.

Separate eyeglasses were given to the patient to support and camouflage the prosthesis as a complex path of placement and removal of the extra-oral orbital prosthesis precluded them from being attached (Figs. 11, 12). Regular follow-up was done. For first week, patient was asked to wear the prosthesis without adhesive. But as the prosthesis was being placed on resilient soft tissue, the retention as well as adaptation was compromised, due to lack of adequate support. Therefore, the patient was advised to use an adhesive with the prosthesis. The case was followed-up after every 6 months for 3 year.

Fig. 11 Patient with definitive prosthesis (frontal view)

Fig. 12 Patient with definitive prosthesis (lateral view)

Discussion

Rehabilitation of patients with maxillofacial defects has always remained an enigma for the prosthodontist. Prosthetic rehabilitation for facial defects has several advantages over surgical reconstruction, as it is quite inexpensive, allows for periodic examination and cleaning and is also an alternative to surgery in unsuitable candidates. Surgical resection of the maxillae results in communication between the oral and nasal cavity that causes difficulty in swallowing, nasal regurgitation, unintelligible speech and unaesthetic appearance. The prosthesis being in the maxilla, constant pull applied on the prosthesis by the gravity also has been found to have ill effect on its retention.

Many methods and materials have been used to fabricate a lightweight, closed, hollow obturator such as sugar [1] and ice [2]. A lightweight prosthesis which was fabricated in this case by lost sugar technique, not only combat problem due to gravity but it also enhanced the resonance of speech.

Many methods and means of fabricating and retaining maxillofacial prosthesis have been described in past. Workers like Jean Nadeau (1955) [3], Boucher and Heupel (1966) [4], Javid (1971) [5] and Federick [6] used magnets. The introduction of rare-earth permanent magnets made of alloys such as Sm–Co (Samarium–cobalt) and Nd–Fe–B (Neodymium–Iron–Boron) has resulted in magnets of very small dimensions. Nickel, gold and titanium coating of these magnets has also overcome the problems of tarnish and corrosion [7]. The major problem encountered in this case was of retention as the defect was continuous and both appliances could not remain in place on their own without the help of additional devices, which in this case, was done by using magnets. A two-component prosthesis retained with the help of rare earth magnets facilitates its easy placement and removal, by breaking down the compound paths of insertion and removal.

A step was provided in the maxillary intra-oral prosthesis and extra-oral orbital prosthesis to provide precision in attaching this prosthesis together after incorporating magnets in it. Orbital acrylic template which was made in heat cure acrylic resin being rigid provided a fixed surface for the magnet in extended silicone eye prosthesis. After wearing of the obturator, a fixed position of the magnet was available and once the eye prosthesis was seated in place, the magnet incorporated in it was automatically attracted to the obturator magnet enhancing retention of both the prosthesis. Although nickel coating provides good shelf life to the magnets, these can be replaced as and when required.

Various methods used in the past to increase retention include tissue undercuts and attaching the prosthesis to the patient's eyeglasses or dentures, which help to retain the prosthesis mechanically. In addition, medical-grade adhesive, tapes and retention by the remaining dental structures are commonly employed techniques. Medical-grade adhesive was used in this case to obtain better marginal adaptation of silicon prosthesis with the adjacent skin of the patient. Also, separate eyeglasses were given to the patient because of the complex path of placement and removal of the extra-oral orbital prosthesis.

Implants supported prosthesis could have been the best possible treatment. But because of economic constraint, magnet retained prosthesis was chosen as a best possible option for this patient.

In spite of many problems, limitations and complexity of rehabilitation procedure, a dedicated effort on our part as a prosthodontist must always be given to rehabilitate these unfortunate patients to our full satisfaction.

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