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CLINICAL REPORT

An Innovative Three Part Prosthetic Rehabilitation of Class-1V Facial Defect

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Abstract Loss of maxillo facial structures due to neoplasm, trauma and accidents gives inconsolable mental, physical and psychological agony to a person's dignified life in his living society. Surgical reconstruction was not feasible for all cases and certain cases needs prosthetic rehabilitation. In this clinical case report, an innovative, simple three part maxillo orbital prosthesis fabrication using magnets was explained.

Keywords Maxillo orbital prosthesis · Class 1V facial defect · Silicone adhesive · Hollow bulb obturator · Dental magnets

Introduction

Squamous cell carcinoma of maxilla invading and penetrating the floor of orbit often requires complete hemi maxillectomy and exenteration of the affected side. Orbital exenteration was a complicated procedure reserved for the treatment of potentially life threatening malignancies or relentlessly progressive conditions unresponsive to other treatments [1–3]. The physical agony suffered by the patient during early surgical phase and the mental agony suffered by him at the later stages cannot be underemphasized. The added difficulty due to hemi maxillectomy greatly enhances his agony due to loss of masticatory function. The prime need for these cases require surgical reconstruction but was not practically feasible for all cases due to systemic contraindication, necessitating meticulous prosthetic rehabilitation. Rehabilitation of these cases involve good coordination among ophthalmologist, plastic surgeon, oncologist, prosthodontist, dietician, physiotherapist, specialist nurses, speech therapist and dental technician [2–4].

Even though various materials were in use, acrylic and silicone still remain as the popular ones. But methodology became so advanced as developments in computerized three-dimensional (3D) data processing has lead to the fabrication of wax pattern without traditional impressions using CAD/CAM/CNC milling machine and Rapid Prototyping 3D systems [5, 6].

Even though various methodologies [4, 7, 8] including implants had been discussed in literatures for fabrication of maxillo facial prosthesis, the need for a simple procedure always exist. The aim of this article was to present one such simple and economical method of fabrication of a three part maxillo orbital prosthesis using magnets [9–12].

Clinical Report

A 50 year old male patient reported to dental clinic for replacement of his left missing eye and maxillary jaw (Figs. 1, 2). Case history revealed that exenteration of left orbit with left hemi maxillectomy was performed due to Squamous cell carcinoma of left maxilla invading the floor of orbit. Right maxilla was edentulous and mandible was partially edentulous. It was identified as a typical class-1V facial defect [13]. Patient's systemic condition was healthy.

A three part maxillo orbital prosthesis was planned for this patient [10]. The three parts constitute (a) maxillary part, (b) obturator part and (c) orbital part.

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Step by Step Procedure of Fabrication

Part-1—Fabrication of Obturator Part

A preliminary impression of maxillary arch was made using silicone putty rubber base (Express STD, 3M ESPE, St Paul, MN). Care was taken to ensure that the putty material extends up to the floor of orbital defect. After the material has set and with the tray in patients mouth, white petroleum jelly (Vaseline, Hindustan Unilever, Mumbai, India) was applied over putty base representing the floor of orbit and a separate impression of orbital defect was made using putty. This orbital impression would serve as a reference for identifying the floor of orbit. After the material has set, the two parts were removed separately and reoriented outside the mouth (Fig. 3). Beading, boxing was done and cast was prepared in dental stone (Kalabhai stone, Kalabhai Karson Pvt Ltd, Mumbai, India) extending slightly below the floor of orbit (Fig. 4). After the dental stone has set, separating medium (Deepti Dental Products of India Pvt Ltd, Ratnagiri, Maharastra, India) was applied and second pour representing the orbit was prepared. After the two parts are set completely, they are separated and verified for reorientation. Undercuts in obturator cast part was blocked out with dental plaster (Kalabhai plaster, Kalabhai Karson Pvt Ltd, Mumbai, India). A 0.5 mm thick modeling wax sheet (Modeling Wax, Deepti Dental Products of India Pvt Ltd,) was uniformly adapted along the walls and roof (Fig. 5). Auto polymerizing acrylic resin (DPI–RR, Dental Products of India Ltd, Mumbai, India) was flown about 1 mm thick on three surfaces (medial, lateral and roof). After acrylic has set, the palatal opening was closed with auto polymerizing acrylic lid made by roll on method. Two acrylic cones (Fig. 6) were attached on the outer surface for stabilization during processing. The entire assembly was processed (Fig. 7) using reinforced heat cure acrylic resin (Acrylin-HI, Asian Acrylates, Mumbai, India) by conventional method. After processing, the acrylic cones were trimmed flat. The finished obturator gives a truncated pyramid appearance.

Attaching Magnets

A 3 mm high elliptical auto polymerizing acrylic ramp (Fig. 8) was created on the palatal part of hollow bulb obturator. Commercially available dental magnets with 3 mm diameter and 2 mm thick were embedded in the acrylic ramp taking care to ensure that magnets surface flush with the surface of ramp. Finally the obturator was tried in patient's mouth (Fig. 9) and kept aside.

Fig. 1 Maxillo orbital defect—Extra oral view

Fig. 2 Maxillo orbital defect—Intra oral view

Fig. 3 Preliminary putty impression

Fig. 4 Boxed impression with first layer

Fig. 5 Wax pattern for hollow bulb obturator

Part-2—Fabrication of Denture Part

Maxillary complete denture and mandibular partial denture was fabricated for this patient. Acrylic special tray with wax spacer was fabricated over primary cast. Border molding was done with low fusing compound (Tracing Stick, Dental Products of India Ltd), wax spacer removed and excess acrylic versus ramp area was trimmed (Fig. 10). Two ferromagnetic keepers (Omega Electronics) of same size are attached to the respective magnets on hollow bulb obturator and medium body elastomeric impression material (Express, 3M ESPE, St Paul, MN) loaded on special tray and definitive impression of maxillary arch was made (Fig. 11). Obturator with keeper was removed from the impression (Fig. 12) and master cast of maxillary arch was prepared in dental stone (Fig. 13) (Kalabhai Karson Pvt Ltd). Mandibular master cast was prepared by conventional dual impression procedure. Denture base was fabricated, bite blocks prepared, face bow transfer and maxillo mandibular relations recorded, wax trial verification done and dentures were processed by conventional methods.

Finished dentures were tried in patient's mouth. Keepers were attached to the magnets on obturator and inserted in the defect. Hollows on maxillary denture representing keepers were slightly enlarged and filled with auto polymerizing acrylic resin (DPI–RR, Dental Products of India Ltd) and inserted in mouth against the obturator. After acrylic has set, the maxillary part and obturator part can be attached and detached at will (Fig. 14).

About 1 mm of acrylic was uniformly trimmed from the surfaces of obturator which comes in contact with tissue. Later obturator was attached to maxillary denture. Soft permanent liner (UFI-GEL-P, Voco GmbH, Cox haven, Germany) was mixed and coated uniformly on the obturator as per instruction and inserted in the defect [14]. Set assembly was removed after 15 min, excess trimmed and polished.

Part-3—Fabrication of Orbital Part

Maxillary complete denture with the obturator and mandibular partial denture was inserted (Fig. 15). Light body rubber base elastomeric impression material (Express Light, 3M ESPE) was injected around the peripheral and anterior half part of orbital defect. When the material was partially set, stapler pins were inserted for retention (Fig. 16). Impression compound (DPI–Pinnacle, Dental Products of India Ltd) was adapted over rubber base for stabilization and wet gauze adapted over it to hasten setting. Set assembly was removed intact. The orbital impression was boxed and poured in dental stone and orbital cast prepared. For reference purpose, a facial moulage impression was made and cast prepared in dental stone. Pre fabricated acrylic eye shell matching the patient's opposite side color and congruence was selected, set in wax pattern taking care to match with the interpupillary and naso canthal lines of opposite eye. Wax pattern (Fig. 17) was neatly carved to duplicate the skin contour and wrinkles. Orbital wax pattern try in was completed and the assembly was flasked, dewaxed and after daylight color matching with patients face, packed with medical grade silicone (COSMESIL M511, Principality Medical Ltd, New Port, South Wales, U.K) and kept for 36 h room temperature curing. Set silicone prosthesis was trimmed, finished and polished.

Finished orbital prosthesis was inserted in the orbital defect (Fig. 18) and reinforced by silicone adhesives (COSMESIL G601,G602,G603,G604, Principality Medical Ltd). Patient was given post insertion instruction regarding good maintenance and care.

Discussion

Rehabilitation of acquired maxillofacial defects remains a challenging task for the specialists especially the prosthodontist when surgical reconstruction was not feasible due

Fig. 6 Completed wax pattern of obturator with acrylic cones

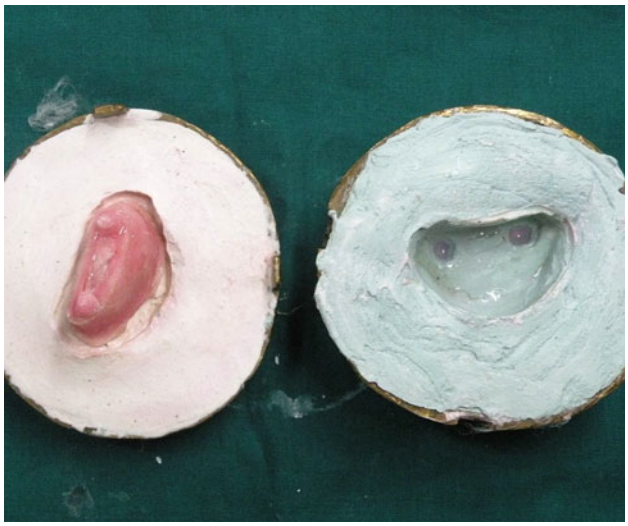

Fig. 7 Processing obturator

Fig. 8 Preparation for acrylic ramp

to general medical contraindication, age, anatomical and surgical limitation, cost, patient's fear factor/psychology etc. This article presents one such simple, nonsurgical,

Fig. 9 Obturator-intra oral view

economical, time saving and convenient method of fabrication of a three part maxillo–orbital prosthesis using magnets. The three parts denotes maxillary complete denture, hollow bulb obturator and orbital part. Complete denture was fabricated using heat cure acrylic resin, hollow bulb part made of auto polymerized acrylic resin on the inner side and heat polymerized acrylic resin on the outer side and the whole assembly lined with a soft permanent liner and orbital part was made of medical grade silicone.

A great advantage of this three part prosthesis was that all the three parts can be removed independently of each other [10]. Maxillary complete denture was made of reinforced acrylic resin which provides superior quality, hollow bulb obturator provides good speech resonance and was of light weight, detachable magnetic attachment between complete denture and obturator provides good retention, and the soft permanent liner over the obturator provides cushioning effect on the surrounding maxillary tissue defect. No part of obturator which contains auto polymerizing acrylic resin comes in contact with tissue. The orbital definitive impression procedure was different from conventional methods in that there was no need to record the complete orbital defect but records only the peripheral and anterior half part. Recording the orbital apex part was needless as the prosthesis was seated only by engaging the favorable orbital undercuts This also reduces prosthesis weight and cause minimal tissue trauma and irritation to the patient. Patient does not experience any difficulty during mastication and chewing function. The prolonged room temperature curing time of 36 h for silicone can be reduced to 1 h by heating in 100 °C water bath as an alternative as per manufacturer instruction. This saves time.

But we also need to discuss some disadvantages of this method. The magnetic alignment between opposing poles

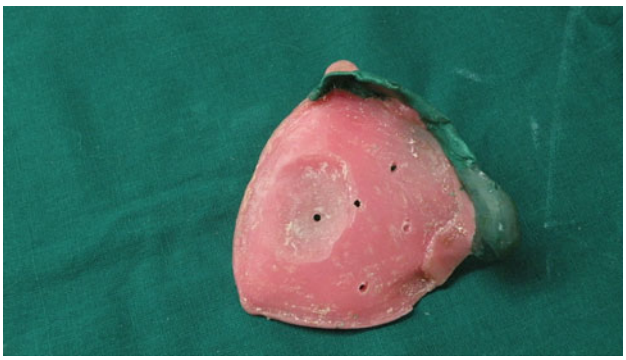

Fig. 10 Special tray before maxillary definitive impression

Fig. 11 Definitive maxillary impression with obturator

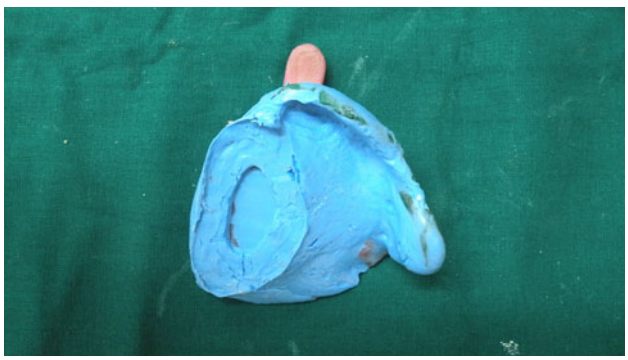

Fig. 12 Definitive impression with obturator removed

must be exact with no dead space between them which reduces retentive force [9, 11, 12]. Candidal inhabitation and adherence on obturator soft liner was a drawback but minimal when compared to direct exposure to oral fluids [2, 14, 15]. This occurrence can be further minimized by proper antifungal treatment regime. Finally as with the other silicone prosthesis, this orbital prosthesis has guarded color stability and durability [2, 3] but provides good

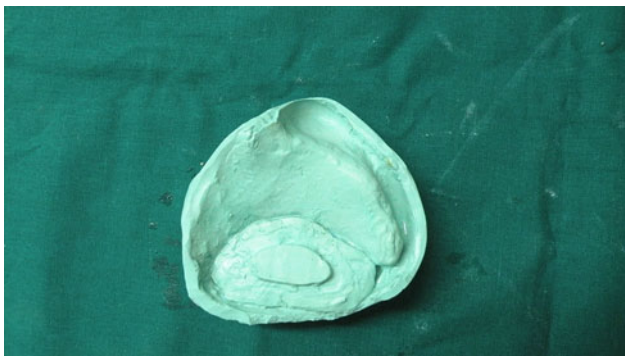

Fig. 13 Maxillary master cast

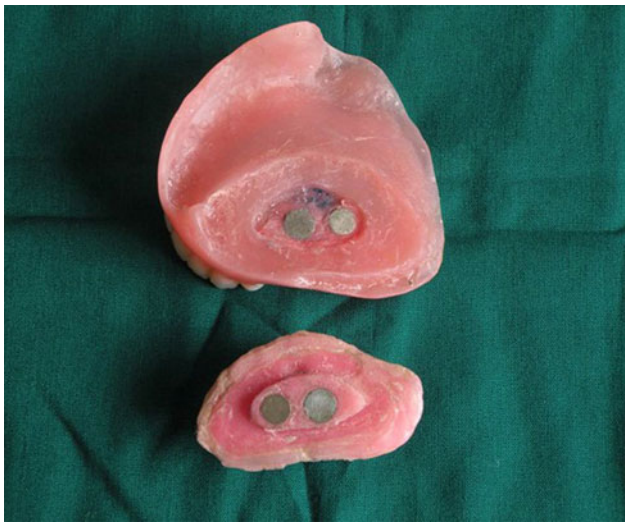

Fig. 14 Two part prosthesis with magnets

Fig. 15 Patient with maxillary denture and obturator

blending with surrounding facial tissues. So research continues in search of an elusive material which provides superlative qualities.

Fig. 16 Definitive impression of orbital defect

Fig. 17 Wax pattern of orbit

Fig. 18 Post treatment view with three part prosthesis

Conclusion

Prosthetic rehabilitation of combined maxillofacial and orbital defects presents a great challenge to the treating prosthodontist. Even though various methodologies have been discussed earlier, this article presents a different method which is more efficient, economical, time saving and comfortable for the patient provided one understands their limitations.

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