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The Restoration of an Orbital Defect Using a Magnet Retained Silicone Prosthesis- A Case Report

Dr. Nupur Hemant Vaidya[1], Dr. Anand Sunil Kulkarni[2]*, Dr. Shobha Rodrigues[3], Dr. Thilak Shetty B[4], Dr. Umesh Pai[5]

[1]Postgraduate, Department of Prosthodontics, Crown and Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Mangalore, India
[2]Postgraduate, Department of Prosthodontics, Crown and Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Mangalore, India
[3]Professor and Head, Department of Prosthodontics, Crown and Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Mangalore, India
[4]Professor, Department of Prosthodontics, Crown and Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Mangalore, India
[5]Associate Professor, Department of Prosthodontics, Crown and Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Mangalore, India

Case Report

***Corresponding author**
Dr. Anand Sunil Kulkarni

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Abstract: Rehabilitation of Maxillo-facial defects is a complex task, requiring an individualized approach and modification of existing techniques to suit the needs of each patient. A removable, suitably retained prosthesis that reduces the patient's discomfort and involves a minimal amount of manual dexterity in its handling is the key to successful prosthetic rehabilitation in such cases. This paper describes a novel technique of the restoration of a complex orbital defect with a removable silicone prosthesis that is retained with the help of magnets incorporated in the prosthesis itself and the spectacle frame.

Keywords: Orbital defect, Maxillofacial Prosthesis, Silicone orbital prosthesis, Magnets.

INTRODUCTION

Acquired or congenital maxillofacial defects are the major reason for facial disfigurement leading to extreme psychological trauma to the patient along with functional disabilities. Taylor has stated that 'The psychology of an individual is a cumulative reflection of his past and present experiences'[1, 2]. Any form of facial disfigurement is debilitating to the self-esteem of an individual. The surgical removal of an eye is especially a traumatizing handicap to a patient because vision is one of the extremely important senses of communication [3]. The loss or absence of an eye can be a result of a congenital defect, irreparable trauma, a painful blind eye, sympathetic ophthalmia, or the need for histologic confirmation of a suspected diagnosis [1,2].

Surgical procedures adopted for the removal of an eye were classified by Peyman, Saunders and Goldberg [4] into three general categories: enucleation, evisceration and exenteration. According to Scoll [5] enucleation is a surgical procedure involving the removal of the globe and the attached portion of the optic nerve. Evisceration is the surgical excision of the contents of globe while leaving the sclera and extra ocular muscles intact. Exenteration, the most radical of the three procedures, involves the removal of the eye, adnexa, and the part of the bony orbit. It is next to impossible to reconstruct an exenterated orbit with autogenous material in a clinical condition wherein there is a complete loss of the upper and lower eyelids along with the eye [6].

Orbital prosthesis is an attractive and economical alternative in situations where the esthetic and functional demands are beyond the capacity of local reconstructive efforts. Prostheses for orbital defects can be made from a variety of materials including RTV silicone elastomer, poly-methyl methacrylate, polyurethane elastomer or urethane backed medical grade silicone. Excisional surgical procedures are a source of major financial expenditure and hence the patient may seek a prosthetic rehabilitation that is economical. The utilization of a maxillofacial prosthetic material that is economically feasible while giving satisfactory and predictable cosmetic results should be the goal of rehabilitating such patients [. The present

case report details the fabrication of RTV silicone prosthesis to esthetically restore an orbital defect of the right side due to exenteration following the development of a locally aggressive form of melanoma.

CASE REPORT

A female patient aged 38 years reported to the Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore for the rehabilitation of her right facial defect. The right orbit and portion of the superior nasal turbinate was removed surgically for the treatment of a locally aggressive melanoma. Extra-oral examination revealed a large orbital defect on the right side which was lined incompletely with a skin graft and hence an opening in the inferior aspect of the defect was evident (figure 1). The presence of an undercut on the superior aspect of the defect was noticed however the skin lining the defect was tender and any pressure exerted resulted in discomfort to the patient. The patient's economic situation and an inconsistent record of the details of radiotherapy administered contraindicated the use of implants. Hence it was decided to fabricate a single piece silicone orbital prosthesis which would obtain its retention from two magnets, one incorporated in an acrylic shim within the prosthesis and its opposing member into the rim of the spectacle which was to be used to mask the borders of the prosthesis.

METHOD

Obtaining the impression of the defect and the facial moulage

The patient was draped for the procedure and her eyebrows and eyelash were lubricated with petroleum jelly so as to facilitate removal of the impression with minimal trauma. The opening on the inferior aspect of the defect was covered with gauze tied to a thread projecting on the external surface to enable retrieval of the gauze after the completion of the impression procedure (figure 2).

First an impression of the defect side was obtained to develop a working cast and then the facial moulage impression was made. Putty consistency elastomeric impression material (Soft putty, 3M ESPE) was adapted on the surface of the defect and stapler pins were incorporated on the external surface before it set to help in the retention (figure 3). Irreversible hydrocolloid (Coltene, Whaledent) was mixed and placed over the putty material and as the irreversible hydrocolloid was setting wet gauze, pieces were incorporated and a thin mix of dental plaster was used over it to provide a suitable base and aid in easier retrieval of the impression (figure 4,6).

To study the case in detail, a full facial impression from forehead region to nose was made with the patient in an upright position and the remaining left eye passively closed [7]. Putty consistency elastomeric material (Soft putty, 3M ESPE) was used to record the defect area similar to the procedure followed for the working cast impression. The area to be recorded in the facial moulage impression was beaded with impression compound and irreversible hydrocolloid (Coltene, Whaledent) was gently applied on the external surface of the putty material and on the unaffected side with the left eye passively closed. Further mixes were made and beaded area was completely filled. The impression material was carefully placed with a minimum thickness to avoid distortion of the facial tissues [7]. Wet gauze and dental plaster were placed over the hydrocolloid mix similar to the previous procedure (figure 5,7). During the entire procedure care was taken to keep the nasal apertures patent at all times and the patient was reassured gently to make her at ease. The retrieved impressions were boxed and poured in Type IV gypsum product (Kalrock, Kalabhai Karson Pvt Ltd).

ACRYLIC SHIM FABRICATION

The working cast was duplicated in type III gypsum product and a wax pattern of the shim was developed on the duplicated cast with modelling wax with an approximate thickness of 0.8mm. The wax pattern along with the cast was flasked, dewaxed, packed and cured according to the manufacturer's instructions (Trevalon clear; Dentsply, New York, PA, USA). The shim was retrieved, excess flash removed, polished and tried onto the working cast and then on the defect site to check for accuracy of fit (figure 8). A heat cured acrylic shim was specially made so as to reduce the residual monomer content to a minimal while maintaining the durability and strength of the acrylic, keeping in mind the sensitive nature of the skin graft lining the defect.

ORIENTING THE WAXED-UP PROSTHESIS IN FACIAL HARMONY

Selection, orientation of the eye shell and wax sculpting

A stock eye shell matching the sclera and iris colour of the patient's left eye was selected from an array of acrylic eye shells. Precise orientation of the artificial eye such that it is virtually inconspicuous to the casual onlooker is one of the major prerequisites for an aesthetic orbital prosthesis [8]. Many methods for the accurate positioning of the eye in cases of rehabilitation of orbital or ocular defects are reported in the literature [9]. A gross wax pattern with approximate orientation of the eye shell was fabricated and tried in the defect side. A series of facial measurements involving the unaffected side were then used to orient the shell in this case. The left eye of the patient was maintained in a conversational gaze during the marking. A medical grade one sided tape was placed on the patient's forehead and a series of vertical lines were marked on it; a line through the midline of the face and a line through the medial canthus of the left eye. Next lines were drawn at the medial and distal end of the iris of the left eye. The distance between the lines was

measured from the midline and similarly lines were drawn at an equidistant position on the opposite side (figure 9). The vertical lines helped in orienting the shell mediolaterally in the defect when the patient presented a normal straight gaze. These measurements were transferred to the working model to assist in wax pattern modification [7]. Next the periorbital tissues were replicated by carving the wax on the working cast followed by chairside alterations (figure 10). The acrylic shim was incorporated in the wax itself during the trial procedure. Carving the anatomic replica of contiguous soft tissues in an orbital prosthesis is an extremely subjective, intricate and protracted procedure and the medio-lateral, antero-posterior and supero-inferior positioning of the eye shell was repeatedly verified during the process. The consent of the patient and her immediate family was obtained before finalizing the wax trial prosthesis.

Shade matching

During the same appointment as the wax trial, shade matching with the patient's natural skin tone was also accomplished. A small amount of the RTV silicone (M.P Sai Enterprises, India) was used and the pigments provided by the manufacturer were used to obtain a shade of the silicone that matched with the patient's skin tone (figure 11).

STABILIZATION OF THE EYE SHELL

One of the important tasks during the processing of an orbital prosthesis is maintaining the three-dimensional position of the eye shell without discrepancy during processing. The anterior indexing method was used for stabilizing the eye shell during processing. A small cylindrical acrylic button was added onto the surface of the eye shell before investing and dewaxing. This helped in positioning the eye shell into the gypsum used for investing without any movement during the dewaxing and packing stage.

Packing, finishing, attaching the magnets and insertion of the prosthesis

The packing was done according to manufacturer's instructions in the dewaxed mould and kept for 24 hrs before retrieving the prosthesis. RTV silicone (M.P Sai Enterprises, India) with the intrinsic staining method was used for the fabrication of the prosthesis (figure 12). After retrieval the gross excess was cut and artificial hair was used to recreate the patient's lashes and eyebrow (figure 13). Two cobalt samarium magnets were used with their poles oriented correctly. A hole the approximate size of the magnet was prepared into the acrylic shim and a similar hole on inner surface of the bridge of the spectacle frame. The magnets were attached with the help of cyanoacrylate glue and auto-polymerising clear acrylic (figure 13,14). A black elastic thread was attached to the distal end of the prosthesis so that the patient could loop it around her ear for added retention if required. The prosthesis was inserted and the spectacle was placed over it so that the magnets helped in the retention of the prosthesis. The patient was trained in the use and care of the prosthesis (figure 15).

Fig-1: Pre-Operative Extra-Oral Frontal View

Fig-2: Inferior marginal opening blocked before impression procedure

Fig-3: Putty impression of defect area

Fig-4: Right side impression for working cast

Fig-5: Facial moulage impression procedure

Fig-6: Impression of the Defect Side

Fig-7: Facial moulage impression

Fig-8: Acrylic shim trial

Fig-9: Orientation of Prosthetic eye shell

Fig-10: Finished wax pattern

Fig-11: Shade determination for intrinsic staining

Fig-12: Packing of the RTV silicone

Fig-13: Finished Prosthesis

Fig-14: Magnet attached to spectacle

Fig-15: Post-Operative Extra-Oral Frontal View

DISCUSSION

The challenges faced during constructing an orbital prosthesis are innumerable. They include, obtaining a satisfactory working model without tissue compression, accurate positioning of the ocular portion in harmony with the unaffected side, reproducing the contour and anatomy of the periorbital tissues and obtaining a satisfactory skin shade match. The other potential criteria to be assessed are material and method for prosthesis fabrication and the mode of retention of the prosthesis [7]. Various methods of auxiliary retention for orbital prostheses include eyeglasses, engagement of hard and soft tissues undercuts, magnets, adhesives, combinations of the above and Osseo integrated implants [10-12]. Modern prostheses are secured with adhesives that are readily available, easily applied, and provide satisfactory retention for a limited period of time. However, continual use of adhesives may cause an allergic response or irritation to the delicate facial skin especially in the healing phase post-surgery. Conventionally retained orbital prostheses are practical, economical, require less chairside time and laboratory steps and are successful. The most commonly used conventional method to retain orbital prostheses is the eyeglass frames and anatomic retentive undercuts [10,3].

This case report details the prosthetic rehabilitation of an orbital defect with an orbital prosthesis which was retained by the use of two magnets. The problem of orienting the eye shell in the defect and in harmony with remaining eye was solved using facial measurements. In the present case, the design of the prosthesis helped in protecting the healing skin graft tissue from undue pressure. The mechanical lock provided by the magnets offered good prosthesis retention and prevented accidental removal by dislodgment. The additional use of the black elastic thread for retention also added to the comfort and the confidence of the patient in using the prosthesis [13].

SUMMARY AND CONCLUSION

The loss of an eye is an extremely traumatic experience for an individual. Rehabilitation of such patients emotionally, psychologically and prosthetic ally is really a phenomenal task. Attention to detail in every step is necessary to bring out a satisfactory end result. This clinical report details fabrication of an orbital prosthesis retained entirely with magnets for a female patient following enbloc removal of her right eye. The techniques employed greatly helped in increasing the retention of the prosthesis and helped in reducing the discomfort of the patient while providing her with a renewed confidence and self-esteem.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the

patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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