

Ocular defect rehabilitation in battle causality with custom made ocular prosthesis – A case report

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Abstract

The disability associated with the loss of an eye can cause significant physical, psychological and emotional disturbances. A maxillofacial Prosthodontist can boost the physical and psychological well being of such patients by restoration of functional and esthetic requirements. A 30 year old male serving soldier who sustained a blast injury to the left eye during a counter insurgency operation in the northern sector of the country was referred to Department of Prosthodontics for prosthetic rehabilitation of missing left eye. A custom made heat polymerized polymethyl methacrylate ocular prosthesis was fabricated for the patient which restored normal opening of the eye, some degree of movements and esthetically pleasing appearance.

Keywords: Ocular defect, Custom ocular prosthesis.

Introduction

Eyes are the functional organs of sight and prominent features of the facial structure. Loss of an eye can be because of various reasons like congenital defects, traumatic injury due to road traffic accidents, gunshot wounds, or due to malignant tumors of the orbit or facial structures. Mine blast injuries or Gunshot wounds are the most common causes for the damage to the eyes in Armed Forces personnel. The disability associated with the loss of an eye can cause significant physical, psychological and emotional disturbances. Prosthetic rehabilitation of congenital or acquired ocular defects is a challenging task which requires a multidisciplinary approach. A maxillofacial Prosthodontist can boost the physical and psychological well being of such patients by restoration of functional and esthetic requirements.^{1,2}

Patients requiring rehabilitation with custom ocular prostheses are those who have lost ocular structures through orbital evisceration or orbital enucleation. Evisceration is the removal of the contents of the globe but leaving the sclera and at times the cornea in place because the extraocular muscles are left intact, good mobility of the prostheses is usually possible. However with the cornea left in place, sensitivity to the prosthesis can result. Enucleation is the removal of the eyeball, usually with the extraocular muscles attached to the orbit.

Generally three types of acrylic resin prosthesis are used: Stock eye, stock prosthesis modified by various methods, and custom made ocular prosthesis made from an impression of the socket^[3-5]. A custom prosthesis which is closely adapted to the underlying tissues, not only restores some degree of movement of the prosthesis, but also provides maximum comfort.

This case report brings out rehabilitation of a patient with acquired ocular defect using custom made ocular prosthesis.

Case Report

Patient Evaluation

A 30 year old male patient was referred from Department of Ophthalmology, to Department of Prosthodontics for prosthetic rehabilitation of missing left eye. The patient was a serving soldier who sustained a blast injury to the left eye during a counter insurgency operation in the northern sector of the country. The blast had resulted in the rupture of the globe with deposition of foreign material into the soft tissue. Evisceration was carried out 03 months back at a peripheral hospital during which most of the muscle attachments and fatty tissue in the base of the socket could be preserved (Fig. 1). The patient was transferred from the peripheral hospital with a stock eye to a tertiary care naval hospital for further management. The patient complaint of pain and discharge from the eye following the placement of the stock eye. On removal of the stock eye, foul smelling purulent discharge was seen deposited in the socket along with excoriation of the base. A secondary repair and antibiotic therapy was undertaken followed by meticulous wound care. Four weeks later when the ocular bed was well healed, the patient was referred to Department of Dental Surgery to explore the possibility rehabilitation with a custom made ocular prosthesis.

Custom tray fabrication and functional impression record

A special tray was fabricated by duplication of the existing conformer in autopolymerizing acrylic resin (Fig. 2). It was checked for extension in the socket and a 5 mm diameter opening was made. A dispensing tip for impression material was attached and impression was made using light body polyvinylsiloxane impression material (3M ESPE Express XT, Seefeld, Germany). The patient was made to sit in an upright position with the head supported by the headrest. This position allows the natural positioning of the palpebrae and surrounding tissue relative to the force of gravity. The patient was asked to perform full range of movements of the normal

eye while the material was setting to obtain a dynamic record of the socket bed (Fig. 3). The impression was removed and examined for defects and voids. The impression tray was removed from the syringe, rinsed with water and replaced in the defect to check for proper lid contour and mobility of the impression.

Wax pattern trial and processing

A split putty polyvinylsiloxane mold was fabricated and used to make the wax pattern. This wax pattern was tried in the socket and ocular movements were evaluated (Fig. 4). The wax pattern was modified to match the palpebral fissure of defect side with that of normal eye. The location of iris was determined using measurements from midline and distance from the medial canthus of the normal eye.^{6,7} The stock eye was selected by matching the colour of the iris with that of the normal eye. The iris was trimmed, positioned on the wax pattern and tried in the patient. The wax pattern was flaked, dewaxed and processed using heat polymerizing acrylic resin (Dental Products of India, Mumbai, India) after suitable shade matching to match the scleral part of patient’s normal eye. A thin layer of acrylic was trimmed off the superior surface to allow space for clear acrylic that would simulate cornea. A thin layer of wax was added onto the corneal part and second stage flasking and dewaxing carried out. Pigments and red rayon fibers were used for characterization of the sclera. The flask was then packed and processed using clear heat polymerizing acrylic resin.⁸ The prosthesis was finished and polished to a smooth glossy surface (Fig. 5). Co-ordinated movements in different directions in relation to normal eye were checked (Fig. 6).

Prosthesis insertion and follow up

The patient was educated about the insertion, removal, cleaning and care of both prosthesis as well as anophthalmic socket^[9]. The patient was asked to report at one week, one month, three months and at six months for follow up. During the follow up visits, the prosthesis was checked for fit, mobility and direction of gaze. Muscle training exercises were explained to the patient for improving ocular adaptation to the prosthesis. Marked improvement in terms of esthetics was achieved with custom made ocular prosthesis (Fig. 7).¹⁰



Fig. 2: Fabrication of custom tray



Fig. 3: functional impression with PVS



Fig. 4: Wax pattern trial



Fig. 1: Pre-treatment frontal view



Fig. 5: Characterisation and processing



Fig. 6: Evaluation of functional movements



Fig. 7: Pre-treatment and post-treatment

Discussion

A well fabricated ocular prosthesis should be able to maintain its orientation when the patient is looking straight ahead, support the eyelids, restore normal opening of the eye, restore a degree of movement and be esthetically pleasing. Ophthalmic surgeons commonly advocate the use of a stock ocular prosthesis of an appropriate size and color. However, because of the extreme individual variations and diverse nature of ocular injuries, most patients would benefit more from custom made ocular prostheses. The esthetic and functional results justify the extra efforts involved in fabrication of a custom made ocular prosthesis.^{6,7} The close application to the tissue bed provides ample opportunity for

movement. Custom ocular prosthesis also eliminates voids that collect mucus and debris, thereby reducing irritation to mucosa and a potential source of infection. The optimum cosmetic and functional results of a custom ocular prosthesis enhance the patient's physical and esthetic return to a normal life-style.⁸

Hydroxyapatite (HA) intra-ocular implants are inherently biocompatible and have capability to become fibro-vascularly integrated with the residual muscles and tissues. HA ocular motility implants are advocated for use in primary planned enucleation or visceration of benign or atraumatic etiology. However, less predictable results have been obtained in traumatic enucleation or secondary implant replacement procedures. Functioning extra-ocular muscles that are attached to an implant are necessary for an optimal result. Its use allows the prosthesis and implant to be subsequently successfully integrated with a secondary procedure, thereby increasing mobility of prosthesis as well as minimizing fear of bacterial contamination from the overlying socket. Development of sensory substitution devices to impart artificial vision for such patients is the exciting next step in this field.

Conclusion

Restoration of the residual ocular defect not only provides functional and esthetic improvement but also rehabilitates the patient socially back into the society. A custom fabricated ocular prosthesis provides better results by utilization of the regional anatomy of the ocular and supporting tissues along with the recent advances in the field of maxillofacial rehabilitation. Accurate fit, low cost and biocompatibility due to minimal residual monomer content make these a better and viable treatment option in the field of ocular rehabilitation.

Source of funding

None.

Conflict of Interest

None.

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