

Case Report

FABRICATION OF A CUSTOM RESIN ARTIFICIAL EYE FOR REHABILITATION OF A BEAR MAULED PATIENT- A CASE REPORT

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Abstract:

Ocular trauma can be caused by road traffic accidents, falls, assaults, or work-related accidents, but it very seldom it may be due to animal attacks. Bear attacks are relatively rare, but frequent enough to be of concern for those who are in bear habitats. Disfigurement associated with loss of an eye in cases of animal attacks can cause significant psychological and emotional problems. The fundamental objective in restoring such defects is to enable the patient to cope better with the difficult process of rehabilitation after an enucleation or evisceration. A sequence of steps for construction of a custom-made resin ocular prosthesis is outlined in this case report.

Keywords: Ocular prosthesis, Artificial eye, Prosthetic rehabilitation.

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INTRODUCTION

The loss of a part of the face, particularly the eye, requires early replacement so that the patient may return to a normal life. The defect is disturbing, and both psychologic and economic difficulties arise.¹ The disfigurement associated with the loss of an eye can cause significant physical and emotional problems. Most patients experience significant stress, primarily adjusting to the functional disability caused by the lost eye and to societal reactions. Thus, replacement of the lost eye is necessary to promote physical and psychological healing for the patient and to improve social acceptance.²

An ocular prosthesis can be either ready-made (stock) or custom-made. Stock prosthesis comes in standard sizes, shapes, and colors. They can be used for interim or

postoperative purposes. Custom eyes have several advantages including better eyelid movements; even distribution of pressure due to equal movement thereby reducing the incidence of ulceration, improved fit, comfort, adaptation, improved facial contours, and enhanced esthetics gained from the control over the size of the iris, pupil and color of the iris and sclera.³

The eye is an even organ and so its reproductions is challenging. The ocular prosthesis must be as similar as possible to the natural eye, mainly regarding the iris, which determines the color of the eyes. The reproduction of the prosthetic iris is a critical step during the construction of ocular prosthesis. It has been accomplished with all technical and artistic resources available.²

This case report describes a simplified approach to fabricate a custom made ocular

prosthesis with long life expectancy and superior esthetics by characterization with veined fibres and acrylic pigments.

CASE REPORT

A 32-year-old male patient reported to Department of Prosthodontics, Himachal Pradesh Government Dental College and Hospital, Shimla, with an enucleated right eye. Case history revealed history of bear mauling on 9th April 2014. Patient suffered from enucleated right eye, bilateral Type III Naso-orbitoethmoidal Fracture, facial asymmetry and tenderness over the affected region. Open reduction and internal fixation was done under general anesthesia on 11th of April 2014. (Fig 1a,b)



Figure 1 (a): Preoperative photograph



Figure 1(b): Postoperative photograph

Prosthetic treatment for the lost eye was started 3 months after the surgery. On

examination mucosa was healthy. Sulcus depth was sufficient enough to retain the restoration. A custom-made ocular prosthesis was planned to meet the needs of the patient since it would result in better esthetics than a stock eye shell.

External tray technique was used for making the impression of the right eye socket. Light cure acrylic resin sheet was used to fabricate the external tray by adapting it over a pattern of red modeling wax that was adapted over patient's right orbit and trimmed it down to the approximate shape of the orbit. Beading of the tray was done with light cured acrylic sheet material according to patient's orbital contours. Escape holes were made in the external tray for the impression material.

Irreversible hydrocolloid was used for making the impression. Petroleum jelly was applied to the eye brows for easy removal of the impression. A 20 cc syringe was used for injecting the impression material into the socket and the patient was asked to perform functional movements. Concurrently, alginate impression material was loaded on the tissue surface of the external tray and it was placed over the orbit to record the external surface details of orbit and eyelids. (Figure 2) After the material was set the impression was taken out of the socket and carefully examined.



Figure 2: External tray placement for final impression making

Split- cast technique was used for pouring the impression. The first pour was made till the height of contour of the impression and

petroleum jelly was applied as the separating medium over the set first pour. Then the second pour was made over the height of contour (Figure 3a, b).

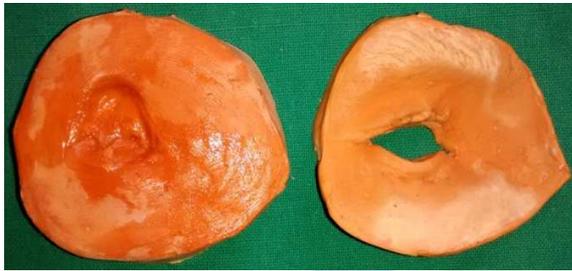


Figure 3 a & b: Mold formed by split-cast technique

Once set the upper and lower members of the cast were separated. The upper member of the cast was sectioned into two halves with a die cutting saw and the two halves were positioned back over the lower member. The mold was then painted with separating medium and thereafter ivory wax was melted into the mould to fabricate the wax pattern. Once the wax cooled the pattern was retrieved by separating the two halves of the upper member.

The fit of the sclera wax pattern was evaluated by observing the extension into the fornices. The height of convexity of the wax pattern should be centered over the pupil and palpebral opening should be same as that of natural eye. Alternating layers of red modeling wax and white ivory wax were used for altering the height of convexity of wax pattern to serve as a guide regarding the previous increment. (Figure 4)



Figure 4: Sclera pattern try-in

A stock eye shell was selected whose iris colour matches with the right natural eye's iris of the Patient. The iris was cut from the stock eye and its size was adjusted as per the size of the iris of the left natural eye. It was then placed into a receptacle made in the wax pattern corresponding to the left eye. Finally, the prosthesis was tried in the left orbital socket to compare with the contra lateral eye for eyelid fullness, iris size, colour and its position in the scleral pattern. (Figure 5a,b) Sclera colour selection was made after comparison of the natural eye with heat cured tooth colored shade guide.



Figure 5: a) Scleral pattern try-in b) Final scleral pattern

The wax pattern was flaked and dewaxed. (Figure 6) To simulate capillaries of the real eye characterization was done with red coloured veined acrylic fibres and acrylic pigments were also used. The mould was then packed with tooth



Figure 5: b) Final scleral pattern

The mould was then packed with tooth colored heat cure acrylic resin, the shade of which was initially matched with the scleral portion of contralateral eye. Curing and polishing of scleral shell were done.



Figure 6: Invested finalized wax pattern

Finished custom made eye was placed in left eye socket and verified for the esthetics and function as adjusted at try in stage. (Figure 7 a,b,c) The patient was instructed on insertion and removal of the prosthesis. Follow up was done after 1, 3 days and 1 week.



Figure: 7a) Final custom ocular prosthesis. b&c) Post insertion pictures of patient with custom made right eye prosthesis

DISCUSSION

The ocular prosthesis is an artificial replacement for the bulb of the eye. After the surgeon enucleates the eye, prosthodontist is a person who comes into an act of providing the patient with an artificial eye to overcome the agony of losing an eye. A well-made and properly made ocular prosthesis maintains its orientation when patient performs various movements.⁴

The esthetic and psychological benefits of an ocular prosthesis have motivated a constant research in improvement of its prosthetic technique. The general consensus among authors is that close matching the natural eye

is the key to mask the loss and achieve an esthetic outcome for patients with ocular defect.⁵

The literature has suggested many techniques for the fabrication of ocular prosthesis. Stock eye prosthesis was advocated by Laney.⁶ Before the advent of methyl methacrylate ocular prostheses, most ocular prostheses were constructed of glass.⁷ Because glass prostheses could not be changed in size or dimension, the clinician's supply became known as stock eyes. Although resin ocular prostheses offer superior strength and can be modified in shape and size, many clinicians still consider prefabricated methyl

methacrylate ocular prostheses as rigid and unchangeable. Beumer et al. state that a prefabricated resin eye should not be used in eviscerated sockets because intimate contact between the ocular prosthesis and the tissue bed is needed to distribute pressure equally.⁸ The common techniques for the fabrication of custom made prosthesis are paper iris disk and black iris disk technique. However, painting the iris disk involves both artistic skills and science of color.⁹ Now with the advent of newer materials like heat cure acrylic resin (DPI) as used here, it is possible to fabricate prosthesis with a life-like appearance. Moreover the use of stock ocular prosthesis of appropriate size and color cannot be neglected; a custom-made ocular prosthesis provides better results functionally as well as esthetically. It retains shape of defective socket, prevents collapse of lids, provides muscular functions of the lids, maintains palpebral opening, and gives a gaze similar to that of natural eye.⁴

CONCLUSION

An accurate iris reproduction in the fabrication of ocular prosthesis is a key factor to achieve an esthetic outcome for patients with ocular defect. A simplistic procedure for fabricating the ocular prosthesis has been suggested here. The ocular prosthesis is esthetically natural to the patient and to the observer and is durable and stable for many years of use. The technique has provided good results from patient's esthetics, comfort and satisfaction point of view.

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