REHABILITATION OF OCULAR DEFECT USING CUSTOM MADE OCULAR PROSTHESIS- A CASE REPORT

A Case Report

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ABSTRACT

As eye is a vital and important organ, loss of eye can lead to crippling effect on the facial appearance and affects the psychology of the patient. In such cases Ocular Prosthesis is probably the only alternative to rehabilitate the anophthalmic patients. After enucleation, evisceration and exenteration of the eye the main purpose of the ocular prosthesis is to maintain the volume of eye socket and create an illusion of a healthy eye and surrounding tissues. When compared to Stock Eye, Customized Eye Prosthesis provides more aesthetic and precise result. Here is the case report presenting, sequential steps for the construction of the custom made ocular prosthesis in a simplified cost effective manner.

Key words: Ocular Defect, Customised Ocular Prosthesis, Ocular Rehabilitation

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INTRODUCTION:

Loss or removal of this organ can occur in cases of a congenital abnormality, severe trauma, disease such as an infection, a tumour or malignancy, sympathetic ophthalmia or in suspected cases for the histological confirmation for diagnosis.[1] Surgical procedures adopted for the removal of an eye are classified by Peyman, Saunders and Goldberg (1987) into three general categories: enucleation, evisceration and exenteration. According to Scoll (1982) enucleation is a surgical procedure in which the globe and the attached portion of the optic nerve are excised from the orbit. Evisceration is removal of the contents of globe while leaving the sclera and extra ocular muscles intact. Exenteration is the most radical of the three procedures and involves removal of the eye, adnexa, and the part of the bony orbit.[2]

The disfigurement resulting from loss of an eye can cause significant physical, psychological as well as social consequences. Replacement of the lost eye as soon as possible is necessary to promote physical and psychological healing for the patient and to improve social acceptance.[3] Early management of an anophthalmic socket prevents loss of volume in the anterior orbital area and facial asymmetry. A multidisciplinary management and team approach are essential in providing accurate and effective rehabilitation and follow-up care for the patient.[4]

Frequently, an implant is placed in the tissue bed to facilitate the construction of an ocular prosthesis. However, apart from its cost, principal disadvantage is the erosion of the overlying tissue, resulting in the exposure of the implant or contamination of the implants at the time of insertion.[5] Other side, an ocular prosthesis can be either readymade (stock) or custom-made. Stock prosthesis comes in standard sizes, shapes, and colours. They can be used for interim or postoperative purposes.[6,7,8] Custom made eyes have several advantages including better mobility, even distribution of pressure due to equal movement thereby, reducing the incidence of ulceration, comfort, tissue adaptation, improved facial contours, improved fit and enhanced gained from the control over the size of the iris, pupil and colour of the iris & sclera.[9] Thus the ideally constructed prosthesis must duplicate the missing features so precisely that the casual observer notices nothing that would draw attention to the prosthetic reconstruction.[10]

Case Report

A 74 years old male patient reported to the Dept. of Prosthodontics, Ahmedabad dental college and hospital with chief complain of difficulty in eating. Intra oral examination revealed completely edentulous maxillary and mandibular arches, while extra oral examination revealed loss of left eye due to measles infection acquired at the age of 5 years and he had been wearing pre-fabricated eye prosthesis since 50 years. The mucosa of the eye socket appeared healthy with intact tissue bed. [Fig-1] So according to the present condition and economic reasons, rehabilitation of the ocular

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defect by fabricating a custom made ocular prosthesis was planned, to replace the missing eye and surrounding structures, after thorough explanation of the procedure to the patient with obtained consent.

Primary Impression Procedure:

An ophthalmic topical anaesthesia was applied to the socket to increase the patient's comfort for the entire procedure. A primary impression of an anopthalmic socket was made by using alginate impression material (Mari flex, Septodont Healthcare India Pvt Ltd., Class A, Type II: Normal setting). A thin mix of the material was being flowed into the socket by using a disposable syringe (Dispo van 5 ml, Hindustan syringes & medical devices Ltd). Patient was seated, with the head tilted at the angle of 45^{0} to the floor and then asked to perform various eye movements like closing, opening, up-down and lateral movements of the contralateral eye. The set alginate impression was then supported and retrieved from socket by using 19 gauge orthodontic wire loop [Fig-2] and poured with type III dental stone (Gold Stone, Asian Chemicals, Gujarat, India) from which a self-cure acrylic resin (Pyrax polymars, India) special tray was fabricated. The tray was perforated centrally, for the attachment to the syringe nob and at the periphery, for the excess material to get flowed through, during final impression. [Fig-3]

Final Impression Procedure:

For the final impression, the disinfected special tray was tried in patient's eye socket to check for the extensions. Additional silicone light body material (Photosil, DPI) was homogenously mixed, loaded and carried out in a disposable syringe. The material was then injected into the socket and was supported by the special tray attached to the syringe nob. [Fig-4] Patient was then asked to perform muscular movements of the contralateral eye ball in all directions to allow the material to flow in all the areas of socket, as well as on the outer surface of the tray to record the movements of eye lids also. The set final impression was then carefully picked up from the socket and was checked to ensure the fine surface details. [Fig-5]

Pouring of The Final Impression and Fabrication Of Two-piece Mould: [Fig-6]

Type IV dental stone (Pearl stone, Asian Chemicals, Gujarat, India) was mixed and poured to produce the internal surface details of the final impression and to make the lower (first) half of the mould. Before the stone sets, the indexing grooves were made for re-orientation. After the application of the separating media over the lower half, the upper (second) half of the mould was poured with type III dental stone (Gold Stone, Asian Chemicals, Gujarat, India), which covers the external surface of the final impression and a funnel shaped hole was left unfilled around the stem of the tray for the passage of the molten wax.

Fabrication and Try in of Scleral Wax Pattern :

The molten modelling wax was poured into the two-piece mould through the hole as described above, allowed to chill and removed from the mould carefully. Then the wax pattern was properly contoured and carved till it fitted properly into the socket. To insert the wax pattern, upper eye lid was lifted up, placing the superior edge of the pattern behind the lid and gently pushed upward. While the lower lid was drawn down, the inferior border of the pattern was seated in the inferior fornix and lower lid was released. The wax pattern was checked for the size, support from the tissues, simulation of functional eye movements, and eyelid coverage until it resembled patient's natural eye.

Selection and Placement of Iris on the scleral Wax Pattern:

An iris, closely matching to the natural eye's shade and size, was selected from the stock eye. For the centralization and correct placement of iris on the scleral wax pattern, parallel lines were marked on the patient's face, surrounding the natural eye and the distance between the lines were measured: from the midline of the face to the medial canthus, from medial canthus to the centre of the iris and from the centre of iris to the lateral canthus. The same markings and measurements were transferred on the defect side eye. [Fig-7] The contralateral eye side measurements were used for comparison and the iris position was located on the wax pattern accordingly, with an indelible marking pen. The pupil was used as the center of the eye ball. Once the position was verified, the wax pattern was removed. Selected iris from the stock eye was trimmed carefully and placed into scleral wax pattern according to measurements [Fig-8] and the wax pattern was again tried and verified with iris in

place. [Fig-9]

Investing, flasking and dewaxing of scleral wax pattern: [Fig-10]

The final carved and adjusted scleral wax pattern with the iris was then invested and flasked in a conventional manner with an attachment in place, made up of clear self-cure acrylic resin (Pyrax polymars, India), fixed to the iris, to secure its placement to the counter-flask while flasking and dewaxing was done in a usual manner.

Packing and Characterization:

The heat cure tooth moulding material (DPI tooth moulding powder, The bombay Burmah trading Corporation Ltd, Mubai, India), matching the shade of the natural eye sclera was selected for packing. First, trial closure was done by using a thin polythene sheet and after separating the flasks, characterization was performed to mimic red veins, by incorporating red fibers, collected from Lucitone heat cure denture base resin, (Dentspy, Germany) with the help of heat cure monomer liquid. After that the heat cure acrylic resin was processed in a usual manner. Processing time can be reduced as less bulk of the resin is used to be cured. So, 20 minutes in boiling water was sufficient. After processing, the flask was bench cooled and the prosthesis was retrieved from the mould. The converted heat cured ocular prosthesis was finished and polished with the pumice. [Fig-12]

Delivery of customised ocular prosthesis: [Fig-14]

The final polished ocular prosthesis was then disinfected (0.5% Chlorhexidine gluconate solution + 70% isopropyl alcohol) for five minutes. After disinfection the prosthesis was rinsed with sterile saline to avoid chemical irritation and was lubricated to improve smooth functional eye movements. The fit of the artificial eye and the lid configurations of both eyes were compared and evaluated by visual observation. Post treatment instructions for placement, removal, cleaning and maintenance of the prosthesis were given and need of regular follow up was explained.

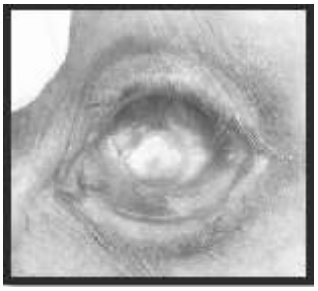

Fig.1: Pre-treatment View: Ocular Defect

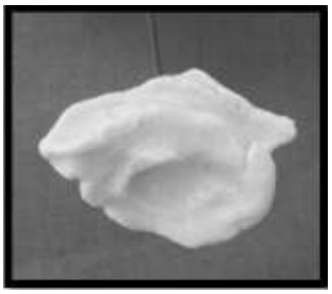

Fig.2: Primary Impression, With Alginate

Fig.3: Fabrication Of Special Tray

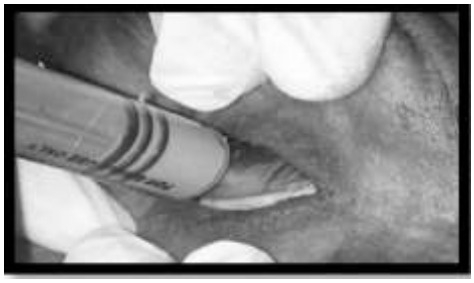

Fig.4: Final Impression Making

Fig.5: Final Impression For Eye Prosthesis

Fig.6: Fabrication Of Two-piece Mould

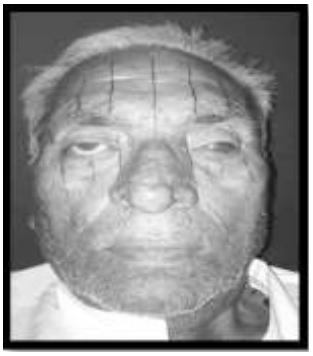

Fig.7: Wax Pattern Trial With Measurements For Iris Placement

Fig.8: Placement Of Iris In Wax Pattern

Fig.9: Final Trial Of Wax Pattern With Iris In Place

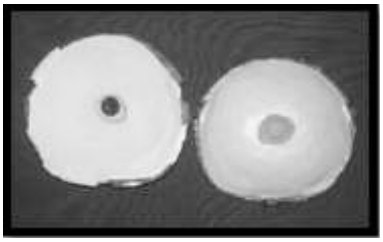

Fig.10: Flasking And Dewaxing

Fig.11: Old Pre-fabricated Eye Prosthesis

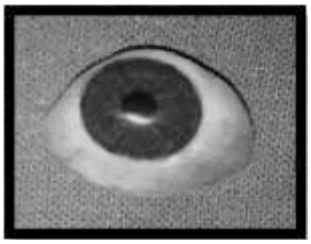

Fig.12: Customised Ocular Prosthesis

Fig.13: Pre-treatment

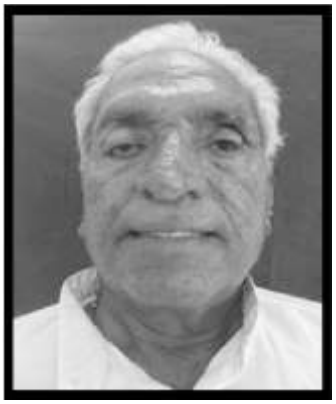

Fig.14: Post-treatment

DISCUSSION:

The art of making artificial eyes has been practiced since ancient times. The first ocular prosthesis was made by Romans and Egyptian priests as early as the fifth century BC. Artificial eyes were made of enamel, metal or painted clay and attached to cloth and worn outside the socket. In the 15th century, the first in-socket artificial eye was made using gold with coloured enamel.[11] Thus fabrication of ocular prosthesis has been known to human being since times immemorial.

Except ocular implants, two other options are available for artificial eye prosthesis, one is a pre-fabricated ocular prosthesis and the other is custom-made. Pre-fabricated prosthesis carries potential disadvantages of poor fit (which endangers the eye to granuloma formation), poor aesthetics and poor eye movements.[11] Moreover, the voids in the prefabricated prosthesis collect mucus and debris, which can irritate mucosa and act as a potential source of infection, which are minimized in custom-made prosthesis.[11,12]

However, custom-made prosthetic eye fabrication involves complex painting procedures in various stages that are quite difficult and based purely on painting skills of the operator.[13] The technique used, to fabricate ocular prosthesis in this case report, modifies a pre-fabricated eye prosthesis to a custom-made fit with improved aesthetics. Thus using a combination technique, in which iris button was attained from the prefabricated eye and customized scleral portion was created from the impression of the socket, can help us to overcome the disadvantages of a prefabricated eye prosthesis. The technique is relatively easy to perform, saves the laboratory time, restores the opening as well as various degrees of eye movements correctly and supports the eyelid. Instead of having various advantages, limitations of this technique are, the clinician is dependent on the availability of the prefabricated eye with properly matching the iris size and shade. Also, the long-term colour stability of the heat-cured acrylic and the strength of its union with the stock iris will have to be closely evaluated with regular follow up.[9]

CONCLUSION:

As the main purpose of the maxillary facial prosthesis is to mimic nature, the technique discussed in the above-reported case ensure that the use of customized ocular prosthesis has been a boon to the patients who cannot afford for the implant placements. The custom made ocular prosthesis also permits the finished prosthesis to generate an equal distribution of pressure and intimate adaptation to the tissue bed, which enhances the patient's comfort and confidence by increased adaptiveness and natural appearance, and also maintains its orientation during various eye movements. Although the vision is the main aspect of the eye, prosthodontist cannot replace this aspect, but can definitely restore the most beautiful aspect of the life, esthetics and facial expressions, which allow the patient to face the world confidently.

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