

Fabrication of custom-made ocular prosthesis using conventional technique

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Abstract

The loss of an eye is an emotional and psychological setback to the patient. An ocular prosthesis is given to uplift the patient psychologically and to boost up patient's self esteem and their social acceptance in the society. To improve the comfort and matching of the prosthesis with that of the adjacent natural eye a custom made ocular prosthesis is preferred. Ocular prosthesis can be given as stock eye shell or by fabrication of custom-made eye prosthesis by sclera painting. Advantages of custom-made eye prosthesis are well established over stock eye shell so, this article presents a case report of a patient-wearing stock eye shell with poor esthetics, and the same was replaced with custom-made eye prosthesis.

Keyword: Pthisis bulbi, Custom made ocular prosthesis.

Introduction

The eye is a vital organ not only in terms of vision but also is an important component of facial expression. Physical defects that compromise appearance or function, prevents an individual from leading a normal life, usually prompt the individual to seek treatment that will reinstate acceptable normalcy. The loss of an eye impairs the patient's visual function, yet also results in a noticeable deformity.¹ Orbital defects are usually associated with congenital deformities, tumours, or acquired traumatic lesions and may affect the soft tissues within the orbital cavity or may include the surrounding muscles and bones.

The fabrication of a definitive ocular prosthesis should begin as soon as the socket has healed. Prosthetic rehabilitation is enhanced if an implant can be placed in the orbit to provide an attachment for the rectus muscles, which can impart motion coordinated with the natural eye.² However the placement of an ocular implant is not always possible or feasible. Patients in this situation can be treated with custom-made ocular prostheses that have been adapted to accommodate specific situations. They may be made of either glass or methyl methacrylate resin. Glass is not selected as it is subjected to breakage and surface deterioration from contact with orbital fluids, resulting in life expectancy of only 18 to 24 months. Methyl methacrylate resin is superior to other ocular prosthetic materials in tissue compatibility, esthetic capabilities, durability, colour permanence, adaptability of form, cost, and availability.

This article describes a technique for fabricating a custom-made ocular prosthesis using conventional technique. The technique described in this article provides a cost-effective choice for optimal ocular defect rehabilitation.

Case Report

A 28 yrs old female patient reported to the Department of Prosthodontics, Regional Dental College, Guwahati, Assam with the chief complaint of facial disfigurement due to faulty prosthesis of the left eye (Fig. 1). While taking the history of present illness it was found that the patient had

injury of the left eye when she was 6 years old and went unnoticed. Later when she was 20 yrs old, she went for a check-up in Ophthalmology clinic, Arunachal Pradesh, India due to family pressure and esthetic reason and the patient was diagnosed with Phthisis Bulbi which was managed conservatively and the practitioner provided her stock eye prosthesis. She was not satisfied with the esthetic of the stock eye prosthesis. On examination there were no signs of adhesion and tissue bed was free of inflammation so we decided to check the measurements of both the eye in Adobe Photoshop CS and then start with the impression procedure.



Fig. 1: Preoperative view

Procedure

An external tray impression technique was employed to make the impression of the defect. An impression of the facial area corresponding to the defected eye was registered with help of putty elastomeric impression material (Variotime, Kulzer) and the same was used as a template for the fabrication of custom external tray (Fig. 2).

Tray extension was again checked in defect eye. 2% lignocaine topical gel is applied to the ocular tissue to reduce the irritability while making the impression. Polyvinylsiloxane light body impression material

(Variotime, Kulzer) is slowly injected into the socket and simultaneously extra material is loaded in the custom external tray and placed over the previously injected impression material in the defect. The patient is directed to gaze the normal eye into one fixed position. Once set, the impression was carefully removed and beading and boxing were done. Impression was poured in two sections in type IV gypsum product (Kalrock, Mumbai, India). The two-piece mould was retrieved from the ocular impression. The mould was coated with a separating medium and melted modelling wax (DPI, India) is poured into the cavity through the opening. The wax pattern obtained was tried in the socket and evaluation was done for proper fullness of the eyelids and contoured similarly to the contralateral normal eye. When the soft tissue contours in the wax pattern were judged to be satisfactory, the pattern was finalized for the next step of iris positioning. Size selection of the iris and its positioning was done with the help of Adobe Photoshop, CS version 8 matching the contralateral normal eye. Iris was obtained from a stock eye shell and was matched with the contralateral eye.³ Finally, the iris is positioned in the wax pattern by removing wax and pattern is tried in the socket.

The wax pattern was invested in type IV gypsum in two sections. The first part was poured till the height of contour of the wax pattern. Once the first pour was set, iris was carefully removed and the remaining part was poured in type IV gypsum product after applying separating medium. After the dewaxing stone mould was packed with tooth coloured heat-cured acrylic resin (DPI, Mumbai, India) which simulate the colour of the sclera portion of the normal eye. After curing, the prosthesis was removed carefully. Prosthesis with iris repositioned was finished, polished and then tried in the patient's socket. About 1mm of acrylic was removed from the anterior surface of the prosthesis leaving the iris intact and again recontoured with modelling wax (Fig. 3). The prosthesis was reinvested and dewaxed. After dewaxing was completed, mould was opened and characterization of the prosthesis was executed. Characterization was done with the help of oil-based acrylic colour and red coloured veined heat cure material to simulate the contralateral normal eye. Once characterization was found to be satisfactory, the mould with the prosthesis was trial packed with heat cure clear acrylic resin (DPI, Mumbai, India) which will give a natural shiny surface and life-like appearance to the prosthesis afterwards. Before final packing extra resin that flowed over the iris due to pressure of trial, the closure was carefully removed with help of a sharp scalpel; the mould was closed tightly and allowed to bench cure slowly over 1 hour and then cured in the Acrylizer at 75°C for 90mins. Once curing was done, the prosthesis was carefully removed (Fig. 4). After final finishing and polishing prosthesis was fitted in the patients' socket to check the esthetic, comfort and proper function (Fig. 5, 6).

Easy steps of insertion and removal as well as instructions regarding cleanliness were given to the patient that includes-

1. Removal and insertion of the prosthesis manually.

2. Wearing the prosthesis day and night, removing and washing it once a day-or more often if mucus accumulates. Generally, mucus is no more of a problem than with a natural eye, except when the prosthesis is scratched or pitted. This should be repolished immediately.
3. Washing the prosthesis only with pure (Ivory) soap and filtered water, scrubbing it well between thumb and fingers and rinsing it well before reinsertion. Warn the patient that preparations containing alcohol or other solvents will damage the prosthesis. In the follow up visits with the prosthesis removed, the soft tissues of the socket are rinsed with an ophthalmic irrigation solution and examined for irritation or infection. The presence of an infection that does not respond to simple irrigation should be referred to an ophthalmologist for necessary evaluation.⁴



Fig. 2: Impression of the defect



Fig. 3: Patient with prosthesis try in



Fig. 4: Characterized ocular prosthesis



Fig. 5: Finished ocular prosthesis



Fig. 6: Patient with final prosthesis

Discussion

A correctly placed ocular prosthesis should maintain its orientation when the patient is looking straight ahead and should restore the normal opening of the eye, support the eyelids, restore some degree of movement, and be adequately retained and sound esthetically.⁴ The use of a stock ocular prosthesis of an appropriate size and colour, adapted by selective grinding or additions of acrylic resin, has been advocated by Laney and Gardner. Standard techniques can produce excellent results for most patients, provided the operator has an adequate selection of prefabricated eyes. However, because of the extreme individual variation and diverse nature of ocular injuries, certain patients would benefit more from custom made ocular prostheses that are modified to their individual needs. This procedure may be more time-consuming and entail a “trial and error” approach, but the esthetic and functional results justify the extra efforts.

An accurate impression is necessary for the development of an accurately fitting extraoral prosthesis. Various ocular impression techniques described in the works of literature and each has its integral advantages and disadvantages.⁵ Most can be placed into one of several broad categories - external impression, impression with stock or modified stock ocular tray, impression using a stock ocular prosthesis, and the wax scleral blank technique. Custom external tray was used in the present case, as the

detailed and accurate impression of the socket tissue bed can be obtained with this.

In comparison to the custom ocular prosthesis, the stock prosthesis has several disadvantages, for example, poor fit, constant tissue irritations due to bacterial growth in the accumulated fluid in tissue prosthesis interface and compromised esthetic outcome. Relining a stock eye shell can improve the fit of the prosthesis to underlying tissue, while sclera contour and iris position would still be compromised. Whereas custom ocular prosthesis provides a good fit, enhanced esthetics, proper eyelid fullness, accurate sclera contour and iris colour match and positioning. Polymethyl Methacrylate resin (PMMA) and glass are generally used for custom ocular prosthesis fabrication. When compared to glass, PMMA has several advantages like easy availability, simplified fabrication method and less chance of breakage. PMMA resin is commonly used for ocular prosthesis fabrication.⁵

In the present case, prefabricated iris shell or iris button was used after matching it with patient contralateral eye and artificial custom made sclera was developed by heat-cure tooth colour acrylic resin making it inexpensive and less time consuming.⁴ Limitations of the above technique are the availability of a pre-fabricated eye with properly matching iris and pupillary part.

Conclusion

The method described in this article can be carried out in a small clinical set-up and this technique does not require expensive equipments. Ocular implant being costly was not used in this patient. Although the patient cannot see with this prosthesis, it has definitely restored her self-esteem and allowed her to confidently face the world rather than hiding behind dark glasses.

Source of Funding

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Conflict of Interest

None

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