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Case Report

Cost-Effective Modified Technique for Custom Made Ocular Prosthesis: A Case Report

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ABSTRACT

The techniques for prosthetic rehabilitation of the missing natural eye are numerous, but unfortunately, these techniques utilize expensive materials which, in turn; incur the cost to the patients, who cannot afford the treatment. A satisfactory prosthesis is that which reproduces the color; form and orientation of every single part of natural companion eye into the prosthesis and at the same time allow the patient to afford it.The present case report describes a novel technique of ocular prosthesis fabrication which is cost effective, comfortable and alluring to the patient.

Keywords: Custom-made ocular prosthesis; Enucleation; Scleral wax pattern; Iris painting; Prosthetic rehabilitation

INTRODUCTION

An ocular prosthesis is a maxillofacial prosthesis that artificially replaces a natural missing eye missing as a result of trauma, surgery, or congenital absence. The prosthesis does not replace missing eyelids or adjacent skin, mucosa or muscle [1]. The etiology of missing natural eye is classified as either congenital or acquired defects, like irreparable trauma and tumor [2]. The main goal of prosthetic rehabilitation of such patients with an ocular prosthesis is to enable them to live comfortably in the society. This prosthesisis classified into stock eye shell and custom-made eye prosthesis. The advantage of custom-made ocular prosthesis is to maintainan intimate contact with the tissue bed and reduces the chances of fluid accumulation at tissue-prosthesis interface, whichimproves the well-being of the tissue; thereby decreasing the chances of tissue irritation and bacterial growth. It is also acknowledged that customized prosthesis distributes the pressure more equally and decrease the incidence of conjunctival abrasion [2,3]. Stock ocular prostheses, in turn, are usually advocated when time is limited and cost is a consideration and it usually relies on experience, intuition and visualization of the anatomy and contours of the socket. The disadvantages of stock ocular prosthesis are compromised esthetics and unreliable fit [4].

The surgical management ocular defect includes evisceration, enucleation, or exenteration. Evisceration is surgical procedure in which the intraocular contents of the globe are removed, leaving the sclera, Tenon's capsule, conjunctiva, extraocular muscles, and opticnerve undisturbed. Enucleation is the surgical removal of the globe and a portion of the optic nerve from the orbit. Exenteration is the en bloc removal of the entire orbit, usually involving partial or total removal of the eyelids, and is performed primarily for eradication of malignant orbital tumors [5]. After the surgery is performed, conformer is placed into the defect which plays an important role in minimizes the changes of the socket size, maintains the shape of conjunctival fornices and prevents scar tissue from contractures [6]. After the tissue healing has been completed, the conformer is replaced by permanent ocular prosthesis. Patient with such defects usually presents to the clinician either with conformer or unsatisfied existing ocular prosthesis.

There are numerous techniques for fabrication of an ocular prosthesis [6,7]. The fabrication of ocular prosthesis necessitates the use of expensive components/materials like ocular tray, ocular wax, iris disc, corneal button and monopoly syrup etc. The present technique utilizes prefabricated laboratory made custom ocular tray for impression making, modeling wax instead of ocular wax, prefabricated iris disc that are prepared in the metal mold accustomed with varying diameter, modified counter flask to replace corneal button and laboratory prepared monopoly syrup**.** The authors claim that these modifications altogether, in the present technique make this procedure comparatively inexpensive as all these components/materials are fabricated or prepared in the laboratory.

CLINICAL REPORT

A forty years old male patient reported to the ********** with

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the complaint of unaesthetic left artificial eye and desired it to be replaced**.** The patient gave a history of trauma of the eye during fire crackers seven years ago, followed by surgical enucleation of the eye. The artificial eye was removed from the socket for the evaluation of tissue bed and other soft tissue structures around it (Figure 1). The tissue bed was found to be slight inflamed but no signs of pain and discomfort in the peri-orbital tissue with remarkable conjunctivalfornices depth. The existing artificial eye was discolored and loose. On examination of the defect, the space was sufficient to accommodate the artificial eye. Since, the tissue bed was mobile as with the companion natural eye, exceptional mobility of the prosthesis could be achieved with excellent aesthetics. The left eye was normal and healthy. The patient was prescribed anti-inflammatory ointment to reduce the inflammation and recalled after a week. A custom-made ocular prosthesis was planned for the patient. The treatment procedure was explained to the patient and informed consent was taken before begin the treatment. Impression was made using polyvinyl siloxane impression material of light body consistency (3M ESPE Express STD, 3M ESPE Dental products, ST Paul, MN, USA) with the help of custom made ocular tray fabricated in the laboratoryfollowed by casting in the polyvinyl siloxane material of putty consistency (3M ESPE Express STD, 3M ESPE Dental products, ST Paul, MN, USA) to fabricate the mold (Figure 2). After the silicone material sets, impression was retrieved from it and the resulted mold was poured with molten modeling wax (Metrowax, Metrodent Ltd. Huddersfield, England) to fabricate the wax pattern and later-on this wax pattern was tried-in in the patient and location and size of iris was determined using anatomical landmarks with the help of protective eye wear; used in dental clinics (Figure 3). The advantage of using the modeling wax is of low cost and the same time provides exceptional results comparable with expensive corneal wax.Iris disc was positioned and sealed in the wax pattern at the determined location and checked for its gauze and movement with the companion natural eye. Wax pattern and iris assembly was flasked in the dental stone (UltraRock, KalabhaiKarson Pvt. Ltd, Mumbai, India) and stem of the iris was cut off, leaving behind 2-3 mm of length (Figure 4), which will later assist in providing the concavity for corneal convexity.After dewaxing and packing of scleral acrylic (Technovent, UK) into the mold, the ocular flask was unfastened and checked for any unevenness**.**Acrylic eye shell was trimmed of about 2 mm using depth orientation groovein the scleral portion in all the aspects, except medial and tissue surface, to provide space for the future clear corneal acrylic. The counter flask was modified in a concave depression to provide room for the corneal convexitywhich replaces the use of expensive corneal button(Figure 5). After the modifications done in both acrylic shell and counter flask (Figure 6), the eye shell (iris and sclera) was ready to color match with the companion natural eye.The color matching was completed (Figure 7) and fixed with the help of laboratory made mono-poly syrup.After the petrolatum jelly is applied onto the dental stone in the flask, the completed matched color eye shell

Figure1: Pre-operative photograph with or without existing ocular prosthesis.

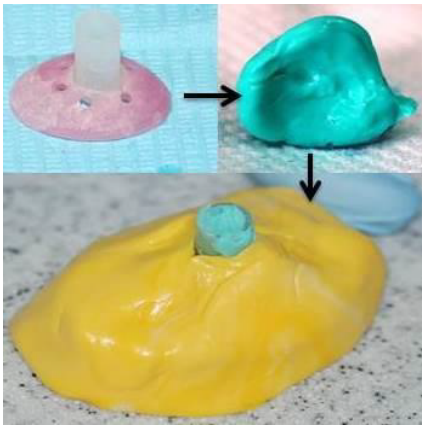

Figure 2: Polyvinyl siloxane impression made with the help of custom made ocular tray fabricated in the laboratory followed by mold fabrication.

Figure 3: Try-in of wax pattern followed by determination of location and size of iris using anatomical landmarks with the help of protective eye wear.

Figure 4: Stem of the iris cut off, leaving behind 2-3 mm of length (marked arrow).

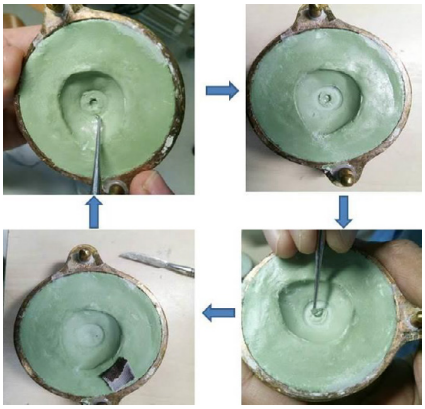

Figure 5: Modification in counter flask in a concave depression to provide room for the corneal convexity.

Figure 6: After the modifications in both acrylic shell and counter flask.

Figure 7: Application of petrolatum jelly, completed matched color eye shell was placed back for the second cure.

was placed back for the second cure (Figure 8).The clear heat cure acrylic (Kemdent, Kemdent works, Wiltshire, UK) was mixed and placed in the counter flask and allowed to cure for 10 minutes and after the curing is completed, deflasking was performed and eye shell was retrieved, finished, polished and issued to the patient (Figure 9).

Figure 8: Cured flask after clear heat cure acrylic was mixed and placed in the counter flask.

Figure 9: Post-operative photograph.

FINDINGS AND OUTCOMES

The authors find that these modifications altogether, in the present technique make the procedure comparatively inexpensive as all these components/materials are fabricated or prepared in the laboratory and the same time achieve an excellent satisfactorily aesthetics.It can be affordable by the low socio-economic status and it would have a great potential impact on the maxillofacial clinics to attract more patients of such kind of defects and rehabilitate them with excellent aesthetics and in a cost effective way.

DISCUSSION

The disfigurement associated with eye loss can cause significant physical and emotional disturbance. Psychological distress can be reduced by timely replacement with an artificial eye. A custom-made ocular prosthesis replicates the orientation, color, contour, and size of the missing anatomical structures, providing realism and symmetry to the patient's face. Accurate impression of the defect is a key factor for the successful prosthetic rehabilitation. Literature suggested the use of ophthalmic irreversible hydrocolloid [4] and elastomeric impression material [8,9] for making the impression.In the present technique, author utilizes the poly-vinyl siloxane light body elastomeric impression material to achieve the minute details of the defect at resting as well as functional movement.

The proper positioning of the patient is of utmost importance during impression making. In this technique, patient was instructed to tilt the head backward at an angle of 15° to ensure that material flows into the deepened part of the fornix because of gravitational effect. The light body polyvinyl siloxane impression material was injected into the left eye socket and once filled, the head was moved back to the vertical position and the patient was directed to move his eyes up and down. This will facilitate the flow of the impression material to all aspects of the socket. Patient was asked to look at a distant spot at eye level with his gaze maintained in a forward direction. After the material was set; cheek, nose and eyebrow regions were massaged to break the seal. While the patient gazed upwards, the cheek was pulled down and the inferior portion of the impression rotated out of the socket. Impression was checked for accuracy and excess material was trimmed [9].

The fabrication of mold after the impression is made is a two parts mold technique, to prevent distortion of the impression after being engaged into the undercuts [4]. This mold can be fabricated either by die stone [4] or putty consistency elastomers [8]. The advantage of using die stone is its strength and dimension ally stable but at the same time it is a tedious process. In the present technique, author uses the putty elastomer and get an excellent waxed up prosthesis with minimal adjustments.

Accurate iris reproduction, in particular its position, size and color; is a key factor for achieving an aesthetic outcome of the prosthesis. Iris positioning is a technique sensitive procedure, visual assessment alone may not be accurate. The procedure for positioning the iris is by transparent grid template which accurately locates and positions the iris on the custom-made ocular prosthesis [10]. In the present technique; author uses the protective eye wear, used in dental clinics, and mark anatomical landmarks to locate the position of the iris. It was achieved by measuring the diameter of iris using digital vernier caliper and replicated it on the eye wear. The mid-line was marked on the eyewear using mid-line of the nose as an anatomical landmark. Later on, the distance between medial surface of iris & medial canthus and lateral surface of iris & lateral canthus are measured and marked on the eyewear, while the patient's gaze was fixed at a straight distant point.

Several authors [11-13] have suggested various techniques for obtaining colored match iris as with the natural companion eye; such as the use of a digital photography, prefabricated iris from stock eye shells and iris painting using dry earth pigments or oil colors mixed into a painting medium called monopoly [4] but all these techniques are two stages; iris customization followed by scleral customization. Monopoly is syrup of polymethylmethacrylate (PMMA) and it is available commercially or can be prepared by combining ten parts of heat cure acrylic resin monomer and one part of heat cure clear acrylic resin polymer by weight [4]. The present technique utilizes the iris and sclera color customized painting simultaneously using laboratory prepared monopoly as a fixing medium. The color customization of the iris using painting technique provides the excellent aesthetic but at the same time it requires the artistic skills.

Earlier techniqueused corneal button over the customized iris to provide corneal convexity [13,14]. In the present technique,

author modifies the counter flask to provide corneal convexity to make the technique inexpensive and the same time providing the exceptional outcome.

CONCLUSION

This technique presents a cost effective method of custom made ocular prosthesis fabrication for an enucleated patient. It can be affordable by the low socio-economic status and it would have a great potential impact on the maxillofacial clinics to attract more patients of such kind of defects and rehabilitate them with excellent aesthetics and in a cost effective way.

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest.

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