An innovative impression technique for fabrication of a custom made ocular prosthesis

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Various impression and fitting techniques have been described in the past for restoring ocular defects. The present article describes a new direct impression technique for recording and rehabilitating ocular defects, by custom-made ocular prosthesis. All the techniques described in the history, mainly concentrated in recording the tissue surface of the defect, which made it difficult to contour the palpebral surface resulting in the poor esthetics of the prosthesis. The present impression technique uses heavy bodied polyvinyl siloxane impression material, which facilitates accurate recording of the tissue surface and the palpebral surface of the defect, resulting in the fabrication of functionally and esthetically acceptable prosthesis.

Key words: Heavy body elastomeric material, impression techniques, ocular prosthesis, palpebral surface, tissue surface

Of all senses, vision must be the most delightful and eyes are the first features to be noted in any person.¹ Loss of eyes as a result of congenital defects, irreparable trauma or tumors will have a physical, social and psychological impact on those who are affected.²,³ Maxillofacial prosthetics is one such branch, which thrives to improve the patient’s esthetics by replacing the lost stomatognathic and associated facial structures with artificial substitutes, and thus helps enhancing the general well-being of the patient.⁴

Custom made ocular prostheses are a better choice when compared to a stock or prefabricated ones because; they are fabricated by recording the defect anatomy of the individual.⁵ The success of an ocular prosthesis mainly depends on an impression that accurately records the defect. Various impression techniques described in the past primarily concentrated in recording the tissue surface of defect only. Techniques for recording the under surface of the eyelid or the palpebral surface are very less documented. Secondly, these techniques used syringes or stock ocular prostheses as a tray to hold the impression material which prevents complete closure of the eyelids and thus, interferes with accurate molding of the defect.

The present article describes a direct impression technique which is successful in recording both the tissue surface and the palpebral surface in a single step, using heavy bodied poly vinyl siloxane elastomeric impression material. This technique also enables us to functionally mold the material and record the defect boundaries in a physiological state allowing the final prosthesis to move according to the retained ocular movements of the patient making it functionally and esthetically acceptable.

Case Report

A 35-year-old male patient reported to Department of Prosthodontics and Maxillofacial Prosthetics for the restoration of missing the right eye. His past medical history revealed that he has been undergone for enucleation of the right eye to treat septicemia resulting from a shrapnel injury [Fig. 1]. Patient was wearing a prefabricated eye shell since 14 months which is oversized and restricts complete closure of the eye. Our treatment plan was to restore the defect with a custom made acrylic ocular prosthesis fabricated by using the direct impression technique.

Heavy body polyvinyl siloxane impression material (Aquasil Ultra Heavy; Dentsply Caulk, Milford, USA) was used to make the impression of the defect; because of its high viscosity material is self-supportive and moldable. Impression material was injected into the ocular socket by a syringe without using any custom or stock tray to carry the material. Direct impression without using any type of tray eliminates interferences in the closure of lids while making an impression. Once the material completely fills the socket

References

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Figure 1: Ocular defect without prosthesis
patient was advised to close the eye and perform various ocular movements until material sets. Closure of the eyelids facilitates recording of palpebral contours for the prosthesis along with tissue surface of the defect and ocular movements provides recording of limiting tissues of the defect in their functional form [Fig. 2].

Set impression was removed from the defect by applying slight oblique outward pressure or holding the material flash on outer surface with tweezers, and was poured in dental stone (Ultrarock; Kalabhai, India.) by using split cast technique to create mold cavity [Fig. 3]. Molten wax (Hindustan Modeling Wax; The Hindustan Dental Products, Hyderabad, India) was poured into stone mold to create a wax conformer or wax pattern of the prosthesis. Corneal portion of the acrylic stock eye was separated from the entire stock eye by using a straight fissure carbide bur, leaving sclera. Instead of separating corneal disc and pupil button from cornea obtained from the stock eye, we used entire corneal portion intact and was incorporated into wax conformer. Additional characterization of cornel portion taken from the stock acrylic eye with custom painting gives a more natural look to prostheses.

Try in of the wax pattern along with cornea was done in the patient to check fit, extensions and position of pupil and cornea [Fig. 4]. To make the prostheses appear more natural the distance from corneal limbus to their respective medial and lateral canthus of the natural eye was measured, and the same measurements were used to center the corneal portion in the wax pattern.

The amount of corneal portion covered by upper and lower eyelids in patient’s natural eye was also considered in centering the corneal portion in the wax pattern. Thus avoiding scleral show and ptotic appearance of the lid and to maintain normal palpebral fissure height. Pupil centration is also considered in positioning the cornea in the wax pattern by Hirschberg light reflex test.

After the wax trail, processing of the prosthesis was done with white color heat polymerizing acrylic resin (DPI Tooth Moulding Powder; Dental Products of India LTD, Wallace Road, Mumbai). Care was taken that shade of the acrylic resin matches with a scleral shade of the left eye. The scleral portion was custom fabricated by using white colored acrylic resin and red acrylic fibers (to reproduce conjunctival vascular patterns) and acrylic stains.

Basic requisites in matching the sclera with fellow eye can be achieved by careful reproduction of conjunctival
vascular patterns near medial, lateral canthi and circum corneal region and location of yellow, black or brown pigments in the prosthesis similar in the sclera of fellow eye. Three-dimensional effect of corneal button can be enhanced particularly by fine painting and applying a coat of clear acrylic resin during processing. This enhances the depth of underlying scleral and corneal contents. Processed prosthesis was finished, polished and inserted into patient’s ocular socket. Postinsertion instructions were given [Figs. 5 and 6].

Discussion

Impression techniques using custom or stock trays and prefabricated acrylic shells to carry impression materials into the defect interferes with complete closure of eyelids and functional molding of the material by various ocular movements. This results in errors in recording defect space and poor palpebral contours of the prosthesis. Direct impression technique with heavy body polyvinyl siloxane material used in the article facilitates accurate recording of the defect space and molding of the palpebral surface of impression without any interference. Conditions like evisceration and atrophic ocular sockets may demand for usage of some type of tray to hold the sufficient bulk of material where intra defect space is limited.

Stock or prefabricated prostheses are ill-fitting because of their over or undersize. Over extended borders result in lid incompetence, irritation and increased chances of secondary infections. Custom made ocular prostheses are more economical, esthetical and comfortable. Custom staining and characterization improves aesthetics and recording of defect tissues in a functional state, prosthesis moves according to ocular movements and permits competency of eyelids in closure.

Conclusion

Restoration of ocular defects often indicated not only to prevent supporting tissue changes, but also to avoid distress to the patient. A thorough knowledge of the regional anatomy and recent developments in the field is prudent. Low fabrication cost and proven biocompatibility of custom made acrylic ocular prostheses when compared to commercially available glass or acrylic shells justify their usage in treating economically compromised the patient.

References

1. Doshi P, Aruna B. Prosthetic management of patient with ocular defect. J Indian Prosthodont Soc 2005;5:37-8.
2. Newton JT, Fiske J, Foote O, Frances C, Loh IM, Radford DR. Preliminary study of the impact of loss of part of the face and its prosthetic restoration. J Prosthet Dent 1999;82:585-90.
3. Perman KI, Baylis HI. Evisceration, enucleation, and exenteration. Otolaryngol Clin North Am 1988;21:171-82.
4. Beumer J, Curtis TA, Firtell DN. Maxillofacial Rehabilitation: Prosthodontic and Surgical Consideration. 3rd ed. Los Angeles: Mosby; 1979.
5. Erpf SF. Comparative features of plastic and/or glass in artificial-eye construction. AMA Arch Ophthalmol 1953;50:737-44.
6. Parr GR, Goldman BM, Rahn AO. Postinsertion care of the ocular prosthesis. J Prosthet Dent 1983;49:220-4.
7. Cain JR. Custom ocular prosthetics. J Prosthet Dent 1982;48:690-4.