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CASE REPORT

Prosthetic Rehabilitation of an acquired Ocular Defect in a Pediatric Patient: A Clinical Report

[1]Mitalee Mopkar, [2]Meena A Aras, [3]Vidya Chitre, [4]Kennedy Mascarenhas

ABSTRACT

The eye is one of the vital sense organs. Apart from being a physical disability, the psychological impact can be quite traumatic. The early cosmetic restoration of acquired defects boosts the patient's confidence and enhances maintenance of tissue health. The following article describes a technique to customize a prosthesis in a patient of the pediatric age group. Such a fabricated prosthesis adapts better than prefabricated stock prosthesis and the accurate positioning of the iris disk enhances the esthetic outcome.

Keywords: Custom eye, Custom ocular tray, Iris positioning, Ocular prosthesis, Prosthodontics, Scleral shell.

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INTRODUCTION

The eye is one of the vital sense organs. Apart from being a physical disability, the psychological impact can be quite traumatic. The disfigurement resulting from loss of an eye could be devastating and often results in significant physical and emotional problems for the patient.[1] A multidisciplinary approach is essential involving team work by an ophthalmologist, plastic surgeon, and a maxillofacial prosthodontist to provide effective rehabilitation and follow-up care.[2]

Ocular defects may either be congenital or acquired following trauma, congenital anomaly, irreparable damage, tumors, or sympathetic ophthalmia, among others. Ocular prostheses can either be ready-made known as stock prosthesis or custom-made. They may be fabricated from either glass or methylmethacrylate resin and silicone. Glass is not the preferred material as it is difficult to adjust, is highly prone to breakage, and deterioration of its surface could result from contact with orbital fluids. Methylmethacrylate resin has been the material of choice due to its favorable properties of tissue compatibility, esthetic capabilities, durability, color stability, adaptability, and cost.[3]

The purpose of this article is to describe the fabrication procedure of a customized ocular prosthesis in the management of a bulbous anophthalmic socket in a 10-year-old patient.

[1]Postgraduate Student, [2]Professor and Head, [3]Professor [4]Lecturer

[1-4]Department of Prosthodontics and Crown and Bridge, Goa Dental College and Hospital, Bambolim, Goa, India

Corresponding Author: Mitalee Mopkar, Postgraduate Student Department of Prosthodontics and Crown and Bridge, Goa Dental College and Hospital, Bambolim, Goa, India, e-mail: mitalee.mopkar@gmail.com

CASE REPORT

A 10-year-old male child reported to the Department of Prosthodontics with the chief complaint of a missing right eye (Fig. 1). The patient's history revealed that the patient had lost his eye following an infection contracted during his childhood.

On examination, the socket was lined by healthy epithelium. The superior and inferior fornices had sufficient depth to aid in retention. The tissue bed, however, was bulbous. Hence, it was decided to fabricate a customized "orbital shell" type of prosthesis and procedure was explained to the patient and guardian and a written consent was obtained.

TECHNIQUE

Impression Procedure

The procedure was commenced by first selecting a prefabricated stock eye with its iris matching that of the patient's natural eye. A custom tray was fabricated by investing the stock eye in a mix of irreversible hydrocolloid (Tropicalgin, Zhermack Inc., Badia Polesine (RO), Italy) to form a mold. Upon setting, the conformer was removed and the mold was filled with autopolymerizing clear acrylic resin (DPI-RR Cold Cure, Mumbai, India). The tray was perforated to avoid compression of the tissues. A hollow inlet was made to serve as an attachment for the automixing impression tip which functioned as material delivery device as well as a tray handle (Fig. 2).

After the tray was adjusted to fit, the patient's eyelashes were lubricated with petroleum jelly. During the impression procedure, the patient was instructed to gaze at an object in distance and move the normal eye in

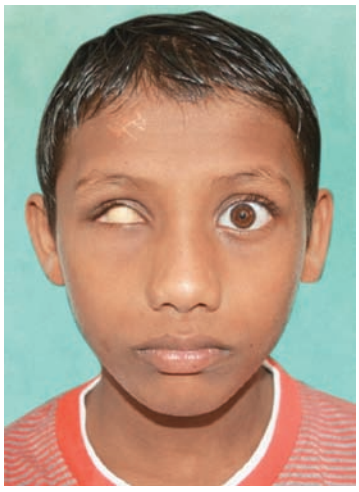

Fig. 1: Pretreatment photograph

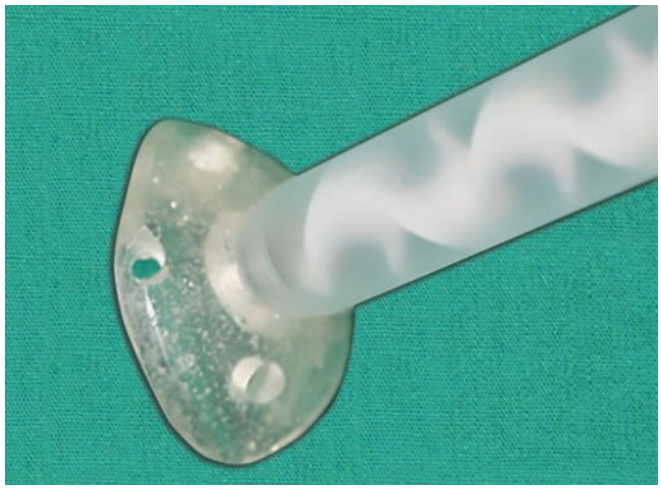

Fig. 2: Customized impression tray

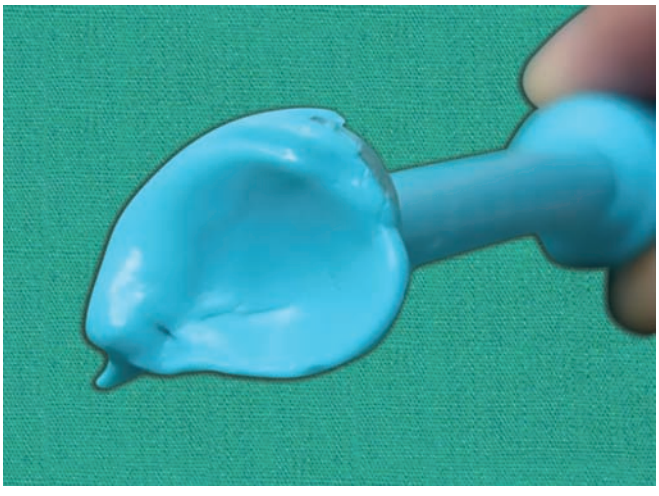

Fig. 3: Impression of the socket

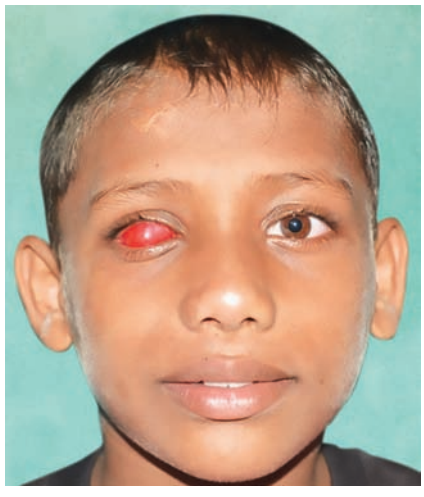

Fig. 4: Wax globe trial

all directions to allow the silicone impression material (Aquasil LV, Dentsply, Mumbai, India) to flow well into the enucleated socket and the outer surface of the tray to record movements of the eyelid; care was taken to ensure that the tray handle replicated the pupillary position. After setting, the impression was removed with a side-to-side rocking motion and checked for accuracy (Fig. 3).

Wax Globe Fabrication

The two-pour technique was used to fabricate a cast by first painting a thin layer of dental stone on the intaglio surface of the impression and carefully embedding it in a plastic cup filled with stone using the automixing tip as the handle till the stone covered the periphery. The second part was poured after lubricating and making orientation grooves on the first half.

After separating the two parts of the cast, the impression was removed and the lubricated mold was filled with molten wax. The solidified wax pattern was retrieved by careful separation from the edges and smoothened.

The wax pattern was tried in and the drape and mobility of the eyelids were examined. The convexity and corneal prominence were checked to match the contralateral eye (Fig. 4) and the globe was duplicated.

Scleral Blank Fabrication

The contoured wax pattern was invested in a flask and a scleral blank was fabricated in a shade closely matching the contralateral eye using heat-cure tooth molding powder, yellow pigment, and clear acrylic resin. The assembly was processed conventionally and tried in the patient (Fig. 5).

Iris Positioning

The iris positioning was done with the help of a graph grid[4,5]:

- An ocular locator was fabricated by printing a graph grid on a transparent sheet accurate to a 1 mm scale.

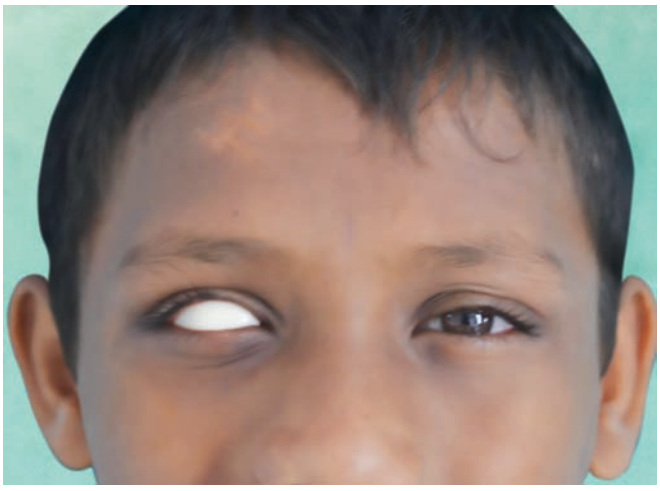

Fig. 5: Scleral blank trial

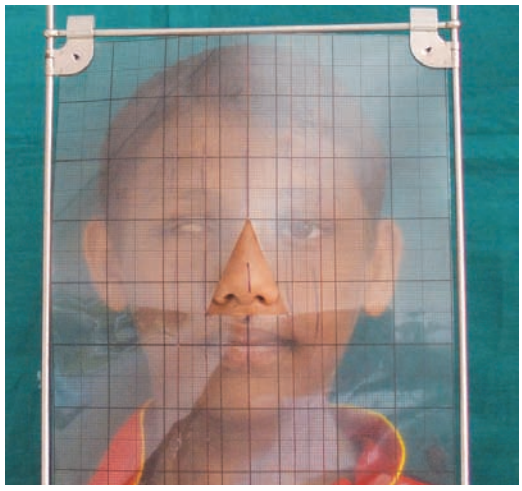

Fig. 6: Iris positioning graph grid

- It contained an X and a Y axis and a mirror image of the axes. The X axis was labeled A through F and their mirror images were labeled A′ through F′.
- The Y axis was labeled from 1 to 10 and the contralateral side was labeled from 1′ to 10′. The distance between each of the markings on the X and Y axes was 1 cm.
- Vertical midline was marked with an indelible marker using certain stable anatomical landmarks of the facial midline: Glabella, subnasale, and the chin. The distance from the pupil of the normal eye to the midline was correlated to that of the contralateral pupil in order to establish and reproduce the repeatable position of this ocular locator.
- With the patient gazing straight at an object 4 ft away,[6] vertical lines passing through the medial and lateral borders of the iris were marked (Fig. 6).
- Horizontal lines passing through the superior as well as the inferior borders of the normal iris were drawn.
- With the transparent grid sheet placed over the patient's face, these markings were transferred onto the sheet.
- With the help of the iris coordinates marked on the grid, the markings were symmetrically and accurately transposed on to the side of the defect.
- The iris perimeter was then circumscribed onto the scleral blank.
- It was then returned to the socket and examined.
- The previously circumscribed area was then excavated, forming a recess to house the iris to a depth equal to the natural iris plane.
- The stock eye iris was trimmed out and secured with autopolymerizing acrylic resin (Fig. 7).

Characterization and Delivery

The finished prosthesis was characterized by painting with composite stains (S R Adoro Liner stains, Ivoclar Vivadent, Auckland, New Zealand) and cured in a light cure unit (Ivoclar Targis Power).

Fig. 7: Iris placed in the scleral blank

A protective coat (G Coat Plus, GC America,USA) was applied to mimic the corneal translucency and protect the stains. After thoroughly cleaning the prosthesis with saline solution, it was delivered to the patient (Fig. 8).

DISCUSSION

Several techniques can be employed to rehabilitate ocular defects. A readymade stock eye may be used as such or with modification or a prosthesis can be customised to fit.[7] A custom prosthesis being closely adapted minimizes the presence of voids that collect debris and mucus, which may potentially be a source of infection. This is an advantage over a stock prosthesis which does not have as accurate adaptability. Secondly, the intimate contact of the customized prosthesis to the defect tissue bed improves the movement of the prosthesis and enhances esthetics,[8] as it conforms to individual contours. The

Fig. 8: Posttreatment photograph with custom-made ocular prosthesis

esthetics can further be enhanced by matching not only the iris but also the exposed sclera. Replicating the scleral color characters to match the contralateral eye has been done using paints and silk threads.[9] Painting has the advantage of adding layers and characterizing by using streaks. Ceramic pigments have also been used successfully, which were found to be highly esthetic and color stable following thermal polymerization.[10] The construction of an ocular prosthesis for a growing child is no different from that for an adult. However, the prosthesis will have to be enlarged periodically to compensate for the growth. This increase in the size should occur gradually over a period of years to facilitate the normal development of eyelids as well as other soft tissues lining the bony orbital margins.[3]

Placement of a prosthesis in a child plays a definite role in stimulating the orbital growth.[11] The socket grows till the age of 12.[12] With increasing age, the ocular prosthesis certainly requires replacement or modification. According to the results of a survey by Raizada et al,[13] change of prosthesis or altering existing prosthesis in growing children was required in 41% children between 18 and 26 months after the prosthesis was delivered.

The indications include enophthalmic prosthesis, rotation of the prosthesis within the socket, decentration of the cornea, loose fit, cosmetically significant ptosis, or prosthesis discoloration.[13]

Adequate volume replacement in the orbit from time to time stimulated orbital growth.[11] Replaced and modified prosthesis functions similarly by contributing to volume replacement and thus continually stimulating orbital growth.

The patient was trained to insert and remove the prosthesis by standing in front of the mirror, tilt his chin downward thus tilting his eyes and the prosthesis upward. The forefinger of one hand is used to pulling down the lower lid simultaneously gently pushing the prosthesis back and toward the nose. Lower edge of the prosthesis is thus disengaged.

It is recommended to wear the ocular prosthesis 24 hours a day. Its removal at night is not advisable, as this may lead to the lids folding and could increase the possibility of inflamed conjunctiva. Removal of the prosthesis could also result in accumulation of lacrimal fluid at the bottom of the cavity and favor the susceptibility to infection. Only mild soap or detergent is used with warm water for cleaning.[14] Abrasive and alcohol-based cleaners are strictly avoided. Litwin et al[15] in their study have observed and recommended smooth well-polished surfaces for superior patient comfort. The smooth surface being nonconducive to biofilm adhesion reduces irritation and chances of infection.

CONCLUSION

A correctly fabricated prosthesis should result in restoration of the normal opening of the eye and must provide support to the eyelid. It should also improve the degree of movement and be sufficiently retentive and esthetically pleasing. An eye prosthesis that looks as close to normal and is comfortable to use can significantly encourage the patient to use it.

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