Use of an iris disc from stock eye in the fabrication of a custom-made ocular prosthesis – A clinical report

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Abstract

Loss of eye causes severe functional disability due to vision impairment. Mental stress associated with the vision loss and the societal reaction to the facial disfigurement further increases the sufferings of the patients. The prosthetic rehabilitation of the ocular defects consists of a stock eye prosthesis or custom-made prosthesis. The iris disc of the custom-made ocular prosthesis can be fabricated by various techniques. This article describes the use of a stock eye shell iris in the fabrication of the custom-made ocular prosthesis to simplify the procedure of iris characterization.

Keywords: Custom-made ocular prosthesis, ocular defect, stock eye

Introduction

Eye loss causes severe functional as well as esthetic disfigurement with significant physical and emotional problems. The causes of the ocular defects can be a congenital defect, irreparable trauma, a painful blind eye, tumor, need for histologic confirmation of a suspected diagnosis, or sympathetic ophthalmia.

Evisceration, enucleation, and exenteration are the three surgical procedures generally carried out to remove the eye or ocular contents in case of pathology of the eye. In evisceration, the intraocular contents of the globe are removed, leaving the sclera, Tenon’s capsule, conjunctiva, extraocular muscles, and optic nerve undisturbed; the cornea may be retained or excised. Enucleation is the surgical removal of the eye globe and a portion of the optic nerve from the orbit. Orbital exenteration involves en bloc removal of the entire orbit, involving partial or total removal of the eyelids.

Functional disability due to eye loss and the reactions of people to the facial disfigurement causes significant stress in patients with ocular defects. Therefore, the rehabilitation of the ocular defect with an ocular prosthesis should be started soon after the healing is complete. Ocular implants enhance the results of rehabilitation by providing an attachment for the rectus muscles, which can impart motion, coordinated with the natural eye. However, the placement of ocular implant is not always possible, mainly due to medical complications or financial problems.

The ocular prosthesis is of two types; stock eye prosthesis and custom-made prosthesis. Stock eye prosthesis is usually advocated when time is limited and cost is a consideration. Stock prostheses have concavity on the tissue side which does not fit precisely in the ocular defect. This misfit creates voids which causes collection of mucus and debris thereby causing irritation and infection. Custom ocular prosthesis minimizes these problems due to its close adaptation to underlying tissues and provides optimum cosmetic and functional results.

Several techniques are available for the fabrication of custom-made ocular prosthesis. Most of these techniques use iris painting or digital photographs for matching of the iris discs of the prosthesis with that of the natural eye. This article describes the use of iris disc from a stock eye shell to simplify the fabrication procedure of the custom ocular prosthesis.

Case Report

A 41-year-old woman reported with missing the right eye globe [Figure 1]. She was suffering from acute meningococcal infection which led to panophthalmitis which was treated by surgical evisceration of the right eye. The lesion was completely healed, showing no sign of pain or discomfort in the periorbital tissue. The eyelid was considerably depressed inwards. The left eye was normal and healthy.

A perforated ocular-shaped impression tray was fabricated using autopolymerizing acrylic resin. A syringe was fixed in the center of the tray. The patient was instructed to sit upright with the contralateral normal eye open and fixed on a point straight ahead about 6 feet away from the patient. Light body polyvinyl
siloxane (Aquasil; Dentsply Intl., York, PA) was mixed according to manufacturer’s instructions and loaded into the syringe. The point of the syringe was placed inside the eye socket by separating the eyelids by the left hand. Care was taken that the tray should remain at the margins of the eye socket. The impression material was injected carefully and a complete void-free impression of the defect was obtained. An outline was marked on the tissue surface of the impression corresponding to the most convex part (largest diameter) of the impression. This marking ensured that no undercut was present during pouring of the impression. Type III gypsum material (Kalstone; Kalabhai Karson, Mumbai, India) was mixed and poured into the base flask. The impression along with the syringe was inserted into the unset mix of dental stone up to the marking on the impression. The impression was held in that position until the stone was hardened. Three indentations were made on the stone surface at the periphery of the impression and petroleum jelly was applied on the stone surface. Again, the type III gypsum material was mixed and poured up to the outer surface of the acrylic custom tray to make a lid. After the stone was set, the lid was cut into two sections and carefully separated from the underlying base to obtain a three-piece mold [Figure 2]. Petroleum jelly was applied all over the three-piece mold and white pattern wax (Maarc Shiva Products, Mumbai, India) was poured into the mold and the mold was closed accurately with the help of the indentations and a wax sclera pattern was obtained. After the wax hardened, the wax sclera pattern was removed from the mold, finished, polished, and tried in the defect. The outer surface of the defect was then molded and shaped by adding and trimming the wax until satisfactory contours of the eyelids were achieved in both open and closed positions of the eyelids. The fit, support, and contour afforded by the sclera pattern were compared visually with the contralateral natural eye of the patient.[6] After complete evaluation of the eye contour, size, and movements, the wax sclera pattern was invested into flask in such a way that only the most prominent part of the sclera pattern was dipped in the stone to avoid undercuts. Counter flasking was done after applying petroleum jelly to the base flask and the flask was kept for dewaxing in the boiling water for 20 min. After dewaxing, 100 g of clear heat-polymerizing acrylic resin (Acralyn-H, Asian Acrylates, Mumbai, India) and 1.5 g of zinc oxide powder (Deepashree Products, Ratnagiri, India) were mixed and packed in the mold to obtain sclera white acrylic resin.[6] After processing at 150°F for 9 h and at 212°F for 2 h, the acrylic resin sclera was removed from the flask carefully without breakage of the mold and the mold was preserved.[6] The sclera was finished and polished to a high shine. The acrylic resin sclera was tried in the defect and evaluated for proper fit, contour, and support like that of the wax scleral pattern [Figure 3]. After a complete evaluation, the distance between center of the pupil and inner canthus of the contralateral eye was measured using a Vernier caliper while the patient’s gaze was fixed at a straight distant point. Using this measurement, the center of the pupil was marked on the resin sclera. The diameter of iris of the contralateral eye was measured. The resin sclera was then removed from the eye and a circle of the same diameter as the contralateral iris was scribed by placing the point of the architect’s compass at the center of the pupil. This marked sclera was again inserted in the eye.
socket and evaluated for the position of the iris and portion of the iris covered by the eyelids. A space was created in this marked circle of the resin sclera to accommodate the iris disc. A stock eye shell iris matching with the patient’s iris for proper color, shape, and size was selected. The iris disc was trimmed off from the stock eye shell to the size of the patient’s natural iris [Figure 4]. The iris disc was placed in the space created and fixed with clear autopolymerizing acrylic resin. A uniform 2 mm layer was reduced from the rest of the anterior sclera and roughened using large abrasive stone. For the characterization of the remaining sclera, monopoly syrup was formed with 10 parts of heat-cure acrylic monomer and 1 part of clear acrylic polymer. Different artist’s oil paint colors were mixed with the monopoly syrup and painted on the rough anterior surface of the sclera to match with the patient’s eye. Fine threads of red cotton fibers were placed on the sclera on medial and lateral of iris to mimic the blood vessels. After the monopoly syrup was set, the sclera was replaced into the previously preserved flask and packed with clear autopolymerizing resin. The flask was closed and kept under bench press and processed. After polymerization of the acrylic resin, the prosthesis was finished and polished to obtain a smooth shiny surface [Figure 5]. The prosthesis was inserted in the eye socket of the patient for final evaluation [Figure 6]. The patient was given written as well as oral instructions for the insertion and removal of the prosthesis and its proper maintenance. The patient was recalled for follow-up at regular intervals to evaluate the defect and the prosthesis. After 1 ½ years of the use, the iris was not discolored and the prosthesis appeared to be in good condition. The patient was satisfied with the prosthesis.

Discussion

The techniques for the fabrication of the custom-made ocular prosthesis have several variations, particularly in the fabrication of the iris disc. Iris is fabricated conventionally using oil paint and monopoly iris painting technique. The painting of the paper iris is time consuming and requires artistic skills to closely resemble with the contralateral eye. Digital photographs of the contralateral eye are also used to closely match with natural eye. This overcomes the disadvantages of the conventional techniques but requires special digital photography equipment and settings, as well as computer software that allows for image adjustments. The use of the iris disc from a stock eye shell adds more simplicity in the fabrication procedure of a custom-made ocular prosthesis than the conventional techniques. The skillful artistic painting of iris is escaped with the readymade stock iris disc. Furthermore, the stock iris disc is more durable in terms of color stability as found in this patient after 1 ½ years of follow-up, but further follow-up is necessary. The need of special equipment required for the digital photographic technique is also excluded. However, availability of the stock iris with close resemblance to the patient’s natural eye may be a problem. Further, research is needed to investigate the long-term outcome of these prostheses.

Conclusion

Dentistry is evolving with time and new ideas and innovations are coming forth as we progress, so it is important that the dentists upgrade their knowledge and skills. The article describes

Figure 4: Space created in resin sclera and trimmed stock iris disc

Figure 5: Finished and polished ocular prosthesis

Figure 6: Insertion of the ocular prosthesis
a method of fabrication of ocular prosthesis with minimum armamentarium and materials and still manages to provide the patient with aesthetic prosthesis.

Summary

Early rehabilitation of the patients with ocular defects is necessary to help relieve these patients of the severe stress of eye loss. Custom-made ocular prostheses are the most esthetic and comfortable to the patient. Prosthodontists should be flexible in their treatment modalities because each patient provides a challenge to develop and improve on old, accepted practices. A stepwise treatment procedure to fabricate custom-made ocular prosthesis using stock eye shell iris is described in detail.

Clinical Significance

The rehabilitation of an ocular defect with a proper fitting ocular prosthesis is essential to help relieve the patient from the severe mental trauma and to help the patient to live a normal life.

References