Prosthetic Rehabilitation of an Ocular Defect with customized Iris: A Case Report

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ABSTRACT
One of the main goals towards restoration of an acquired or congenital defect of eye with an ocular prosthesis is to enable the patient to cope better with the difficult process of rehabilitation after ocular enucleation. Iris colour plays a pivotal role to restore aesthetics. An esthetically pleasing ocular prosthesis is the one that reproduces colour, form and orientation of iris and allows the patient to return to an accustomed lifestyle. Sequential steps for the construction of custom-made ocular prosthesis are outlined in this case report utilizing digital imaging technique.

Key Words: Photographic iris, Custom-made ocular prosthesis, Digital imaging, Enucleation


INTRODUCTION
The human facial disfigurement associated with loss of an eye can lead towards significant levels of physical and emotional problems. Patients experience stress not only adjusting to the functional disability caused by the lost eye but also to societal reactions. Thus replacement of the lost eye is essential to promote physical as well as psychological healing for the patient.1

In the past, the need for an artificial eye was fulfilled by a crude stock prosthesis that comes in standard sizes, shapes, and colours. Stock ocular eye requires no special skills or materials for fabrication. They are relatively inexpensive and the entire process is also less time consuming. However, nowadays, its use is mostly restricted as a conformer after surgery. A custom-made ocular prosthesis is advantageous as there is enhanced level of tissue adaptation, increased mobility of the prosthesis, and acceptable aesthetics due to better match of the size and colour of the iris and sclera. Nevertheless, a custom prosthesis is more expensive than a stock prosthesis, and several steps are required for its fabrication.2

The reproduction of an eye is challenging. The ocular prosthesis must be as similar as the natural eye, mainly regarding the iris, which determines the basic colour of the eye. The reproduction of the prosthetic iris is a critical step during the construction of ocular prosthesis. It has been accomplished with all technical and artistic resources available.3

Several studies have proposed the prosthetic reproduction of iris, using several materials like paints, pigments and papers, such as white cardboard with water colour paint, black card board and acrylic and oil paints. But they depend upon the artistic skills and colour science of the operator and are also time consuming.4 In this study, we attempted to customize the iris by means of digital photography hence restoring natural aesthetics.

CASE REPORT
A 45 year old male patient was referred to the Department of Prosthodontics, Career Postgraduate Institute of Dental College, Lucknow (India) with a main complaint of facial disfigurement due to the loss of left eye (Figure 1).
History of present illness revealed that the patient had congenitally missing left eye. He had never used any kind of ocular prosthesis and was never informed by any health personnel that it can be replaced. Ocular examination revealed a shrunken eye socket. The intra-ocular tissue bed was healthy. Inadequate depth was seen between the upper and lower fornices. The conjunctiva covering the posterior wall of the ocular defect showed synchronous movements. A custom-made acrylic resin ocular prosthesis was planned, and the treatment procedure was explained to the patient.

Prothesis fabrication
1. An impression of the ocular defect was made with an irreversible hydrocolloid impression material using a 5 ml modified disposable syringe (Dispo van) according to the Miller technique (Figure 2). The patient was instructed to perform eye movements while the impression material got set.

2. The ocular impression (Figure 3) was removed from the socket and then poured with Type III dental stone (DPI Pvt Ltd, Mumbai, India) until the height of contour (Figure 4).

3. After the stone had setup, keyholes were made and boxed for the orientation of ocular prosthesis (Figure 4). Then a second layer was poured, to obtain a two piece cast.
4. The wax pattern was fabricated using modeling wax (Y-Dent, MDM Corporation New Delhi). The fit of the wax pattern was evaluated by observing the extension into the fornices (Figure 5).

5. Prefabricated iris was positioned in the wax pattern using transparent grid method and tried-in for the patient (Figure 6).

6. Definitive impression was made by relining the scleral wax pattern using light viscosity poly-vinyl siloxane impression material (Figure 7).

7. A digital photograph of the patient’s iris using a digital camera (Sony H20, Japan, 20 Megapixel, 10X optical zoom) was captured.

8. Adjustment of the colour, brightness, contrast, hue, of the digital iris was done by using graphics software (Photoshop 7.0; Adobe system Inc, San Jose, California). Further colour modifications were done by using professional quality colour pencils. The final image was printed on good quality photo-paper in different sizes to match the patient’s natural iris (Figure 8).

9. Wax pattern with prefabricated iris was flanked and processed using heat-polymerizing acrylic resin (DPI-Heat cure, Dental Products of India Ltd). Ocular prosthesis was tried-in with the patient sitting erect and viewing an object kept 3 feet away at eye level. Supra and infra palpebral fullness was evaluated (Figure 9).

10. Following this, the prefabricated iris was carefully removed using a chisel and mallet. Then the photographic iris (that best matched the patient iris) was cut from the digital photograph of the patient and transferred onto the created sclera blank. The Photographic iris was attached to sclera blank using cyanoacrylate adhesive (Figure 10).
11. For contouring the convexity, the prefabricated iris was converted into a transparent button by abrading the fitting surface. Then, it was re-positioned over the photographic iris and patient was asked to fix his gaze on a predetermined object. Palpebral convexity was reverified. Finishing and polishing of the prosthesis was done (Figure 11).

12. The patient was instructed on insertion and removal of the prosthesis. Follow up was done after a week. This ocular prosthesis with customized iris led to improvement of aesthetics which hopefully will let to enhancement of patient’s social status and confidence with time (Figure 12).

DISCUSSION

The aesthetic and psychological benefits of an ocular prosthesis have motivated a constant research in improvement of its prosthetic technique. The general consensus among authors is that close matching the natural eye is the key to mask the loss and achieve an aesthetic outcome for patients with ocular defect.3

The literature has suggested many techniques for the fabrication of ocular prosthesis. Stock eye prosthesis was advocated by Laney.6 Many clinicians have concluded that iris colour of prosthetic eye is the most important consideration for the aesthetic acceptance of the prosthesis. The main disadvantage of a prefabricated ocular prosthesis is its inability to match iris colour.7

The common techniques for the fabrication of custom made prosthesis are paper iris disk and black iris disk technique. However, painting the iris disk involves both artistic skills and science of colour.8

Using digital imaging in the fabrication of the ocular prosthesis presents several advantages as compared to the conventional iris painting technique. The digital image provides acceptable aesthetic results as it closely replicates the patient’s iris with minimal colour adjustments and modifications. The method is simple, less time consuming, and requires minimal artistic skills, which are necessary in the iris painting technique. Nevertheless, special digital photography equipment and settings, as well as computer software are required for image adjustments.1

CONCLUSION

An accurate iris reproduction in the fabrication of ocular prosthesis is a key factor to achieve an aesthetic outcome for patients with ocular defect.
A simplistic procedure for fabricating the ocular prosthesis has been suggested here. The method uses a digital photograph of the patient’s natural iris for the rehabilitation. The technique has provided good results from patient aesthetics, acceptance and satisfaction point of view. Modification of the above technique may include the digital photograph of sclera and iris as a further step toward personalized aesthetics.

REFERENCES


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