

Ocular Defect Rehabilitation Using Digital Photography

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Abstract

Surgical intervention for the management of ocular disorders may lead to eye defects. The primary objective in rehabilitating such defects with an ocular prosthesis is to reestablish the physical and mental well-being of the patient. A series of detailed steps for custom-made ocular prosthesis fabrication using the advantages of digital photography are presented in this article. The iris reproduction by capturing it in a digital camera and editing the image in graphic software is presented. The presented technique replicates the natural iris without the need for iris painting and special artistic skills in a short time and simplified manner.

Keywords: Custom-made, digital photography, geriatric patient, iris, ocular prosthesis

INTRODUCTION

Eyes are among the first features of the face to be noticed.^[1] Loss of an eye leaves a psychological impact on the patient; thus, a prosthesis should be provided at the earliest.

The critical step in ocular prosthesis fabrication lies in iris orientation and its color.^[2-5] The iris is the part of the uveal tract which is pigmented with melanin and lipofuscin. The pupil is in the center, usually painted with multiple layers and appears as a black dot.^[6] The following case report describes the rehabilitation of an ocular defect with the aid of digital photography in an elderly patient to bring out the best esthetic results.

CASE REPORT

A 51-year-old male patient reported to the Department of Prosthodontics for the replacement of his left eye. On eliciting history, it was noted that the patient met a road traffic accident 5 years ago. He was operated for the same by surgical enucleation.

On examination, the socket revealed a healthy tissue bed and adequate depth between the upper and lower eyelids for the retention of the ocular prosthesis. The contralateral eye showed a grayish-white ring on the outer surface of the eye [Figure 1a]. The stock eye given to the patient was not matching to the contralateral eye with respect to the color of iris and sclera. The patient was not satisfied with the prosthesis; therefore, a decision was made to fabricate a

custom-made ocular prosthesis with digital photography to simulate eye color.

The patient was seated in an erect position in order to allow the tissues involved in the defect to be recorded in their natural drape. An impression of the enucleated socket was made with light body addition silicone impression material (Aquasil, DENTSPLY) using a special tray fabricated from the stock eye [Figure 1b].

An index was obtained by molding the putty addition silicone impression material (Aquasil, DENTSPLY) around the socket impression, in two halves with notches for reorientation. [Figure 1c]. A wax conformer was fabricated by flowing molten wax (Modelling Wax, Deepti Dental Products of India Pvt. Ltd.) in the index. It was tried in the patient's eye socket and adjusted for desired volume, retention, and comfort [Figure 1d].

The wax conformer was processed in the conventional manner [Figure 1e]. After acrylization, 1.5 mm of the scleral blank was reduced from the outer surface for a layer of clear heat cure acrylic resin to be added after pasting of printed iris and sclera [Figure 1e and f]. The reduction was confirmed by adding putty between the scleral blank and stone mold [Figure 1g].

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A high-quality digital photograph of the patient's natural eye was obtained using a digital single-lens reflex camera (NIKON D5200 with the 18–55 kit lens). The image obtained was edited by using CorelDRAW (CorelDRAW Graphics Suite X5, Corel Corporation) and Adobe Photoshop CS4 (Adobe Systems Inc.) keeping the iris size at 1 mm smaller than the natural eye to compensate for the magnification caused by the clear corneal prominence. The edit included mirroring the image and extending the scleral part of the image to cover the conformer adequately [Figure 2a]. Different combinations of brightness and contrast were used to produce a variety of images so as

to pick up the closest match for the prosthesis. The images obtained were printed on a self-adhesive glossy vinyl paper sticker using a color laser printer (Classic Business Centre, Goa, India).

Using the graph-grid method,^[2] the iris position was marked on the scleral blank [Figure 2b]. The images printed on the paper sticker were matched to the contralateral eye, and the best one was selected and cut precisely to cover the visible palpebral fissure area. The cutout was then pasted on the conformer [Figure 2c]. A protective coating (G-Coat Plus, GC America Inc.) was applied over the sticker to protect the color

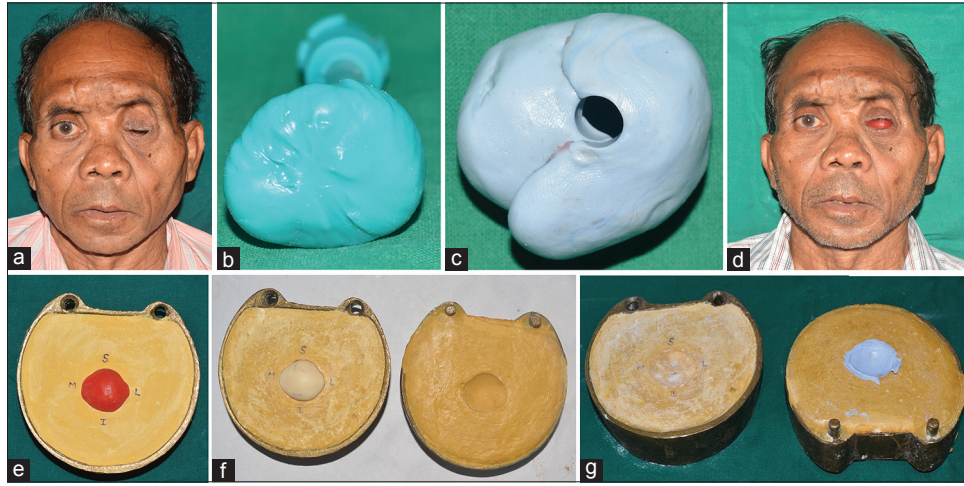


Figure 1: (a) Preoperative facial view. (b) Ocular impression. (c) Index to obtain wax conformer. (d) Try-in of wax conformer. (e) Processing of wax conformer. (f) Scleral blank after processing. (g) Confirmation of reduction of scleral blank with putty.

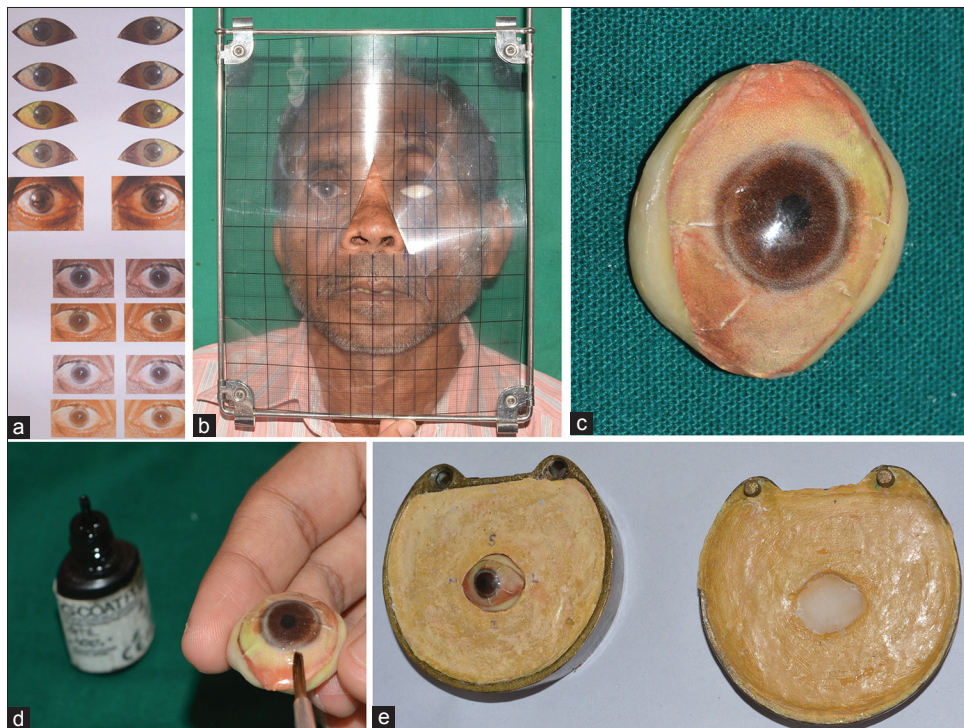


Figure 2: (a) Self-adhesive glossy paper sticker with modified images printed on it. (b) Marking of iris position using graph-grid method. (c) Pasting of cutout of printed iris on scleral conformer. (d) Protective coating application. (e) Addition of clear heat cure acrylic resin using previous mold.

of the printed iris along with sclera [Figure 2d]. A layer of clear heat cure acrylic resin was obtained by packing the prosthesis in the previous mold preserved for further processing [Figure 2e]. This gives a glossy and realistic appearance to the prosthesis.

The ocular prosthesis obtained was finished and polished and was delivered to the patient with postdelivery instructions. The patient was happy and satisfied with the ocular prosthesis [Figure 3].

DISCUSSION

Ocular defects constitute an important maxillofacial deficiency which calls for an immediate prosthetic replacement. Geriatric patients present with different color of eyes owing to aging. These patients may have a smattering of brown throughout the sclera and more in the area of limbus and conjunctiva due to the deposition of hepatic by-products. Sclera of an older eye thus shows slight yellowish color as compared to having a clear eyes in a young age.^[6]

The reproduction of the iris is a crucial step in ocular prosthesis fabrication. Various methods have been devised for prosthetic iris reproduction of which iris painting forms an important part.^[7] These techniques are dependent upon operator's artistic skills and are time consuming. Artopoulou *et al.* have presented a technique of iris reproduction using digital photography.^[8] Kale *et al.* suggested a technique of using digital photography to replicate both sclera and the iris.^[9]

The above-described technique is relatively simple and is cost effective. It uses a customized self-adhesive sticker having multiple images with varying brightness and contrast, thus saving chairside time. Moreover, it allows predictable and esthetic iris reproduction without any additional armamentarium unlike as described by Artopoulou *et al.* wherein ocular button was used to position the iris on the wax pattern.

In this technique, a protective coating (G-Coat Plus, GC America Inc.) preserves the color of the print during

acrylization of clear heat cure acrylic resin and even thereafter, hence increasing color stability. It is a light-cured, protective clear coating formulated with adhesive monomers and nanofillers.

Another advantage of the described technique is the preservation of the anterior curvature of the scleral blank before the cutback and printed eye try-in in the form of the processing mold, hence reducing the needed prosthesis adjustments at the insertion visit.

The technique of digital photography requires equipment and knowledge of software for editing which according to the authors is easy to acquire and implement.^[10] Care should be taken while selecting printing paper type and quality which should be waterproof and glossy photo paper. The settings of the camera are adjusted appropriately to capture the iris and sclera accurately.

CONCLUSION

An accurate iris reproduction is essential for esthetic outcome in custom-made ocular prosthesis. The case report presents the use of digital photography to mimic the iris in the prosthesis. The advantage of time reduction and simplicity of use makes this technique a viable alternative for ocular prosthesis fabrication.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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Figure 3: A happy and satisfied patient with ocular prosthesis.

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