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A Simple Method of Positioning the Iris Disk on a Custom-Made Ocular Prosthesis. A Clinical Report

Satyabodh S. Guttal, MDS, MFPT,[1] Narendra P. Patil, MDS,[2] Naina Vernekar,[3] & Amit Porwal[3]

[1]Reader, Department of Prosthodontics, SDM College of Dental Sciences and Hospital, Dharwad, Karnataka, India
[2]Professor and Chairman, Department of Prosthodontics, SDM College of Dental Sciences and Hospital, Dharwad, Karnataka, India
[3]Postgraduate Student, Department of Prosthodontics, SDM College of Dental Sciences and Hospital, Dharwad, Karnataka, India

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Correspondence
Satyabodh Guttal, Reader, Department of Prosthodontics, SDM College of Dental Sciences & Hospital, Dhavalnagar, Sattur, Dharwad, Karnataka 580 009, India. E-mail: drsatyabodh@yahoo.co.in

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Abstract

We report two cases of ocular prosthesis fabrication that make use of a transparent graph grid for positioning the iris disk. The custom-made ocular prostheses achieved intimate contact with the tissue bed enabling ideal fit. As asymmetry may result in a squint-eyed appearance, proper positioning of the iris disk in the scleral wax pattern is vital to fabricating the custom-made artificial eye. The position of the iris disk in the custom-made ocular prosthesis was in symmetry with that of the natural eye, restoring esthetics of the patient.

Congenital defect, pathology, or accidental trauma may necessitate surgical intervention resulting in removal of the eyeball.[1] The minimal surgical procedure is evisceration where the contents of the globe are removed, leaving the sclera intact. A more invasive procedure is enucleation, wherein the entire eyeball is severed from the muscles and optic nerve. Exenteration, the most radical, involves removal of the contents of the orbit.[2] With an enucleation defect, a conformer is placed to maintain the fornices.[1] The ocular prosthesis can be initiated 10 to 14 days following surgery.[3]

The disfigurement associated with eye loss can cause significant physical and emotional disturbance.[4] Psychological distress can be reduced by timely replacement with an artificial eye. The custom-made acrylic resin ocular prosthesis achieves intimate contact with the tissue bed. The close adaptation of the custom-made ocular prosthesis tends to distribute pressure more equally, vis-à-vis a prefabricated ocular prosthesis.[5]

The iris should be bilaterally symmetrical; therefore, accurate placement of the custom-painted iris disk on the scleral wax pattern is critical. McArthur[6] described methods for positioning the artificial eye in the orbital prosthesis using an ocular locator and fixed caliper. This determined the placement of the prosthetic eye in the mediolateral and supero-inferior planes. Benson[7] suggested a method for fabricating a custom-made acrylic resin ocular prosthesis in which he determined the size and position of the iris by visual judgment. Because iris positioning is a technique-sensitive procedure, visual assessment alone may not be accurate.

The present article explores a method of positioning the iris disk assembly in a custom-made ocular prosthesis. This method is employed in the treatment of two cases with anophthalmic sockets.

Case presentations

Case 1

A 25-year-old female patient was referred to the Department of Maxillofacial Prosthetics, S.D.M. College of Dental Sciences & Hospital, Dharwad, India. The patient complained of facial disfigurement due to loss of the left eye. A history of traumatic injury to the left eye followed by enucleation was noted. Consequent to this, the patient suffered severe emotional trauma in terms of facial esthetics and social acceptance (Fig 1).

Case 2

A 50-year-old male patient was referred to the aforementioned department. The patient complained of a missing left eye that had been enucleated following a thorn prick and subsequent infection (Fig 1).

Both patients were seeking artificial eye replacements. On examination, the conjunctiva covering the posterior wall of the anophthalmic socket elicited synchronous movements in both cases. A custom-made acrylic resin ocular prosthesis was planned, and the treatment procedure explained to the patients.

Figure 1 Cases 1 and 2 presenting ocular defect.

Identical methods were employed to verify the reliability of the results in both patients.

Prosthesis fabrication

An impression of the anophthalmic socket was made using an impression method suggested by Allen and Webster.[8] Using a syringe, the irreversible hydrocolloid (Algitex, Dental Products of India, Mumbai, India.) was injected into the socket through the hollow stem of the impression tray. The excess material came out through the perforations in the trays and allowed only the critically needed volume to remain.[9] The impression was poured in two sections using dental stone (Kalastone, Kalabhai Pvt Ltd, Mumbai, India).

Painting the iris disk involves both artistic skills and the science of color. Many techniques have been described in the literature for painting an artificial iris.[10–12] The diameter of the iris disk was cut on a white card paper corresponding in size to the iridic diameter of the patient's existing eye. Acrylic-based pigments (Fevicryl, Pidilite Industries Ltd, Mumbai, India) were used to paint the iris disk. The painted iris disk was checked for color accuracy against the natural eye by placing a drop of water on the painted surface during construction. A custom-made corneal button was fabricated using heat-polymerizing acrylic resin (DPI-Heat cure, Dental Products of India Ltd). The size of the corneal button was similar to the size of the painted iris disk. It was attached to the painted iris disk using cyanoacrylate adhesive (Laborfix, Bracon Ltd, Sussex, England). Later the scleral wax pattern was fabricated in the two-piece mold obtained from the ocular impression. Following the trial wax pattern, the supra-orbital folds, margins of the lower eyelids, and iris plane were evaluated, all of which resembled the natural eye.

Method of attaching the iris disk

1. The transparent graph grid was used in this method to attach the iris disk.
2. During the trial of the scleral wax pattern, certain guidelines were marked on the patient's face with an indelible pencil (Fig 2): a vertical midline was marked considering the stable anatomical landmarks and prominent points on the face.[6,13,14] The midline was marked passing through the forehead crease, glabella, tip of the nose, and chin. The distance from the right eye medial canthus to the midline

Figure 2 Markings done on Case 1.

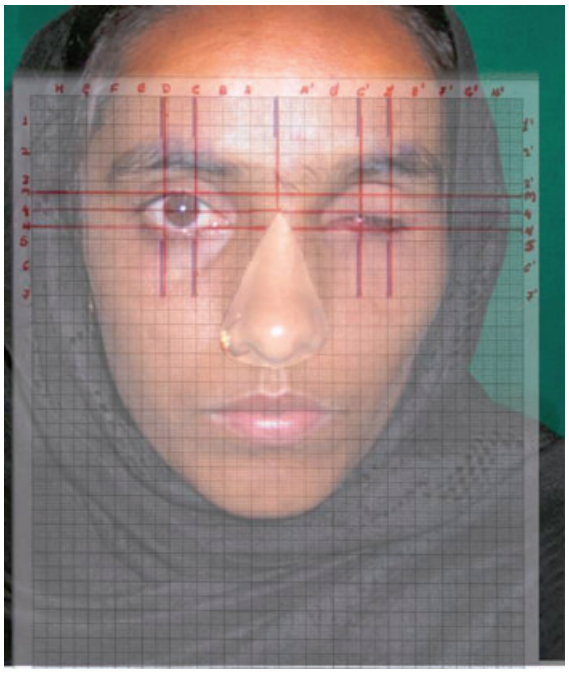

Figure 3 Markings on the transparent graph grid corresponding to the markings done on the face.

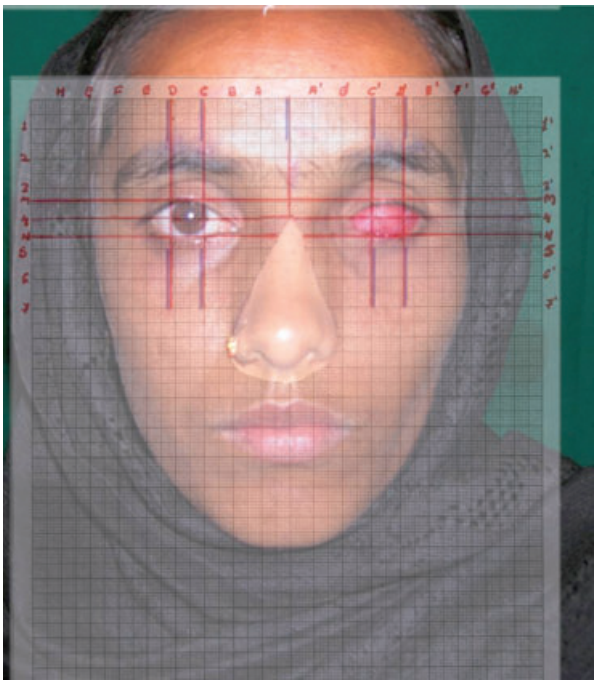

Figure 4 The iris position transposed onto the scleral wax pattern.

and left eye medial canthus to the midline was measured. This distance standardized the midline marking and was used to reposition the grid template each time during the try-in visit.

3. The patient was asked to gaze straight at an object kept 4 feet away.[15] The operator then marked the vertical lines coinciding with the medial and distal extremities of the iris of natural eye.
4. Similarly, the horizontal lines referring to the center, inferior, and superior limits of the iris were marked.

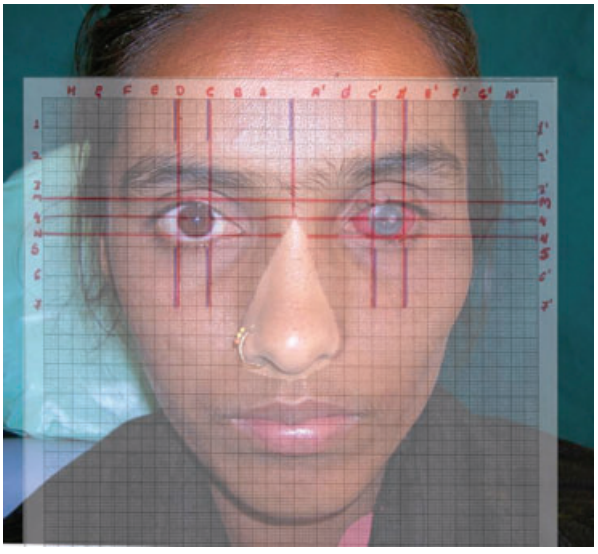

Figure 5 Iris button attached to the wax pattern.

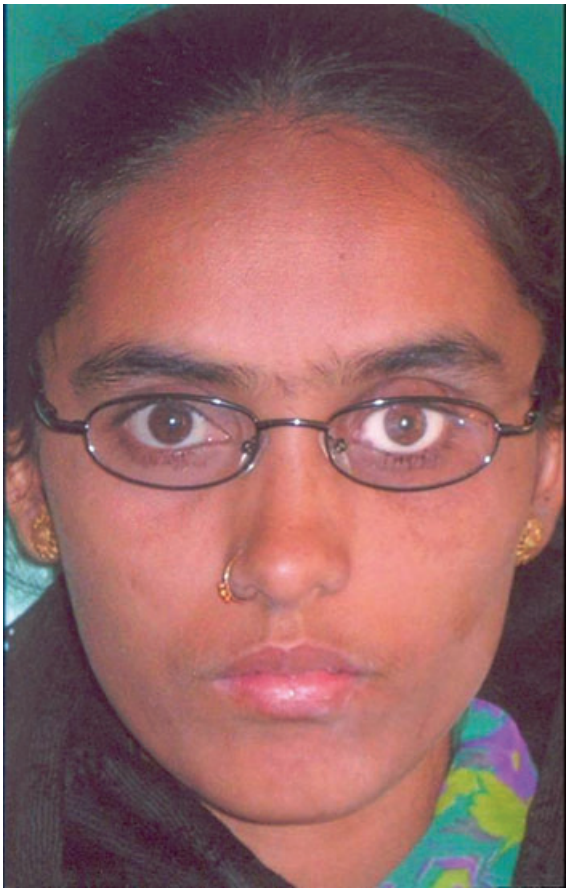

Figure 6 Prosthesis in situ.

5. Markings were also made on the transparent grid template, on the X-axis from A through H starting from the midline, and on the left side A^1 to H^1; similarly, on the Y-axis from 1 through 7 and 1^1 to 7^1. The distance between each marking was 1 cm on both X and Y axes. These markings were made to correspond to the markings done on the patient's face previously (Fig 3).
6. The facial markings were transferred to the grid template by placing it on the patient's face. These markings were transposed onto the side of defect. This can be done either directly on the patient's face or on the facial moulage. The markings were transferred onto the sculpted scleral wax pattern, and the iris button attached to the wax pattern (Figs 4, 5, 7, 8).

The custom-made iris was evaluated with the grid template. This confirmed the positioning of the iris disk in the wax pattern in comparison to the iris of the contra-lateral eye. The soft tissue contours and location of the iris were satisfactory. The wax pattern was acrylized, and the prosthesis was finished and polished. Further characterization was done by attaching artificial veins to simulate that of the natural eye. External staining was also done.[12] The prosthesis was covered with a thin layer of wax (Modeling wax, Dental Products of India Ltd) and

Figure 7 Iris position transposed onto the scleral wax pattern on Case 2.

Figure 8 Prosthetic iris in Case 2 corresponding with the contra-lateral eye as well as the grid template.

further acrylized. Finally the eye was recovered from the flask, finished, polished, and placed in the eye socket (Figs 6, 9).

Discussion

Eye defects constitute an important maxillofacial deficiency, which requires prosthetic replacement.[16] A custom-made ocular prosthesis replicates the orientation, natural color, contour, and size of the pupil and iris, providing realism and symmetry to the patient's face. In addition, it improves the fit of the prosthesis by gaining the intimate tissue adaptation.[17] Positioning of the iris is an important step in fabrication of the custom-made ocular prosthesis, which helps achieve better esthetics and self-esteem of the patient. The literature suggests many techniques for positioning the ocular component in the orbital prosthesis,[6,13,18–20] but little has been published[14,21] on positioning the iris on the ocular prosthesis.

Roberts[14] has suggested the use of a pupillometer for precise alignment of the pupil in the eye prosthesis. Though the advocated method may be more precise, it may not be feasible to use the pupillometer in every clinical set-up. The method described in this article involves a simple procedure for positioning the iris in a prosthetic eye and is a modification of the technique described previously.[6] The accurate placement of the iris and pupil component in the ocular prosthesis simulated the conversational gaze. Thus, the use of a transparent grid template helped us accurately locate and position the iris on the custom-made ocular prosthesis rather than relying purely on the visual assessment,[15] the latter being subjective with possible interobserver errors. The method used in this article is objective; however, a subjective evaluation was also undertaken. The method described here has provided good results from patient esthetics, acceptance, and satisfaction points-of-view. Eyeglasses were used to conceal the background effect and enhance psychological comfort.

The method described here is undemanding and can be carried out in a small clinical set-up. In cases of facial asymmetry,

Figure 9 Lateral profile in Case 2 shows natural contour of the ocular prosthesis.

accurate marking of the midline and the extremities of the natural iris could produce subjective errors. This is a limitation of the method described here; however, there may be scope for other maxillofacial prosthodontists to verify the reliability of this method by comparing with other techniques.

Summary

The success of an ocular prosthesis depends largely on the accurate orientation of the iris disk assembly. A simplistic procedure for fabricating the ocular prosthesis has been suggested here. The method uses a transparent grid template from which the iris is traced. This gives an accurate registration of position and alignment of iris disk assembly, mimicking a natural look.

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References

1. Raflo GT: Enucleation and evisceration. In: Tasman W, Jaeger E (eds): Duane's Clinical Ophthalmology, vol 5, (ed 2). Philadelphia, PA, Lippincott 1995, pp. 1-25
2. Bartlett OS, Moore JD: Ocular prosthesis: a physiologic system. J Prosthet Dent 1973;29:450-459
3. Rathban JE, Croewell B, Quickert MH: Evaluation of 48 cases of orbital exenteration. Am J Ophthalmol 1971;72:191-199
4. Lubkin V, Sloan S: Enucleation and psychic trauma. Adv Ophthalmic Plast Reconstr Surg 1990;8:259-262
5. Ow KKR, Amrith S: Ocular prosthetics: use of a tissue conditioner material to modify a stock ocular prosthesis. J Prosthet Dent 1997;78:218-222
6. McArthur RD: Aids for positioning prosthetic eyes in orbital prosthesis. J Prosthet Dent 1977;37:320-326
7. Benson P: The fitting and fabrication of a custom resin artificial eye. J Prosthet Dent 1977;38:532-539
8. Allen L, Webster HE: Modified impression method of artificial eye fitting. Am J Ophthalmol 1969;67:189
9. Cain JR: Custom ocular prosthesis. J Prosthet Dent 1982;48:690-694
10. Murphey PJ, Schlossbert L: Eye replacement by acrylic maxillofacial prosthesis. US Naval Med Bull 1944;43:1085
11. Beumer J, Curis TA, Firtell DN: Maxillofacial Rehabilitation: Prosthodontic and Surgical Considerations. St Louis, MO, Mosby, 1979, p. 35
12. Firtell DN, Anderson CR, Donnan ML: Vein application technique for ocular prosthesis. J Prosthet Dent 1975;34:192
13. Jooste CH: A method for orienting the ocular position of an orbital prosthesis. J. Prosthet Dent 1984;51:380-382
14. Roberts CA: An instrument to achieve pupil alignment in eye prosthesis. J Prosthet Dent 1969;22:487-489
15. Hang PS, Andres JC: Fabrication of custom ocular prosthesis. In: Taylor DT (ed): Clinical Maxillofacial Prosthetics. Chicago, IL, Quintessence, 2000, pp. 265-275
16. Shivji AR, Bhat S, Shetty P: Prosthodontic management of an ocular defect—a case report. JIPS 2001;1:33-35
17. Mathew FM, Smith MR, Suttion JA, et al: The ocular impression: a review of the literature and presentation of an alternate technique. J Prosthodont 2000;9:210-216
18. Nusinov NS, McCartney JW, Mitchell DL: Inverted anatomic tracing: a guide to establishing orbital tissue contours for the oculofacial prosthesis. J Prosthet Dent 1988;60:483-485
19. Nusinov NS, McCartney JW, Mitchell DL: The orbital shell: an aid in positioning the ocular component and verifying margin contours for the oculofacial prosthesis. J. Prosthet Dent 1984;51:380-382
20. Janeja PO, Madan KS, Mehra DM, et al: Orbital prosthesis. J Prosthet Dent 1976;36:307-310
21. Brown KE: Fabrication of an ocular prosthesis. J Prosthet Dent 1970;24:225-235