

A Case Report on Iris Disk Positioning on a Custom-Made Ocular Prosthesis Using an Adjustable Trial Frame

Review began 02/15/2024
Review ended 03/18/2024
Published 03/18/2024

© Copyright 2024

Naik et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Sadhvi G. Naik ¹, Muness Akhtarkhavari ¹, Aradhana Nagarsekar ¹, Meena A. Aras ¹, Vidya Chitre ¹

¹. Prosthodontics and Crown and Bridge, Goa Dental College and Hospital, Bambolim, IND

Corresponding author: Sadhvi G. Naik, naiksadhvi25@gmail.com

Abstract

Trauma, cancer, and congenital defects may all result in the loss of an eye. This leads to significant emotional and physical challenges in an individual's life. In such cases, cautious preoperative, surgical, and prosthetic planning employing a multidisciplinary approach is essential for effective rehabilitation. Iris positioning is one of the crucial steps in the fabrication of a customized ocular prosthesis. Iris positioning is a technique-sensitive process, hence visual evaluation by itself could not provide reliable results. This case report illustrates a method of iris disk positioning on a custom-made ocular prosthesis using an adjustable trial frame. The advantage of the adjustable mechanism of the adjustable trial frame was utilized here to position the iris on the scleral blank. Since the iris disk on the ocular prosthesis was positioned in symmetry with that of the natural eye, the patient's aesthetics were restored.

Categories: Other, Dentistry, Ophthalmology

Keywords: iris positioning, adjustable trial frame, customised impression tray, custom ocular prosthesis, ocular defect

Introduction

Partial or complete loss of an eye affects the patient's ability to see and results in an obvious facial deformity [1]. The main objective of treating an acquired or congenital eye defect with an aesthetically acceptable prosthesis is to let the patient confront the outside world and resume their regular activities [2]. The precise positioning of the iris on the custom-made ocular prosthesis is one of the most difficult aspects of the fabrication of the prosthesis [3]. Iris positioning is important for obtaining the accurate interpupillary distance and its orientation in relation to the natural eye. Numerous techniques for accurately placing the iris disk on the custom-made ocular prosthesis have been developed. This article reports a case in which an iris disk was positioned on a custom-made ocular prosthesis using an adjustable trial frame.

This article was presented as a poster at the 50th Conference of the Indian Prosthodontic Society on November 11, 2022, in New Delhi.

Case Presentation

A 65-year-old man came to the prosthodontics crown and bridge department in order to get his missing left eye prosthetically restored. On enquiring about the patient's past, it was discovered that a year prior, he had suffered a catastrophic injury to his left eye that required surgical evisceration of the eye (Figure 1).



FIGURE 1: Pretreatment photograph

How to cite this article

Naik S G, Akhtarkhavari M, Nagarsekar A, et al. (March 18, 2024) A Case Report on Iris Disk Positioning on a Custom-Made Ocular Prosthesis Using an Adjustable Trial Frame. Cureus 16(3): e56382. DOI 10.7759/cureus.56382

On evaluation, the tissue bed was in good shape, the eyelids were unharmed, and the space between the upper and lower eyelids was deep enough to accommodate an ocular prosthesis (Figure 2). No gross facial asymmetry was noted. The Department of Ophthalmology had referred the patient with a stock eye with matching iris (Figure 3). Informed consent was obtained from the patient, and it was decided to make a customized ocular prosthesis utilizing the stock eye's iris. To make a mold, a putty impression (Zhermack Elite HD+; Zhermack GmbH, Badia Polesine (Rovigo), Italy) was made using the stock eye (Figure 4). A clear auto-polymerizing acrylic resin was used for making a customized tray in the putty mold (DPI, India). In the socket, the tray's margins were modified, and vent holes were created. This tray had an auto-mixing tip attached to it (Figure 5) that facilitated the flow of light body addition silicone (Aquasil Dentsply) to record the tissue bed (Figure 6). The impression was poured using the two-pour split cast technique (type III dental stone) to obtain a mold (Figure 7).



FIGURE 2: Eviscerated left eye socket



FIGURE 3: Stock eye with matching iris



FIGURE 4: Putty impression made using the stock eye

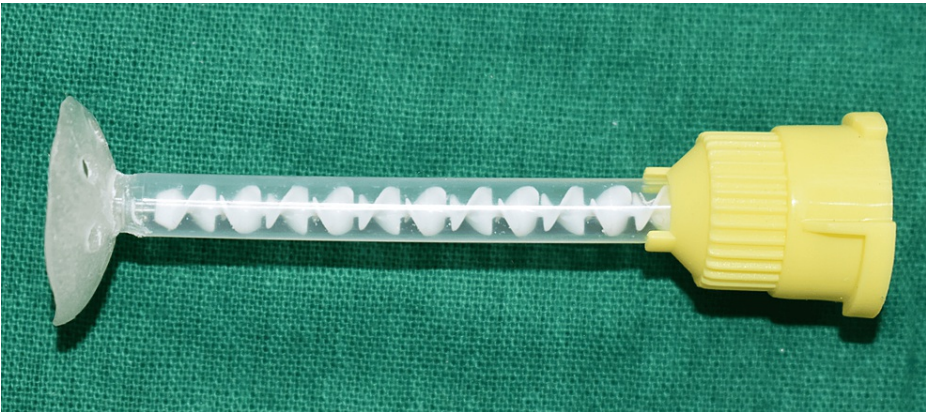


FIGURE 5: Custom tray with the auto-mixing tip



FIGURE 6: Impression making

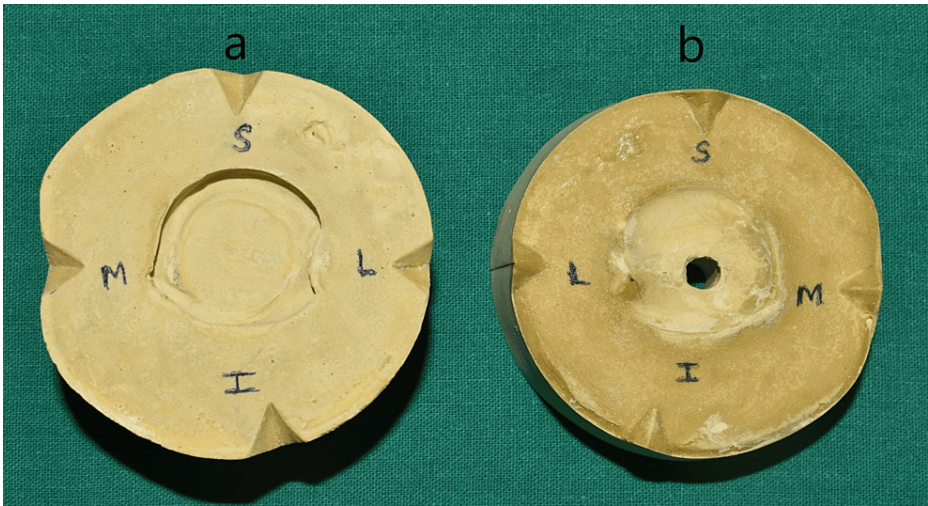


FIGURE 7: Mold obtained using the two-pour split cast technique

a: cavity of the mold, b: core of the mold

This mold was filled with modeling wax (Deepti Dental Products of India Pvt. Ltd., Delhi, India) to create a wax pattern, which was then adjusted on the patient to achieve an appropriate shape (Figure 8). The investing of the wax pattern was followed by dewaxing. A clear heat-polymerizing acrylic resin and teeth molding powder were used to fabricate a scleral blank (DPI, India). The patient's glabella, tip of the nose, chin, and forehead crease were used to mark the midline for iris positioning. The patient was asked to align the opposing eye by looking off at the distant point after the scleral blank had been inserted into the socket.



FIGURE 8: Wax pattern trial

The location of the iris was then marked on the scleral blank using an adjustable trial frame (Medik Trial Frame, Regular, Eye Care Products, Delhi, India) with respect to the inner and outer canthus and the upper and lower eyelids of the normal contralateral eye (Figure 9). Following this, the iris from the stock eye was separated and placed on the scleral blank using cyanoacrylate glue, and its placement was verified (Figure 10).



FIGURE 9: Iris positioning on the scleral blank using the adjustable trial frame



FIGURE 10: Iris position verified

Composite paints (SR Adoro Stains, Ivoclar Vivadent, Germany) were used to tint the sclera, and it was cured in the polymerization unit. The stains on the prosthesis were first photoactivated for 40 seconds in accordance with manufacturer instructions (Quick Curing Unit, Ivoclar Vivadent, Liechtenstein). The polymerization of the prosthesis was then finished by placing it in the Targis Power Upgrade unit under light and vacuum for 16 minutes. To preserve the characterization, a layer of protection (G-Coat Plus, GC America Inc., Alsip, IL, USA) was put on. The final prosthesis with post-delivery instructions was delivered to the patient (Figures 11, 12). The patient was evaluated after a day, week, and month. The patient was content with the ocular prosthesis.



FIGURE 11: Final prosthesis



FIGURE 12: Prosthesis in situ

Discussion

Surgical intervention may be needed for congenital defects, accidental trauma, or pathologies that may result in the removal of the eyeball [4,5]. Peyman GA et al. [6] divided eye removal surgical techniques into three groups: the removal of the globe's contents while keeping the sclera, extraocular muscles, and optic nerve intact is known as Evisceration. When the muscles and optic nerve are severed, the globe is removed completely, a process known as Enucleation and Exenteration that involves removing all tissues from the orbit and the socket, including the globe, conjunctiva, orbital fat, and all or part of the eyelids [7,8]. An ocular prosthesis is fabricated for the first two surgeries, and an orbital prosthesis is given for the third [7]. A customized ocular prosthesis requires an impression of the socket, a wax pattern trial, iris positioning, and acrylization [9]. The most crucial stage in the fabrication of a customized ocular prosthesis is iris positioning [3]. Different techniques and customized instruments have been reported in the literature for positioning the iris accurately in a prosthetic eye from 1969 until 2019 (Table 1) [10].

Study	Year	Technique/Instrument
Roberts et al [11]	1969	Pupillometer
Brown et al [12]	1970	Facial measurements using anatomic landmarks
Joneja OP et al [13]	1976	Window light
Helene James et al [14]	1976	Visual assessment
McArthur et al [15]	1977	Ocular locator
Nusinov et al [16]	1988	Inverted anatomic tracings
Guttal et al [8]	2007	Graph grid method
Manvi S et al [17]	2008	Boleys gauge
Pai et al [3]	2010	Grid cutouts placed on the spectacle frame
Gupta et al [18]	2013	Customized scale
Yunpen Bi et al [19]	2013	CAD/CAM
Shetty PP et al [20]	2017	Modified Hanau wide-view spring bow
Chamaria et al [9]	2017	Customized frame spring bow assembly
Bhochhibhoya et al [21]	2019	Pupillary distance ruler
Dasgupta et al [22]	2019	Digital photograph
Chihargo et al [23]	2019	Optical vernier IPD ruler
Lanzara et al [24]	2019	Electronic vernier caliper

TABLE 1: Studies regarding iris positioning in the ocular prosthesis

*Credit: Positioning of iris in an ocular prosthesis: A systematic review; Sathe et al. [10]

CAD: computer-aided design, CAM: computer-aided manufacturing, IPD: interpupillary distance

In this case report, iris positioning on a custom-made ocular prosthesis was done using an adjustable trial frame. This frame is used by ophthalmologists to hold the lenses and other accessories for assessing refractive errors [25]. There are knobs to adjust the interpupillary distance, side angle, and height. The positions of the two side assemblies give an exact measurement of the interpupillary distance [26]. Iris positioning was carried out on the scleral blank using this adjustable mechanism in relation to the upper and lower eyelids, as well as the inner and outer canthus, of the normal contralateral eye. The technique presented here has shown positive outcomes in terms of patient aesthetics, acceptability, and satisfaction.

Other advantages of this technique include the fact that it requires only one armamentarium, which is readily available, requires less expertise due to its simplicity, allows for repeated verification of iris position, and can be used on multiple patients.

However, accurate identification of the midline and margins of the intact iris may lead to subjective errors in cases of face asymmetry. Patients without ears cannot utilize this technique, as stabilization of the adjustable trial frame is necessary to attain accuracy in iris disk positioning.

Conclusions

The ocular and orbital prostheses are no exception to the general principle that symmetry is the key to the pleasing esthetics of maxillofacial prostheses. Several methods have been evolved to make ocular and orbital prostheses that restore aesthetic function and boost patient confidence. The accurate positioning of the iris disc assembly results in a successful ocular and orbital prosthesis. The method outlined in this article utilizes the benefits of adjustability of the trial frame that helps us achieve an accurate registration of the iris disk position, mirroring a natural look.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

- Lokhande SP, Aras MA, Rajagopal P, Mysore A, Nagarsekar A, Chamaria A: Evaluation of patient acceptance using three techniques for the fabrication of ocular prosthesis: a case report. *Int J Appl Dent Sci*. 2018, 4:77-82.
- Kavlekar AA, Aras MA, Chitre V: An innovative and simple approach to fabricate a hollow ocular prosthesis with functional lubricant reservoir: a solution to artificial eye comfort. *J Indian Prosthodont Soc*. 2017, 17:196-202. [10.4103/0972-4052.194946](#)
- Pai UY, Ansari NA, Gandage DS: A technique to achieve predictable iris positioning and symmetry in ocular and orbital prostheses. *J Prosthodont*. 2011, 20:244-6. [10.1111/j.1532-849X.2011.00692.x](#)
- Raflo GT: Enucleation and evisceration. *Duane's Clinical Ophthalmology*, 2nd ed. Tasman W, Jarger E (ed): Lippincott Williams and Wilkins, Philadelphia, PA; 1-25.
- Cevik P, Dilber E, Eraslan O: Different techniques in fabrication of ocular prosthesis. *J Craniofac Surg*. 2012, 23:1779-81. [10.1097/SCS.0b013e31826701bb](#)
- Venkatesh Prajna NV: Peyman's Principles & Practice of Ophthalmology 2nd Ed. Jaypee Bros, Delhi, India; 1987. <https://dokumen.pub/peymans-principles-amp-practice-of-ophthalmology-2nbsped-9741283608-9789352702916.html>.
- Da Costa GC, Aras MA, Chalakkal P, Da Costa MC: Ocular prosthesis incorporating IPS e-max press scleral veneer and a literature review on non-integrated ocular prosthesis. *Int J Ophthalmol*. 2017, 10:148-56. [10.18240/ijo.2017.01.24](#)
- Guttal SS, Patil NP, Vernekar N, Porwal A: A simple method of positioning the iris disk on a custom-made ocular prosthesis. A clinical report. *J Prosthodont*. 2008, 17:223-7. [10.1111/j.1532-849X.2007.00272.x](#)
- Chamaria A, Aras MA, Chitre V, Costa GC: Iris positioning using a grid attached to a spring bow for a custom ocular prosthesis. *J Clin Diagn Res*. 2017, 11:ZD12-3. [10.7860/JCDR/2017/22011.9460](#)
- Sathe S, Pisulkar S, Nimonkar SV, Belkhode V, Borle A: Positioning of iris in an ocular prosthesis: a systematic review. *J Indian Prosthodont Soc*. 2020, 20:345-52. [10.4103/jips.jips_374_19](#)
- Roberts AC: An instrument to achieve pupil alignment in eye prosthesis. *J Prosthet Dent*. 1969, 22:487-9. [10.1016/0022-3913\(69\)90216-9](#)
- Brown KE: Fabrication of orbital prosthesis. *J Prosthet Dent*. 1969, 22:592-607. [10.1016/0022-3913\(69\)90234-0](#)
- Joneja OP, Madan SK, Mehra MD, Dogra RN: Orbital prostheses. *J Prosthet Dent*. 1976, 36:306-11. [10.1016/0022-3913\(76\)90188-8](#)
- James H, Ellis JR, Foulds WS: A method of artificial eye manufacture. *Br J Ophthalmol*. 1976, 60:153-5. [10.1136/bjo.60.2.153](#)
- McArthur DR: Aids for positioning prosthetic eyes in orbital prostheses. *J Prosthet Dent*. 1977, 37:320-6. [10.1016/0022-3913\(77\)90074-9](#)
- Nusinov NS, McCartney JW, Mitchell DL: Inverted anatomic tracing: a guide to establishing orbital tissue contours for the oculofacial prosthesis. *J Prosthet Dent*. 1988, 60:483-5. [10.1016/0022-3913\(88\)90254-5](#)
- Supriya M, Ghadiali B: Prosthetic rehabilitation of a patient with an orbital defect using a simplified approach. *J Indian Prosthodont Soc*. 2017, 8:116-8.
- Gupta L, Aparna IN, Dhanasekar B, Prabhu N, Malla N, Agarwal P: Three-dimensional orientation of iris in an ocular prosthesis using a customized scale. *J Prosthodont*. 2014, 23:252-5. [10.1111/jopr.12104](#)
- Bi Y, Wu S, Zhao Y, Bai S: A new method for fabricating orbital prosthesis with a CAD/CAM negative mold. *J Prosthet Dent*. 2013, 110:424-8. [10.1016/j.prosdent.2013.05.003](#)
- Shetty PP, Chowdhary R, Yadav RK, Gangaiah M: An iris positioning device and centering approach: a technique. *J Prosthet Dent*. 2018, 119:175-7. [10.1016/j.prosdent.2017.01.018](#)
- Bhochhibhoya A, Mishra S, Mathema S, Acharya B, Maskey B: Alternative technique of iris orientation in a custom-made ocular prosthesis. *J Prosthodont*. 2019, 28:601-4. [10.1111/jopr.12687](#)
- Dasgupta D, Das K, Singh R: Rehabilitation of an ocular defect with intraorbital implant and custom-made prosthesis using digital photography and gridded spectacle. *J Indian Prosthodont Soc*. 2019, 19:266-71. [10.4103/jips.jips_226_18](#)
- Chihargo S: CRC1. Iris positioning technique by using optical vernier interpupillary distance ruler on the custom ocular prosthesis. *J Indian Prosthodont Soc*. 2018, 18:35. [10.4103/2F0972-4052.244655](#)
- Lanzara R, Thakur A, Viswambaran M, Khattak A: Fabrication of ocular prosthesis with a digital customization technique - a case report. *J Family Med Prim Care*. 2019, 8:1239-42. [10.4103/jfmpc.jfmpc_133_19](#)
- Jones JA, Edewaard D, Tyrrell RA, Hodges LF: A schematic eye for virtual environments. *IEEE*. 2016, 221-230. [10.1109/3DUI.2016.7460055](#)
- Eskridge JB, Amos JF, Bartlett JD: *Clinical Procedures in Optometry*. Lippincott Williams and Wilkins, Philadelphia, PA; 1991.