

Functional Customization Of A Stock Ocular Prosthesis For Rehabilitation Of An Enucleated Eye Socket: A Case Report

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ABSTRACT

Background:

Loss of an eye due to trauma has profound esthetic, functional, and psychological consequences. Although stock ocular prostheses provide a simple and economical rehabilitation option, their long-term use often results in poor adaptation, inadequate palpebral support, reduced prosthetic motility, and compromised facial esthetics. Functional customization of a stock ocular prosthesis represents a practical alternative that combines the affordability of stock prostheses with the improved adaptation of custom-made prostheses.

Case-Presentation:

A 62-year-old male presented with complaints of a loose ocular prosthesis, sunken appearance of the left eye, reduced palpebral opening, and poor prosthetic movement. The patient had undergone enucleation of the left eye following a stick injury during childhood and had been wearing the same stock ocular prosthesis for more than 40 years. Clinical examination revealed a healthy conjunctival socket without residual sclera or orbital implant. Mild mucoid discharge associated with prolonged use of the ill-fitting prosthesis was noted. A functional impression of the anophthalmic socket was recorded using medium-body addition silicone, following which the existing stock ocular prosthesis was customized by incremental wax additions during dynamic functional movements. An addition silicone putty index was fabricated to preserve the optimized contours, and the wax pattern was processed using clear self-polymerizing acrylic resin to obtain the definitive prosthesis.

Outcome:

The customized prosthesis demonstrated improved adaptation, enhanced palpebral fullness, satisfactory retention, and significantly improved prosthetic motility. At the 24-hour follow-up, the patient reported excellent comfort and satisfaction with the esthetic appearance, with no evidence of irritation or discomfort.

Conclusion:

Functional customization of a stock ocular prosthesis using dynamic wax contouring and a putty index transfer technique offers a simple, economical, and clinically effective alternative to conventional custom ocular prostheses. The technique provides improved palpebral support, enhanced prosthetic movement, and superior patient satisfaction while minimizing laboratory complexity and treatment cost.

INTRODUCTION

The loss of an eye due to trauma, congenital anomalies, or surgical removal results in significant esthetic, functional, and psychosocial impairment. Beyond the obvious facial disfigurement, patients frequently experience diminished self-esteem, social anxiety, and reduced quality of life.¹ Consequently, prosthetic rehabilitation of the anophthalmic socket constitutes an integral component of comprehensive patient care by restoring facial harmony, maintaining eyelid support, and improving psychological well-being.

Ocular prostheses can be broadly classified into stock prostheses and custom-made prostheses.^{2,3} Stock prostheses are prefabricated, readily available, require minimal clinical time and cost-effective; however, they rarely conform accurately to the unique anatomy of an individual socket. Inadequate

adaptation frequently results in poor retention, compromised prosthetic motility, insufficient palpebral support, accumulation of secretions, and unsatisfactory esthetics. On the other hand, custom-made ocular prostheses provide intimate adaptation to the socket, improved distribution of pressure, enhanced prosthetic movement, and superior esthetic outcomes. Nevertheless, their fabrication is time-consuming, technique-sensitive, and associated with increased laboratory procedures and cost. Various modifications of stock ocular prostheses have been described to combine the advantages of both approaches while reducing treatment complexity. Functional impression techniques enable accurate recording of dynamic socket anatomy during ocular movements, thereby improving tissue adaptation and transmission of muscular activity to the prosthesis.^{4,5} Similarly, contour modification during wax try-in allows restoration of eyelid fullness and facial symmetry, which is

frequently compromised in long-term wearers of stock prostheses.

The present case report describes the functional customization of a stock ocular prosthesis in a patient who had been wearing the same prosthesis for more than four decades following traumatic enucleation. By combining a functional socket impression, dynamic wax contouring, and contour transfer using an addition silicone putty index, an economical prosthesis with improved adaptation, palpebral fullness, retention, and prosthetic motility was successfully fabricated.

CASE REPORT:

A 62-year-old male presented to the Department of Prosthodontics, Crown & Bridge, Implantology and Maxillofacial Prosthodontics, KIMS Dental College and Hospital, Amalapuram, with the chief complaint of an unesthetic appearance associated with a loose ocular prosthesis in the left eye. The patient reported a progressively sunken appearance of the left orbit, reduced palpebral opening, and inadequate prosthetic movement, which adversely affected facial symmetry and self-confidence. (Fig 1)



Fig 1: Frontal view with patient's previous prosthesis and without prosthesis depicting insufficient palpebra.

The patient's ocular history revealed traumatic loss of the left eye following a stick injury sustained during childhood. Enucleation had been performed shortly after the injury. The patient had subsequently been rehabilitated with a stock ocular prosthesis, which had been in continuous use for more than 40 years without replacement. There was no history of systemic illness or previous reconstructive surgery involving the orbital socket.

Clinical examination revealed an anophthalmic socket lined with healthy conjunctival tissue. No residual scleral tissue or orbital implant was present. Mild mucoid discharge was observed and was attributed to prolonged use of the ill-fitting prosthesis. The existing stock prosthesis exhibited poor adaptation to the socket with unsatisfactory dimensions, inadequate support of the eyelids, reduced retention, and minimal prosthetic motility during ocular excursions. Loss of palpebral fullness resulted in a noticeable sunken appearance of the left orbit and asymmetry of the face. The contralateral eye was healthy and served as the reference for shade selection, iris orientation, and contour reproduction.

Considering the patient's financial concerns, the satisfactory condition of the socket tissues, and the limitations of the existing prosthesis, functional customization of a new stock ocular prosthesis was planned. The treatment objectives were to improve adaptation to the anophthalmic socket, restore palpebral fullness, enhance prosthetic movement, and achieve an esthetic appearance comparable to the contralateral eye while avoiding the complexity and cost associated with fabrication of a completely custom ocular prosthesis. Written informed consent was obtained from the patient before initiation of treatment and for the use of clinical photographs for academic publication.

STEPWISE PROCEDURE

Clinical Steps - Primary & secondary impressions:

The patient was seated in an upright position to simulate the natural orientation of the ocular tissues. Petroleum jelly was applied to the eyelashes to facilitate atraumatic removal of the impression material. A primary impression of the anophthalmic socket was made using irreversible hydrocolloid impression material (Pyrex, India), with the patient's existing stock ocular prosthesis serving as a custom impression tray. The impression was poured in Type IV dental stone to obtain the primary cast.



Figure 2: Primary Impression and primary cast and customized tray is fabricated with clear acrylic from primary cast.

The undercut areas on primary cast were blocked with modelling wax followed by fabrication of a custom tray with self-polymerizing clear acrylic material (Fig 2). A functional secondary impression was then obtained by injecting medium-body PVS (Aquasil LV Monophase, Dentsply Sirona, USA) directly into the socket via syringe (Fig 3), instructing the patient to perform gaze movements (medial, lateral, upward, downward) to capture dynamic tissue contours. The impression is retrieved & cast is poured using Type IV gypsum to obtain the definitive master cast.



Figure 3: Making of Secondary impression with medium body

Shade Selection, Try-in & Insertion:

The iris shade and scleral color were selected by comparison with the contralateral eye using a prefabricated stock ocular prosthesis. Iris positioning was determined by transferring measurements from contralateral eye marking the reference lines. The distances from the medial and lateral canthi to the centre of the iris were measured using a digital Vernier caliper and transferred to the prosthesis to reproduce the horizontal orientation accurately. Vertical positioning was verified clinically while the patient maintained a natural forward gaze. (Fig 4)



Figure 4: Marking the reference lines & determining the Iris position using contra lateral eye

To this stock tray the adjustments were made according to the secondary cast obtained, iris position was marked during dynamic eye movements for precise horizontal and vertical orientation, and the stock tray is seated into the secondary cast. Wax try-in initially revealed insufficient palpebral support, so during the wax trial, incremental additions of modelling wax were made over the prosthesis to compensate for the loss of soft tissue support associated with prolonged use of the ill-fitting prosthesis. The contour was progressively modified while evaluating facial symmetry, eyelid support, and ocular movements until satisfactory palpebral fullness and harmonious appearance with the contralateral eye were achieved. (Fig 5).

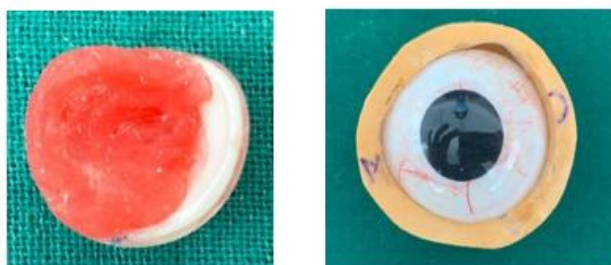


Figure 5: Prosthesis with wax adaptation after trial in patient and adapting the prosthesis to master cast

After clinical verification of esthetics, retention, and functional movements, an addition silicone putty index (Aquasil Putty, Dentsply Sirona, USA) was fabricated to preserve the three-dimensional contour established during the wax trial. The wax was subsequently replaced with clear self-polymerizing acrylic resin (DPI Self-Cure Clear Acrylic Resin, Dental Products of India Ltd., Mumbai, India) using the putty index as a guide to reproduce the verified contours accurately. The definitive prosthesis was finished, polished, disinfected, and inserted into the anophthalmic socket. The completed prosthesis demonstrated intimate adaptation to the socket with improved eyelid support, enhanced palpebral fullness, satisfactory retention, and coordinated prosthetic movement during ocular excursions. (Fig 6)



Figure 6: Post operative view of the patient after insertion of ocular prosthesis with fullness of palpebra

Post-Insertion Instructions:

Post-insertion instructions regarding hygiene maintenance, prosthesis cleaning, lubrication, and periodic clinical review were explained to the patient. Daily eyelash cleaning prevents mucous buildup; prosthesis cleaning uses sterile water and saline or boric acid rinses. Avoid unnecessary removal; use lubricant drops for moisture. Regular follow-ups with ophthalmologists and prosthodontists are advised.

DISCUSSION:

Rehabilitation of an anophthalmic socket represents one of the most demanding procedures in maxillofacial prosthodontics because successful treatment requires restoration of esthetics, eyelid support, prosthetic motility, and patient confidence.¹ The psychological consequences of ocular loss are often profound, and an acceptable prosthetic outcome contributes significantly to the patient's social interaction and quality of life.² Consequently, the prosthodontist must focus not only on replacing the missing globe but also on recreating facial symmetry and achieving harmonious integration of the prosthesis with the surrounding periorbital tissue. Stock ocular prostheses remain a widely used treatment option because they are economical, readily available, and require minimal laboratory procedures. Nevertheless, their prefabricated contours rarely correspond to the unique anatomy of an individual anophthalmic socket. Poor adaptation creates dead space between the prosthesis and socket tissues, leading to instability, inadequate transmission of muscular movements, accumulation of secretions, insufficient eyelid support, and compromised esthetics. These shortcomings become increasingly evident in patients who have worn the same prosthesis for several decades, as progressive soft tissue remodeling and age-related changes further reduce prosthetic adaptation.

The present patient had continuously worn the same stock ocular prosthesis for more than four decades following traumatic enucleation during childhood. Such prolonged use contributed to reduced palpebral fullness, diminished prosthetic movement, poor retention, and a noticeable sunken appearance. Although the conjunctival lining remained healthy, mild mucoid discharge was observed, which was considered secondary to prolonged use of an ill-fitting prosthesis rather than active infection. These findings emphasize the importance of periodic replacement or modification of ocular prostheses to maintain tissue health and functional performance. Although custom ocular prostheses remain the treatment of choice because of superior tissue adaptation and esthetics, they require multiple clinical appointments, artistic characterization of the iris and sclera, and greater laboratory expertise⁶. In contrast, stock ocular prostheses are economical, readily available, and require minimal laboratory procedures; however, they frequently demonstrate compromised tissue adaptation, inadequate palpebral support, and limited prosthetic motility owing to their standardized contours⁷. The present technique was developed to bridge this therapeutic gap by combining the simplicity and affordability of a stock ocular prosthesis with patient-specific functional customization, thereby enhancing adaptation, eyelid support, retention, and ocular motility without the complexity of fabricating a completely custom-made prosthesis.

The principal feature of the present technique was functional customization of the stock ocular prosthesis rather than fabrication of an entirely new prosthesis. A functional impression of the socket was recorded using medium-body polyvinyl siloxane while the patient performed ocular movements. Recording the socket under functional conditions allows dynamic tissue contours to be captured more accurately than static impressions, resulting in improved adaptation of the definitive prosthesis.^{8,9} Better adaptation facilitates transmission of muscular activity from the socket to the prosthesis and contributes to improved prosthetic motility. An additional distinguishing aspect of this technique was restoration of palpebral fullness by incremental wax modification during the trial stage.¹⁰ Instead of accepting the contours of the prefabricated stock prosthesis, the external surface was progressively modified while continuously assessing eyelid support, facial symmetry, and ocular movements.¹¹ This dynamic approach permitted individualized contour development according to the patient's anatomy and functional requirements. Restoration of eyelid fullness is particularly important because

inadequate support produces a sunken appearance, exaggerates facial asymmetry, and negatively influences the patient's psychological well-being.¹²

To preserve the contour established during the clinical wax trial, an addition silicone putty index was fabricated before processing the definitive prosthesis. Although this appears to be a simple laboratory procedure, it provides an important clinical advantage by accurately transferring the verified three-dimensional contour to the definitive acrylic prosthesis while minimizing distortion during processing. Consequently, the morphology approved during the clinical evaluation can be reproduced with minimal chairside adjustment.¹³ This step improves reproducibility and may reduce remakes or repeated contour modifications. The definitive prosthesis was processed using clear self-polymerizing acrylic resin, which provided a practical and economical alternative to conventional laboratory fabrication techniques. The use of self-polymerizing acrylic resin reduced processing time and enabled efficient reproduction of the customized contours established during the trial stage. For institutions with limited laboratory resources, this technique represents a feasible method of improving the performance of stock ocular prostheses without substantially increasing treatment cost.

At the 24-hour follow-up, the customized prosthesis demonstrated satisfactory adaptation, improved retention, coordinated prosthetic movement, and restoration of palpebral fullness. The patient reported excellent comfort and expressed satisfaction with the esthetics outcome. No evidence of irritation or discomfort was observed following insertion. Although the follow-up period was short, the immediate clinical outcome suggests that functional customization of a stock ocular prosthesis can provide meaningful improvements in both esthetic appearance and prosthetic function. Despite these favorable findings, certain limitations should be acknowledged. The technique remains dependent on a prefabricated iris and scleral shell; therefore, the esthetic outcome may not equal that achieved with a completely custom-made ocular prosthesis, particularly regarding iris characterization, scleral vascular detailing, and precise color matching.¹⁴ Furthermore, the findings presented in a single case cannot be generalized to all patients with anophthalmic sockets. Long-term clinical evaluation involving a larger number of patients is necessary to assess prosthesis longevity, tissue compatibility, maintenance requirements, and patient-reported outcomes.¹⁵

In this present case has prolonged use of the same ocular stock prosthesis for more than 40 years following traumatic enucleation. Long-term use of an ill-fitting ocular prosthesis can result in progressive anatomical changes within the anophthalmic socket, leading to reduced tissue adaptation, inadequate eyelid support, compromised prosthetic motility, and accumulation of secretions.¹⁶ The successful rehabilitation achieved in this patient highlights the importance of periodic clinical evaluation and timely replacement or modification of ocular prostheses¹⁷ to maintain optimal esthetic, functional, and psychological outcomes. Furthermore, the present technique demonstrates that functional customization of an existing stock ocular prosthesis can effectively restore palpebral fullness and improve prosthetic performance without the need for fabrication of a completely custom-made prosthesis.

Within these limitations, the present technique demonstrates that careful functional modification of a stock ocular prosthesis can substantially improve adaptation¹⁸, eyelid support, prosthetic motility, and patient satisfaction while maintaining simplicity, affordability, and clinical efficiency. The procedure may therefore serve as a valuable treatment alternative in patients

who are unsuitable for or unable to undergo fabrication of a completely custom ocular prosthesis.

CONCLUSION:

The present case demonstrates that functional customization of a stock ocular prosthesis is a simple, economical, and clinically effective approach for the rehabilitation of an anophthalmic socket. The combination of a functional impression technique, dynamic wax contouring, and contour preservation using an addition silicone putty index resulted in improved prosthesis adaptation, restoration of palpebral fullness, enhanced prosthetic motility, satisfactory retention, and excellent patient satisfaction. This technique successfully bridges the gap between conventional stock and completely custom-made ocular prostheses by combining affordability with patient-specific customization while reducing clinical and laboratory complexity. Functional customization of a stock ocular prosthesis using a functional impression, dynamic wax contouring, and putty index transfer technique provides a practical method for improving prosthesis adaptation without the complexity of fabricating a completely custom ocular prosthesis. The technique restores palpebral fullness, enhances prosthetic motility and retention, and improves facial symmetry while remaining economical and relatively simple to perform. It may be particularly beneficial in patients requiring replacement of long-standing stock prostheses and in clinical settings where laboratory resources or financial considerations limit fabrication of fully custom ocular prostheses.

Although the findings are limited to a single clinical case, this modified approach may serve as a practical treatment alternative for patients with long-standing ill-fitting stock ocular prostheses, particularly in resource-limited settings.

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