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CASE REPORT

Maxillofacial esthetic rehabilitation using bilateral custom ocular prosthesis in a case of anophthalmia and phthisis bulbi

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ABSTRACT

Bilateral loss of the eyeballs is a condition that not only causes visual impairment but also significantly impacts the patient's aesthetic appearance and psychosocial well-being. Rehabilitation through the fabrication of custom ocular prostheses can help restore facial appearance and patient self-confidence. This case report aims to describe the fabrication process and clinical outcomes of bilateral custom-made acrylic ocular prostheses in a patient with right-sided anophthalmia and left-sided phthisis bulbi. A 54-year-old male patient presented to the Prosthodontics Department at RSGM UNPAD, Bandung, with complaints of loose and uncomfortable right and left ocular prostheses. The patient had undergone enucleation of the left eye and had been wearing prostheses for the past five years. A new pair of custom ocular prostheses was planned. The treatment procedure included socket impression using polyvinyl siloxane (PVS), fabrication of a positive model, wax pattern try-in followed by acrylic sclera construction, manual iris painting, and application of clear acrylic as the final layer. The prostheses were inserted following a comprehensive evaluation of adaptation, retention, symmetry, and the psychological response of the patient and family. Custom ocular prostheses provide an effective rehabilitative solution for bilateral ocular loss. With an individually tailored design, they restore facial symmetry, enhance self-esteem, and reduce psychological distress. (IJP 2025;7(1):55-59)

Introduction

The human eye is a vital sensory organ that plays a crucial role in daily functioning and quality of life. However, the eye is also highly susceptible to various pathologies that can lead to functional impairment, permanent blindness, or the loss of the eyeball itself. Eyeball loss can result from several factors, including congenital defects or surgical removal necessitated by tumors, trauma, or other severe ocular diseases. Such a loss is a traumatic event, encompassing both medical challenges—specifically visual impairment—and psychological distress, such as the development of an inferiority complex due to altered social perception and appearance.[1,2]

Rehabilitative care through the fabrication of an ocular prosthesis is essential to restore the patient's aesthetic appearance and self-confidence. The primary advantage of an ocular prosthesis is its ability to return the patient's eye to a natural appearance, thereby mitigating the psychological trauma associated with eyeball loss and facilitating social reintegration. Furthermore, failure to promptly replace a lost eyeball with a prosthesis can lead to long-term complications, including the atrophy of surrounding tissues and eyelids. Functionally, an ocular prosthesis also serves to close the space between the upper and lower eyelids, preventing foreign bodies from entering the empty orbital cavity.[3,4]

Surgical interventions for eyeball removal include enucleation, evisceration, and exenteration.5 Enucleation involves the removal of the eyeball from the orbital cavity while preserving the attached extraocular muscles and the eyelids. Evisceration involves the removal of the internal contents of the globe, leaving the sclera (and occasionally the cornea) intact. Exenteration is the most extensive procedure, involving the removal of the entire eyeball along with all surrounding soft tissues within the orbit.[4,6] The success of an ideal ocular prosthesis, particularly following enucleation, depends on precise surgical execution, the formation of a near-normal conjunctival or mucosal environment, adequate prosthetic mobility, and the presence of functional, aesthetically normal eyelids.[7,8]

Ocular prostheses are categorized into two types: prefabricated (stock) and custom-made. The primary advantage of prefabricated ocular prostheses is the reduced clinical time, as they do not require laboratory processing stages. However, their disadvantages include a frequent lack of conformity to the patient's orbital socket and suboptimal aesthetic outcomes. In contrast, custom-made ocular prostheses offer superior comfort because they are fabricated to follow the precise contours of the orbital socket. Furthermore, custom-made prostheses provide better results as the scleral characterization and iris painting are tailored to match the contralateral eye using the aid of patient photography. Consequently, custom-made ocular prostheses are more acceptable to patients due to their precise

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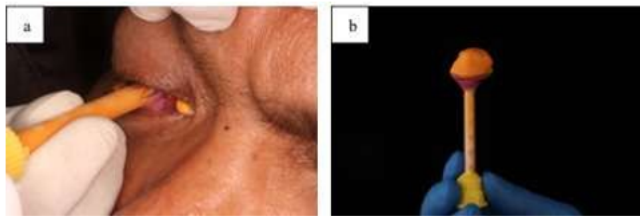

Figure 1. A and B. Impression using polyvinyl siloxane to capture the anatomy of eyeball socket.

Figure 2. Laboratory procedure: A. Investing, B. Application of separating agent, and C. Deflasking the acrylic sclera.

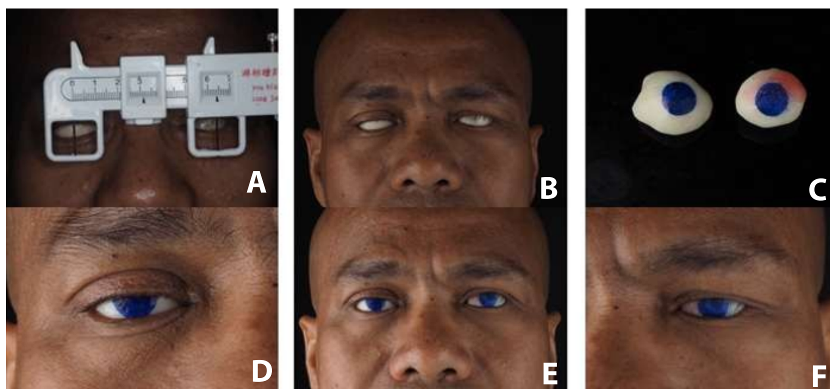

Figure 3. A. Measurement of pupil position using pupillary distance ruler, B. Try in the sclera, C. Mock-up of pupil and iris, D. Until, F. Try-in position of pupil and iris on both eyeball socket.

Figure 4. A and B. Iris area was reduced, C. Final ocular prothesis after finishing.

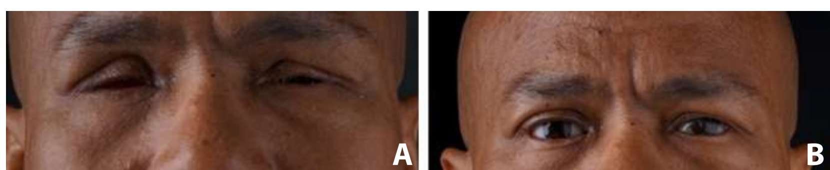

Figure 5. A. Clinical condition before insertion and B. Insertion of ocular prothesis

fit and enhanced aesthetic appearance.[4,9,10]

Phthisis bulbi represents an advanced stage of ocular pathology characterized by progressive globe shrinkage due to the cessation of aqueous humor production; the term 'phthisis' itself denotes 'wasting' in clinical terminology. This condition is marked by atrophy, shrinkage, and internal structural irregularities, leading to both visual loss and aesthetic distortion. Common etiologies include chronic uveitis (post-traumatic or otherwise), surgical complications, or end-stage glaucoma following intensive treatment.[11,12]

In cases of eyeball loss, immediate rehabilitation using an ocular prosthesis is needed. This prothesis is parts of an imperative maxillofacial prosthesis designed for orbital rehabilitation.[13] The primary objectives are to maintain a healthy socket, preserve eyelid blink function and lash position, prevent eyelid malposition, and ensure normal lid closure, all of which are critical for an ideal prosthetic outcome.[14,15] This case report discusses the fabrication of a custom acrylic ocular prosthesis for a patient with right-eye anophthalmos and left-eye phthisis bulbi, further complicated by a hypotonic and ptotic left eyelid.

Case Report

A 54-year-old male patient presented to the Prosthodontics Department at Oral and Dental Hospital (RSGM) UNPAD, Bandung, with complaints of loose and uncomfortable right and left ocular prostheses. The patient had undergone enucleation of the left eye and had been wearing prostheses for the past five years. The patient's medical history revealed that he had undergone enucleation of the left eye and had been wearing ocular prostheses for the past five years. He requested the fabrication of new ocular prostheses to improve both comfort and fit. Patient prothesis display iris and pupil asymmetry as well as inadequate retention. Extraoral clinical assessment revealed orbital sockets both left and right were wide and exhibited adequate depth. There is no sign of inflammation in bilateral conjunctiva and extraocular muscle movements were within normal limits for both side. Left palpebra shown significant drooping (ptosis) compared to the right side. Based on the clinical history and physical examination, the definitive diagnosis for this patient was right-sided anophthalmos post-enucleation and left-sided phthisis bulbi. The treatment plan involved the fabrication of bilateral custom ocular prostheses.

The initial clinical appointment focused on the fabrication of the custom ocular prosthesis. Prior to the commencement of the procedure, written informed consent was obtained from the patient as part of the ethical protocol. The procedure began with the irrigation and cleaning of the orbital cavity using sterile saline solution (0.9% NaCl) to remove any debris or tissue remnants. Subsequently, the fit of a custom-made impression tray, fabricated from self-cured acrylic resin, was evaluated. This tray was equipped with a Polyvinyl

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Siloxane (PVS) mixing tip to serve as an injection port for the impression material. The impression was recorded with the patient in a relaxed, upright sitting position using a PVS-based elastomeric material. The material was slowly injected through the port until it completely filled the anatomical structures of the socket, including the orbital and palpebral areas. This step aimed to obtain a precise negative impression of the socket, serving as the foundation for an accurate, individualized prosthesis figure 1A. During the impression process, the patient was instructed to maintain an open-eye gaze and perform functional ocular movements—such as opening, closing, and looking in various directions—to capture the dynamic anatomy of the orbital cavity. Once the PVS material had fully set, the impression was carefully retrieved from the socket figure 1B. The cavity was then clinically inspected to ensure that no material residue remained. The retrieved impression was disinfected with an alcohol spray before proceeding to the laboratory phase. The impression was then cast using Type III dental stone to produce a definitive positive model of the orbital cavity.

After the stone had set, a wax pattern was fabricated to form the initial prosthetic sclera. This wax pattern will be utilized in subsequent stages for contour refinement, iris positioning, and final characterization figure 2A.

During the second visit, a clinical try-in of the scleral wax pattern was performed. The wax pattern was inserted into the orbital socket for a comprehensive evaluation of its adaptation, retention, and the conformity of the scleral contour to the orbital anatomy. The assessment also included the convexity of the scleral surface and the functional mobility of the eyelids during opening and closing movements. Refinements were made while observing the patient from multiple perspectives to ensure maximum aesthetic resemblance to the natural eye. During the second visit, a clinical try-in of the scleral wax pattern was performed. The wax pattern was inserted into the orbital socket for a comprehensive evaluation of its adaptation, retention, and the conformity of the scleral contour to the orbital anatomy. The assessment also included the convexity of the scleral surface and the functional mobility of the eyelids during opening and closing movements. Refinements were made while observing the patient from multiple perspectives to ensure maximum aesthetic resemblance to the natural eye. The resulting mold was coated with Cold Mold Seal (CMS) as a separating medium and allowed to dry completely. Subsequently, an acrylic resin—specifically selected to match the patient's predetermined scleral shade—was packed into the mold figure 2B. The flask was then submerged in a water bath and processed (cured) at 80°C for approximately one hour. Following the cooling period, the acrylic sclera was recovered from the flask (deflasked). Any excess material (flash) was trimmed, and all sharp edges were meticulously smoothed and polished figure 2C.

During the third visit, the processed acrylic sclera was evaluated using the same criteria as the wax pattern try-in. The pupil position was determined using a Pupillary Distance (PD) ruler and marked on the scleral surface figure 3.

The iris diameter was then outlined, and the facial surface of the sclera was reduced by 1.5–2 mm using a fraser bur to accommodate the clear acrylic overlay. A 2 mm-deep iris seat with convergent walls was created using a fissure bur to ensure optimal retention figure 4A. To achieve a natural appearance, the limbal area was painted circumferentially with black pigment. The iris was manually characterized using acrylic paints to match the contralateral eye and allowed to dry thoroughly figure 4B. Vascularization was simulated by selectively applying red nylon fibers fixed with epoxy resin figure 4C. The characterized sclera was then re-invested in the flask, and clear acrylic resin was applied over the painted surface. After pressure-packing and flash removal, the prosthesis was cured in a water bath at 80°C for 90 minutes. Following a cooling period, the final prosthesis was deflasked, trimmed to remove sharp edges, and polished to a high-gloss aesthetic finish figure 4C.

The final ocular prosthesis was delivered during the fourth visit. The patient was seated in an upright, relaxed position for the insertion. The clinician then evaluated the prosthesis for fit, aesthetics, and comfort, following the same criteria established during the acrylic sclera try-in phase. Patient and family education was provided regarding the proper maintenance, removal, and insertion of the prosthesis. The specific instructions were as follows: (1) Instruction for removal the lower eyelid should be retracted downward while the patient looks upward, allowing the inferior margin of the prosthesis to be gently pulled out with a finger, and (2) Insertion of the prosthesis should be pre-moistened before placement to facilitate easier entry into the orbital socket. Follow-up appointments were scheduled at 24 hours and one week post-delivery. During these reviews, the patient reported being highly satisfied and comfortable, noting a significant restoration of selfconfidence and social acceptance figure 5.

Discussion

The fabrication of individualized ocular prostheses, also known as the custom ocular prosthesis technique, is a rehabilitative approach aimed at restoring both functional and aesthetic aspects in patients who have lost an eyeball.[16] In cases of bilateral ocular loss, rehabilitation becomes significantly more complex as it involves both orbital cavities. This condition profoundly impacts the patient's facial expressions and psychosocial wellbeing; therefore, an individualized approach to the design and fabrication of the prosthesis is essential to

ensure long-term clinical success and patient satisfaction.[3,17-19]

The custom-made technique offers several advantages over stock (prefabricated) ocular prostheses, particularly regarding anatomical adaptation and color matching. While stock ocular prostheses offer immediate availability, custom-fabricated alternatives are clinically superior as their precise adaptation to the ocular tissue bed eliminates the dead space associated with prosthetic-related infections and allows for the accurate anatomical restoration of iris positioning and periorbital aesthetics, including the correction of ptosis and palpebral fissure narrowing.[20] These prostheses are specifically tailored to the patient's unique orbital morphology, taking into account the shape, volume, and condition of the residual soft tissues. Besides, custom prostheses are designed to provide the illusion of a perfectly healthy eye and surrounding tissue and allow for precise iris button centralization, ensuring a symmetrical.[21] This precision is vital for bilateral cases, where achieving a balance between both sides of the face is the primary determinant of facial harmony and aesthetic symmetry.[22,23]

In the present case, given the diagnosis of a right anophthalmic socket (postenucleation) and left-phthisis bulbi, custom-made ocular prostheses were indicated. This modality provides superior contouring and more accurate color matching compared to mass-produced alternatives. Another advantages is optimal aesthetic outcomes were achieved by characterizing the iris color and positioning it to replicate a natural appearance. This case report use pupillary distance ruler to navigate the position of pupil position. Studies from Bhochhibhoya et al.[24] also ultilized of a pupillary distance ruler for iris positioning ensures an objective and accurate registration of prosthetic alignment, significantly reducing the margin of error associated with subjective conventional visual assessment.[24]

Furthermore, the psychosocial aspect is a primary concern in bilateral loss. Beyond the physical deficit, the loss of bilateral ocular structures impacts the patient's self-identity and social integration. Moreover, radical procedures from the surgical procedures can impact patient mental state. The prosthesis is a critical tool for the emotional rehabilitation of the patient, specifically designed to boost their psychological and mental state following those procedures by providing an aesthetic replacement, the prosthesis helps the patient cope with the trauma of losing a sense organ.[25] Consequently, a successful prosthesis must provide more than just aesthetic restoration; it must also restore the patient's self-esteem and emotional well-being, as measured by their ability to reintegrate into their community without fear of being viewed as different.[26] In this context, pre- and post-operative counseling are considered integral components of the holistic treatment plan.[15,27]

The prognosis for bilateral ocular prostheses depends on several factors, including the volume and condition of the residual soft tissue, the depth of the fornices, patient compliance with maintenance, and the frequency of follow-up care. Comprehensive education regarding the insertion, removal, and hygiene of the prosthesis is mandatory. Also, Rokohl et al.[29] stated that less frequent cleaning of ocular prostheses is generally better and recommend a monthly cleaning schedule rather than daily or weekly maintenance, advising patients to leave the prosthesis in place for as long as possible and to consult with the doctor.[28] Periodic evaluations are necessary to monitor tissue adaptation and to perform adjustments if required, especially as orbital dimensions may change over time due to tissue resorption or alterations in eyelid morphology.[29]

Given these complexities, rehabilitating bilateral ocular loss with custom techniques requires a multidisciplinary approach. Collaboration between maxillofacial prosthodontists, ophthalmologists, and clinical psychologists is highly recommended to guarantee optimal functional, aesthetic, and psychosocial outcomes. It should be noted that in this specific case, the shrunken state of the left globe (phthisis bulbi) prevented the prosthesis from filling the socket as optimally as the right side. This resulted in minor asymmetry and limited muscle motility in the left socket. To address ongoing changes, it is generally recommended that ocular prostheses be replaced every 2 to 5 years. This ensures the appliance continues to adapt to anatomical changes in the socket, maintains color stability, and ensures healthy contact with the surrounding tissues.[30]

Conclusion

Custom ocular prostheses represent a superior rehabilitative option for patients with bilateral ocular loss, as they can be precisely adapted to the individual morphology of each socket. Bilateral loss of the eyes not only results in visual deficits but also has a significant impact on the patient's psychosocial well-being. Through a precision design approach, custom ocular prostheses enable aesthetic restoration that closely mimics natural eyes, including iris and eyelid symmetry. This ultimately enhances the patient's comfort, self-confidence, and social acceptance in their daily life.

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