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CASE REPORT

Custom ocular prosthetic rehabilitation in patient with Post-enucleation deep eye socket using iris button technique

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Keywords: Custom ocular prosthesis, Iris button, Physiologic impression

ABSTRACT

The eyes are a vital component of facial esthetics and expression. Ocular defects can have a significant psychological impact on patients. An ocular prosthesis is an artificial maxillofacial prosthesis used to restore the appearance of a missing eye. It can be customized to replicate the patient's natural eye in terms of color, shape, size, and movement, resulting in a realistic and natural-looking outcome. The objective of this case report is to explain the procedural steps involved in the fabrication of a custom ocular prosthesis, employing an impression technique using a custom tray and incorporationg the iris button technique. A 36 years old female patient came to RSGM Padjadjaran University to fabricate a new eye prosthesis. The patient had a prior medical history of a severe ocular infection, which necessitated enucleation surgery. The ocular prosthesis was fabricated using an impression technique with a custom tray, employing a physiological impression method to capture the deep regions of the superior palpebral socket. The sclera, iris, and pupil were fabricated using the iris button technique. Custom ocular prostheses incorporating physiological impression technique and iris button technique offer ocular prosthesis with good stability and more natural appearance. (IJP 2025;6(2):97-102)

Introduction

The eyes are a vital component of facial esthetics and expression. The loss of an eye may exert both physical and psychological impacts on the patient, ultimately compromising overall quality of life. This condition may arise from various causes, including malignancy, congenital anomalies, severe trauma, a painful non-functional eye, or infection.[1]

Surgical management of severe ocular conditions may involve evisceration, enucleation, or exenteration. Evisceration involves the removal of the eye's internal structures while the sclera and, in some cases, the cornea are left intact. Enucleation, by contrast, refers to the complete removal of the globe along with a portion of the optic nerve from the orbital cavity. In more severe cases, exenteration involves the total removal of all structures inside the orbit, with extraocular muscles, in a single surgical procedure.[1]

Ocular prostheses serve not only to restore facial esthetics but also to improve psychological health and reinforce patient self-esteem. They represent an essential component of maxillofacial rehabilitation, mitigating both the functional and psychosocial sequelae of eye loss. Defined as a maxillofacial prosthetic device, an ocular prosthesis is specifically fabricated to reestablish the natural appearance of a missing eye.[2] Prefabricated stock ocular prostheses are selected to approximate the patient's ocular characteristics, while custom ocular prostheses are manufactured specifically to match the patient's eye socket shape.[3] The use of custom-made ocular prosthesis is particularly beneficial due to the individualized nature of each socket, requiring precise sizing and shaping of the prosthesis It can be customized to replicate the patient's natural eye in terms of color, shape, size, and movement, resulting in a realistic and natural-looking outcome.[2]

Until now, practitioners have endeavored to construct custom ocular prostheses that exhibit precise adaptation to the surgically treated socket. Such outcomes can be attained by performing an accurate impression of the ocular socket. Herein, a functional ocular impression technique is presented to achieve a better fit of the prosthesis to the defect area. This technique aims to combine cosmetic excellence with comfort for greater benefit to the patient.[4]

One of the essential components in the fabrication of an ocular prosthesis is the replication of the iris. One technique to fabricate custom ocular prosthesis is using iris button technique. Various techniques have been described for obtaining iris buttons, including the use of prefabricated stock eye irises, photographic printing on paper, hand-painting with oil-based pigments, and the incorporation of electronic components for dynamic iris simulation. Among these, hand-painting with oil paints remains the most widely practiced approach due to its adaptability and precise color control through pigment blending during the painting process. This method is also capable of producing aesthetically superior, three-dimensional iris reproductions.[5] Several techniques have been proposed for determining iris orientation in custom-made ocular prostheses. Conventional visual assessment is inherently subjective and often yields inaccurate positioning. To overcome this limitation, a more precise method utilizes the pupillary distance (PD) ruler, an instrument originally employed in optometry for spectacle fitting. The PD ruler

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Figure 1. Clinical view of the patient's ocular socket

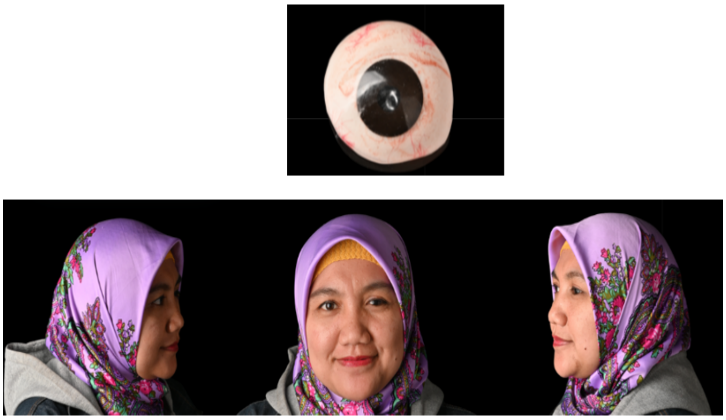

Figure 2. A. Patient's Prefabricated Ocular Prosthesis, B. Extraoral views of the patient with prefabricated ocular prosthesis; right lateral view, C. Frontal view, D. Left lateral view

Figure 3. A. Custom Impression Tray, B. Impression Procedure in the Patient

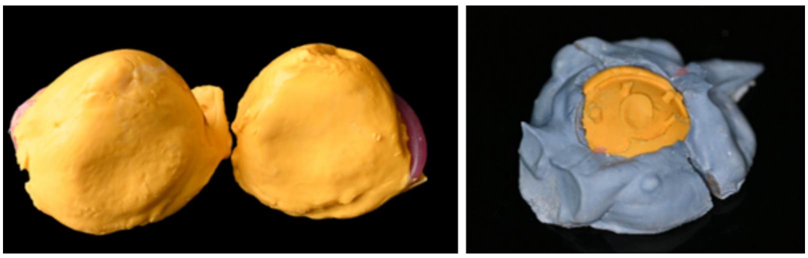

Figure 4. A. Impression of the Patient's Ocular Socket using PVS light body, B. Working Model

enables accurate measurement of both binocular interpupillary distance and monocular pupillary distances, thereby minimizing operator bias associated with traditional techniques.[2]

The objective of this case report is to explain the procedural steps involved in the fabrication of a custom ocular prosthesis, employing an impression technique using a custom tray and incorporationg the iris button technique.

Case Report

Case Presentation

A 36-year-old female patient presented to the Dental Hospital of Universitas Padjadjaran with a complaint of loss of the left eyeball since seven years ago. The patient had undergone enucleation of the left eyeball due to an abscess in the ocular socket. She works as a kindergarten teacher, which requires her to interact with many people on a daily basis. The patient had been wearing a prefabricated ocular prosthesis and had replaced it several times due to discomfort. The prefabricated prosthesis was loose, causing frequent rotation of the iris and pupil. In addition, the prosthesis often irritated the ocular socket, occasionally resulting in bleeding. The patient requested a new ocular prosthesis that would provide comfort, proper adaptation to the socket, and satisfactory esthetics.

The examination of the eye socket revealed a healthy conjunctiva without signs of infection or inflammation covering the posterior wall of the anophthalmic socket. In addition, the patient's ocular muscles appeared collapsed, resulting in a sunken eye appearance. Examination of the ocular socket showed a very deep superior region with a slight bulge in the superolateral area, while the inferior region appeared very shallow figure 1.

The operator also examined the patient's prefabricated ocular prosthesis. The shape and size of the prosthesis did not correspond to the patient's socket. The iris diameter was disproportionate compared to the contralateral pupil. Furthermore, the scleral portion exhibited extensive reddish discoloration, which did not match the contralateral sclera figure 2.

After a comprehensive examination, the diagnosis was established as anophthalmic left eye post-enucleation due to socket abscess. Differential diagnoses included phthisis bulbi, microphthalmia, congenital anophthalmia, and post-traumatic ocular atrophy. A treatment plan was then formulated according to the patient's condition. The main challenge in this case was the excessively deep superior socket and the very shallow inferior socket, which made it difficult to achieve adequate retention and stabilization. The ocular prosthesis fabrication technique selected for this case was the iris button method.

At the first visit, the patient completed an informed consent form. The procedure was then initiated by fabricating a custom impression tray using a light-cured acrylic material, which was connected to a straw to provide access for the insertion of impression material figure 3A. Prior to trying the tray in the patient's eye, the ocular socket was cleaned with sterile sodium chloride solution to remove any debris or dirt. Subse-

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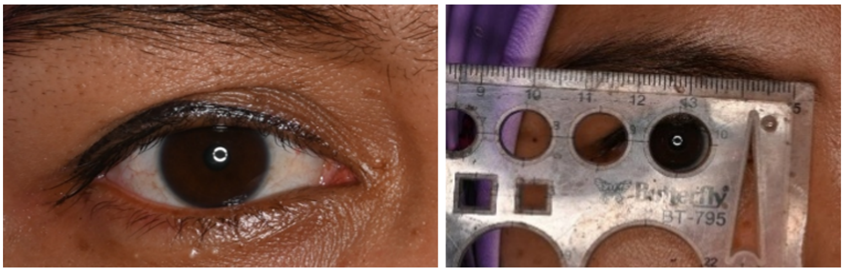

Figure 5. A. Photograph of the Patient's Normal Right Eye, B. Measurement of Iris Diameter Using a Ruler

Figure 6. Fabricated Iris Button

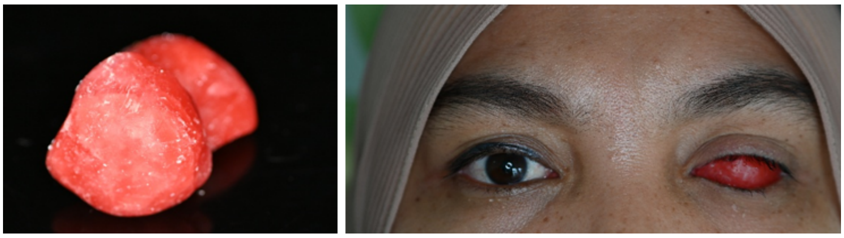

Figure 7. A. Sclerae Wax Template, B. Try-in of the Scleral Wax Template in the Patient's Eye

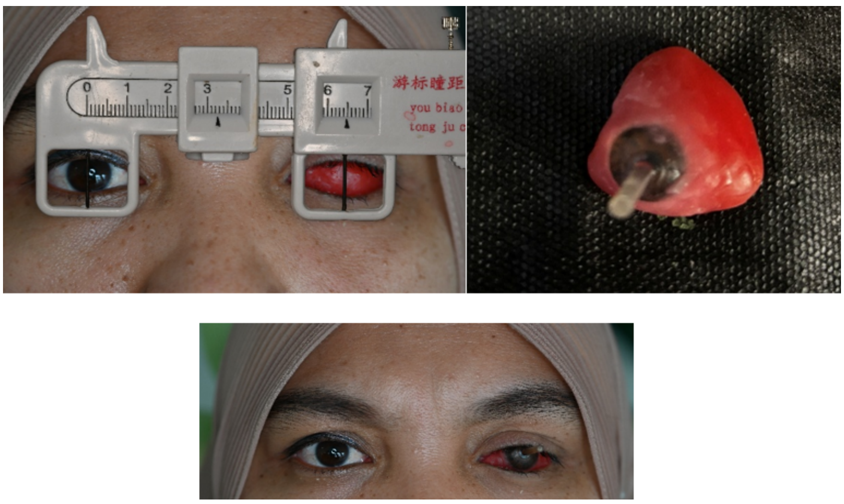

Figure 8. A. Determination of pupil position using a PD ruler, B. Wax Pattern with Attached Iris Button, C. Try-in of the Wax Pattern and Iris Button in the Patient

quently, the custom impression tray was tried in the patient's socket, and necessary adjustments were made to ensure proper fit and adaptation within the socket.

Before making the impression, an escape hole was created in the custom impression tray. The impression of the ocular socket was made using polyvinyl siloxane (light body) impression material. Prior to inserting the material into the socket, the patient's eyelashes were coated with Vaseline. The impression material was then slowly and evenly injected into the socket until it flowed into the orbital and palpebral areas. During the impression procedure, the patient was instructed to keep the eyes open and to move them to the right, left, upward, downward, and to blink slowly. The impression tray was removed after the PVS material had set figure 4A. The ocular socket was examined again to ensure that no impression material remained inside. The impression was disinfected with alcohol spray and poured with dental stone figure 4B.

During the first visit, a photograph of the patient's normal right eye was also taken figure 5A. This served as a reference for the fabrication of the iris button of the left ocular prosthesis. In addition, the diameter of the patient's iris was measured using a ruler to guide the adjustment of the iris button to be fabricated figure 5B. Thereafter, the reference is transferred to the laboratory to serve as a basis for the fabrication of the iris button figure 6.

At the second visit, a scleral wax template was fabricated from the working model figure 7A. The scleral wax template was tried in the patient's ocular socket figure 7B. All wax surfaces The wax surfaces were carefully contoured and smoothed to prevent irritation to the socket. The contour and convexity of the wax were then evaluated and adjusted to match the patient's normal right eye. The patient was instructed to open and close the eyes, as well as to move them in all directions. The scleral wax should demonstrate good retention and stability. The patient was able to close the eyes completely, and during eye movements, the wax remained in position without rotation or dislodgement from the socket.

Subsequently, the position of the pupil was determined using a PD ruler figure 8A The PD ruler was placed as close as possible to the patient's eye, and markings were made on the wax template. The wax was then slightly heated, and the previously fabricated iris button was inserted into the wax figure 8B. The template was reinserted into the patient's eye, and the position of the iris button was evaluated to ensure alignment with the contralateral normal eye figure 8C.

The wax pattern with the attached iris button was then sent to the laboratory for processing. The scleral portion was packed with white acrylic resin, and red fibers were incorporated to simulate blood vessels. The external surface was subsequently laminated with clear acrylic resin to provide a glossy appearance and resemble the natural eye figure 9.

The third visit consisted of the insertion of the

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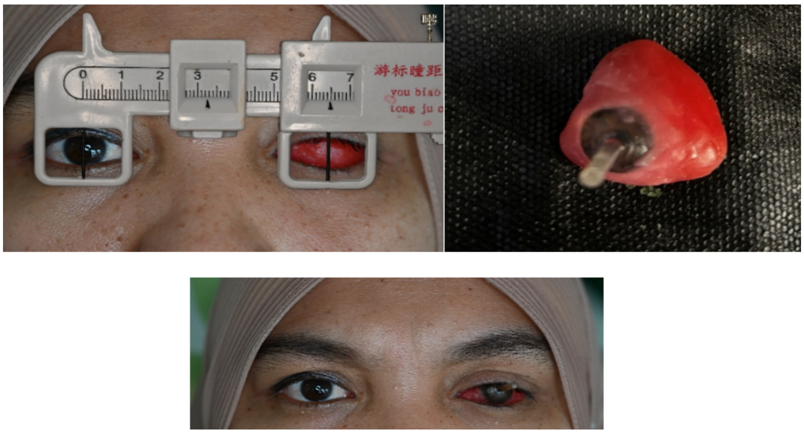

Figure 8. **A. Determination of pupil position using a PD ruler, B. Wax Pattern with Attached Iris Button, C. Try-in of the Wax Pattern and Iris Button in the Patient**

Figure 9. **Final Ocular Prosthesis after Packing**

Figure 10. **Ocular Prosthesis Inserstion; A. Frontal View, B. Lateral View, C. Frontal View When Patient Close Eyes**

ocular prosthesis figure 10. The patient was instructed to sit upright and remain relaxed. The ocular prosthesis was inserted into the patient's eye socket, after which the patient was asked to open and close the eyes slowly. The eyelids had to be able to close completely. The patient was also instructed to move the eyes in all directions and to bend the head forward. The ocular prosthesis was required to demonstrate adequate retention and stability. It had to fit properly, without rotation or dislodgement during functional movements, and should not fall out when the patient bent forward. The patient was instructed to return for a follow-up visit one week later.

At the fourth follow-up visit, the patient was asked about any complaints of pain or discomfort. Areas causing excessive pressure were adjusted on the ocular prosthesis and subsequently polished. Following these adjustments, the patient reported comfort, and the prosthesis demonstrated stable function without dislodgement.

Discussion

The eye is a vital organ because of its complex structure and key role in vision. Loss of vision from different causes can lead to both physical difficulties and emotional distress.[6] Anophthalmia can arise from various etiological factors, predominantly injuries and neoplasms, often following enucleation, evisceration, or exenteration of the eye globe and surrounding orbital tissues. In the present case, the patient developed recurrent socket abscesses, which eventually required surgical management through enucleation. Enucleation specifically involves the removal of a diseased globe from the orbit.[7] The recommended time for initiating ocular prosthesis fabrication is within 6–8 weeks after surgery. Patients should be encouraged to report for prosthetic rehabilitation during this period, as the prosthesis can be constructed concurrently with the healing process.[4]

Patients undergoing enucleation require an ocular prosthesis to compensate for the loss of the natural eye.[8] From a clinical perspective, the desired outcome includes correct eyelid positioning, adequate blink function, normally aligned eyelashes, symmetry with the unaffected eye, good motility, and fabrication of a customized prosthesis.[9] Ocular prostheses serve as comprehensive corrective solutions for post-enucleation defects, fulfilling both functional and aesthetic roles. They contribute to the restoration of facial symmetry, prevention of eyelid malposition, protection of the anophthalmic socket, regulation of tear flow, and reduction of intra-cavity fluid accumulation. Furthermore, they support eyelid function, enable natural eye-opening, and partially reestablish motility while providing a lifelike cosmetic appearance. Importantly, such rehabilitation has profound psychosocial benefits, enhancing patient confidence, improving interpersonal relationships, and ultimately contributing to better quality of life.[10]

Several methods have been proposed throughout the years for constructing ocular prostheses.11 Ocular prostheses are classified into custom-made and prefabricated types. The rehabilitation of anophthalmic sockets represents a significant challenge for dental clinicians, primarily because of cicatricial contraction, progressive atrophy, and tissue changes. As in the present case, the patient had undergone enucleation seven years earlier and had repeatedly worn prefabricated ocular prostheses that did not properly conform to the socket. This led to muscular atrophy and alterations in the surrounding tissue

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architecture, factors that require careful consideration in the design and fabrication of a custom ocular prosthesis. This complex condition necessitates careful consideration of the prosthesis dimensions and contour to achieve optimal outcomes in terms of realistic appearance and symmetry.[12] Custom-made ocular prostheses improve cosmetic results and cause less discomfort for patients. They mimic the lost eye in color, contour, and size, helping to restore facial symmetry. Because they fit closely to the socket tissues, they prevent fluid buildup, keep the tissues healthier, and lower the risk of irritation or infection. They also spread pressure more evenly, reducing the chance of conjunctival abrasion.[8,10]

In this case, impression of the ocular socket was made using a custom tray. Many authors have recommended making a custom tray for ocular impressions. In this instance, creating the personalized tray was an easy and quick workaround. To obtain a good fit, it has also been recommended to modify an existing stock or custom ocular prosthesis using relining material.6 Accurate impression of the defect is a key factor for the successful prosthetic rehabilitation.[8] There are several impression techniques available for obtaining an ocular anophthalmic cavity impression.[11] The technique used in this case report is physiologic impression technique. After the material is injected to the eye socket, the patient was directed to move his eyes up and down, left and right. This will facilitate the flow of the impression material to all aspects of the socket. The polyvinyl siloxane light body elastomeric impression material to achieve the minute details of the defect at resting as well as functional movement.[8]

The reproduction of the iris, especially with respect to its position, size, and color, is critical for the aesthetic success of an ocular prosthesis. Given the technique sensitivity of iris positioning, reliance on visual judgment alone is often inadequate. To ensure precision, a PD ruler is utilized to locate and align the iris accurately on the custom-made prosthesis. The midline is delineated using the ruler while the patient fixes their gaze on a distant point in primary position.[8] The diameter of iris is also important. In this case, It was achieved by measuring the diameter of iris using iris diameter template as the picture above. Roberts et al. recommended the use of a pupillometer for precise pupil alignment in ocular prostheses. In their method, a transparent graph template was employed to accurately determine iris position, thereby minimizing the interobserver variability associated with visual assessment alone, which is prone to binocular vision and parallax errors. This technique is simple and can be readily implemented in routine clinical practice.[13]

The color of iris is also important. Many have suggested various techniques for obtaining colored match iris as with the natural companion eye; such as the use of a digital photography, prefabricated iris from stock eye shells and iris painting using dry earth pigments or oil colors mixed into a painting medium called monopoly.[8] For this case, the iris of the ocular prosthesis was colored using the hand oil painting technique. Zoltie et al. emphasized that hand painting remains the gold standard in artificial eye fabrication, as no scalable alternative has proven equally effective. Oil paints are particularly advantageous due to their versatility and wide color range. This technique allows precise color control, enabling the creation of highly individualized, realistic, three-dimensional irises that surpass results achieved with photoprinting or prefabricated stock options. When performed by a skilled operator, hand painting ensures optimal color blending and produces a natural iris closely resembling the patient's contralateral eye.[14]

In this case, the iris of the ocular prosthesis was fabricated using the iris button method. The iris button technique has been proven to be a reliable method in ocular prosthesis fabrication. According to Dasgupta, et al., this approach allows for highly precise iris reproduction, resulting in superior aesthetic outcomes that closely resemble the patient's natural eye.[15] Putra et al., suggested that this method produce a highly natural, three-dimensional, and textured iris that enhances the aesthetic appearance of the ocular prosthesis.[16] Besides, These techniques have demonstrated advantages, such as simplifying the fabrication process and reducing chairside time.[17]

Conclusion

The rehabilitation of an anophthalmic socket with a custom-made ocular prosthesis provides not only esthetic improvement but also psychological and functional benefits for the patient. The use of a physiologic impression technique allowed for accurate reproduction of the socket anatomy, ensuring proper adaptation, comfort, and stability of the prosthesis. Incorporating the iris button technique enabled precise replication of the contralateral eye in terms of size, color, and position, thereby enhancing the natural appearance of the prosthesis. This case highlights that custom ocular prostheses fabricated with these techniques are a reliable treatment option to offer good stability and a more natural appearance, thereby restoring facial esthetics, promoting patient confidence, and improving overall quality of life.

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