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(CASE REPORT)

Custom-made ocular prosthesis: Left microphthalmia congenital abnormalities

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Abstract

A person with eyeball abnormalities or undeveloped eyeballs will definitely have reduced self-confidence, quality of life and psychological decline. Because the eyes are one of the most important aspects of life. Therefore, making eye prostheses is an important role in overcoming complaints and a person's quality of life. This case report explains in full the process from the initial stage to completion of making an eye prosthesis for a patient, where in this case there was a defect in the patient's left eye area caused by an abnormality in the development of the eyeball since birth. Making eye prostheses focuses on the size of the eye prosthesis, the color of the eye sclera, the size and color of the iris and the size of the eye pupil. This must be adjusted to the antagonist to get good aesthetics. Therefore, in this case, a custom-made prosthesis is used rather than a stock eye to achieve the desired fit. One of the advantages of using a custom-made prosthesis is that you can adjust the prosthesis to the condition of the available tissue, the results are more natural, and the cost is more affordable than stock eye prosthesis.

Keywords: Ocular Prosthesis; Custom made; Congenital; Microphthalmia

1. Introduction

The eyes are an important part of facial expression and an important organ of vision. Apart from vision loss, eye loss/defects can also cause physical deformity which can affect the patient's psychological condition and reduce the patient's quality of life. One type of maxillofacial prosthesis to replace the eye is an ocular prosthesis. An ocular prosthesis can replace eye loss due to trauma, surgery or congenital disease, but this prosthesis cannot replace the eyelids, skin, mucosa or muscles around the eye [1].

The use of eye prostheses has been shown to have a positive effect on psychological well-being and increase patient self-confidence [2]. These prostheses play an important role in aesthetic rehabilitation, addressing the physical and emotional problems associated with eye loss [3].

Ocular prostheses are divided into 2 types, namely stock ocular prosthesis and custom made. Stock ocular prostheses are prostheses that have been made with standard variations, sizes and colors for the right and left eyes, so that the suitability of color, size and direction of view is limited. The stock ocular prosthesis is characterized by a very concave shape at the back of the eye. The empty back can accommodate various shapes and sizes of orbital implants but can allow accumulation of socket secretions in the space between the prosthesis and orbital tissue. To avoid this deficiency, a custom-made ocular prosthesis can be made that fits better, has a more appropriate color, a more natural anatomical contour of the eye, and can increase the adaptation of eyeball movements so that it can follow the position of the original iris [4].

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In this case, we will explain step by step how to make a custom-made ocular prosthesis.

2. Case Report

A 26 year old female patient came to the RSKGM-P Universitas Airlangga Prosthodontics specialist clinic wanting to have an eye prosthesis made to replace the left eyeball defect which had not developed properly since birth. The patient had no history of systemic disease. The patient has never used an eye prosthesis. (Figure 1) The patient's left eyeball is visible, which is not fully developed and is covered with a white layer. The patient's left eye muscles can still move when making glancing movements. The patient did not feel any pain during palpation.

Figure 1 Initial condition of patient

2.1. Fabrication Method

First, print the patient's eye defect using a custom printing spoon with irreversible hydrocolloid (alginate) printing material (Figure 2). The impression material is applied using a syringe until it is evenly distributed throughout the defect, then the impression spoon is slowly inserted into the impression material and the patient is instructed to close their eyes (Figure 3).

Figure 2 The printing process on the eye defect area**.**

Figure 3 The results print the patient's eye defects

Embedding the impression of the patient's eye defect into type III gypsum to obtain a mold to make a wax pattern. After setting the medial part of the gypsum is sawed and broken, then the impression spoon is taken and a mold is obtained that matches the patient's eye defect (Figure 4).

Figure 4 Gypsum mold results for making wax patterns

The gypsum mold is soaked in water then filled the mold obtained with melted red wax and waited until the red wax hardens. After hardening, the mold is opened and the wax pattern is taken, then the wax pattern is smoothed (Figure 5).

Figure 5 Night pattern

Try the ocular prosthesis night pattern on the patient. When installing the night pattern, corrections are made to the size and convexity of the protest and patient comfort. After the patient feels comfortable, the iris focus point is recorded, the iris diameter is measured, and the iris color is determined according to a normal eye (Figure 6).

Figure 6 Try in on the patient

Embed the wax pattern into type III gypsum to get a mold to make the sclera (Figure 7).

Figure 7 Make a sclera pattern on a mold that has been made using self-cure acrylic material (Stellon) no. 3

Try the scleral pattern on the patient. When trying on the scleral pattern, corrections are made to the size and convexity of the prosthesis, as well as the patient's comfort when using the scleral pattern, and adjustments are made to the focus point and diameter of the iris that has been made (Figure 8).

Figure 8 Try attaching the sclera

Punch a hole in the sclera pattern that has been made according to the width of the iris diameter that has been determined and coat the sclera pattern that has been punched with a thin layer of wax in preparation for making a clear acrylic layer (Figure 9 and 10).

Figure 9 The sclera has been perforated according to the size of the iris

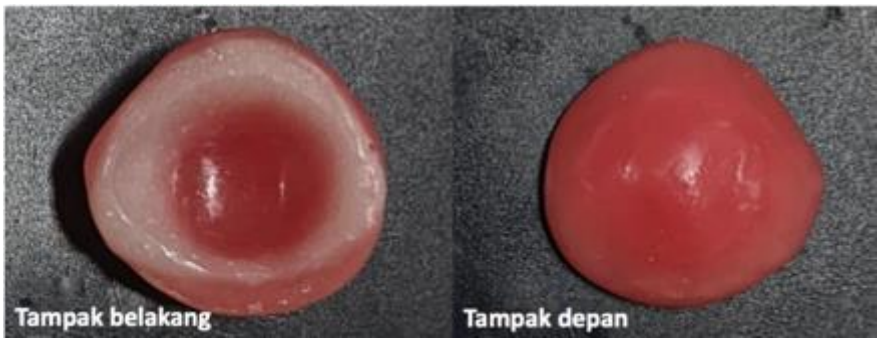

Figure 10 A pattern of sclera that has been coated with a thin layer of wax.

Embedding the sclera pattern that has been coated with wax into the cuvette. After setting the gypsum, the cuvette is opened and the night is removed. Provide the formation of blood vessels in the sclera pattern using red thread. Coat the sclera pattern with clear acrylic. Applying cold mold seal (CMS) to the gypsum surface. The clear acrylic layer is made using heat cured acrylic (Probase). Powder and liquid acrylic are mixed in a ratio of 22.5:10, after the dough phase the acrylic is applied to the cuvette and coated with wet cellophane plastic first, then the cuvette is closed and pressed until the excess acrylic comes out, then the cuvette is opened and the excess acrylic around the sclera pattern is cleaned . Then the cuvette is closed again and pressing is carried out without the cellophane plastic layer. Next, heat polymerization was carried out in water at a temperature of 100°C for 45 minutes. After cooling, the cuvette is opened and the prosthesis is removed. Next, polishing is carried out on the prosthesis (Figure 11).

Figure 11 Try coating clear acrylic on the sclera pattern

Perform iris coloring. Before staining, a hole is made in clear acrylic the size of the pupil diameter at the patient's focus point. Staining is done using oil paint and adjusted to the patient's normal eye color (Figure 12 and13).

Figure 12 Match the diameter of the eye pupils

Figure 13 Iris color matching

Cover the posterior part of the prosthesis using self-cure acrylic and restore the dipole prosthesis until it is shiny (Figure 14).

Figure 14 Final results of left ocular prosthesis in patients

When inserting the eye prosthesis, the stability of the prosthesis and the patient's comfort when using the prosthesis are evaluated. The patient admitted that he felt comfortable. In daily use, patients are trained how to remove and install the prosthesis and are instructed to remove the prosthesis only when cleaning. The prosthesis is cleaned at least once a week using liquid soap and running water. Patients are instructed to have routine control every 3-6 months (Figure 15).

Figure 15 (A) The patient before using the eye prosthesis, (B) The patient after using the eye prosthesis.

3. Discussion

The use of an ocular prosthesis is highly recommended, because it can effectively replace the entire eye or damaged parts of the eye, such as the outer part of the sclera, thereby restoring the appearance of the eye [5].

The ocular prosthesis is expected to provide aesthetics that are in harmony with the natural appearance of the existing natural eye, especially in the accurate placement of the iris, because if the placement is incorrect, it will cause the eye to appear asymmetrical [6]. The obtained anatomical retention of the soft tissue structures around the eye and eyelids contributes to accurate duplication of the size, color and natural contour of the eye socket, resulting in a more natural and symmetrical appearance of the prosthesis [7].

Printing of the ocular defect in this case was carried out with a material that does not irritate the eye cavity, namely irreversible hydrocolloid. The sitting position when printing is an upright position with the head resting on the headrest. This position causes the eyelids and surrounding tissue to be positioned relative to gravity. An eye molding spoon is placed on the defect before making the mold to ensure there is no overextension, then from the mold a night model is made which will be tried on and adjusted to the patient's condition before making an acrylic prosthesis [8,9].

There are various techniques for determining the alignment of the iris location in an ocular prosthesis. Visual observations carried out conventionally are subjective and produce inaccurate measurements. Currently there is a tool called a PD ruler (pupillary distance ruler). PD Ruler is a tool like a ruler that is used to measure the distance between

pupils in optometry for fitting glasses so that it can eliminate calculation bias between operators. This instrument can effectively measure the binocular pupil distance as well as the right and left individual pupil distance. [10].

The success of an ocular prosthesis, apart from having good aesthetics, comfort when used also needs to be considered. Custom-made ocular prostheses, because they are adapted to the shape and size of the patient's eye, can provide era adaptation between the prosthesis and the eye tissue, resulting in a more even pressure distribution. In addition, if the eye prosthesis has good contact with the surface of the eye, can improve tissue health by reducing fluid accumulation which can cause irritation and bacterial growth [11].

In daily use, there are several instructions that need to be conveyed to patients in order to maintain healthy eye sockets. Patients are trained how to remove and install the prosthesis so that it is comfortable when used. Patients do not need to remove the prosthesis other than for cleaning. Cleaning is done between 1-6 months using mild soap and rinsing well. This is because when inserting and removing the eye prosthesis, there is the possibility of irritation of the tissue around the eye, the presence of bacteria and viruses, as well as the need for re-adaptation of the tissue around the eye. However, it is still necessary to keep the prosthesis clean by irrigating the eye socket with saline with the help of a syringe. The presence of tear protein deposits can help prosthesis adaptation but should not be allowed to deposit too much. The prosthesis must be protected from scratches or deposits. If there are scratches, the patient must be controlled to re-polish the prosthesis. Routine control every 6 months needs to be carried out for inspection and evaluation [8,9].

4. Conclusion

Having an eye disorder or losing an eye can reduce the sufferer's self-confidence and reduce the quality of life. The use of eye prostheses is considered to be one of the successes in improving this quality. Costum-made prosthesis is the creation of an eye prosthesis that adapts to the condition of the defect being experienced and can be made very naturally according to the condition of the adjacent eye or the condition of the patient's profile.

Compliance with ethical standards.

Disclosure of Conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participant included in the study.

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