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Determination Of Iris Custom Ocular Prosthesis With Facebow Bioart Modified Eyebrow Ruler (FBMER) In Post Enucleation Socket Syndrome

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Abstract:
Background: *Prolonged Use Of Stock Eyes After Enucleation Causes Post-Enucleation Socket Syndrome (PESS). This Syndrome Causes Upper Eyelid Ptosis, Lower Eyelid Laxity, And Superior Sulcus Deformity. A Conservative Way To Treat This Syndrome Is To Make Custom Ocular Prostheses. Ptosis Condition In PESS Makes It Difficult To Determine The Iris Position Symmetrically.*
Objectives: *The Purpose Of The Facebow Bioart Modified Eyebrow Ruler (FBMER) In The PESS Is To Accurately And Precisely Measure The Shape, Orientation, And Dimensions Of The Iris.*
Case Report: *A Male Patient, 56 Years Old, Came To Dental Hospital USU With A Complaint That His Artificial Eye Was Not Symmetrical. The Patient's Left Eye Has Been Enucleated And Fitted With Stock Eyes For 20 Years. The Determination Technique Of Iris Positioning With FBMER Uses 3 Reference Points Which Are Anterior To The Nose And Posterior To Both Ears. Determination Of Centric Occlusion Using A Bite Fork With Aluwax While The Distance Of The Iris To The Midline Of The Face Is Based On The Eyebrow Ruler. PESS Case With The FBMER Technique Is More Stable And Accurate Than Other Techniques.*
Conclusion: *The Technique Of Determining The Location Of The Iris With A Bioart Facebow Modified By An Eye Brow Ruler Aims To Complete The Shortcomings Of The Previous Techniques. Modification Of This Technique Aims To Obtain An Alignment Of The Determination Of The Iris, Especially In Eye Loss Of Patients With Facial Asymmetry.*
Key Word*: Iris Centering, Iris Positioning, Custom Ocular Prosthesis*

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I. Introduction

Eye damage can be treated with surgical or non-surgical procedures. An artificial eye must be made for surgical treatments that cause eye removal through enucleation or evisceration. In contrast to evisceration, which only removes a piece of the eyeball while preserving the sclera in the eye socket, enucleation involves the removal of the complete eyeball while keeping the extraocular muscles in place. (1–3) Eye loss is caused by several factors such as accidental trauma, pathology, and congenital defects. This eye loss-related deformity can damage a person's psychological's well-being and social interactions by affecting vision and reducing aesthetic appeal. Eye loss can be overcome by making artificial eyes according to a patient's eye socket. This aims to restore aesthetics and prevent eye infections. (2,4–12)

Based on the manufacturing method, there are two categories of artificial eyes: stock eyes and customized ocular prostheses. Stock eyes have advantages as prostheses in patients with limited time and cost but have disadvantages in aesthetics and retention. The iris and sclera are just not oriented or colored in a way that is aesthetically pleasing to the patient's natural eye. The insufficient size can cause the stock eye may lose retention. The use of stock eyes for a long time after enucleation causes a problem called post enucleation socket syndrome (PESS). This syndrome causes upper eyelid ptosis, lower eyelid laxity, and superior sulcus deformity. One of the conservative ways to treat this syndrome is to make a custom ocular prosthesis. (6,12)

Determining the location of the iris in the manufacture of a custom ocular prosthesis has its challenges. Patients with a history of trauma who do not use the correct size or dimensions of the artificial eye in the long term will cause changes in the shape of the eye socket to be asymmetrical. (8) Previous studies have used a pupillometer, calipers, graph grid, ocular locator, compass with a ruler, anatomical, and visual determination to define the location of the iris. (12,14) Nowdays, a method using facebow bioart modified by an eyebrow ruler (FBMER) was developed to precisely locate the iris in cases of eye loss with an asymmetrical eye defect

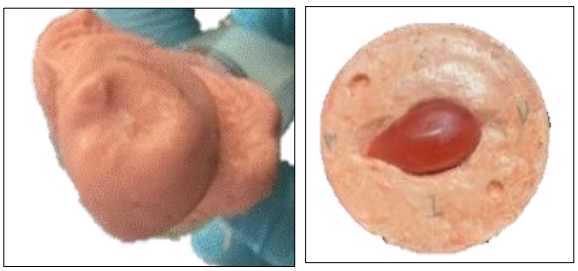
II. Case Report

A 56-year-old male patient came to the Dental and Oral Hospital, Universitas Sumatera Utara with complaints of an asymmetrical artificial eye. The patient's left eye had been enucleated and then replaced with a stock eye for 20 years. On initial examination, the pupil shape and sclera size of the stock eyes did not appropriate for the ocular defect. The patient's natural iris color is bluish-brown, with lower eyelid laxity and upper eyelid ptosis (figure 1a). While examining the eye socket with the improper stock eyes, asymmetry in the development of the defect was identified (figure 1b). Postenucleated socket syndrome may be diagnosed based on the findings of these tests (PESS). The patient was systemically healthy.

(a) (b)

Figure 1a. Preliminary examination of the eye socket
Figure 1b. Examination of stock eyes

Custom ocular trays are made of self-polymerized acrylic resin (Self Curing Vertex®, Vertex-Dental B.V., Netherland). A custom ocular tray is formed on the surface of the index finger. Primary impressions were taken at the initial appointment with irreversible hydrocolloid impression material (Hygedent USA) (Figure 2a). Before making a primary impression, the eye sockets were lubricated with petroleum jelly (Vaseline®, Unilever, India) to prevent lagging of the eyelashes on the impression material. Alginate impression material is mixed and loaded into 10 ml of a disposable syringe and injected directly into the enucleated socket. The primary cast was filled with a type IV dental stone (Hard Stone THS-S Type 4, TST, Taiwan) which aims to obtain a scleral pattern wax with baseplate wax (Shangchi®, Shanghai Medical Instruments Co., LTD, China) according to natural convexity of patient's sclera (Fig. 2b)



(a) (b)

Figure 2a. Primary impression
Figure 2b. Making sclera with the wax pattern on mold

After that, the scleral wax pattern was tried in the patient's eye socket to obtain the shape and size where the highest point was in the center of the pupil (Figure 3). After everything is appropriate then the wax pattern was trimmed and smoothed.

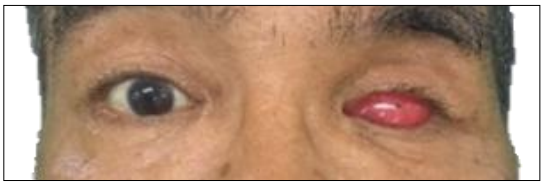
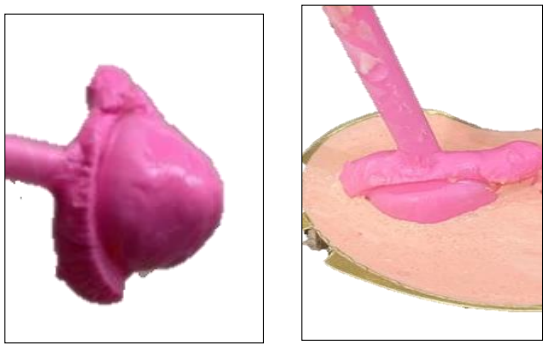


Figure 3. Determination of the center of the pupil

The next stage is the fabricating of custom ocular trays with self-polymerized acrylic resin (Self Curing Vertex®, Vertex-Dental B.V., Netherland) for the final impression according to the wax pattern. The final impressions were made using the impression material polyvinyl siloxane (Light Body Nobilium®, CMP Industries LLC, New York). A custom ocular tray is placed and injected with PVS light body material into the eye socket. Then the patient is instructed to make eye movements until the impression material is set. After the final impression was set, the final cast was made with a type IV dental stone (Hard Stone THS-S Type 4, TST, Taiwan) (Figures 4a and 4b). The next step was wax-up of a final cast with baseplate wax (Shangchi®,

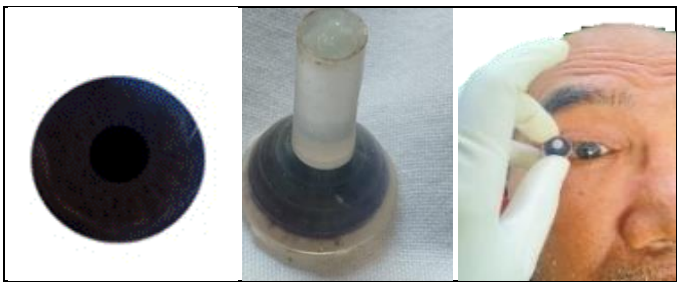
Shanghai Medical Instruments Co., LTD, China) to obtain the size and volume of the sclera that matched the patient's eye socket.



(a) **(b)**

Figure 4a. Final impression
Figure 4b. Placing the final impression into a mold

Iris staining was carried out using a mobile digital photography technique (Figure 5a). After the printout is obtained then proceed with making the iris button. The eye-stained prints were packed into a flask using clear acrylic (Regular Vertex® #4, Vertex-Dental B.V., Netherland). Then the flask is put into the water bath and heated to a certain temperature until polymerization occurs. The iris button is then trimmed off and polished according to the patient's iris color (Figures 5 b and 5 c).



(a) **(b)** **(c)**

Figure 5a. Mobile digital photography method of iris selection
Figure 5b. Iris button
Figure 5c.The same color of the iris button is polished according to the natural eye

Using the Facebow Bioart Modified Eyebrow Ruler (FBMER), the location of the prosthetic eye's iris button in the wax pattern was determined (Figure 6a). Centric occlusion bites made with aluwax were used to determine the patient's iris alignment. Position the facebow according to the ala-tragus and ala-nasion planes where the eyebrow ruler notch is centered on the nose. The patient is instructed to gaze straight at an object and keep it 4 feet away. Measurements were made with a viewing distance of 8 inches (20 cm). The FBMER's position of the facial midline in relation to the original eye. Measurements were made to determine the anterior scale using the original eye's midline and the ala nasion's midpoint. While both ala tragus is used to determine the posterior scale. The FBMER was locked to prevent adjustments once an accurate scale of 5 cm was achieved. Draw a straight line after defining the measurement scale with an indelible marker. The iris button was polished and the FBMER was removed (Figure 6b).

(a) **(b)**

Figure 6a. Iris location determination with FBMER
Figure 6b. Symmetrical determination of the location of the artificial iris with the right eye

The wax pattern was boiled with a flask and then after forming the mold was filled in with an A3 shade of heat-cured white acrylic as the fabrication of the sclera (Figure 7a). The flask was closed and reheated using a water bath until polymerization occurred. Then sclera is trimmed and smoothed. The scleral bulge was reduced by 1 mm based on scleral impressions using a putty (Putty Hand-Mix Type 0 Nobilium®, CMP Industries LLC, New York). Staining of the sclera was done using colored pencils (Faber-Castell International, Indonesia) and red wool thread to get the natural color of the eye fibers. In order not to change the staining results, the sclera was coated with monopoly syrup and then packing with an iris button using clear acrylic (Regular Vertex® #4, Vertex-Dental B.V., Netherland) (Figure 7a). The ocular prosthesis was trimmed off and polished (Fig. 7b).

(a) **(b)**

Figure 7a. The eye prosthesis was packed into a flask with clear acrylic
Figure 7b. Custom ocular prosthesis

After the laboratory procedure was completed, the artificial eye was cleaned with an ultrasonic bath (Dadi DA-968, QSunrun, China) for 5 minutes before being inserted into the patient's eye socket. Observations were made on the position of the iris, the stability of the artificial eye during movement, and complaints of discomfort. The results of the artificial eye installation are obtained aesthetically through the symmetrical and accurate location of the iris. (Figure 8). The patient was given post-installation instructions to keep the eye socket and denture clean. Periodic control after the first week and 1 month later.

BEFORE **AFTER**

Figure 8. Comparison before (left) and after operative view (right)

III. Discussion

Determination of the size and position of the iris can be done by various methods. Benson's visual determination of the size and position of the iris is very sensitive and inaccurate due to frequent errors. Roberts said the use of a pupillometer tool will obtain a symmetrical artificial pupil of the eye. Pupillometer is an instrument with a positive cylindrical lens that is aligned in both eyes so that the midpoint of the location of the pupil is obtained. However, this is difficult for clinicians. In another study, McArthur used an ocular locator and a fixed caliper to determine the location of the custom ocular prosthesis. This technique is subjective and less stable in patients with facial asymmetry. (10,12,14)

The study conducted by Shetty is the use of an inverted spring bow with the midpoint centered on the orbital bone and then locked according to the size scale with the dimensions and location of the iris vertically and horizontally. The stability of this tool depends on the ear and allows errors to occur because there is no reference point in determining the vertical dimension of the iris position. (10-14) Another technique is the use of glasses, but in this technique, the iris position can be wrong because it is too centered. This happened due to an error when transferring the mark from the face to the glasses. Then another technique was developed by modifying the use of a facebow with a bite fork. (12) This technique is considered very stable because it takes the bite and when an error occurs it can be repeated until an accurate position is obtained.

The measurement reference points are taken from the anterior and posterior points. The posterior point was determined in both ears, while the anterior was determined by taking a bite with a bite fork to obtain an image of the face from the front. This aims to reduce the possibility of movement when determining the left and right artificial iris symmetrically. So that the facebow is modified using the eyebrow ruler. The previous use of the eyebrow ruler is a modification of the technique of Noni et al.(13) However, this technique does not use a facebow so it is possible to make errors in determining the location of the symmetrical iris. Therefore, this case report developed a technique for determining the location of the iris with a modified Facebow Bioart using the Eyebrow Ruler to obtain an accurate 2D symmetrical shape and size of the iris. (12)

IV. Conclusions

The use of a modified facebow bioart eyebrow ruler as a technique for determining the location of the iris reduces subjective errors. The previous iris determination method has shortcomings in terms of accurately determining the location of the iris symmetrically. Determination of the location of the custom ocular prosthesis with the Facebow Bioart Modified Eyebrow Ruler (FBMER) on PESS aims to obtain aesthetics through accurate and symmetrical shape, orientation, and dimensions of the iris. This was obtained through reference points on the anterior and posterior parts of the face using a bite fork. In this technique, there are several shortcomings in determining the location of the iris because only horizontal measurements are obtained from the distal to the median part of the eye socket, therefore other measuring of instruments are needed that are appropriate for determining both vertically and horizontally..

References

[1]. Hughes MO. A Pictorial Anatomy Of The Human Eye/Anophthalmi Socket: A Review For Ocularists; Journal Of Ophthalmic Prosthetics 2004; 50-65.

[2]. Guttal S, Patil N, Vernekar N, Porwal A: Simple Method Of Positioning The Iris Disk On A Custom-Made Ocular Prosthesis. A Clinical Report, Journal Of Prosthodontics: 2008, 223 – 7.

[3]. Sutjipto, Hoesin RG. Protesa Mata Pasca Enukleasi Dan Eviserasi. Jurnal Oftalmologi Indonesia 2008; 6(2): 69-80.

[4]. Misra SK, Ramesh C. Reproduction Of Custom Made Eye Prosthesis Maneuver: A Case Report. Journal Of Dentistry And Oral Hygiene 2009;1(5): 59-63.

[5]. Ponnanna Aa, Porwal A, Verma N. Impressions Techniques For Ocular Prosthesis- A Clinical Review. International Journal Of Dental Clinics 2009:1(1): 27-31.

[6]. American Cancer Society. Eye Cancer Melanoma And Lymphoma; 2013, 1-49.

[7]. Jamayet NB, Yosawat T, Srithavaj T, Alam MK. A New Technique To Correct The Iris Shading Of Ocular Prosthesis. International Medical Journal 2013; 20(5): 621 – 2.

[8]. Chiramana S Et All. A Time-Saving Method To Fabricate A Custom Ocular Prosthesis. J Of Orofacial Research 2013; 3(1): 42-45.

[9]. Lokendra G, Aparna IN, Dhanasekar B, Et Al. Three-Dimensional Orientation Of Iris In An Ocular Prosthesis Using A Customized Scale. J Prosthodont 2014;23(3):252–255.

[10]. Chamaria A, Aras MA, Chitre V, Et Al. Iris Positioning Using A Grid Attached To A Spring Bow For A Custom Ocular Prosthesis. J Clin Diagn Res 2017;11(3).

[11]. Shetty P, Chowdharyz R: A Iris Positioning Device And Centering Approach: A Technique: JPD 2017:1-3.

[12]. Arora D, Singla S, Kumar K, Sehgal K, Sharma P: Comparison Of Two Novel Techniques For Iris Centering In Ocular Prosthesis., Dental Journal Of Advances Studies, 2020: 1-5.

[13]. Noni H Et Al: Modified Impression Tray And Iris Positioning Ocular Prosthesis Of Post Enucleation Socket Syndrome: A Case Report; Indonesian Journal Of Prosthodontics December 2021; 2(2): 51-55.

[14]. Sathe S, Pisulkar S, Vinod S, Belkhode V, Borle A: Positioning Of The Iris In An Ocular Prosthesis: A Systematic Review, The Journal Of Indian Prosthodontic Society, 2020, 345- 52.Jones PH, Davidson MH, Stein EA, Et Al. Comparison Of The Efficacy And Safety Of Rosuvastatin Versus Atorvastatin, Simvastatin, And Pravastatin Across Doses (STELLAR* Trial) American Journal Of Cardiology.2003;92(2):152–160.