Orbital reconstruction of a patient with esthesioneuroblastoma: A case report

Running Title: Orbital reconstruction in esthesioneuroblastoma

Faranak Vakili[1],
Pooya Jannati[1*]
[1]Postgraduate student, Department of Prosthodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

***Corresponding Author: Pooya Jannati**
Postal Address: North Kargar Street, Tehran Dental Faculty, Iran.
Phone number: +989112557720
Fax number: 021 8801 5950
Email: pooya_jannati@yahoo.comr

Abstract

Background and purpose: Maxillofacial rehabilitation, a combination of art and science, has always been challenging. The eyes are vital organs not only for vision but also for facial expression. Facial disfigurement due to the loss of an eye and the associated structures may cause physical and psychological distress to the patient. Providing artificial substitutes to restore the form and functions is mandatory to elevate the psychological status of such patients. Retention, stability, and marginal gap due to excessive bone loss following surgery are the major rehabilitation problems in orbital defects with adhesive retained orbital prostheses. Rehabilitating apatient with a removable orbital prosthesis is an economical and patient-friendly procedure that restores the patient's social situation. The present article describes a conventional technique for fabricating an orbital prosthesis for a patient with an orbital lesion due to esthesioneuroblastoma.

Keywords: esthesioneuroblastoma, orbital prosthesis, ocular prosthesis, maxillofacial
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teratogenic drugs during pregnancy), pathological lesions (e.g., retinoblastoma), and trauma can lead to eye loss. There are three surgical approaches depending on the amount of destruction of the eye structure:

1. Evisceration: surgical removal of all the intraocular contents
2. Enucleation: surgical removal of the optic nerves besides intraocular contents

Introduction

Replacement of the body structures by prosthesis, particularly in the esthetic areas, is a valued treatment. Precise rehabilitation of shape, shade, contour, texture and surface characteristics of the lost tissue is essential in these areas. Along with the severe physical injury, losing part of the face, especially the eye, has psychologicalimpacts, too. Factors such as congenital genetic defects, diseases (e.g., measles, rubella, etc.), drugs (using

temporary orbital prosthesis until the implant placement was performed.

A. Orbital impression-making

1. For the patient's comfortwhile obtaining an impression, Tetracaine Hydrochloride Ophthalmic Solution 0.5% was used 15 minutes before the procedure.
2. Medical Vaseline was applied to the tissues surrounding the socket, the intact side, and the eyebrows to reduce his discomfort and prevent the impression material from getting stuck.
3. The patient lay in a semi-supine position with his head supported so that the facewas in a normal and relaxed state.
4. Using a copying pencil, a line was drawn along the face midline and iris from the inner canthus to the nasal bridge; it would be used as a guide in making the wax pattern (Cavex, Haarlem, Netherlands).
5. Additional silicone impression material (light and medium body) (Müller-Omicron, Lindlar, Germany) was injected in the socket consistently and without removing the injection tip to prevent bubble formation.
6. Several ridges and shredded sterile gauze were placed on the impression material to make a mechanical sealing before being set.
7. To speed up the setting, white plaster (Kadent, Tehran, Iran) was mixed with slurry water, and the impression material was placed on it for better support.
8. After the plaster hardened, the patient was asked to contract and expand his facial muscles (i.e.,frowning, laughing, bending his head) repeatedly, and the impression was taken out of the socket in the opposite direction of the undercut.
9. Impression was prepared with dental stone (type III)(GC, Tokyo, Japan) to fabricate the enbloc mold.
3. Exenteration: surgical removal of the extraocular muscles besides the intraocular content and optic nerves (1-3).

Orbital reconstruction is challenging because the eye is a visible structure and needs to be symmetrical with the intact eye. There are two types of eyeprostheses: ocular and orbital. An ocular prosthesis replaces the evacuated contents of the entire globe following the evisceration by a surgeon,along with retaining the extraocular muscles. When exenteration is performed on the whole globe, eyelids, and eyebrows, the orbital prosthesis is used for reconstructing the missing structure (3-5).

Regarding the fabrication method, an orbital prosthesis can be prepared using stockor custom-made artificialeyes. In contrast to stock artificial eyes, preparing custom-made ones is time-consuming, from obtaining an impression to fabricating and placement. However, the custom-made eye has the advantages of better contour, more accurate surface characteristics,and better symmetry. This study reports the reconstruction of a custom-made orbital prosthesis in a patient with a pathological lesion undergoing an eye exenteration (6).

Case report

A 63-year-old male patientwas referred to Dental Clinic for Maxillofacial Prostheses at Tehran University of Medical Sciences to reconstruct his left eye. He mainly wanted his eye replacement to restore his face's esthetics (Figure 1). History revealed that he was affected by esthesioneuroblastoma in the left orbit and had undergone 33 sessions of radiotherapy of 65 Gy. The clinical examination showed thatthe ocular socket and the surrounding tissues were healed; there was no sign of inflammation, pain, and irritation. Bone tissues inside the socket were examined regarding undercuts. Due to his history of radiotherapy, we decided to fabricate a

tissue and translucent false eyelash glue (Sunku, Seoul, South Korea). The patient was provided with the necessary information on maintaining and observing the prosthesis's health (Figure 5). The explanation was as follows:

1. Use the prosthesis for 2-3 hours a day.
2. Cleanse the tissue before use.
3. Apply a thin layer of Sunku glue (Sunku, Seoul, South Korea) on the surface of the tissue before using the prosthesis.
4. Periodically have follow-up every six months for extrinsic staining.

Discussion

An appropriate ocular prosthesis must remain stable with proper orientations during the facial movements; therefore, preparing a precise impression is a significant step in fabricating an orbital prosthesis. The criteria fora goodimpression include recording the walls and undercuts meticulously, with the most extension of the upper, lower, and proximal edges. Matching the shape, shade, and size can be performed using the inversion technique. In this technique, the intact eye is drawn on a transparent sheet considering the dimensions, and placed on the lesion to present an estimate of the intact eye shape (7).

Some auxiliary implants can be used to get better stability and fixation. They candecrease the problems related to mucosal irritation caused by adhesives and prolong the orbital prosthesis durability. However, factors such as inflammation of the tissues surrounding the implant (peri-implantitis), hygiene, and dose therapy, will affect theprognosis of implant osteointegration. Hence, using undercuts can be helpful in these cases (8).

Using proper undercuts has advantages: the prosthesis tends to move less in functional movements, in case the prosthesis completely extends to the undercuts, there arefewer open margins in the prosthesis due to high stability, and

Communicating verbally with the patient was necessary to ensure his physical and psychological conditions during the impression-making.

B. Ocular prosthesis selection

1. The patient comfortably sat upright, facing the clinician
2. The stock ocular prosthesis was chosen according to his intact eye size, shape, and color.
3. Considering its situation and orientation with the intact eye, it was meticulously placed on the cast in the defect region.

C. Wax-up

An en bloc wax mold was prepared using base plate wax (Cavex, Haarlem, Netherlands) and was placed on the eye socket to check the esthetics and stability. We assessed the possibility of extending the mold borders with the purpose of a uniform ending of the prosthesis on the skin when the patient performed facial movements. Then, we made improvements in areas where the sealing was less compatible. Finally, mold preparation was done (Figure 4).

D. Coloring the Silicone

The patient's skin color was assessed in natural light. A large amount of vinyl resin (Dow corning, Michigan, United States) with the skin's base colorwas placed on the glass slab. Then, color pigments (Cosmosil, Nacalaitesque, Japan) were added to the base color for intrinsic staining; each time, it was placed beside the patient's face to match it. Finally, the base shade silicone was injected into the mold using a syringe, and the mold was packed with pressure. After 24 hours, the silicone prosthesis was taken out. For more esthetics, extrinsic staining was performed using intrinsic pigments (Factor II, USA). Artificial eyelashes and the patient's hair were used to match his eyebrows and eyelashes.

E. Delivery

The prosthesis was inserted in the socket. It was fixed by undercutting the lesion

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there is no need for performing some invasive processes for implant placement (5, 8).

In this case, the treatment process started shortly after his radiotherapy. To provide stability and fixation, we used the remaining anatomical undercuts, such as upper and lower bony undercuts, in combination with the adhesive (false eyelash glue) to seal the borders in the prosthesis. To fix the undercuts, the prosthesis position is critical. The patient should know how to place and remove the prosthesis because it can reduce the margin changes.

Conclusion

Fabricating the ocular prosthesis is a process that relies on the clinician's and technician's science and art. Precise impression-taking and appropriate match, coloring, and artistic elegance are required for fabricating a custom-made ocular prosthesis.

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Figure1: A patient with a lesion in the left eye

Figure2: impression making steps of the lesion

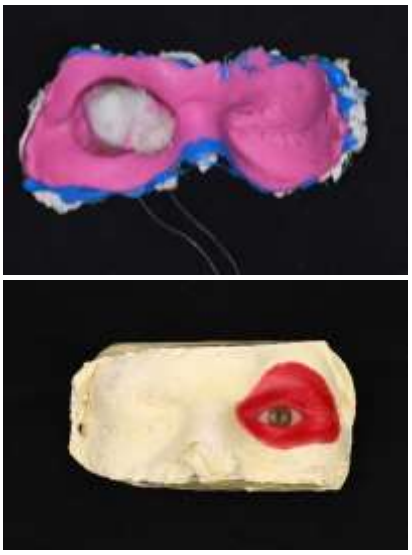

Figure3: Mold prepared by additive silicone and cast

Figure4: Clinical examination of wax and artificial eye

Figure5: Prosthesis delivery