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Case Study

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A SIMPLIFIED APPROACH TO FABRICATION OF AN OCULAR PROSTHESIS: A CASE REPORT

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ABSTRACT

The eye is a vital organ and an important part of facial expression. Loss of one or both eyes cause social, psychological and physical distress to the patient. The aim of an ocular prosthesis is to restore the facial appearance, improve self-confidence and social acceptance. There are various materials and techniques used for the fabrication of the ocular prosthesis. Advantage of custom ocular prosthesis over stock eye prosthesis includes better movements of the eyelid, even distribution of pressure, thereby reducing the chances of trauma to the tissue bed, better fit, comfort and aesthetics.

KEYWORDS: Ocular prosthesis, Rehabilitation, Enucleation.

INTRODUCTION

Eyes are the "windows to the soul". Loss or absence of a part of the face especially eye can cause severe physical and emotional problems.[1] Loss of eye could be because of malignancies, congenital defects, irreparable trauma, painful blind eye or sympathetic ophthalmia.[2] Depending on the severity of the involvement, the surgical management may include one of three approaches: evisceration, enucleation or exenteration. Evisceration is the surgical procedure involving the excision of the intraocular contents of the globe, leaving the sclera, and sometimes the cornea. Enucleation is the surgical removal of the entire globe and a portion of the optic nerve from the orbit. Exenteration is the enbloc removal of the entire contents of the orbit including the extraocular muscles.[3]

A fundamental objective when restoring an ophthalmic socket with an ocular prosthesis is to enable the patient to cope better with the process of rehabilitation.[4] Multidisciplinary management and a team approach are essential in providing accurate and effective rehabilitation and follow-up care for the patient.

Psychological distress associated with the loss of eye can be significantly improved by an ocular prosthesis, simulating the natural eye. First evidence for the replacement of missing eye was obtained from the Egypt dynasty, who used precious stones, earthenware, copper, and gold. Materials such as vulcanite and celluloid were used during 19th century. In the early part of 20th century, Muller-Uri family fabricated glass eye using sand with a low iron oxide content. In 1944, by the combined efforts of the individuals of the armed forces of the United States, methyl-methacrylate resin was successfully used for the fabrication of the ocular prosthesis.[5] Since then, usage of resin gained popularity because of its light weight, translucency, better fracture resistance, ease of fabrication, easy adjustability, and its capability for intrinsic and extrinsic coloring.[6]

There are several techniques documented in the literature for fitting and fabricating the artificial eye. It includes fitting a stock eye, modifying a stock eye on the positive replica of the ocular defect and the fabrication of the custom eye prosthesis. In custom ocular prosthesis, both sclera and iris are custom made. First two techniques are less time-consuming but often have the disadvantages like compromised esthetics and unreliable fit. Custom ocular prosthesis provides improved esthetics, and fit but usually more time-consuming and complicated.

CASE REPORT

A 46 year old male patient reported to the department of prosthodontics for the prosthetic replacement of missing right eye (fig 1). The history revealed traumatic injury to the right eye followed by the enucleation of the same. On Examination of the eye socket a healthy conjunctiva with no signs of infection or inflammation covering the posterior wall of the ophthalmic socket was observed and

showed synchronous movements. The palpebral fissure was examined in open and closed position and found to be normal and there was adequate depth between the upper and lower fornices for the retention of the ocular prosthesis.

A semi-customized ocular prosthesis with stock iris and custom-made sclera was planned for the patient, and the treatment procedure was explained to the patient before the commencement of the same.

Fig. 1: Preoperative photograph.

Procedure

Impression making

Separating medium (Vaseline) was applied to the area around the ocular defect. A Polyvinyl siloxane impression material of the heavy body consistency was used to make the impression of the defect; because of its high viscosity material is self-supportive and mouldable. Impression material was injected directly into the ocular socket without using any custom or stock tray to carry the material (fig 2). Direct impression without using any type of tray eliminates interferences in the closure of lids while making an impression. Once the material completely fills the socket, patient was advised to close the eye and perform various ocular movements until material sets. After complete setting of the impression material, it was carefully retrieved with a suction cup and examined for defects or voids. Any excess impression material is trimmed off and the impression was poured with Type III dental stone, once the stone was set, it was used in construction of wax pattern (fig 3).

Fig. 2: Primary impression.

Fig. 3: Primary cast.

Wax conformer or the scleral try-in

The cast was lubricated with separating media and hard wax was used to fabricate the wax pattern. Wax conformer was fabricated on the mold. It was retrieved from the mold and inserted in the ocular cavity and checked for stability and esthetics. Necessary sculpting of the anterior surface of the conformer was done to mimic the features of the contra-lateral natural eye. The wax conformer was placed back in the socket, and the patient was instructed to move both the conformer and the natural eye in various directions with his head upright. This functional impression recording allows the artificial eye to move in coordination with the natural eye without getting dislodged from the socket (fig 4).

Fig. 4: Scleral try in.

Selecting and Positioning iris

The size, shade, and configuration of the iris were selected by taking the contralateral natural eye as a guide. Most closely matching iris was selected from the stock eyes. Scleral part of the stock eye was trimmed off using an acrylic trimmer. This stock iris was positioned on the scleral wax pattern, and the border was sealed using a hot instrument. The position of the iris was finalized in accordance with the contralateral eye and Shade selection for the sclera was done using the natural eye as a guide (fig 5). Final impression was made using light body addition silicone material and during this, the patient was again asked to perform various movements to obtain the functional impression (fig 6).

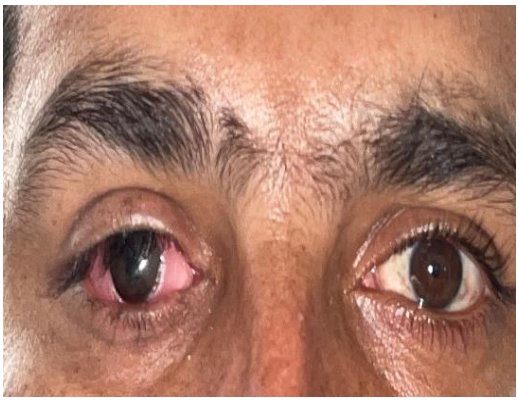

Fig. 5: Positioning of iris.

Fig. 6: Secondary impression.

Fabrication of resin sclera

Scleral wax pattern with the stock iris positioned over it was removed from the socket. It was washed under tap water. To stabilize the stock iris within the mold, an auto polymerizing acrylic resin extension of a diameter of around 4mm and length of around 6 mm was attached over its center (fig 7). Flasking and dewaxing were done in a conventional manner. Selected shade of the heat cure acrylic resin was manipulated and packed into the prepared mould. Acrylization was done by following a short curing cycle. Polymerized ocular prosthesis was retrieved from the mold, finishing and polishing of the prosthesis was done.

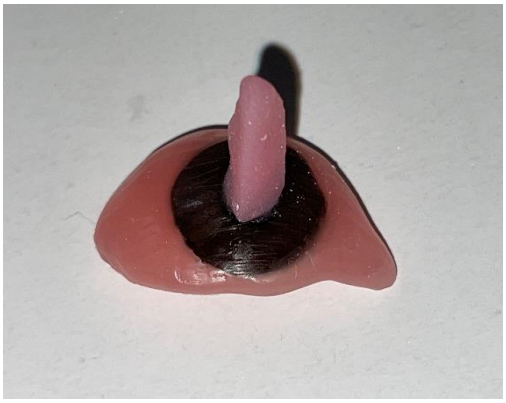

Fig: 7. Acrylic extension.

The prosthesis was inserted into the eye socket and it was evaluated for aesthetics and the comfort of the patient. The patient was educated to insert and remove the prosthesis. Regular follow up appointments were given, along with instructions regarding the maintenance of the prosthesis (fig 8).

Fig. 8: Post operative photograph.

Prosthetic eye care instructions[7]

1. Never clean or soak your artificial eye with rubbing alcohol because it will crack and destroy the ocular prosthesis.
2. Remove the ocular prosthesis as per instruction and store it in water or soft contact lens saline solution. This will keep deposits from drying on the surface.
3. To clean your prosthesis, use an antibacterial soap.
4. Use sterile saline with bulb syringe to rinse out the socket.
5. Any eye drops can be used with the artificial eye in peace.
6. Visit at least once a year or more often to have your ocular prosthesis checked, clean and polished.

DISCUSSION

Prosthetic rehabilitation cannot restore the vision but can fulfil aesthetic as well as psychological requirements for a patient. Several techniques have been used for fitting and fabricating artificial eyes, like empirically fitting a stock eye (ocular shell prosthesis), modifying a stock eye by making an impression of the ocular defect and the custom eye technique.[8] The disadvantages of the empirical fitting of an ocular shell are that, it leaves the vaulted spaces in the cavity and leads to accumulation of tears and mucous secretion, creating heaviness in the cavity and resulting in the dislodgement of the prosthesis from the cavity. Moreover, the aesthetics is also compromised, as the shades of the sclera and the iris do not exactly match those of the contralateral eye. When the impression of the ocular defect is made and a custom-made prosthesis is fabricated, then an intimate contact is achieved between the prosthesis and the tissue bed.[9] The close adaptation of the custom-made prosthesis tends to distribute pressure more equally than does a stock eye prosthesis, thus helping in reducing the incidence of the conjunctival abrasion and ulceration. It also enhances the tissue health by reducing the potential fluid stagnation spaces at the prosthetic-tissue interface. The custom-made ocular prosthesis provides more aesthetic results because the iris and the sclera are custom fabricated and painted. If the stock prefabricated eye prosthesis is customized according to the patient's contra lateral eye by using the acrylic resin pigments and if it is fabricated appropriately by making an impression of the ocular defect, then it can provide a satisfactory fit and aesthetic appearance for the patient.[10]

A correctly placed ocular prosthesis should maintain its orientation when the patient is looking straight ahead. It should also restore the normal opening of the eye, support the eyelid, restore a degree movement, be adequately retained and aesthetically pleasing.[11] An accurate impression is necessary for the development of an accurately fitting extraoral prosthesis. Acrylic resin for the fabrication of ocular prosthesis has following advantages like durability, biocompatibility, easy to color, economical, easy to clean, reliable mechanical retention; therefore, it is the one of the materials of choice to fabricate ocular prosthesis. For the fabrication of ocular prosthesis white pigmented and colorless acrylic resins are used to match the artificial sclera.[1]

CONCLUSION

Human irises have a layered and highly complex structure which is difficult to mimic. Custom made ocular prosthesis has many advantages over stock eye prosthesis like, better color matching, contouring, more coordinated movements with the contralateral eye. Success of ocular prosthesis mainly depends on the precision, knowledge and artistic skills of the clinician.

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