CASE SERIES

CUSTOMIZED OCULAR PROSTHESIS TO REHABILITATE PATIENTS WITH OCULAR DEFECTS: SOLVING TWO DIFFERENT SITUATIONS

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ABSTRACT

An ocular defect not only affects a person's vision, but also causes severe psychological trauma. An ocular prosthesis improves appearance, increases confidence and enhances social acceptance. But stock eyes are not satisfactory in most situations. A custom made ocular prosthesis provides better adaptation, aesthetics and comfort than a stock one. Polymethyl methacrylate (PMMA) is most commonly used material for ocular prosthesis. Two patients with different ocular defects were treated with acrylic customized ocular prosthesis to provide better quality of life.

KEY WORDS

Evisceration, Enucleation, Ocular Prosthesis, Hollow Prosthesis

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INTRODUCTION

"The face is the mirror of the mind, and eyes without speaking confess the secrets of the heart." - St. Jerome. An ocular prosthesis is an artificial replacement forthe bulb of the eye (bulbus oculi). When the entire content of the orbit (includingmuscles, fascia, eyelids, conjunctiva and the lacrimalapparatus) is removed, the artificial replacement isreferred to as an orbital prosthesis.[1] Ocular defects may be congenital or acquired. Congenital defects include congenital anophthalmia and micropthalmia. Acquired defects may be due to trauma (41%) or due to surgical removal of a tumour like retinoblastoma (24%), or due to glaucoma etc.[2] Evisceration surgery refers to the removal of the inside contents of the eye (cornea, iris, lens, vitreous, and retina). The white shell of the eye (sclera) is left in place. The extraocular muscles are left attached to the eye surface and the optic nerve is not cut.[3] Enucleation is the removal of the globe from the orbit, involving the separation of all the connections between the globe and the patient. Primary enucleation eliminates the risk of sympathetic ophthalmia (incidence rate upto 2%). Ocular prosthesis with or without ocular implant is used to rehabilitate these cases.[6] Exenteration means removal of the globe along with all the soft tissues of the orbit including extra-ocular muscles and eyelids. Here an orbital prosthesis is required to replace associated soft tissue structures along with the eye to obtain favourable aesthetic outcome.[4]

In 1832, Ludwig Müller-Uri, a glassblower who used to make doll's eyes at the famous Lauscha Glass factory in Sonneberg (Germany), developed the cryolite glass eye which was more durable than previous glass eyes.[5,6] In 1885, an English doctor, Phillip Henry Mules implanted a glass sphere into the scleral cavity of an eye following evisceration. The implant restored lost orbital volume and gave more movement to the overlying prosthetic eye.[5] Rohm and Hass in 1936 introduced polymethyl methacrylate (PMMA) in the form of a transparent sheet. In 1937 Du Dout De Nemours introduced it in powder form. In 1937 methyl methacrylate was clinically evaluated by Wright and found to fulfil virtually all the requirements of an ideal denture base material. The acrylic resin represented such

significant improvement in its application as denture base material that by 1946.[5,6,7] Custom made PMMA prostheses created opportunity for further development of orbital implants as well. Medical grade silicone is also used to fabricate ocular prosthesis.[5,7] PMMA is now the most widely used material for fabrication of ocular prosthesis as it requires relatively less technical skills and having properties like good colour stability, light weight, dimensional stability, bio-compatibility etc.

This article focuses on the rehabilitation by ocular prosthesis. It is always a challenge for the operator to fabricate an accurately fitting and aesthetically acceptable ocular prosthesis to satisfy a patient.

CASE 1

A 48 year old male patient reported to the Department of Prosthodontics and Crown & Bridge of Guru Nanak Institute of Dental Sciences and Research, Kolkata. His right eye was severely injured in an accident and evisceration surgery was performed on that eye around 20 years back (Fig 1). At that time, he was given a stock ocular prosthesis. But he never used that one as because that was not aesthetic and ill-fitting. On examination, it was found that the upper and lower fornices had sufficient depth to provide retention for the ocular prosthesis. The tissue bed was initially sensitive to touch. It was decided to fabricate a custom PMMA ocular prosthesis though the available space was not ample (approximately 5 mm). An informed consent of the patient was taken before the fabrication procedure. For sensitivity he was prescribed an eye drop containing Atropine (anticholinergic), Chloramphenicol (antibiotic) and Dexamethasone (steroid).

PROCEDURE

Prior to making impression, the patient was draped and petroleum jelly was applied to his right eyebrow and eyelids. An ocular conformer, made in clear acrylic resin, was used to make the impression. Multiple holes were made in the conformer to provide mechanical retention to the impression material. At the centre of the conformer a 5ml injection syringe was attached (Fig 2). After proper disinfection, the conformer along with a syringe was checked in patient's eye. Adhesive was applied over the conformer. Polyvinyl siloxane (light body consistency) impression material was used for impression. The patient was instructed to move his eyes in all directions to facilitate flow of impression material into the socket and was later advised to look straight. The impression was checked for voids and defects (Fig 3). The impression was then poured in stone and a cast was obtained. A thin scleral shell was made with inlay wax on that cast. The shell was then placed inside the patient's eye, contoured properly, and position of pupil was marked with a black marker (fig 4).The diameter of pupil of the other eye (left eye)

Fig 1: Patient with ocular defect

Fig 2: Ocular conformer

Fig 3: Ocular impression

Fig 4: Wax pattern with marking

Fig 5: Customized iris

Fig 6: Final prosthesis

Fig 7: Patient with ocular prosthesis

was measured and a small and thin disc of clear acrylic resin with same diameter was fabricated. The disc was painted with acrylic colour to replicate the colour and contour of the other pupil (Fig.5). The disc was positioned properly on the scleral shell. A small wire was fixed on the pupil as position indicator and the wax pattern was invested. Following dewaxing, packing was done with tooth-coloured heat cure acrylic resin. A thin layer of monopoly was applied after final characterization of that cured prosthesis. Later finishing and polishing were done (Fig.6).The prosthesis was disinfected with 2% glutaraldehyde solution. Final prosthesis was compared with the other side normal eye (Fig7). Post-insertion instructions were given. Post-operative check-up done after 24 hours and some necessary corrections were made. Further check-up was done after 1 week and after 1 month. Patient was satisfied with his appearance and fitting of the prosthesis.

CASE 2

A 27 years old male patient reported to the Department of Prosthodontics and Crown & Bridge of Guru Nanak Institute of Dental Sciences and Research, Kolkata, with a history of enucleation following trauma to the left eye nearly 3 years back He was using a stock eye since then, which was aesthetically not satisfactory (Fig.08). There was no intra-orbital implant placed previously. The patient was not interested to go through another surgery to place an intra-orbital implant. After taking his consent, impression was made with polyvinyl siloxane impression material (Fig.09). As the available space was large, it was decided to make a hollow PMMA ocular prosthesis to reduce weight. All the steps were same as the previous case, except that during processing of acrylic resin, lost salt technique was used to make the prosthesis hollow (Fig.10). After external characterization, layers of monopoly were added. After finishing and polishing, proper disinfection of the prosthesis was done before delivering the prosthesis to the patient. (Fig. 11, 12)

DISCUSSION

An ocular prosthesis can be stock or custom-made. Retention of the ocular prostheses is mechanical where the sulcular fornix usually retains the prosthesis. The adaptation of an adjusted stock eye with the tissue surface can never be as precise as a customized ocular prosthesis. As a result, a dead space always exists in between the stock eye and tissue bed, leading to debris accumulation and subsequent inflammation. Sometimes the fitting surface of an acrylic stock eye is also modified with acrylic to improve adaptation. A properly fabricated customised ocular prosthesis not only provides better adaptation, but is also more aesthetic. Custom-made prosthetic eye fabrication involves complex painting procedures in various stages that are quite difficult and are based purely on painting skills of the operator.[8]

Dimensions of the defect determine the quality of an ocular prosthesis. Ideally 10 mm space (in between the tissue bed and external prosthesis surface) is

Fig 8: Patient with stock ocular prosthesis

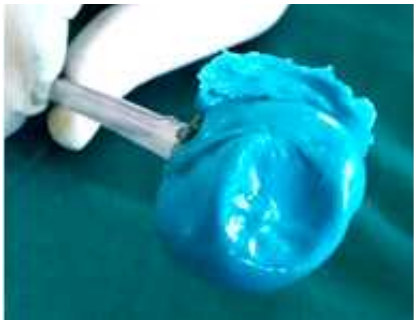

Fig 9: Impression with polyvinyl siloxane material

Fig 11: Finished prosthesis

Fig 10: Hollow prosthesis floating on water

Fig 12: Patient with custom made ocular prosthesis

required for fabrication of a customised prosthesis with 3-dimensional depth perception. If the space is less than 5 mm, then ocular shell prosthesis is fabricated with paint-on technique. It is more common in case of evisceration surgeries. However, ocular shell prosthesis is usually not as aesthetic as a normal ocular prosthesis.[9]

In the first case, the patient had long-standing ocular defect with sensitive tissue bed. The space was sufficient for ocular shell prosthesis, but not for ocular prosthesis. Fortunately sensitivity reduced after 1 month of medication. Understanding his aesthetic demand, we decided to fabricate an ocular prosthesis with 3-dimentional effect. The resultant prosthesis was sufficient to please the patient. Eye movement was good. In the second situation, the space was excessive. Patient was already using prosthesis. The hollow prosthesis solved the aesthetic problem. There is no doubt that in both the cases, ocular prosthesis drastically changed the appearance and social acceptance of the patients.

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