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Hollow ocular prosthesis: an offshoot from the conventional

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Abstract

Fabrication of an ocular prosthesis not only restores the esthetics of the patient but also preserves the socket by restricting the outgrowth of soft tissues. A well preserved socket is open to more treatment options compared to a poorly managed ocular defect. Custom ocular prosthesis improves tissue health by eliminating any stagnating space with its close tissue adaptation. It provides better range of movements and improves patient comfort. Primary factor that decides the fabrication protocol for a maxillofacial prosthesis is the defect size. Larger ocular defects could be rehabilitated using a custom fabricated hollow ocular prosthesis.

Keywords: Ocular Prosthesis, Hollow Prosthesis, Enucleation

Introduction

Custom ocular prosthesis has got many advantages over stock prosthesis. It adapts closely to the soft tissue bed in the socket there by distributing the pressure equally and improves tissue health by eliminating any stagnating spaces.[1,2] A customized prosthesis shows better range of movements through its close adaptation.[3] Hollow ocular prosthesis further improves patient comfort by reducing the weight through its hollowness. Size of the ocular defect is the primary factor that decides the prospects of fabricating any prosthesis. Larger defects are usually rehabilitated using hollow ocular prosthesis.

The ultimate objective of any prosthetic management is to rehabilitate the patient to as near normal form and function as possible. Loss of a facial structure especially the eye, if not life threatening, is a severe problem that affects the patient's psychology. Fabrication of an ocular prosthesis not only restores the esthetics of the patient but also preserves the socket by restricting the outgrowth of soft tissues. A well preserved socket is open to more treatment options compared to a poorly managed ocular defect.

Case report

A forty year old male patient reported to the Department of Prosthodontics for dental treatment. An ocular prosthesis was observed in the right eye. On taking history, it was found that the patient had been using an unmodified stock ocular prosthesis which was unchanged for sixteen years. The patient sustained a shrapnel injury to his right eye at the age of twenty four, which necessitated surgical enucleation. Examination revealed a completely healed right eye socket (Fig.1). His left eye had normal vision and did not have any other relevant medical history.

After taking all the aspects of present case into consideration, a hollow ocular prosthesis was planned. Preliminary impression of the defective socket was captured using poly vinyl siloxane light body elastomeric material (Aquasil Ultra LV, Dentsply, India). Mild defect in the impression was corrected using modeling wax (Fig.2) before pouring the mould in type III gypsum (Gemstone, Shruthi Products, India). Wax pattern was made using the mould and was tried in. Corrections were made so as to properly seat the pattern into the socket.

A stock ocular prosthesis having matching iris with the contra lateral eye was selected. Iris was sectioned out from this stock prosthesis and positioned manually on the wax pattern based on an objective judgment of position of contra lateral iris (Fig.3). Once the position of the iris was finalized, poly vinyl siloxane light body impression material was applied on to the tissue surface of the wax pattern and inserted into the socket for accurate reproduction of surface details. The visual axis of the prosthesis was controlled till the time the impression material set. This was accomplished by attaching a match stick in the region of iris, at right angle to the corneal surface of the stock eye shell. All the eye movements were carried out and the patient was asked to gaze ahead and shut the eye lids intermittently. The impression was retrieved once the material was set (Fig.4). The impression was evaluated and the match stick was removed and then flasked in dental stone. A small self-cure clear acrylic stump of 7-8mm was fabricated and placed at the junction between iris and the wax pattern to reinforce the position of iris in the upper segment of the flask. Counter flasking and dewaxing was carried out in conventional manner.

Prior to packing, two coats of cold mould seal (Heat cure separating medium, DPI, India) was applied and allowed to dry. Heat cure tooth molding powder (DPI, India) of shades A and C were selected to match the shade of patient's sclera. Characterization was done using intrinsic pigments and red nylon fibers. After characterization, tooth molding powder was mixed according to manufacturer's instruction and carefully adapted on to the walls of each compartment. Common salt was added to the much deeper lower compartment (Fig.5) and both halves of the flask were approximated and closed under pressure completing the packing. Bench curing was done for 45minutes.

A modified curing protocol was followed to minimize the monomer content of acrylic eye. In this technique, the flask was placed in water at 95°C for 20 minutes and thereafter in boiling water for additional 20 more minutes.[4]After curing, the prosthesis was retrieved,

trimmed and finished but polishing was delayed. Two holes 0.5mm in diameter were placed in the intaglio surface of the prosthesis (Fig.6). Hot water was pumped through the holes to flush out the salt. The holes were later sealed with self-cure resin (DPI RR Cold Cure, DPI, India.) and the prosthesis was polished (Fig.7).

The finished prosthesis was disinfected in 0.2% chlorhexidine glucoanate (Hexidine, Indoco, India) and delivered to the patient (Fig.8) with instructions regarding the use and care of the prosthesis. Patient was very happy with the final outcome of his new prosthesis. The customized prosthesis showed a better degree of adaptation and movement within the socket and simulated normal eye movements. On his review after 3 months, the patient was completely acclimatized to the prosthesis and showed a positive response.

Discussion

The etiology of eye loss include malignancy, infection, trauma and conditions that are not amenable to medical or surgical therapy.[5] Depending on the severity, the surgical management may include one of three approaches: evisceration, enucleation or exenteration. Evisceration is the surgical procedure wherein the intraocular contents of the globe are removed, leaving the sclera, Tenon's capsule, conjunctiva, extraocular muscles and optic nerve undisturbed; the cornea may be retained or excised. Surgical removal of the globe and a portion of the optic nerve from the orbit is called as enucleation. Orbital exenteration is the en bloc removal of orbit, usually involving partial or total removal of the eyelids, and is performed primarily in case of malignant tumours.

Custom ocular prosthesis has got many advantages. It adapts closely to the soft tissue bed in the socket there by distributing the pressure equally and improves tissue health by eliminating any potential stagnating spaces.[1,2] A custom made ocular prosthesis will always have a better range of movement when compared to a stock prosthesis.[3] This feature improves the naturalness of the prosthesis. In cases of deep sockets, fabrication of a mere custom made prosthesis may not be the best choice as the prosthesis becomes heavy. The additional bulk puts constant pressure and impinges the ocular soft tissue. In such situations, reduction of weight of the prostheses becomes crucial and inevitable.

Fabrication of a hollow prosthesis resolves the problem as it reduces the weight of the prosthesis to a great extent. Different materials have been used to make the prosthesis hollow. Polystyrene (Thermocol) and table salt are usually the most commonly utilized materials.

An ideal ocular prosthesis must possess optimal durability, flexibility, weight, color, hygiene, thermal conductivity, ease of use, biocompatibility, texture and availability. There is no such prosthetic material that possesses all of the above mentioned properties. Polymethyl methacrylate (PMMA) is considered better than most other ocular prosthetic materials. It is durable, biocompatible, light weight, adjustable, translucent, easily available and cost effective. Room Temperature Glass made eyes have also been used in cases of allergy to PMMA.[6] Vulcanizing (RTV) medical-graded silicone (Factor II) has been recommended for making ocular prostheses, since they provide better esthetics compared with acrylic due to their flexibility and less weight.[7] A study conducted by *da Silva et a.l*[8] found that microwave processed resin is more biocompatible than heat processed resin.

Disinfection of the prosthesis can be done by immersing the prosthesis for five minutes in 0.5% chlorhexidine and 70% isopropyl alcohol, followed by a saline rinse before insertion. However, *Kiesow et al.*[9] showed that isopropyl alcohol damaged PMMA resins. His study recommends the use of specialized denture cleansing tablets for effective disinfection without damage to the prosthesis.

After insertion, evaluation of the prosthesis for any sort of irregularity is a must and if present, it must be immediately resolved. Drying of the eyes and subsequent irritation may be managed by the use of ophthalmic lubricants prior to insertion of the prosthesis. *Kavlekar et al.*[4] managed a case with dryness through the fabrication of an ocular reservoir.

A recall visit every six months for reviewing, polishing and adjustments should be advised. In children, the size of the prosthesis would warrant timely adjustments so as to match with the expansion of the enophthalmic cavity.[10] The prosthesis can be cleaned with water and soap, baby shampoo, or contact lens cleaner. The frequency for cleaning has been suggested every day. Subtractive adjustments are usually not performed for a few days, unless the patient complains of irritations. The patient must be recalled after one day, three days and one week for follow up. Patients who have had the experience of wearing an ocular prosthesis may not require further follow up.[5,6]

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Legends Figure

Figure 1: Defective right eye

Figure 2: Poly vinyl siloxane (light body impression) of the defective eye

Figure 3: Wax pattern with iris positioned manually

Figure 4: Wash impression made in light body addition silicone

Figure 5: Common salt being used to create a hollow space in the heat cured PMMA resin

Figure 6: Holes placed into the hollow bulb to flush out the remnant salt.

Figure 7: Polished hollow ocular prosthesis

Figure 8: Insertion of Prosthesis