J Indian Prosthodont Soc (July-Sept 2013) 13(3):343–347
DOI 10.1007/s13191-012-0142-9

CLINICAL REPORT

# Rehabilitation of an Infected Eye with an Acrylic Ball Implant and a Custom made Scleral Ocular Prosthesis

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Received: 1 December 2010 / Accepted: 23 June 2012 / Published online: 17 July 2012


**Abstract** This clinical report describes the prosthetic rehabilitation of a patient with corneal abscess with endophthalmitis of the left eye. Infection with a history of trauma resulted in loss of vision but with intact eye ball movements. Cornea excising evisceration was carried out following placement of poly(methyl methacrylate) ocular ball implant. Later custom made scleral prosthesis was fabricated to maintain functional integrity of the socket and to satisfy patient's aesthetic needs.

**Keywords** Evisceration · Poly(methyl methacrylate) · Scleral prosthesis

## Introduction

Eye is considered as the jewel of our body. Loss of eye may be due to congenital defect, trauma, tumour or infection. The patients become emotionally weak and conscious and avoid taking part in social events, which in turn causes anxiety, stress and depression. A seemingly minor trauma can be serious if the eye penetration goes unnoticed or if secondary infection develops. Recovery after the loss of an eye requires oneself to get adjusted to monocular vision. Appearance can be improved with the use of artificial eye carefully prepared to match the remaining natural eye. The custom made ocular prostheses are very comfortable and help improve their appearance, which in turn, encourages them to build up their self-confidence to return back to their social life.

There are three general categories of surgical procedures in the removal of an eye:

Evisceration, enucleation and exenteration. Orbital implants can be used as fillers following enucleation or evisceration surgeries to replace the lost volume for better cosmesis and motility of the artificial eye.

## Case Report

A 35-year-old male patient reported to the Department of Ophthalmology, KVG Medical College and Hospital with a chief complaint of lack of vision and pain in the left eye from 1 week before. Patient had a history of trauma to the left eye from a hay stick, 1 month ago and had not taken any medical treatment. Visual perception for light was nil, but had intact eye movements. The case was diagnosed as corneal abscess with endophthalmitis (Fig. 1).

Treating this case needed surgical removal of the corneal contents and rehabilitation with prosthesis. Ophthalmologist and Prosthodontist, with an interdisciplinary approach, planned for rehabilitation in two phases. In first phase: evisceration to remove the intraocular contents. Heat cured poly(methyl methacrylate) (PMMA); ball implant prosthesis to be placed within this intraocular space. In second phase: after a gap of 4–6 weeks of evisceration, custom made scleral prosthesis to be fabricated.

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**Fig. 1** Infected left eye

Under local anaesthesia with aseptic precautions conjunctiva and tenons capsule were separated, cornea was excised (Fig. 2) and uveal tissues were scooped out (Fig. 3) and was thoroughly washed with povidone-iodine and antibiotic solution. A 16 mm tooth coloured heat cured PMMA (Stellon, Dental Products of India, Ltd.) ball was implanted inside the hollow cavity. A stress free primary closure of the wound was achieved (Fig. 4). Tenons capsule was sutured with 6-0 vicryl suture and the conjunctiva with nylon suture. The operated eye was allowed to heal for a period of 6 weeks (Fig. 5).

To fabricate the scleral prosthesis, first, primary alginate impression (Algitex, Dental Products of India) was made. The impression was poured in two sections. The first half of the cast was poured with a mix of dental stone (Goldstone, Asian Chemicals, Rajkot, Gujarat). The mix was

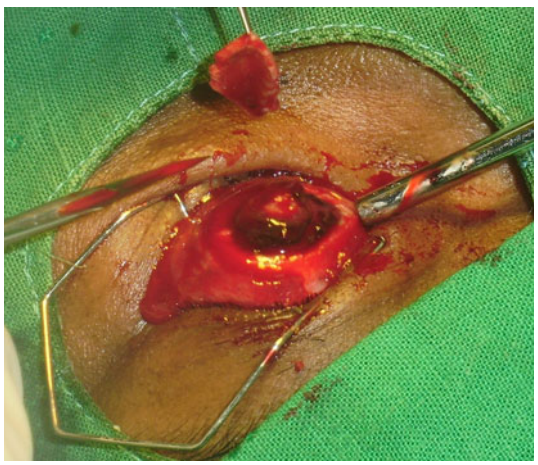

**Fig. 2** Cornea was excised

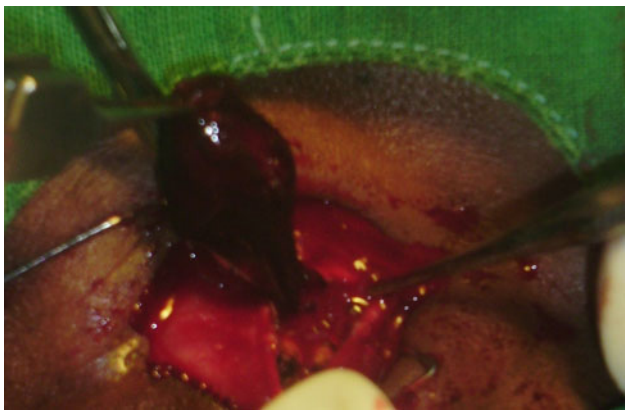

**Fig. 3** Removal of intraocular uveal tissue

vibrated onto the boxed impression up to and around the widest part of the socket impression. At least two keyways were cut into the surface of the first pour using a large, round vulcanite bur. The stone was then lubricated with a separating medium and the second half of the impression was poured.

After the stone was set, the mould was separated and the alginate impression material removed. After placing a layer of wax sheet (Modelling wax, Hindustan Dental Products, Ltd.) all around the tissue surface, self cure clear acrylic (DPI-RR cold cure, Dental Products of India) was added inside the mould. The layer of wax around acted as a spacer for final impression. The self cured acrylic matrix thus formed was perforated and a 2 ml disposable syringe was attached. This served as a custom made ocular special tray and final impression was made with light body polyvinyl siloxane elastomeric impression material (Reprosil-Hydrophyllic vinyl polysiloxane impression material, DENTSPLY) (Fig. 6).

The impression was poured in two sections as done earlier. Wax pattern of the recorded mould space was fabricated and was tried in patients socket and lid contours were evaluated, and then invested. Acrylic resin sclera was fabricated using tooth colour heat cured PMMA. Slow curing cycle was followed. The acrylic resin sclera was recovered from the flask and the flash removed with rotary instruments and polished with wet flour of pumice. The sclera was inserted and the contours and lid opening was again verified (Fig. 7).

Iris was fabricated using paper iris disc technique. Fine red threads of the veined heat cure acrylic were used to mimic the blood vessels of the patient's natural eye. Oil colour (Camel Students' Oil Colours, Camlin Ltd, Mumbai, India) was also used over the scleral blank to mimic the adjacent eye. The scleral blank was flasked and clear acrylic resin was added and trail packed. Once after verifying that the iris is not moved, the flask was closed and then processed. Then the prosthesis was finished, polished and delivered to the patient (Fig. 8). Post operative

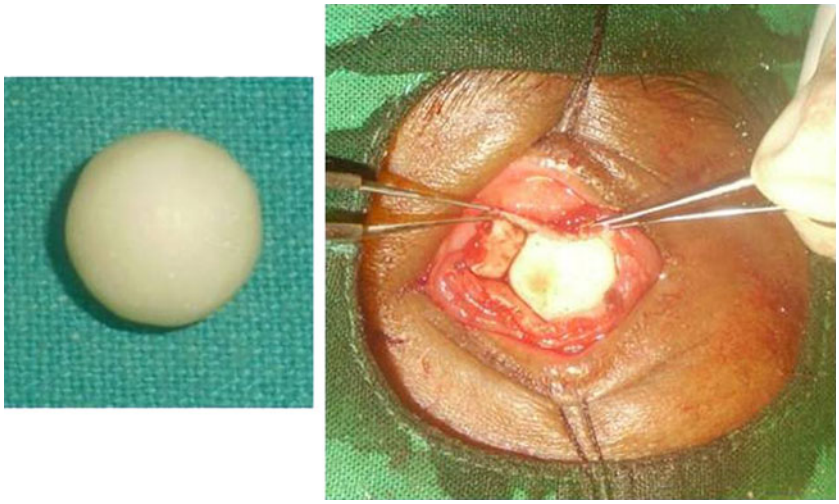

**Fig. 4** Placement 16 mm intraocular poly(methyl methacrylate) ball implant

**Fig. 5** Post operative healing

**Fig. 6** Custom made ocular special tray and final elastomeric impression

**Fig. 7** Verification of the sclera blank

instructions were given and patient was advised for periodic check-up.

## Discussion

Endophthalmitis is defined as an intraocular inflammation which predominantly affects the inner spaces of the eye and its contents, i.e., the vitreous and/or the anterior chamber. Fungal endophthalmitis may occur after intraocular surgery or injury due to vegetable matter such as thorn or wooden stick and has an incubation period of several weeks. As soon as it is evident that eye cannot be saved and is completely blind with no light perception, it should be eviscerated [1].

Evisceration/enucleation of nonseeing, disfigured or painful eye leaves the patient with an empty or anophthalmic socket resulting in a volume depletion of

**Fig. 8** Final prosthesis

7–7.5 $cm^3$ from a total orbital volume of 30 $cm^3$ [2]. Materials used as orbital implant are mainly PMMA, Silicones Medpore or hydroxyapatite [3, 4].

The cost and availability were factors to choose the PMMA material. Also it has been reported that rough surface of the porous Hydroxyapatite derived from coral occasionally lead to chronic inflammation resulting in breakdown of sclera and conjunctiva. The surgical technique for insertion and fixation of these hydroxyapatite implants with extraocular muscles requires a wrapping material over it, often taken from donor's sclera. This could increase the risks of transmitting slow virus infections like human immune deficiency syndrome. The other disadvantages of the coral derived implants are their source dependent non-reliable properties and high cost, that restricts their use particularly in developing countries like ours.

The size of the implant should be such that it occupies the available intra scleral space and yet the edges can be opposed to cover the implant anteriorly [5]. In this case, once enucleation was done and 14, 16, 18, 20 mm PMMA diameter implant was tried inside the socket for primary closure. The best diameter (in this case 16-mm diameter) facilitating the primary closure without causing tension at the suture line was selected.

An ideal intra-orbital implant should be very light in weight (<2 g), simple in design and be completely buried within the sclera to eliminate chances of infection. Further, they should be chemically inert without any possibility of bio-degradation and need to be smaller than the patient's eyeball in size [6]. Residual monomer content of a properly processed prosthesis is less 1 % and is found to rarely cause any adverse allergic reactions. To enter the circulatory system the residual monomer must pass through many barriers, that significantly diminish the volume of monomer reaching the blood stream. The residual monomer that does reach the blood stream is rapidly hydrolysed to methacrylic acid and excreted. Hence slow curing cycle was used. The acrylic eye ball was processed in a constant temperature water bath at 74 °C (165 °F) for 8 h. The processed acrylic eye ball was stored in water for 24 h for complete elimination of surface monomer.

A well fitting prosthesis is essential for functional integrity of the socket and the eye, rather than being purely cosmetic. It should retain the shape of the socket and prevent prolapse of the fornices. The shape of the lids should be retained allowing full movements of the lids. The prosthesis should provide proper muscular action of the lids and thus help in tear flow. It should also prevent accumulation of fluids in the socket [7].

Even though the ball implant is inserted we will not be able to get the full contour as of the natural eye. Sufficient peri-scleral space is available and the scleral prosthesis compensates for the same. Making of a scleral prosthesis following evisceration requires an impression of the remaining ocular tissues. An accurate impression of these tissues facilitates a close adaptation of the custom prosthesis to the tissue bed, resulting in better potential for movement.

The paper iris disc technique utilises readily available materials and techniques familiar to the dental office and allows almost limitless adjustment of colouration [8]. Different aids are used for the correct placement of the prosthesis in the eye [9].

## Summary

Eye is an important component of facial expression and its loss has crippling effect on the psychology of the patient. Orbital implants replace the volume lost by the eviscerated eye, impart motility to the prosthesis, and maintain cosmetic symmetry with the fellow eye. The custom ocular impression tray and light body elastomeric impression will be very useful for to record accurate impression of the tissues. This will facilitate a close adaptation of the custom prosthesis to the tissue bed, resulting in better potential for movement. From cosmetic point of view, corneal diameter, corneal position, anterior convex curvature of the prosthesis and the colour of the iris, all form critical components that has to be accurately reproduced for better prosthetic results.

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