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## **Fabrication of custom -made ocular prosthesis using a graph grid**

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### **Abstract**

The successful rehabilitation of the ocular defect with a prosthesis will improve physical & emotional status of the patient. This article describes the rehabilitation of an ocular defect with a custom-made eye prosthesis using graph grid for the proper orientation of the iris.

**Keywords:** Ocular prosthesis, Grid, Enucleation, Ocular defects

### **Introduction**

The eye is an important component which gives vitality for the facial expression <sup>[1]</sup>. Loss of eye can either be caused by trauma, infection or malignant tumours <sup>[2]</sup>. Defects of the eye can be ocular or orbital. Ocular defects involve only the eyeball, whereas orbital defects include periorbital tissues. Surgical procedures in the removal of an eye can be broadly classified as evisceration, enucleation, exenteration <sup>[3, 4]</sup>. These procedures are carried out depending on the degree of injury to the eye or extend of tumour spread in the socket. Successful rehabilitation of the defect with prosthesis will improve the physical and emotional status of the patient. The orientation of iris is a difficult task. So, a method should be used for the proper positioning of iris on the prosthesis. This article discusses the prosthetic rehabilitation of a patient with orbital defect using graph grid.

### **Case report**

A 72 years old female patient reported to the department of prosthodontics followed by the enucleation of left eye (Fig. 1). Patient gave a history of trauma on left eye 10 years back. Recently, due to pain and infection she had undergone surgery on the left eye. On examination it was found that healing was complete without any inflammation (Fig. 2).

### **Treatment procedure**

#### **Impression tray fabrication**

A mould was fabricated from stock eye and poured in die stone (Fig. 3). This cast was used to fabricate a custom ocular tray with self-cure acrylic resin and needle cap (Fig. 4). The needle cap with opening at both ends will act as a handle as well as channel for injecting light body elastomeric impression material into the socket. The fabricated tray should be smooth, round and tried in the socket to correct the extensions in order to prevent abrasions of the tissues in the socket.

#### **Impression with addition silicone**

The tray was properly seated into the socket and polyvinyl siloxane light body material was injected through the handle of the tray. The patient was trained to perform eye movements. After the impression material was set the patient was instructed to look up, then the lower eyelid was drawn down and the lower border of the impression was removed from the inferior sulcus. Similarly, the patient was instructed to look down and the tray was removed from the superior sulcus. The impression was checked for any voids, under extension, overextension of

any borders (Fig. 5).

**Wax pattern fabrication**

An index of the impression was made using alginate in a silicone well (Fig. 6). Once it was set, it was poured with molten modelling wax. On hardening the wax pattern was gently retrieved and smoothed with a lecron carver and cotton. The wax pattern was tried in the patient eye and checked for retention, fullness, comfort and movement of the eyelid (Fig. 7). The projection of the eye was checked from lateral view and compared with normal eye. Necessary corrections were made after viewing from different angle.

**Iris positioning with grid**

A grid was fabricated by taking a xerox of graph paper on a OHP sheet. A triangular piece was cut out from the centre of the grid in order to accommodate the nose. An iris disk of similar colour of the normal eye was selected from a stock eye. The grid was placed and width of normal eye, width of iris was measured. The scleral portion was trimmed and the iris was reduced to the same size as that of the normal eye. On the grid a straight line was marked from the centre of normal iris which was extended to the other side, this helps to orient the centre of iris disk on wax pattern (Fig. 8).

**Investing, Dewaxing and packing procedure**

The wax pattern was invested into the first pour in a three-piece flask. Then the needle cap was attached to the iris, which will help to properly orient the iris after dewaxing procedure (Fig. 9). The medial, lateral, upper, lower poles of the wax pattern were scribed on the plaster for the ease of intrinsic pigmentation. The putty material was used to cover the needle cap and exposed portion of the wax pattern and then the second pour was made. Once the plaster was set it was dewaxed, then got the imprint of tissue surface on the base flask and iris with needle cap and the putty index of the exposed portion of the wax pattern was incorporated on to the counter flask (Fig. 10). For characterisation place small amounts of acrylic pigment powder on the putty index at different positions to mimic the contralateral eye. Clear heat cure acrylic resin powder was mixed with tooth coloured acrylic resin powder in a certain proportion and cured and thus shade of the sclera was matched with normal eye (Fig. 11). This proportion was used for final packing of ocular prosthesis. After curing the custom fabricated ocular prosthesis was trimmed, smoothed and polished to get a natural glossy finish (Fig.12, 13).



**Fig 3:** Cast fabricated from stock eye



**Fig 4:** Custom ocular tray



**Fig 5:** Ocular impression



**Fig 6:** Alginate index of putty impression



**Fig 1:** Pre-operative frontal view



**Fig 2:** Defect



**Fig 7:** Wax pattern trial



**Fig 8:** Iris positioning with grid



**Fig 9:** Needle cap placed on iris disk



**Fig 10:** Dewaxed



**Fig 11:** Acrylic colours



**Fig 12:** Final prosthesis



**Fig 13:** Post-operative view

### Insertion appointment

The patient was given instructions for the usage of the prosthesis. The prosthesis was removed by pulling the lower eyelid down and engaging the lower margin of the prosthesis with one finger. So that it was expelled downward into the hand. Prosthesis should be wet prior to the insertion. Prosthesis should be washed with soap and tepid water once a day to remove the debris and mucin attached on the surface of the prosthesis. <sup>[5]</sup>

### Discussion

Trauma, infection, tumours, congenital defects may lead to

surgical procedures which results in to the removal of eyeball. <sup>[6]</sup> Eye defects can be classified as ocular and orbital. Ocular defects involve the eyeball whereas the orbital defects involve the periorbital tissues as well.

According to Peyman G.A *et al* the surgical procedures for the removal of an eye can be classified as (a) Evisceration (Removal of eye with sclera intact) (b) Enucleation(Removal of entire eye including globe with orbital contents) (c) Exenteration (removal of contents of the eye socket including muscles, lacrimal glands, optic nerve). <sup>[3, 4, 7]</sup> For the first two procedures were rehabilitated with ocular prosthesis and for latter, the orbital prosthesis was given.

A successful rehabilitation of an orbital defect is a complex task. A prosthetic eye can improve the appearance of the affected eye socket. It is commonly called as glass eye or fake eye. There are two methods for the rehabilitation of orbital defects. One with prefabricated stock eye and other with custom fabricated prosthesis. The custom-made prosthesis was superior in fit, comfort, colour, support and provide natural gaze and similar eye movements. <sup>[8]</sup>

### Conclusion

A successful rehabilitation of an ocular defect is a complex task. Accurate impression, proper iris positioning and adequate shade selection will provide fit, aesthetics, comfort and confidence to the patient.

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