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Eye for an Eye: Ocular Prosthesis – A Case Report

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Abstract*: Maxillofacial prosthesis include all the artificial prosthesis that restore missing parts of the face which might be either due to trauma, congenital defects or surgically removed, the reason for it being either a malignant or benign neoplasia or trauma. The rehabilitation of facial defects is a complex task requiring a specific design of the techniques to be used in an individual patient. The disfigurement associated with the loss of eye can cause significant physical and emotional problems. Maxillofacial prosthesis which restore and replace stomatognathic and associated facial structures with artificial substitutes, aims to improve the patient's aesthetics, restore and maintain health of the remaining structures and consequently provide physical and mental well- being. Treatment of such cases includes implant and acrylic eye prosthesis. A custom made ocular prosthesis is a good alternative. The present article describes the prosthetic management of a custom made ocular acrylic prosthesis, which has acceptable fit, retention and aesthetics.*

Keywords*: Custom- made ocular prosthesis, Maxillofacial prosthesis, scleral shell prosthesis.*

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I. Introduction:

As the conversation often starts with an eye contact, the prosthesis replacing eye defects certainly deserve special importance. Eyes are naturally, the first feature of the face to be noticed. The psychological impairment to the patient often exceeds physical impairment.

An ocular prosthesis does not provide vision; this would be a visual prosthesis. A patient with an ocular prosthesis is totally blind on the affected side. A maxillofacial prosthodontist can help replace the missing part with a prosthesis that will restore the defect, improve aesthetics and thereby boost the morale of the patient.

Classification:

Artificial replacement of the eye is done with the help of an ocular prosthesis which can be customized according to the defect for that particular patient. Surgical procedures adopted for removal of eye are classified by Peyman, Saunders and Goldberg into three general categories:

- Enucleation,
- Evisceration and
- Extenteration.[1]

II. Review of Literature:

Tylman introduced the use of a resilient vinyl copolymer acrylic resin for facial prosthesis. A wide variety of colouring materials were also described. The introduction of various kinds of elastomers resulted in major changes in the fabrication of facial prosthesis. Silicone elastomers have gained popularity among clinicians.[2]

Barnhart (1960-1970) was the first to use silicone rubber for constructing and colouring facial prosthesis by combining a silicone rubber base material with acrylic resin polymer stains.[3]

Tashma used dry earth pigments dispersed in colourless acrylic resin polymer powder for intrinsic colouring of silicone facial prosthesis.[3]Advances in polymer chemistry have renewed interest in developing new materials for facial prosthesis.

A new generation of acrylic resin is being investigated by Antonucci and Stansbury.[4] Mark S Chambers has described a method for indexing ocular portion of an orbital prosthesis.[5]The following case report shows the use of a customised prosthesis to replace the missing eye.

Case Report:

A 37-year-old male patient, reported to the Department of Prosthodontics, D.Y. Patil University, School of Dentistry, Nerul, Navi Mumbai, with a chief complaint of the appearance of the old prosthesis and its impingement while he was wearing it during the day.

He had lost his left eye because of a road accident 3-4 years ago. He had his first artificial eye constructed 1 year back.

(Fig 1)

Figure 1: Showing the old prosthesis which has a dull appearance

On examination of the defective eye socket it was found that he had a defect with a shrunken orbit and intact tissue.

(Fig 2)

Figure 2: The defect with reddening visible, indicating spot of irritation

Procedure:

Patient's eye was first irrigated with saline water and a thin layer of Vaseline was applied, prior to making an impression using Alginate material.Patient was instructed to gaze directly forward at a fixed point at least 6 feet away. This will provide impression of the site with the muscles captured in neutral position. Impression was first made by injecting the material into the depth below the upper eyelid and then into the lower.[6]

This was done to record the proper extensions of the defect. After which the eye socket was filled with the material and the patient was instructed to perform all movements of the eye. A metal wire with a "J shaped" bend was put into the material before it set and used to pick up the impression. The bend is important to prevent any lacerations to the underlying mucosa. **(Fig 3)**

Figure 3: Impression being made of the defect

Figure 4: Impression retrieved showing the extensions

The impression was retrieved when it had completely set**(Fig 4)**. This impression was then invested to obtain a primary cast.
After complete setting of the cast a special tray was fabricated, finished and polished**(Fig 5)**. The special tray was tried in the patients socket and adjusted for a passive fit**(Fig 6)**.

Figure 5: Special tray made

Figure 6: Special tray checked for passive fit

The final impression was made using soft putty consistency and light body addition silicone impression material. The soft putty was used to record the gross extent of the defect and light body was used as a wash material for the final impression.[7]

Figure 7: Final impression being made while the patient makes functional movements

The patient was asked to move both his eyes up and down, which facilitated the flow of the impression material into all aspects of the socket**(Fig 7)**. The metal Handle is cut off. This impression was then invested to obtain a two-piece split cast mould.[7]After the stone was set; the two parts of the spilt cast were separated and the impression material along with the tray was removed**(Fig 8)**.

Figure 8: Two- piece split cast mould

In order to prepare the wax pattern for the prosthesis, the inner surface of the mould was coated with separating medium. Wax was heated, and molten wax was poured into the mould.[8] Then the mould was opened to retrieve the wax pattern**(Fig 9)**.

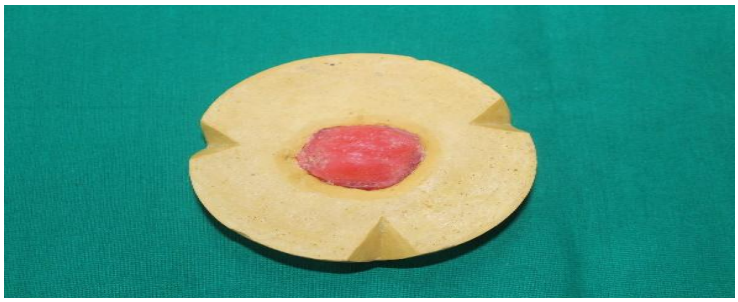

Figure 9: The wax pattern ready in the mould

The metal loopand sharp edges were removed and recontoured into a smooth hemispheroid. The wax pattern was highly polished and free from dust and debris when placed in the socket**(Fig 10)**.

Figure 10: Highly polished wax up to assess freedom of movement and extensions of the prosthesis

At the time of the wax pattern trial, the following was taken care of:

- Areas of discomfort or pressure points were relieved,
- The eye contour and lid configuration were checked from all different angles, during which asking the patient to open his eye and by manual palpation with the eyes closed.
- The height of convexity was cantered over the pupil, which is slightly medial to the midline between the inner and outer canthi.

- the eyelid was closing completely over the wax pattern
- the contours and palpebral fissure were resembling the adjacent natural eye.

The size of the iris was determined and marked on the wax pattern using the natural eye as a guide. The distance was measured from the midline to the centre of the pupil of the natural eye and the same distance to the left side was marked and engraved into the wax pattern[9]**(Fig 11)**.

Figure 11: Size of the cornea determined. Care is taken not to go too close to the natural eye

Also, his eye movements were checked for symmetry and function and it was seen that the wax pattern moved and synchronised in harmony with the patient's natural eye movements.

A cornea of similar size and colour was selected and then placed on the pre- determined position in the wax pattern and the wax pattern is tried in**(Fig 12)**. Shade selection of the sclera is done using the natural eye as the shade guide.

Eye movements are crosschecked at this stage.[8]

Figure 12: The corneal button and the button on the decided position of the wax up

The waxed-up prosthesis is then invested in a flask. To stabilize the corneal button into the plaster, a small handle of cold cure acrylic was attached to it, which prevents its displacement during dewaxing.

The second pour was poured in such a way that the handle attached to the corneal button was embedded into the plaster of the counter flask. Then the dewaxing was done after the final set, taking care that there was complete wax elimination from the mould space**(Fig 13)**.

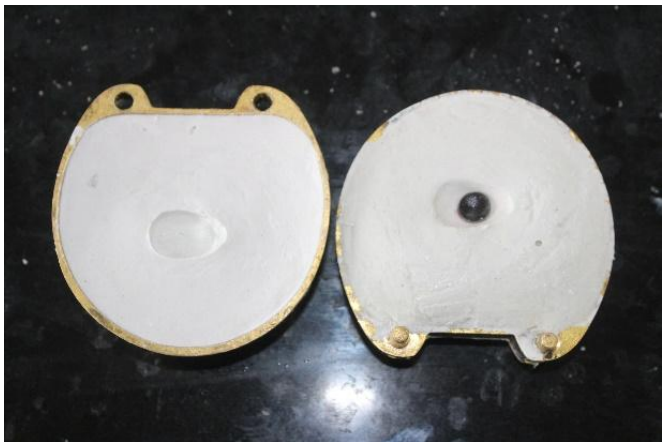

Figure 13: Dewaxed flasks (with corneal button in the correct position) ready for packing

The mould was packed with heat cured tooth coloured acrylic resin of appropriate shade and kept for bench curing to enable complete polymerisation and prevention of any excess of monomer. It is then cured in an acrylizer followed by another bench curing cycle. It prevents any untoward irritation or sensitivity and there by rejection of the prosthesis by the patient's body. The eye socket is extremely sensitive, and the residual conjunctiva and related structures react to any surface roughness and irregularities. Hence when the arcylized prosthesis was retrieved from the flask, it was trimmed to remove irregular and sharp surfaces**(Fig 14)**.

Figure 14: The heat cured acrylic prosthesis

The next step is important as it involved the characterisation of the prosthesis, where it is customised to give it a more life- like appearance.

- First a putty impression was made out of the prosthesis as a later reference for original contour.
- Acrylic resin was trimmed to a depth of 1mm around the corneal button of the prosthesis with an acrylic trimmer.[8]
- A combination of yellow, red and orange shade was applied on the trimmed surface to simulate the colour of the natural eye. The colours were selected and mixed using monomer as the thinning agent.
- To simulate blood vessels, red satin strands were placed.
- The autopolymerising clear acrylic resin was mixed, placed on the painted surface and the prosthesis was replaced on the putty impression to regain the original contour of the surface.
- After the acrylic polymerizes, the prosthesis was trimmed, polished and finished**(Fig 15)**.

Figure 15: The final prosthesis after characterization

- Finished prosthesis required a highly polished surface which should have a glass like finish to provide maximum adaptation and overall success of the prosthesis.
- At the time of insertion, aesthetics, fit and movement of the prosthesis were assessed**(Fig 16)**.

Figure 16: The final prosthesis given to the patient

The final outcome of the prosthesis was ascertained from the satisfied look on the face of the patient. The patient was given instructions for wearing the prosthesis and its home care protocol which are as follows:

- prosthesis should be handled with care and clean hands
- removal of acrylic prosthesis during night is ideal, it should be soaked in antibacterial solution to kill surface bacteria.
- Routine polishing of the prosthesis should be done every year to prevent deposition of protein and bacteria.

III. Conclusion

A prosthetic eye can improve the appearance of the person who has lost an eye to injury or disease. A well- made and properly planned ocular prosthesis maintains its orientation when patient performs various movements. The custom made ocular prosthesis has been a boon to the patients who cannot afford for implant replacement. The aesthetic and functional outcome of the prosthesis is superior to the stock ocular prosthesis. Although the patient cannot see with this prosthesis, it has restored his self-esteem and allowed her to confidently face the world.[10]

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