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Case Note

Ocular prosthesis in children – clinical report

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Abstract
Children and adolescents are particularly susceptible to injuries because of their fearless manner of play and their athletic immaturity due to which irreparable trauma to the eye is very commonly seen. Glaucoma is another common cause for eye loss in children. The loss of an eye causes disfigurement of the face due to which the children become emotionally weak and conscious and avoid taking part in social events, which in turn causes anxiety, stress and depression at an early age in life. Recovery after the loss of an eye requires an adjustment to monocular vision and improvement of the appearance with the use of artificial eyes carefully prepared to match the remaining natural eye. The custom made ocular prostheses are very comfortable and help children improve their appearances, which in turn, encourages them to build up their self-confidence to return back to their social life.

Anophthalmos is a condition in which no eyeball can be found in the orbit[1]. Injury to the eye is a very common event in children and a common cause for removal of an eye. A seemingly minor trauma can be serious if the eye penetration goes unnoticed or if secondary infection develops. The other common cause for anophthalmia is Glaucoma. Other than these two causes, the indications for removal of an eye include malignancy, congenital deformities, infection and cosmetic reasons. There are three general categories of surgical procedures in the removal of an eye.

Evisceration – this is the minimal surgical procedure where the contents of the globe is removed leaving the sclera (and at times the cornea) intact.

Enucleation – is the most commonly performed procedure where the entire eyeball is removed after severing the muscles and the optic nerve.

Exenteration – is the most radical in which the entire contents of the orbit including the eyelids and the surrounding tissues are removed leaving a large exposed cavity[2].

Eye loss in early childhood hinders normal growth process and if the eye is removed due to malignancy, the radiation treatment further retards development[2]. The replacement of the lost eye with a custom made ocular prosthesis should be carried out as early in life as possible. In case of infants with congenital deformities the treatment should be done within the first four weeks of birth by placing a small ocular prosthesis (conformer) in the conjunctival socket. To prevent the cul-de-sac from shrinking and to promote development, a conformer of a larger size must be changed as the child grows[1].

The construction of a custom made ocular prosthesis for a child is the same as for an adult, but periodic enlargement of the prosthesis is necessary for a growing child. To aid in the normal development of the lids and the soft tissue lining the orbital bone, the size of the prosthesis is gradually increased over a period of years. The soft tissues get stretched during this period of growth and thus enhance the development of the fornices which is necessary for good cosmetic result[3]. The socket is fully developed at about twelve years of age, thus teenage patients should be treated as adults[2].

The close adaptation of the custom made ocular prosthesis to the tissue bed provides maximum comfort and restores full physiologic function to the accessory organs of the eye[3]. Voids that collect mucus and debris, which can irritate the mucosa and act as a potential source of infection are minimized and this prosthesis also provides optimum cosmetic and functional results[3].

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In this article the fabrication of a custom ocular prosthesis is described and the results of three paediatric patients with enucleation of one eye are shown.

Technique

The patient's history, including the details of the loss of eye was taken. This is very important because if the eye loss was due to any malignancy then one has to be alert for any evidence of recurrence during initial and subsequent visits. The eye socket was then examined to check for complete healing of the surgical wound and also to see if any oedema and inflammation existed.

***Impression Procedures*:** The impression of the socket was made with a light viscosity polyvinyl siloxane impression material, with an auto-mixing device (Contrast, Voco, Germany). Before making the impression, a thin layer of petroleum jelly was applied on the eyelashes and around the eye socket to prevent the impression material from sticking to the eyelashes. The material was then injected slowly into the socket and the patient was asked to perform various eye and eyelid movements to facilitate the flow of the impression material into all aspects of the socket. The impression was carefully removed from the socket once the material had set.

Formation of the cast: The impression was poured in three sections. First the upper third of the impression was immersed. After the stone had set, keyholes were cut and boxing was done around the first layer using modelling wax after which separating medium (Cold mould seal, Dental Products of India Ltd.) was applied. Then a second layer was poured to cover the middle third of the impression. Again keyholes were cut and separating medium was applied. Then the final pour was made. After it had set, the three sections were separated and the middle layer was sawed and separated into two halves in order to remove the impression.

Preparation of wax pattern: The second and the final layer of the cast were assembled and immersed in water for few minutes. Molten wax (Modelling wax, Hindustan Dental Products Ltd.) was then poured into the cast. Once the wax hardened, the mould was opened and the wax pattern was removed. Sharp ridges and undesirable irregularities were eliminated and the portion of the wax that represented the palpebral fissure was re-contoured to form a smooth convex surface.

Try in of the wax pattern: The wax pattern was inserted into the patients socket to check for proper contour and bulk. Necessary modifications were done, re-polished and again inserted into the patient's eye socket. This was done until the soft tissue contour and the palpebral tissue resembled the patient's natural eye. The patient was then made to look straight ahead at a distant point and landmarks were marked on the wax pattern for the placement of the prefabricated iris button of appropriate size and similar shade provided by the ophthalmologist. Then a space was created on the wax pattern and the prefabricated iris button was placed and the wax was again smoothened. The wax pattern was again placed in the socket and compared with the patient's natural eye. Once the soft tissue contour and the location of the iris were satisfactory, the pattern was removed and the shade for the scleral portion of the prosthesis was selected using tooth coloured acrylic shade guide.

Acrylisation: Flasking and dewaxing was carried out in a usual manner taking care that the iris button was secured firmly to one compartment of the flask. Heat polymerizing tooth coloured acrylic resin (Stellon, Dental Products of India Ltd.) of appropriate shade was used and after doing a trial closure, stains and veins were added to give a more natural appearance of the artificial eye. After the final closure, the processing was done by a slow curing cycle. After recovering the prosthesis it was polished to get a smooth and shiny surface. On the final appointment the prosthesis was inserted into the patient's eye socket.

Instructions to the patients: The patient (for a child – the parent) was taught the proper method of removal and insertion.

- Removal is done by pulling the lower lid down, gazing overhead and engaging the lower margin of the prosthesis with one finger so that it is expelled downward in to hand.
- Insertion is done by lifting the upper lid with the thumb and forefinger, sliding the prosthesis with other hand as much as possible under the upper lid and pulling the lower lid down to allow the prosthesis to slip into the socket
- The patient was instructed to wear the prosthesis day and night, removing and washing it with a mild soap once a day.
- To improve the movements of the eyelids and to get a sparkle on the surface of the prosthesis, use of an ophthalmic silicone liquid was advised.

Case 1 Before treatment

Case 1 After treatment

Case 2 Before treatment

Case 2 After treatment

Case 3 Before treatment

Case 3 After treatment

Summary

Rehabilitation of child patients who have suffered the psychological trauma of an ocular loss require a prosthesis that will provide the optimum cosmetic and functional result as early in life as possible. The custom made ocular prosthesis is recommended as an effective alternative form of treatment. Ocular prostheses produced by this method are the most aesthetic and comfortable and they should be provided for all patients who require such prostheses.

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