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A Relining Technique for an Ocular Prosthesis: A Case Report.

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Abstract: *Maxillofacial prosthetics includes all the artificial prosthesis that restores missing parts of the face due to trauma, congenital defects or surgically removed [1]. This article describes the relining of an old ocular prosthesis in a male patient, due to atrophic degeneration of the socket and related tissues resulting in ill-fitting prosthesis. The goal of rehabilitation is to return the patient to a normal cosmetic appearance as soon as possible. This functional reline impression technique provides a quick well-adapted prosthesis while improving the patient's appearance and psychological outlook [2].*

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I. Introduction

"Eyes are the mirror to the soul", as rightly said are one of the important sensory organs of the body that enables one to see. The absence of these can be attributed to the causes like accidental trauma, malignancies or by sympathetic ophthalmia. These situations can be managed by one of the three approaches: Evisceration, enucleation, or exenteration. Evisceration is the removal of the contents of the eye leaving only the scleral shell, enucleation involves removal of the whole intact eye by cutting the six extraocular muscles, and transecting the optic nerve and excenteration is the removal of entire orbital contents down to the bone [3].

Replacement of the lost eye as soon as possible is necessary to promote physical and psychological healing of the patient and also early management of an ophthalmic socket prevents loss of volume in the anterior orbital area and facial asymmetry [4].

The similar aims can be achieved with the help of two approaches either by pre-fabricated stock ocular prosthesis or by custom made ocular prosthesis. The first, technique is less time-consuming but often has the disadvantages like compromised esthetics and unreliable fit. On the other hand, the custom-made ocular prosthesis provides even distribution of pressure, better mobility, reducing the incidence of ulceration, improved fit, comfort, and improved facial contours [5, 6].

The present case report demonstrates the combination of both the techniques for fabrication of the ocular prosthesis.

II. Review Of Literature

The earliest known evidence of the use of ocular prosthesis is that of a woman found in Shahr-I Sokhta, Iran dating back to 2900–2800 BCE. It has a hemispherical form and a diameter of just over 2.5 cm (1 inch). It consists of very light material, probably bitumen paste. The surface of the artificial eye is covered with a thin layer of gold, engraved with a central circle (representing the iris) and gold lines patterned like sun rays. On both sides of the eye are drilled tiny holes, through which a golden thread could hold the eyeball in place. Since microscopic research has shown that the eye socket showed clear imprints of the golden thread, the eyeball must have been worn during her lifetime. In addition to this, an early Hebrew text references a woman who wore an artificial eye made of gold. Roman and Egyptian priests are known to have produced artificial eyes as early as the fifth century BCE constructed from painted clay attached to cloth and worn outside the socket [6, 7,13].

The first in-socket artificial eyes were made of gold with colored enamel, later evolving into the use of glass (thus the name "glass eye") by the Venetians in the later part of the sixteenth century. These were crude, uncomfortable, and fragile and the production methodology remained known only to Venetians until the end of the 18th century, when Parisians took over as the center for artificial eye-making. But the center shifted again, this time to Germany because of their superior glass blowing techniques. Shortly following the introduction of the art of glass eye-making to the United States, German goods became unavailable because of WWII. As a result, the US instead made artificial eyes from acrylic plastic [6, 8].

Modern ocular prosthetics has expanded from simply using glass into many different types of materials. The most basic simplification can be to divide implant types into two main groups: non-integrated (non-porous) and integrated (porous). Two methods are used currently for the fabrication of ocular prostheses which are by the placement of orbital implants and custom made prosthesis [6, 7].

III. Case Report

A 24-year-old male patient reported to our department with the chief complaint of ill-fitting eye prosthesis since 2 years. The history revealed that the patient had undergone enucleation procedure of the same 5 years ago, due to an accidental trauma. The ophthalmic socket once had healed, an ocular prosthesis was fabricated for the same and the prognosis then was with acceptable esthetics. On examination of the eye socket displayed a healthy conjunctiva with no signs of infection or inflammation. The prosthesis seemed overextended as compared to the contralateral eye, this had happened due to atrophic degeneration of the ophthalmic socket over a period of 5 years resulting in the ill fit of the prosthesis. It was decided to refabricate a new prosthesis for the patient to improve the esthetics and function, with a semi-customized ocular prosthesis with stock eye shell. A complete medical history was elicited before starting the treatment procedure. The procedure and its drawbacks were explained to the patient to determine the motivation of the patient toward the treatment [2, 3, 12].

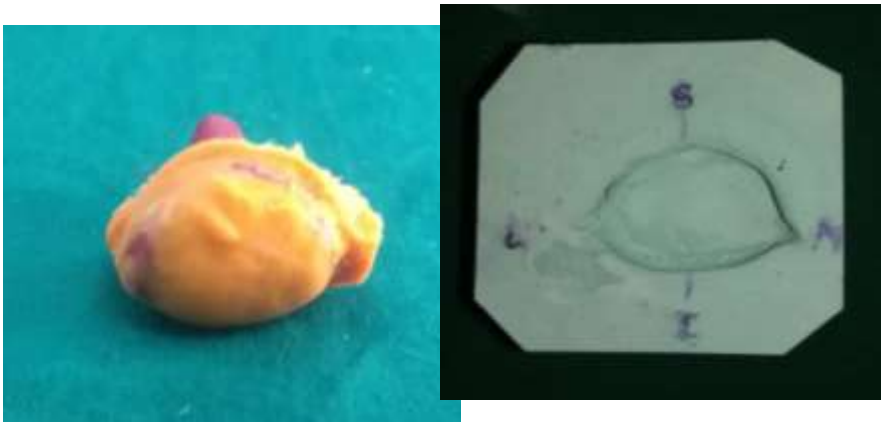
Procedure [4]:

1. Primary impression: impression compound was initially used to record gross extensions of the eye defect, and then it was lined by polyvinyl siloxane light body consistency. This was done to record the complete extensions of the defect along with the surface details of the defect [7, 9].
2. Custom tray fabrication: This was fabricated on the primary cast using cold cure acrylic tray material. A wax spacer was applied 2mm short of the contours of the socket on the cast, and a custom tray with a handle was fabricated. This was then tried in the patient's ophthalmic socket and the extensions were checked and confirmed.
3. Once the custom tray was trimmed and fitted aptly to the contours of the socket the spacer was removed, tray adhesive was applied and an impression was made using polyvinyl siloxane light body consistency. Once material was set, impression was retrieved and inspected carefully [9].
4. Then a master cast was poured in dental stone. The medial, lateral, superior and inferior borders of the defect were marked on the cast for further reference.
5. The acrylic on the intaglio surface of the previous prosthesis of the patient was trimmed, and the eye shell was then tried in the patient's socket and marked for overextensions. The borders of the eye shell were trimmed until they approximated the socket [2].
6. Then, wax was added onto the intaglio surface of the eye shell and was continued to be done until a proper bulk and emergence of the prosthesis was obtained when tried in the ophthalmic socket of the patient.
7. The movements, extensions, emergence profile, centering, approximation of the eyelids, were all checked in the wax-up trial, until satisfactory.
8. Then, the waxed up trial was placed onto the master cast and final fabrication procedure was commenced. Prior to flasking a plastic stick with striations was stuck to the centre of the iris of the shell.
9. Flasking was done.
10. Wax elimination was done.
11. Packing was done using clear heat cure acrylic resin using compression molding technique.
12. Long curing cycle was used, at 74^{o}C for 8 hours.
13. After the flask was cool, the eye was separated from the investment and polished. The polished prosthesis must be free of roughness that could irritate the ophthalmic socket and encourage secretions to accumulate for additional irritation.
14. Prior to inserting the polished prosthesis, disinfection was done in a solution of 0.5% chlorhexidine and 70% isopropyl alcohol for 5 minutes. After disinfection, prosthesis was rinsed in sterile saline solution to avoid chemical irritation [5].
15. Carefully the prosthesis was inserted into the socket but delayed evaluation was done of its appearance and location for 10 minutes to allow protective blepharospasms of the orbicular muscles to subside. After 10 minutes, discrepancies in location were adjusted by grinding the posterior and peripheral surfaces of the prosthesis. The location of the iris was acceptable [5].
16. Ocular hygiene, insertion, and removal of the prosthesis with oral and written instructions were given to the patient prior to dismissal with the new prosthesis. Follow up after 4 days showed no signs of irritation of the socket.

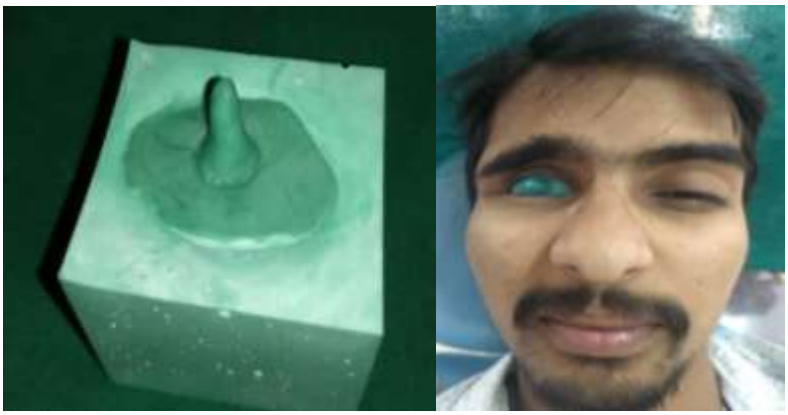
Patient's photograph of prosthesis done 5 years ago immediately after enucleation of the socket

Pre- operative view with and without the prosthesis- note atrophy of the ocular tissues resulting in ill-fit of the previously well adapted prosthesis.

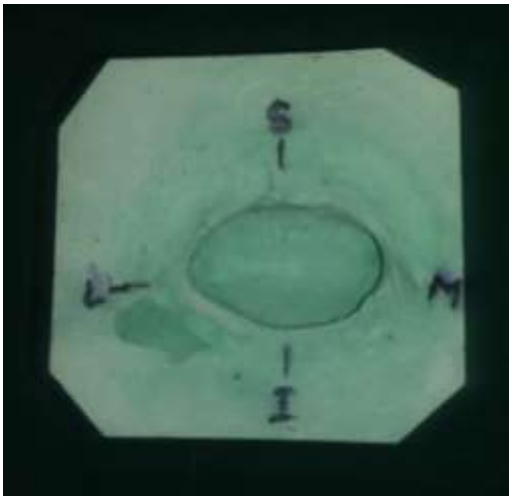
Pre-operative view of the ill-fitting prosthesis



Primary impression and primary cast

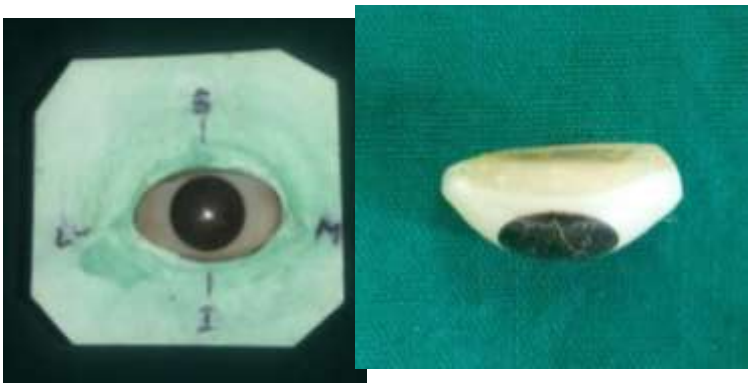


Custom tray fabrication and custom tray trial in the socket

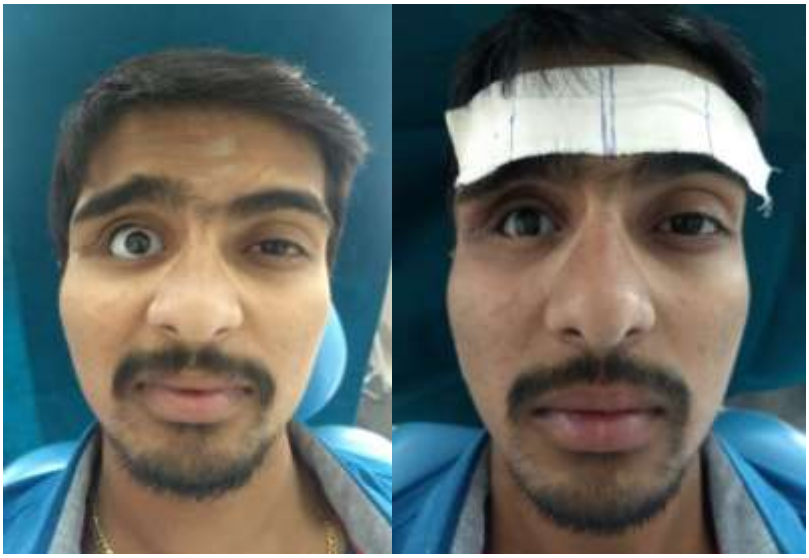


Master cast

Wax trial of the relined old prosthesis



Fabricated final prosthesis



Comparison of pre-operative view and post insertion view of the relined prosthesis

IV. Discussion

The art and science of ocular prosthesis has been refined over many decades to provide a cosmetic replacement of the enucleated or eviscerated eye. The fabrication of a definitive ocular prosthesis should begin as soon as the socket has healed. A correctly placed prosthesis should restore the normal opening of the eye, support the eyelids, restore a degree of movement, and be adequately retained and esthetically pleasing. With the development of newer materials the socket can be finely recorded on which custom made ocular acrylic prosthesis (Sykes, 1996) can be fabricated with exact fit and esthetics although the prosthetic rehabilitation may be enhanced with the use of implants, can coordinate the movements with natural eye, as they are not always possible or feasible [8]

Sykes (1996) used medium viscosity polyvinyl siloxane impression material. A modification of the technique described by Taicher et al (1985) was performed by Sykes. In this case report impression compound was initially used to record gross extensions of the eye defect, and then it was lined by polyvinyl siloxane light body consistency [7, 8]. This was done to record the complete extensions of the defect along with the surface details of the defect. Similarly secondary impression was made using a custom tray which was adjusted according to the socket size, and also the eye movements were checked for, then impression was made using polyvinyl siloxane light body consistency to obtain accurate details of the defect [4].

An artificial ocular prosthesis, is either a pre-fabricated stock prosthesis or a custom-made prosthesis. The prefabricated prosthesis has several drawbacks such as poor fit, poor esthetic and limited eye movements, etc.The intimate contact between the ocular prosthesis and the tissue bed is needed to distribute even pressure, so a prefabricated prosthesis should be avoided [3].

In the present technique, both the methods are used in combination which each other to eliminate the time required for the iris preparation and to achieve better contouring, color matching, and better movements. The use of a stock ocular prosthesis of an appropriate size and color, adapted by selective grinding or addition of acrylic resin, was advocated by Laney and Gardner. An eye shell which matches the pupil and sclera of patient's

normal eye is generally selected. Over extension of the eye shell is trimmed to fit the contours of the eye socket [3].

In current case the patient had a prefabricated eye shell which was appropriately matched to the contralateral eye, but was overextended due to atrophy of the socket. Hence, the old eye shell of the patient was used by trimming the acrylic on the intaglio surface of the prosthesis. The eye shell was trimmed and contoured according to the size of the socket and was supported posteriorly with wax to provide the required emergence profile and the retention of the eye shell.Patients may need their ocular prosthesis relined over a period of time because of atrophic tissue changes that makes their existing prosthesis cosmetically unacceptable. Relining the existing ocular prosthesis can offer the advantage of providing an acceptable prosthesis to the patient [2].

To date, various materials like gold, silver, glass, acrylic, and even porcelain have been used for making artificial eyes, but the preferred material is acrylic [7]. The material is lightweight, easy to fit and adjust, unbreakable, translucent, easily fabricated, has intrinsic and extrinsic coloring capabilities, and is inert to the socket secretions. So in the current case the acrylic was used to customize the prosthesis according to patient. The custom- made acrylic resin ocular prosthesis achieves intimate contact between prosthesis and tissue bed. The close adaptation of the custom-made prosthesis tends to distribute pressure more equally than does stock eye prosthesis. This helps reduce the incidence of conjunctival abrasion or ulceration. It also enhances tissue health by reducing potential stagnation space at the prosthetic-tissue interface [13].

V. Conclusion

The disfigurement related to ocular tissue keeps a person away from social and professional activities. Restoring such defect is a big challenge for the maxillofacial prosthodontist. Hence, maxillofacial prosthodontist plays a role in bringing back such patient to a normal social life.The success rate of the fabrication of the ocular prosthesis is completely dependent on the artistic work of the operator. It also needs the extensive cooperation from the lab and a satisfactory color, contour, and configuration of iris.

The goal ofrehabilitation is to return the patient to a normal cosmetic appearance as soon as possible. This functional reline impression technique provides a quick well-adapted prosthesis while improving the patient's appearance and psychological outlook [2].

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