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RESEARCH ARTICLE

IMPRESSION TECHNIQUES FOR OCCULAR PROSTHESIS - REVIEW

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Abstract

Eye is a vital sensory organ have been playing its role from vision to expression. Construction of the ocular prosthesis was never been so easy numerous techniques was implicated for the fabrication of the ocular prosthesis. Depending upon the availability of materials and time the technique for the fabrication it differs from one author to the another based on its esthetic, comfort and longevity of the prosthesis. This article is a review about various methods implicated by the authors over the due course of time for the construction of a prosthesis.

Introduction:-

An eye is an integral part of facial expression as well as a vital organ for vision. Over the years considerable number of people develop facial defects due to cancer, injuries, and congenital deformities that claim the lives of thousands of people.[1]Apatient'sself-perception, emotional stability, personality characteristics, and social circumstances appear to be theforemostimportant salient factors in handling maxillofacial defects and therefore the rehabilitation process,must meet aesthetic and functional requirements that cannot be met surgically; as a result, a facial prosthesis may be a viable alternative.[2]An ocular prosthesis that focuses on the exact reproduction of natural colour, contour, scale, and ocular orientation turns out to be an effective solution to provide patients with realism and symmetry in appearance.[3]

Ocular prostheses are available in two types: readymade (stock) and custom. When time is of the essence and cost is a factor, a stock prosthesis is generally recommended.If an appropriate iris range is needed, however, a large and costly inventory of readymade prostheses is required, and the prosthesis must then be fitted to the socket. The custombuild hand painted and individually constructed acrylic artificial eye has proved to be the foremost satisfactory ocular replacement.[4–6] Many techniques have been advocated to achieve optimal fit of ocular prostheses. This article was a brief review of impression techniques and materials utilized within the fabrication of ocular prosthesis.

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Literature Review:-

Numerous ocular impression and techniques have been described. Most can be placed into one of several broad categories:

1. Direct impression/external impression.
2. Impression with a stock ocular tray or modified stock ocular tray.
3. Impression with custom ocular tray.
4. Impression using a stock ocular prosthesis.
5. Ocular prosthesis modification.
6. Wax scleral blank technique[7].
7. Rapid prototyping.

Congenital and acquired deformities are the two broad types of indications that include a prosthetic eye.
A. Congenital-Microphthalmia, Anophthalmia
B. Acquired -Post-evisceration, Post-enucleation, Post-chemical injuries, Phthisis bulbi, Atrophic bulbi, Staphyloma Contracted socket following radiation, Post-orbital exenteration.[8,9]
The various types of ocular defects suggested by that of Peyman etal.,include three types

a) Evisceration (removal of intraocular contents of the globe),
b) Enucleation (removal of the globe and parts of the optic nerve)
c) Exenteration (removal of the entire orbital contents, primarily for eradication of malignant orbital tumors)[10].This lost structures can be replaced by ocular prosthesis and effective contraction of them take immense effort by the dentist.

The Direct Impression/External Impression

In 1940s US armed forces suggested direct method of impression making which included the injecting the irreversible hydrocolloid into the patient socket and also external to the surface the main disadvantage of this technique is that the weight of the impression itself distort the countours.[11]

Bartlett and Moore suggest a method in which the patient is asked to sit erect in a position gazing the straight ahead. Then the mixture of irreversible hydrocolloid in liquid consistency is loaded in a disposable syringe gently made to flow through the palpebral inner part of the eye (fig-1).The residual material in the syringe is allowed to run over the eyelid. Gentle message is given over the borders in order to retrieve the impression easily from the surrounding tissues. Then the stone mould is obtained from that of the set impression.They also suggested in wax trial in order to evaluate the physiological position.[12]

Impression With Stock Ocular Tray

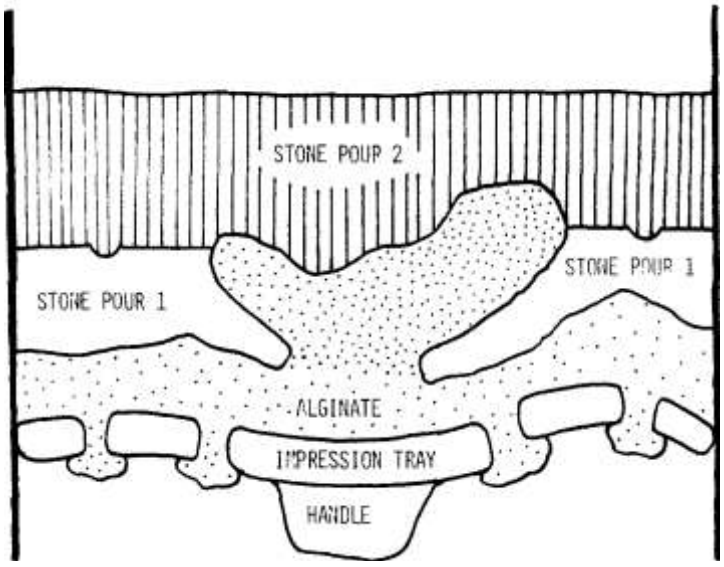

Figure 1:- The diagram shows an impression in a completed mold. Dark vertical lines represent masking tape; the heavily shaded area of the impression represents the portion that will be used to make the wax pattern.

Allen and webster suggested the method called"modified impression technique" in which the normal ocular stock prosthesis shell is used with perforation on the intaglio surface and a hollow stem is attached to that of the prosthesis(fig-2). Thin mixture of alginate is mixed with that of the cold water and optimal amount of anaesthesia is applied topically to avoid the discomfort. The alginate is loaded in syringe and made to follow through the hollow stem which is fastened in the middle of the shell and the perforated shell along with the impression material is allowed to set on the anophthalmicsocket.[13]

Stock Occular Tray Modification

Engelmeier fabricated autoclavable eye impression tray using the available stock or custom tray in the market. He duplicated the external surface of the tray and attached the syringe at the end of the wax pattern and invest,cast ,finish the tray with Nickle chromium alloy(fig-3)(fig-4). That can be sterilised easily.[14]Skyes used an impression compound as the tray and a hollow tube is attached in the middle through which the alginate is injected. He advocated a temporary conformer aid in preventing the socket shrinkage and scar tissue to contract.[15]

Figure 2:- (Allen and Webster) – Perforation on the intaglio surface of the stock ocular prosthesis and hollow stem is attached to it.

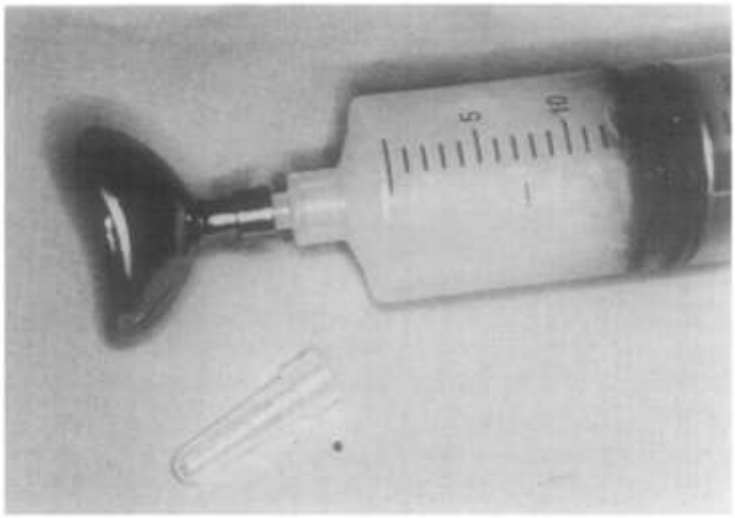

Figure 3:- Globelike eye impression tray through which irreversible hydrocolloid can be injected with a plasticsyringe.

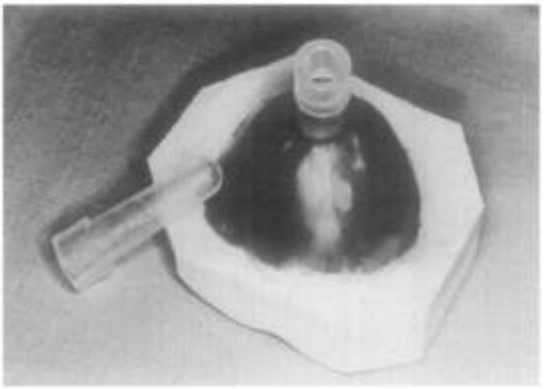

Figure 4:- Waxed eye impression tray with half of a plastic syringe tip cover incorporated.

Impression With Custom Ocular Tray

Miller said that the anophthalmia socket is highly irregular.For such type of irregular socket he modified the patient already existing prosthesis or the conformer and attached a suction rod in the middle of it through which the alginate is made to follow(fig-5).[14,15]

Putting it into the alginate mould when the alginate hardens the existing conformer is removed and substituted with that of the clear acrylic resin and perforations are made in existing tray and the stem is hollowed through which the impression is made to follow.[16,17]Custom-made ocular prosthesis believed to provide more fit when compared to that of the stock ocular prosthesis.[18–20]

Another method of impression making involve using the special tray fabricated from stock ocular prosthesis to which the hollow stem is attached. The tip of the light body addition silicon material isattached to the stem and the impression material is allowed to follow through it (fig- 6).[21,22]

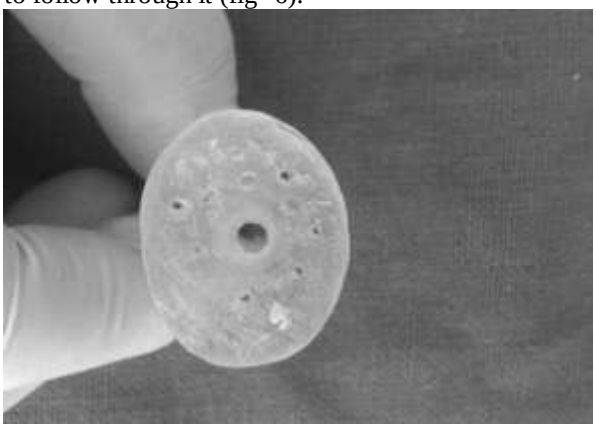

Figure 5:- Vent holes made in the custom made prosthesis for the final impression.

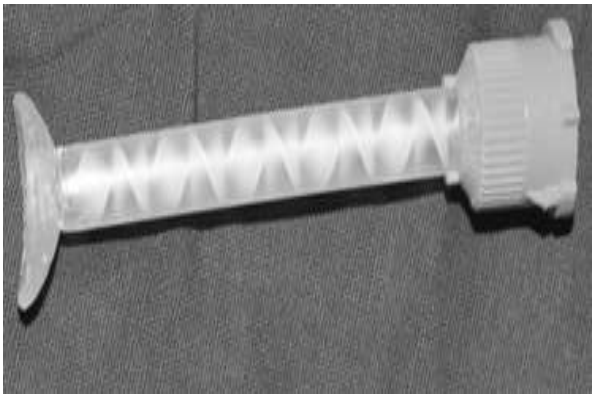

Figure 6:- Impression taken using the light body silicon elastomeric material.

Figure 7:- Impression using modified stock ocular prosthesis.

Impression Using Stock Ocular Prosthesis

The impression using the stock ocular prosthesis provide better adaptation and comfort for the patient. The periphery of the stock ocular prosthesis is trimmed due to the irregular margins of the socket and the borders are relined with that of the ophthalmic alginate recorded in the functional manner. The alginate can also be inserted directly into the patient socket. This technique has the number of drawbacks due to its necessity for large number of stock ocular prosthesis to fit all size and to match the iris and pupil colour.[15,23]

The considerable amount of medium body silicon impression material is injected into the patient socket and the excess is allowed to ooze out and thesome quantity of material is loaded in the modified stock ocular prosthesis(fig-7). The impression is recorded asking the patient to do necessary movements. [24]

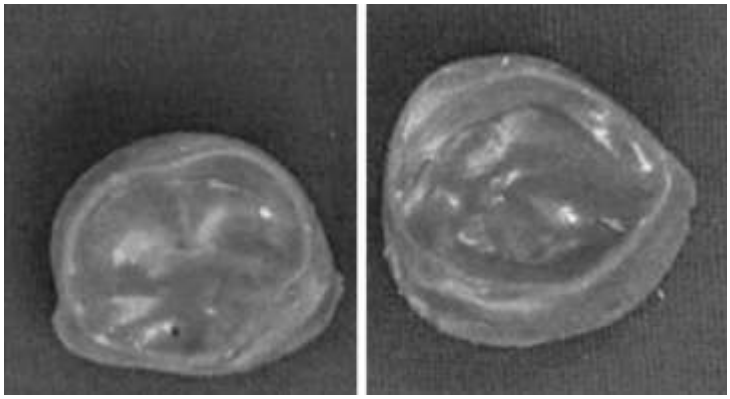

Figure 8:- Ocular prosthesis showing reline impressionmade with Korecta-wax.

Ocular Prosthesis Modification

According to Chalian,stock prosthesis can be modified with the help of alginate or soft wax, after which they are invested and stored.[25]Smithdescribed a reline procedure for an existing prosthesis using a dental impression wax,Korecta-Wax No. 4(fig -8). The ocular prosthesis is reduced peripherally and posteriorly, and modified with baseplate wax.When proper contours and position are achieved, a thin layer of Korecta-Wax No. 4 is added.[26]Warm the lined prosthesis before inserting and adjusting it as desired. The lined prosthesis is left in place for 30 minutes while the patient turns his or her eyes in all directions intermittently for conclusive refinement. After that, a relining operation in the laboratory is carried out.[27]

Ow and Amrith advocated use of a tissue conditioner as a reline material because of its biocompatibility and ease of manipulation.The stock prosthesis's periphery is reduced and then modified with baseplate wax. The is placed for 20minutes after the viscogel has been injected . Excess material is removed, and the ocular prosthesis is worn for 24 to 48 hours to create a functional impression.The prosthesis is relined if the aesthetics and adaptation are satisfactory.[28]

Wax Scleral Blank Technique

Some authors suggested wax scleral blank as the first trade mark for impression making of ocular prosthesis.[29]Bension used a steel ball with the right size and curve for the socket is chosen. The baseplate wax is heated and adapted to fit around the steel ball. The wax is used to outline the boundary and the with a bench knife, excess wax is eliminated. The borders are smoothened, trimmed and adapted in patient socket. The aim is to achieve full peripheral contact as well as proper curvature. Once it is achieved the X mark is made for the iris button and the wax is removed. The removed model is prepared for investing .[30]

McKinstry suggested a "compression impression" method, in which he made a wax pattern based on his impressions of the site. The wax pattern was tried in, modified as desired, and processed after inserting an iris. If the patient's lower lid is weak or the fornix is shallow, the analytical wax blank technique has the advantage of accurately recording and creating an inferior fornix.[31,32]

Le grand and Hughes suggested the “empirical / impression technique”First, a wax model of the anterior side of the eye is created and modified; then using this wax model as an impression tray(fig-9), an impression of the socket is made. The reliability of this approach is its primary benefit. It requires one less laboratory procedure, allowing for the development of a "one-day custom eye."Hughes then proposed attaching a syringe to the finished wax pattern so that impression material could be pumped directly into it.[33]Schneider produced a wax conformer by duplicating the patient's conformer and modifying its parts with Iowa Wax, a dental impression wax. The patient's various ocular motions culminated in a functional impression of the socket.[34]

Instead of using wax pattern for the fabrication that may be distorted easily the polyvinyl chloride can be used which is vacuum formed and adapted to that of the model. And the sheet can be removed removed before the dewaxing procedure.[35,36]

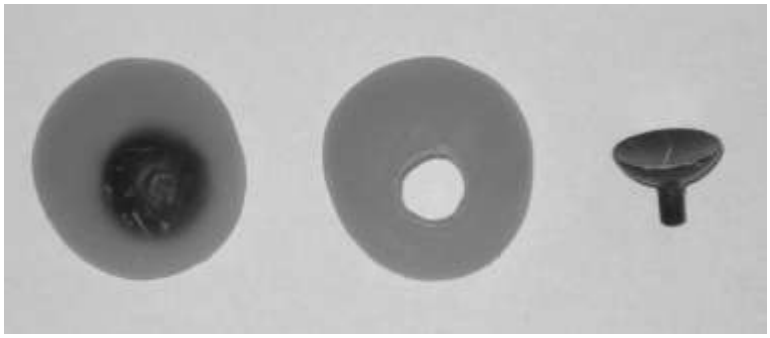

Figure 9:- The “stock” wax fitting shell with an aluminium button attached. The aluminium button will make handling the shell easier.

For the closed eye prosthesis which is fabricated in the extensive cases the involving the ethmoid sinus and other affected structures the impression is taken by packing the alginate in the defective areas and there will be minimal movement or tissue displacement. Before the procedure one should ensure to pack the ethmoidal and other sensitive areas.[2,37]

Rapid Prototyping

Rapid prototyping is the recent advancement in the construction of the ocular prosthesis. the prototype models are printed using the CAD-CAM technology.[38,39] This techniques first starts with fabrication of wax pattern then a CT scan is taken to convert the image into 3D model using MMICS Software and it is redefined by 3Matic software for designing an hollow model(fig -10). The designed hollow model is then given as input to the rapid manufacturing machine which fabricates the prototype model.[40]The prototype model is then sent to the ocularist, who hand-paints the iris by contrasting it to the unaffected eye and ensuring that both are fully uniform. The prosthesis is then coloured and painted by hand to fit the other eye. After that, it's ready for the patient to use.[41]

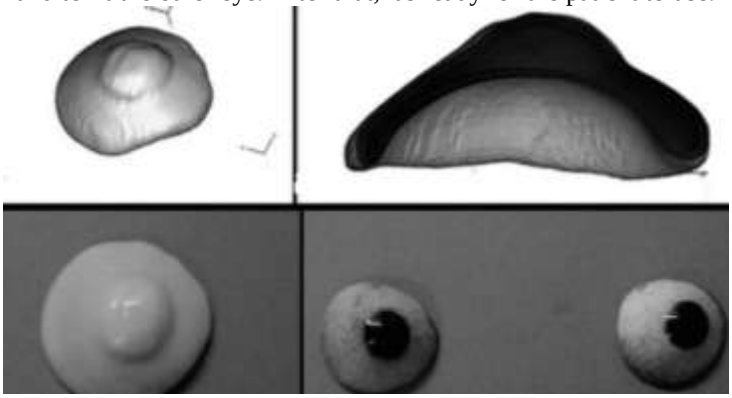

Figure 10:- Three-dimensional model of ocular prosthesis created using CAD-CAM.

When compared to traditional oil paint and monopoly iris painting techniques, using digital imaging in the manufacturing of ocular prostheses has many advantages. Since it precisely replicates the patient's iris with minimal colour changes and modifications, the digital image produces appropriate aesthetic performance. It is necessary to

have specialised digital photography equipment and settings, as well as computer software that allows for image adjustments.[42]

Conclusion:-

The patient suffers both physical and psychological distress when some part of his or her face is lost. The psychological and social effects of losing an eye can be serious. [43,44]

Patients who cannot afford implant placement have benefited greatly from the use of custom-made ocular prosthesis, which far most superior than the stock ocular prosthesis esthetically and functionally.[11]An iris prosthesis that suits the natural colour, form, size, and orientation of the iris is cosmetically appropriate.[26]This review has shown how qualitative approaches can be used to make an impression for fabrication of a prosthesis with a clinical problem.It shows how such methods can act as a link between clinical practise and future quantitative research by providing information on the potential effects of clinical therapies that can be used to guide future research.[44]

Most methods have some basic similarities. Infactthat a correct impression technique can precisely capture the internal tissue surface and fornix of the socket, most authors accept that a wax trial ocular prosthesis try-in is necessary to assess fit, proper lid opening, and overlying tissueoutlines. Before the wax prosthesis can be tested and adjusted, the muscles must be relaxed.[45]

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