Impression Techniques In Ocular Prosthesis: A Review

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Sensory organs play significant roles in our daily lives. One of the most commonly occurring loss of one of these organs is that of an eye.The loss of eye requires early replacement so that itrestores self-confidence in patients and prevents social embarrassment.The primary objective is to construct a prosthesis that will restore the defect, improve esthetics, and thereby benefit the morale of the patient.An ocular prosthesis is a simulation of human anatomy using prosthetic materials to create the illusion of a perfectly normal healthy eye and surrounding tissue.

Surgical procedures adopted for the removal of an eye were classified by Peyman, Saunders and Goldberg into three general categories:Enucleation, evisceration and exenteration [1]. Enucleation is a surgical procedure in which the globe and the attached portion of the optic nerve are excised from the orbit. Evisceration is removal of the contents of globe while leaving the sclera and extraocular muscles intact. Exenteration is the most radical of the three procedures and involves removal of the eye, adnexa, and the part of the bony orbit [2].

Prosthesis for orbital defects is made from a variety of materials, such as poly(methyl methacrylate), polyurethane elastomer, silicone elastomer or urethane backed medical grade silicone. Silicone elastomer is widely used material which is relatively color stable and can be colorized very easily. They are mainly retained using mechanical means of anatomical undercuts, spectacle frames, magnets or by the use of osseointegrated extra oral implants[2].

Ocular impression is a very important step in fabrication of an ocular prosthesis, depending on the operator's experience, patient's evaluation and the material and equipment available.Various impression techniques have been described in the literature. The aim of this article is to review the literature on different Clinical impressions techniques used for the fabrication of an ocular prosthesis.

Different techniques used for fabrication of ocular prosthesis are as follows:

- The Direct Impression/External Impression
- Impression With Stock Ocular Tray
- Stock Ocular Tray Modifications
- Impression With Custom Ocular Tray
- Ocular Prosthesis Modification
- Wax Scleral Blank Technique

The External Impression technique

Several authors suggested this technique in which low viscosity reversible hydrocolloid is injected directly into the enucleated socket.1,2 Brown advocated external impression tray technique in which the ophthalmic irreversible hydrocolloid is mixed in proper proportions specified by the manufacturer. The alginate is then loaded into a disposable 60 ml piston irrigation syringe and injected into the enucleated socket until excess material is ejected out over and around the eyelids. The patient is instructed to gaze directly forward at a fixed point atleast 6 feet away. He recommended the use of an edentulous perforated tray for reinforcement with additional impression material over the eye region allowing the material to combine with the extruded material.3

Barlett and Moore suggested mixing of ophthalmic alginate with excess water until it has free flowing consistency to avoid tissue distortion. The mixed impression material is then filled in disposable plastic syringe. The alginate is introduced at the inner aspect of palpebral opening. And excess material is allowed to flow around the eyelids. The patient is instructed to gaze at a fixed point so that the pupil is well centered.4 (Fig.1)

Taylor recommended similar technique and advocated placement of perforated acrylic resin tray for reinforcement. The impression of anophthalmic socket and overlying tissues is

obtained with this technique.5

Fig1.The mixed impression material is then filled in disposable plastic syringe. The alginate is introduced at the inner aspect of palpebral opening.

Impression With Stock Ocular Tray

Allen and Webster developed a modified impression technique which uses a perforated stock impression tray in the shape of an ocular prosthesis. The impression tray is placed within the socket to support the eyelids. The impression material is mixed with adequate amount of water so that it flows easily over the tissues. A syringe is attached to the stock impression tray through which irreversible hydrocolloid is injected into the socket. The excess material is ejected through the perforations in the tray and stem of the syringe (fig-2).6

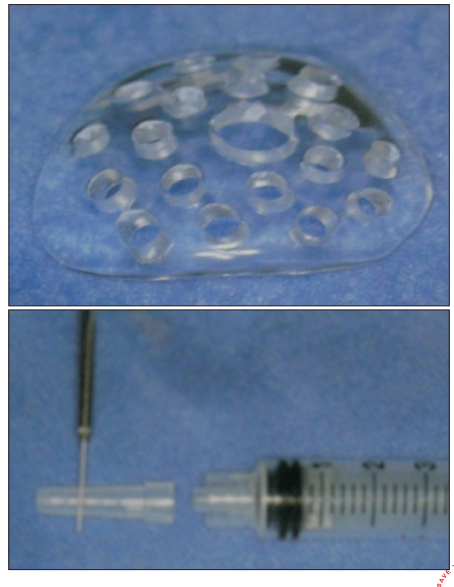

Fig:2 Modified impression technique

Cain suggested a technique similar to modified impression technique using an impression tray in the shape of ocular prosthesis with a hollow stem attached to it. The impression material used was ophthalmic alginate .He recommended mixing of alginate with adequate water so that it flows easily. The mixed material was injected in excess through the hollow stem of the impression try (Fig-3).7

Fig-3 impression tray in the shape of ocular prosthesis with a hollow stem attached to it.

Welden and Nilranenrecommended the use of a stock eye which closely matches the colouring of the iris and sclera of the remaining eye. After selection of stock eye, the complete periphery of the acrylic resin eye was reduced, so that it is free of the periphery of the socket in all dimensions and cause no distortion or displacement of tissues. The posterior portion of the eye is cut to a depth of 3-4 mm with the margin 2-3 mm from the reduced periphery. An orange wood stick 21/2 to 3 inches long is then attached over the pupil of the eye. The orangewood stick will serve as a tray handle, and as means of correlating the line of visionof modified stock eye with that of the patients normal eye.A thin mix of alginate which has a good flow and body was prepared according to manufacturer's instructions.The patient was instructed to maintain a fixed gaze at a point in midline directly in front of the patient.The mixed alginate was applied to the prepared posterior portion of the stock eye. The tray is then inserted gently and alginate is manipulated so that it flows in all portions of the socket.This technique provides a customised stock prosthesis in which stock eye is used as an impression tray for fabrication of ocular prosthesis.8

Taicher,Steinberg,Tubiana suggested a technique similar to Weldon and Nilranen'stechnique. They advocated the use of monoplexsystem,that offers variety of kits that adequately matched iris and scleral colours of patients. In this technique, alginate adhesive is painted before injecting it.The impression is then invested in two piece mold with dental stone.9

Stock Ocular Tray Modifications

Maloney described a technique in which three channels are placed through the superior edge of his own set of customized stock trays to prevent air entrapment. The raised ring around the stem prevents the eyelid from blocking the channels.10

Engelmeier suggested casting a set of stock trays in ticonium which is non precious, removable partial denture alloy which can be sterilized in autoclave for reuse. The impression material of choice was ophthalmic alginate(fig-4).11

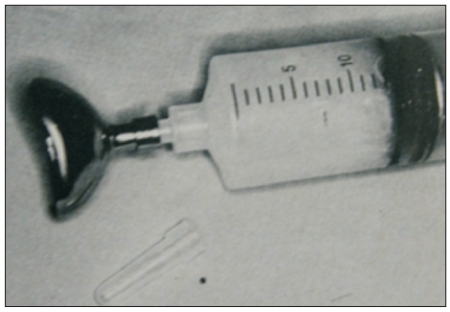

Fig-4: casting a set of stock trays in ticonium which is non precious, removable partial denture alloy which can be sterilized in autoclave for reuse.

Sykes, Essop and Veres advocated the use of modeling plastic impression compound as an ocular tray material, forming it around one-half of a small rubber ball and placing a hollow tube through it. Ophthalmic alginate is then injected through the tube to make an impression.12

Impression With Custom Ocular Tray

Miller recommended the use of a custom ocular tray for anophthalmic socket for which stock trays may not be available.In this technique a solid suction rod is attached to patient's existing prosthesis, conformer, or wax shell and invested in alginate mold. After the alginate sets, the mold is filled with clear acrylic resin. Perforations are made in the resulting tray, and a tunnel is cut into the stem through which injectable alginate can be delivered.13

Ocular Prosthesis Modification

In this technique, the existing ocular prosthesis is modified to obtain improved and an acceptable fit. Chalian suggested that trimming and polishing a stock prosthesis helps in achieving this goal. An alternate technique may be used in which stock prosthesis is modified using alginate or soft wax which is then invested (fig 5). 14

Smith17 recommended relining of an existing prosthesis using a dental impression wax, Korecta-Wax No. 4. The ocular prosthesis is reduced peripherally and posteriorly, and modified with baseplate wax. A thin layer of Korecta-Wax No. 4 is then added after proper contours and position are achieved. The lined prosthesis is warmed, inserted, and adjusted. 15

The use of a tissue conditioner as a reline material is advocated by Ow and Amrith because of its ease of manipulation and biocompatibility. The periphery of a stock prosthesis is modified with base plate wax after reduction. Viscogel is added to the posterior aspect of prosthesis and inserted for 20 minutes. The patient is instructed to wear the ocular prosthesis for 24-48 hours to create a functional impression. If aesthetics and adaptation are acceptable, the prosthesis is relined. The lined prosthesis is left in place for 30 minutes while the patient intermittently moves his or her eyes in all directions.16

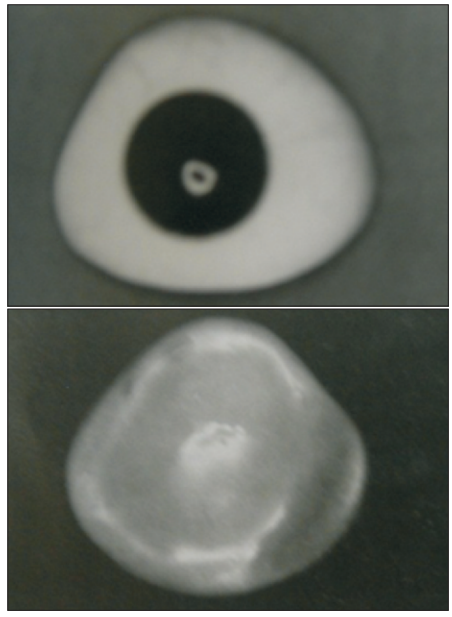

Fig-5:the existing ocular prosthesis is modified to obtain improved and an acceptable fit.

Wax Scleral Blank Technique

Benson created a wax blank by adapting base plate wax around half of an appropriately sized steel ball. The resultant pattern is smoothed, tried in, and adjusted. After the addition of an iris button, the pattern is invested and processed. 17

McKinstry20 suggested “compression impression” technique in which he empirically formed a wax pattern based on examination of the site. The pattern is then tried in, modified as needed, and processed after addition of an iris. One particular advantage of the empirical wax blank method is that it can be more effective than an actual impression in forming an inferior fornix if the patient's lower lid is weak, or the fornix is shallow.

Sykes described modification of technique described by Taicher et al.A wax conformer was used as an impression tray to make a functional impression. The impression material of choice was medium viscosity poly vinyl siloxane impression material.18

Conclusion

This article reviews the various ocular impression techniques that are documented in the literature by different authors. The impression procedure using custom ocular tray using permits the finished ocular prosthesis to generate an equal distribution of pressure throughout the defect and intimate adaptation of the prosthesis to tissue surface of the defect.A well-made, properly planned and functionally moldedstock eye prosthesis maintains its orientation whenpatient performs various eye movements. It givesgreat psychological benefit and restores the cosmetic appearance of the patient.

References:

References are avabile on request at editor@healtalkht.com