Introduction: The disfigurement associated with the loss of an eye can cause significant physical and emotional problems. Most patients experience significant stress, due primarily to adjusting to the functional disability caused by the eye loss, and to societal reactions to the facial impairment. Therefore prosthesis is essential to promote physical and psychological healing for the patient as well as to improve the social acceptance. This article describes the various aspects of ocular prosthesis including fabrication, fitting and maintenance.

History: Making of artificial eye has been practiced since ancient times. The first ocular prosthesis was made of clay attached to a cloth and worn outside the socket (Ectblephas ) by the Romans and Egyptians in the fifth century B.C. About twenty centuries later artificial eyes for the socket were developed from gold and colored enamel. In the sixteenth century, Venetians made artificial eyes out of glass. Later on acrylic was used, and now Poly Methyl Methacrylate (PMMA) has replaced acrylic.

Indications for ocular prosthesis:
- After Enucleation and Evisceration with or without implant
- Over Pthisical eyes (Fig 1A)
- Blind eye with scarred Corneas
- Congenital anophthalmia/microphthalmia

Types of ocular Prosthesis: Based on fitting procedure, there are three types of ocular prosthesis, namely Stock shell, Custom made prosthesis and Scleral shell.

Stock Shell (Fig 1B): Stock eyes are prefabricated and readily available in the market with different corneal and sclera colours. Since it is prefabricated, fitting with this gives only a certain amount of symmetrical appearance with the fellow eye. The prosthesis motility will be less and the patient may develop irritable socket with discharge and redness due to the poor fitting and the poor quality of material. However this type is indicated in few cases where patient cannot afford time and money to spend for custom made eyes. It can also be used for a temporary fit or if one has to change shells frequently.

Custom-made prosthesis (Fig 1C): Custom made shells are comfortable prosthesis fabricated for each patient according to their socket size and it is high quality PMMA material. It is hand painted and fits snugly into the socket. Various Modifications can be made on the custom made prosthesis in order to develop or expand the contracted socket and ptosis shelf to correct the ptosis.

Scleral shell – It is a thin shell with transparent sclera and can be used in eyes with irregular corneas where cosmetic contact lens will not fit.

Fig 2A &B shows the infrastructure for ocular prosthetic clinic.
Process of Custom made prosthesis:
The socket is assessed for fornices, condition of the eyeball, as well as the lining.

Stage 1
The alginate impression of the socket (Fig 3): Alginate material is a non-toxic, non-allergic material that is placed in the eye socket to form a model. An impression tray is selected according to the patient’s socket and inserted in the socket. A measured amount of alginate with 10 cc of water is mixed into a flowing paste, loaded into a 10 cc syringe and into the impression tray which is kept ready in the patient’s socket. The alginate paste fills the entire sac and starts penetrating through the holes of the tray. Once this alginate is set, the impression tray is gently removed from the eye. For children, impression of the socket is taken under general anesthesia or under sedation.

A plastic tumbler is half filled with water and alginate is taken made into a paste. The impression tray is immersed into this paste and allowed to set. Once it is set the contents are taken out and cut into two half and the tray removed. In a wax ladle-carving wax is heated and poured into the hollow space left by the original tray and allowed to set. After fifteen minutes the two halves of alginate are opened and the set wax is taken out to form the wax mould.

Stage 2
Carving the wax: Once the wax mould is ready, a clear PMMA corneal button of the fellow eye size is taken and placed on the wax model (Fig 4). The wax is smoothened by carving with the scalpel blade and hot flame. Now this model along with the iris button is placed in the socket and checked for symmetry. Wax is added or subtracted to match the other eye palpebral fissure, protrusion, total closure of the eyelids superior sulcus, lower lid crease and shape of lids. Once the wax model is perfect we have to proceed with plaster mould.

Stage 3
Plaster mould (Fig 5): Once wax is ready an eye flask is taken and greased with Vaseline. There are many plasters available depending on its properties. Mostly we use blue plaster that is tough but slow in setting along with white plaster which fast setting but week in strength in the ratio 3:1 along with water and this is combined to make a paste. This paste is filled in an eye flask up to the rim, the wax model with corneal button is placed in the flask with the bottom of the stem going deep down and edge of the wax model just touching the plaster from all sides and allowed to set.

Again the plaster is mixed, filled to the other half of the flask and the two halves are put together and pressed firmly so that extra plaster leaks out. It takes about half an hour to set and once it is set the corneal button along with wax is scraped out. Now the plaster is ready for acrylic casting.

Stage 4
Sclera And Cornea: The surface is painted using the dry pigments and Moly-Poly syrup as the medium. The technique used here is called the reverse painting. In a short glass clear polymer liquid is mixed with white monomer powder to form a dough. The painted corneal button and the monomer mixture is placed in the plaster mould and the two halves put together and put in the bench press so that extra plastic leaks out. This is placed in the water bath for 45 minutes at 100-degree centigrade. The temperature should rise from room temperature to 100-degree centigrade.

Once this curing is done the scleral shade plastic is taken out, stem of the corneal button chipped, surface smoothened and tried in the patients socket to check for symmetry. Once again the position of the iris, total closure of the eyelids are checked (Fig 6). When satisfied, the scleral painting and veining is done. Woolen threads are used for veining to give a three dimensional effect. Once painting is over the shell is placed in hot water for 10 minutes to avoid spreading in forth-coming steps.

Meantime clear plastic is prepared in a short glass taking clear polymer liquid and mixing it with clear monomer powder till liquid is absorbed. Once the dough is formed the clear plastic is placed in the plaster mould along with the painted shell and two halves are pressed together under pressure so that
extra leaks out of the mould. This is cured for one hour in the water bath. Once the curing is done the cast is removed. Then shell is smoothened and the edges are polished. Now the artificial eye is ready for delivery.

Even though custom-made, limitations are always there. In a few cases we can camouflage the deficiency by optical manipulation by using spectacle correction, which would disguise the deficiencies in the symmetry and cosmesis. This can be done by giving,

- Larger spectacle frames.
- Using dark tinted glasses.
- Plus or minus spheres or cylinders.
- Prisms.

![Figure 6: Acrylic mould before painting](image)

**Fitting and Removal of prosthesis**

The prosthetic eye is inserted under the upper lid, top first. The “top” of the artificial eye will be shown to you by your attending technician at the time of delivery. (1) Use the forefinger to retract the upper lid, then place the eye under the upper lid and push in as far as possible. (2) Allow the upper lid to fall into place while still holding the eye in position. (3) Using the forefinger, depress the lower lid until the eye is behind both lids. (4) Now release the lower lid and place the forefinger against the eye, holding the eye in place.

For removing the prosthesis ask the person to look up and depress the lower lid and then slide the prosthesis upward and forward out of the socket.

An alternate method of removing the prosthesis is to use rubber suction cup available in the clinic. This is squeezed and placed against the iris of the artificial eye. The suction cup now in place, depress the lower lid with the forefinger, then twist the eye counter-clockwise and lift up and out.

The eye socket is now rinsed with an aseptic solution which your Ophthalmic surgeon will advise. The artificial eye is cleaned with a mild soap and warm water or johnsons baby shampoo and can be reinserted. In the first few weeks

- antibiotic drops can be prescribed. In order to make the surface moist, lubricant eye drops has to be continued.

The following signs should not be over looked and must be corrected in order to maintain a healthy and cosmetically acceptable prosthesis.

- Excessive excreta
- Droopy lids
- Heavy yellowing in the mucus
- Recession of the orbital area
- Color changes in the sclera and iris.
- Discomfort while wearing the prosthesis
- Repeated removing of the prosthesis to gain relief
- Inflammation of the conjunctiva with excessive redness.

**Maintenance of Ocular prosthesis:**

- The shells can be worn continuously
- Wash hands before handling the prosthesis
- Cleaning can be done once a week or more often depending on the secretions with in the socket
- Precaution should be taken to reduce scratches
- Eye lubricants can be used to increase the lid movements and closure
- Protective glasses helps decrease dust and irritation with in the socket
- Polishing must be done once a year.

**Ocularistry**

Ocularistry is an art to rehabilitate people with disfigured eyes cosmetically and socially. An ocularist is a trained personnel skilled in the arts of Fitting, Shaping and Painting artificial eyes or ocular prosthesis. The ocularist works with the oculoplastic surgeon to plan the prosthesis, to modify and to understand the limitations in some sockets to get a good cosmetic fit.