

# Custom designed ocular prosthesis: HOW IT IS DONE.



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When getting an eye prosthesis for the first time, it can be a very nerve-wracking experience for patients, as they have usually been through an evisceration (removing the contents of the eye) or enucleation (removing the complete eye). The first session often requires time to set the patient's mind at ease with the process ahead.

At the outset, we assess the condition of the blinded eye or socket as follows;

- The functionality of inserting the new eye prosthesis.
- Eyelid damage.
- Orbit volume loss.
- Sunken sulcus loss.

Most of our patients have lost some volume if they have had surgery to remove the eye, and that's why the ocularist and ophthalmologist always advocate leaving the blinded eye in situ wherever possible. There are only one or two exceptions to this rule, but generally the older we get, the more fatty tissue we lose in the upper lid area, making it appear more hollow than the sighted eye.

During the early stages of the procedure, there is ongoing communication with the patient. This first appointment usually takes about an hour, but can often take much longer. Our staff are trained to anticipate how long each patient would need for their sessions, so that adequate time can be allotted for the individual's needs.

Ocularists sometimes have to spend many hours with the patient, who sometimes breaks down emotionally. They may still be dealing with the grief process of the loss of a body part and loss of partial or full vision. The psychological aspect of losing an eye is huge. Do not underestimate this. Our patients are urged to seek professional assistance in this regard. The loss of an eye can be as traumatic as the loss of a loved one.

The work begins by taking an impression of the eye socket. This is done by inserting what is called an impression tray, or impression shell under the lids, to keep the eyelids out of the way and open up the socket. These shells or trays come in various shapes and sizes. Although they can be customised somewhat, they are not designed for a specific eye or socket, so may not be comfortable. Once the impression shell has been inserted, a jelly-like alginate is syringed into the socket and is allowed to set while the patient looks straight ahead. This only takes about a minute, but it is one of the most important stages. Without an accurate reading of the back of the eye or eye socket, we are unable to achieve best movement, comfort, shape and size, when fitting the next stage which is the temporary clear model.

Although this first session of work on the socket is uncomfortable, it is bearable, and luckily a quick process. We do this work on small children and babies in the consulting room. The youngest patients in the practice are two-month-olds, who have been born with, for instance, enophthalmos. Patients usually say the pain they've been through in the past with surgery was much more difficult to bear and that this discomfort cannot be equated with actual pain.

Once we've seen the patient for the impression of the eye or socket, we'll manufacture a temporary clear model that will be inserted at the next session. Sessions are dependent on the eye socket scarring, oedema and discomfort the patient may still be experiencing post-surgery.

Getting the shape, comfort, movement and size right, is a meticulous labour of love. This is achieved, with the use of a clear Poly Methyl Methacrylate (PMMA) shell over the blinded phthysical\* eye or a model into the eye socket. If the socket becomes oedematous, we will reschedule the appointment. We do this in spite of the patient's eagerness to receive the new eye. An oedematous socket will affect final shape and size and the patient could experience discomfort in the long term. The size, shape, comfort and movement are all assessed with the clear PMMA model that we insert. Patients say that this session is not painful, but it can irritate the socket, since we are inserting and removing the eye prosthesis repeatedly to modify it. This may be to cut it down or add onto it, or cut down in one area and then add in another. Once we get the model as close in shape and size to the sighted eye as possible, we mark it for position and angle of gaze. Patients with a clear shell over a blinded phthysical\* eye are now trained in insertion and removal before being sent home with a wearing time regime. They will build up to wearing the shell for a full day.

Once the clear model is completed, we paint the iris and pupil onto a button that we'll cut to size for both iris and average pupil size. Patients are assessed for pupil averages during each consult leading up to this one. The iris and pupil are hand-painted, while the patient is with us, so that we can get an accurate representation from the sighted eye. Light is very important at these painting sessions. Moreover, with our blind patients, we ask for a photograph, or a family member as a model we can work from. Next, a negative mould of the clear model is made. An appropriate scleral shade for that patient is mixed in a heat cure PMMA. While at a putty consistency, the PMMA is inserted into the mould with the iris button positioned for the angle of gaze and the beginning of the final eye is cured in our specialised heat curing unit. Heat cured acrylates need to form a chemical reaction between the polymer (powder) and monomer

(liquid) with precise curing times and temperatures, in order to clear the final product from any free monomer. Free monomer will cause irritation to the eye socket over a period of time, either causing discharge or dry eye. This is strictly in the control of the ocularist, and our ethical duty must be, to ensure that our curing is precise, no matter how long it takes.

Once the material has cured, it is time to see the patient again. We'll cut the front surface off of the eye prosthesis and insert veining and paint splotches and shades for the scleral details and can even effect tints of varying intensities over the iris. If the patient has a pterygium or a pinguecula, this is replicated on the prosthesis, so that we can match the eyes as close as possible. The eye prosthesis now needs a layer of clear PMMA over the front surface where it has previously been cut down for painting and veining. For this reason, it goes back into the negative mould and is sent through the curing unit again.

The next appointment is the first fitting of the new eye prosthesis. This can sometimes not go as well as expected. So we always suggest patients don't book a big function to unveil their eye prosthesis on the same day, just in case we need to make adjustments or a remake. A remake usually necessitates repeating the process from the clear model stage.



▲ Before

▲ After

Our work is very artistic in nature, but we also have the chemical component of the workshop to contend with. All these aspects need to come together in order to achieve a high quality product. As ocularists, we face several challenges, working with changing light conditions, which affect our iris and pupil results, changes in patient veining as they tire through the day, lax eyelids and scarring. Curing of the material is not a quick process. This takes either the whole day or the whole night in the curing unit. There is no room for taking short cuts when it comes to curing times, because it will directly affect patient comfort over time.

Once an eye prosthesis has been manufactured and the patient has been trained on insertion and removal techniques, we will do a follow up in two to three weeks to check how the eye prosthesis has settled in situ. Ultimately, success is about producing a quality product, both chemically and aesthetically, but also to treat patients with dignity and manage the very important emotional aspects.

An eye prosthesis is replaced at least every five years due to material breakdown and socket change. It is polished annually on various high speed polishing lathes with a number of burnishing compounds.



▲ Beryl at work

*\*This condition exists when the eye has been damaged and, sight has been lost and the globe of the eye has started shrinking to create a smaller eye with an irregular cornea. Mostly a scleral shell is fitted over such an eye. An optometrist fits a scleral lens, often over a sighted eye, and an ocularist fits a scleral shell over a blinded phthysical eye.*