and industry. The Florey has a project with the Californian company Genentech to produce relaxin; the Baker has a deal with Glaxo (the director, Professor Funder, says that the rules in making links with industry should be "no promises, no equity"); the Garvan has joint projects with Pacific Biotechnology Limited; and the Murdoch has entered an alliance to market a database it has produced on birth defects.

These are just some of a myriad of links with industry, which occur at all levels of the institutes. For instance, Dr Tom Mandel, the head of the transplantation unit at the Hall, has joint projects going with three different companies, and a good proportion of the work in his unit is funded in this way. "Grants from the NHMRC are good for starting projects," he said, "but you've got to get money from elsewhere to build them."

Some of the researchers in the institutes resent the time that they have to spend making links with industry, but most think it time well spent. Not only do the links produce resources for the institutes and potentially Australia but they also provide a route for ensuring that the fruits of research are used. One worry is that the need to make industrial links may distort research agendas, possibly into the trivial and short term. I found little evidence that this was the case.

Conclusions

None of the institutes with block grants has yet been knocked back by the NHMRC, and the council hopes eventually to fund more. This is a measure of success. The success of the strategy also seems to be supported by a recent proposal to convert the John Curtain school of the Australian National University in Canberra to an NHMRC institute. The council and its international review teams must be convinced that they get value for money from institutes. My impression as well is that they are cost effective, have enough critical mass to allow internationally competitive research, and do well with the difficult business of guiding research without stifling it.

The fact that the institutes get only a proportion of their money from the NHMRC means that the council gets great value for its investment. The institutes' need to raise money also obliges them to make important contacts with their communities and with industry. The need for a theme for each institute's research is an important mechanism for producing synergy, but the institutes have to work hard to keep groups cross fertilising each other and to make sure that the total is greater than the sum of the parts. Having a director who is a researcher supported by professional managers also seems to be important. A final important feature of the institutes seems to be that nobody has tenure.

Dozens of people helped me in preparing these articles, and I thank them all. In particular I thank John McDougall, who read all of the articles before publication, and John Finlay-Jones, who read some of them. Any mistakes are, however, my fault.

Everyday Aids and Appliances

Ocular prostheses and contact lenses. I—Cosmetic devices

C Steven Bailey, Roger J Buckley

Among people presenting to ophthalmology departments, the commonest requirements for cosmetic purposes are for whole eye prostheses that will disguise the absence of an eye and for various types of contact lens that will sit on the surface of a disfigured globe and act as a façade.

Whole eye prostheses

Indications for removing an eye include irreparable traumatic damage, malignancy, intractable suppuration, intractable pain in a blind eye, cosmetic reasons, and the prevention of sympathetic ophthalmitis. Removal may be by enucleation (when the whole eye is taken) or evisceration (when the contents of the scleral envelope are scooped out). Enucleation is always used for intraocular tumours and, usually, for pain. Evisceration is used when there may be a danger of intraocular infection spreading back along a cut optic nerve sheath. In other circumstances either operation can be used, although there is controversy over the advantages and disadvantages of each.

At the end of the operation a simple conformer shell of clear perspex must be inserted into the eye socket (fig 1) to prevent postoperative shrinkage of the orbital tissues, which would make it difficult to fit an artificial eye. Care must be exercised over cleanliness at this and all other stages. As with all whole eye prostheses conformer shells should be removed for cleaning at least once every 24 hours.

Patients who have lost an eye are psychologically scarred, and the cosmetic deficit should be corrected at the earliest opportunity by fitting a temporary coloured prosthesis that has been modified from a stock shape. This can be done in a hospital eye department that operates a prosthetic eye service or by the Artificial Eye Service. A final artificial eye can then be manufactured as soon as the postoperative inflammation has settled, usually within six to 12 weeks. The device will usually be made in clinical quality perspex, although glass may be used in selected cases.

To ensure that the eye sits in a natural position and does not fall back into the socket and to minimise any space in which infected debris could collect, the device should be shaped to match the contours of the orbital tissues. An impression of the socket is therefore taken using a quick setting material such as dental alginate. Once set, the alginate is removed and a plaster of Paris mould is made from it. The mould is used to cast a wax shape, which is then trimmed to fit the socket. A further mould is made from the modified wax shape, and the perspex prosthesis is cast in this mould. A hand painted iris button is placed on the front of the eye, scleral features are painted on, and clear plastic is laminated over the top (fig 2).

Whole eye prostheses should be worn overnight during periods of orbital growth. They may continue to be worn overnight later, perhaps for the sake of a partner or else to prevent eyelashes turning in and irritating the conjunctival surface, but if conjunctival inflammation develops secondary to the device it is probably best not worn during sleep. To remove an artificial eye the edge of the lower eyelid is first manipulated under the inferior edge of the device. The

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superior aspect of the prosthesis is then pushed downwards by applying pressure to the upper lid skin crease. Cleaning is best done by hand with a simple liquid surfactant such as baby shampoo. Liquid soaps should be avoided because they contain oils that will interfere with the wetting of the surface of the prosthesis. The surfactant must be rinsed off with water that has been boiled and cooled, and the shell can then be reinserted. It should not be dried: paper tissues will scratch the surface and towels are likely to be contaminated with microbes. After removal of the prosthesis the socket may be gently irrigated with sterile isotonic saline at body temperature. The saline is available from high street optical practices in single use sachets. A 20 ml hypodermic syringe is a suitable applicator.

Cosmetic contact lenses

Cosmetic contact lenses are intended to disguise eyes that have developed unacceptable appearances. The lenses fall into three groups: scleral shells, soft corneoscleral contact lenses (hydrogel), and rigid corneal contact lenses (fig 3). Rigid lenses are unusual, and most patients will be fitted with one of the first two types.

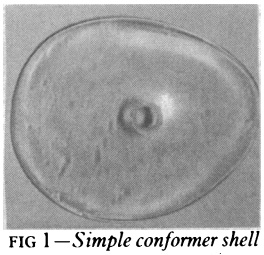

FIG 1—*Simple conformer shell with vent for insertion after enucleation*

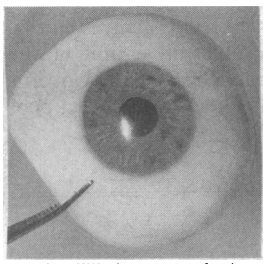

FIG 2—*Whole eye prosthesis*

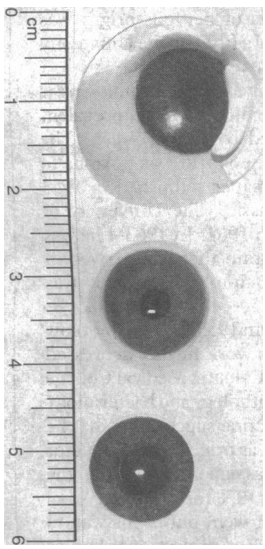

FIG 3—*Cosmetic contact lenses (from top to bottom); scleral shell, soft corneoscleral lens, and perspex lens*

SCLERAL SHELLS

Scleral shells are indicated when the eye is shrunken or its surface is very uneven. The thickness of the shell can be varied; a property that can be used to fill out the volume deficit that accompanies ocular atrophy. Attempts to fit such a device to a disfigured but normal sized eye may result in an appearance of exophthalmos. Shells can hide a small degree of strabismus, but large angle squints in eyes with good ocular movement must be corrected surgically before a prosthesis is fitted. This is because the movement of the device will be limited unless unsightly gaps are left around it, and if the eye behind it has a greater freedom of movement it will scrape across the posterior surface of the shell.

Scleral shells should be worn only while awake as the shell occludes the cornea, placing it under metabolic stress and increasing the risk of ulceration. The eye is anyway slightly stressed under the closed lid during sleep so it is advisable to remove the shell an hour or two before going to bed to encourage the corneal epithelium to recover. Because of the risk of ulceration more scrupulous care must be taken over the maintenance of a scleral shell than over a whole eye prosthesis. When the shell is removed in the evening it should be cleaned with a surfactant designed for rigid contact lenses, rinsed in cool water that has been boiled, and put into a clean case filled with fresh rigid contact lens disinfecting solution. The necessary solutions are not available on NHS prescriptions, except when dispensed from an hospital pharmacy, but they can be readily obtained from high street optical practices.

SOFT CORNEOSCLERAL LENSES

These lenses are used to hide corneal scars and iris defects in normal sized eyes that have a fairly regular surface (fig 4). Corneal scarring may occur after trauma or infection. Iris defects are usually induced by trauma but may be congenital. Soft lenses cannot be used if the eye is so misshaped that the lens will not centre or if the tear film is deficient. These lenses can be fully occlusive, with both pupil and iris coloured to match the fellow eye, or they can have a clear pupil if the eye is sighted. In the latter case the lens may also be powered to correct a refractive error.

Soft lenses of this type must be worn only while awake for the same reasons that apply to scleral shells. They should be cleaned and disinfected on removal

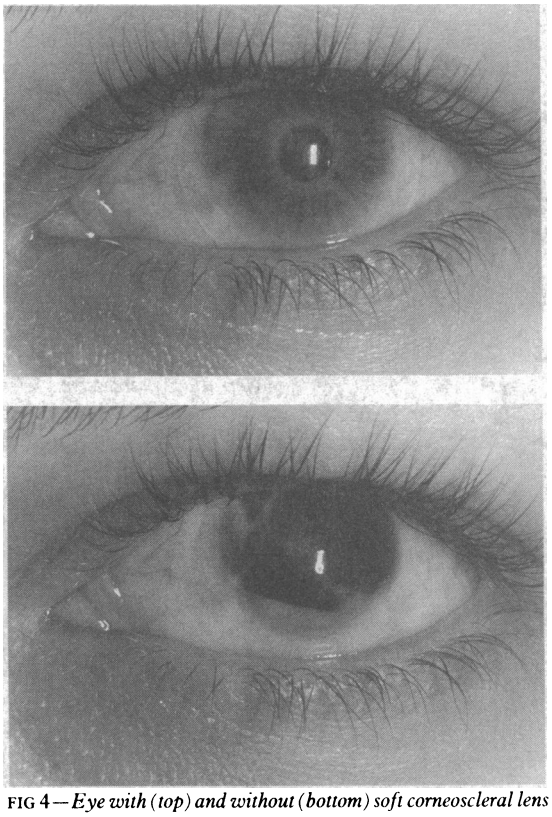

FIG 4—*Eye with (top) and without (bottom) soft corneoscleral lens*

with solutions designed for soft contact lenses. Only sterile saline from a single use sachet or pressurised canister (both available from optical practices) should be used to rinse them. Soft lens disinfecting solutions containing chlorine or hydrogen peroxide should not be used with these lenses because the colours will eventually become bleached. Fitting cosmetic contact lenses is a specialist task that is usually managed from suitably equipped hospital eye departments.

Complications

The problems associated with wearing scleral shells and cosmetic contact lenses are the same as for other types of contact lenses, but two conditions are worthy of special mention.

PAPILLARY CONJUNCTIVITIS

Papillary conjunctivitis associated with foreign bodies is common in wearers of whole eye prostheses and shells and can cause great distress. It represents a cell mediated hypersensitivity reaction to components of the deposits which collect on the surface of the device. These potential allergens are rendered more effective by being rubbed against the upper tarsal conjunctiva during blinking. Patients complain of local irritation, due to the release of inflammatory mediators, and of sticky discharge, due to excess mucus secretion. The upper tarsal conjunctiva is characteristically hyperaemic, infiltrated, and oedematous and often shows massive papillary hyperplasia. The condition may be controlled by ensuring that the prosthesis is kept scrupulously clean and by reducing the wearing time, but if these measures are not sufficient topical drugs may be considered.

Sodium cromoglycate eye drops used four times daily can be helpful, but sometimes topical steroids are required. Drops are preferable to ointment for long term treatment because the smearing of the prosthesis tends to be cosmetically unacceptable. It is not usually necessary to remove the artificial eye before applying the treatment. Steroids are not without hazard, even in the case of blind or absent eyes. Although frank

infection is a relatively uncommon cause of discharge from an empty socket, this possibility should be considered before commencing treatment. Clinicians should not be tempted to try to cover all possibilities by prescribing an antibiotic and steroid combination that contains an aminoglycoside because of the risk of a hypersensitivity reaction.

Over 40% of cases of infective conjunctivitis are caused by *Staphylococcus aureus*, *Haemophilus* spp are responsible for a further 20% and streptococci for another 14%. The remaining 26% are due to organisms such as *Acinetobacter calcoaceticus*, *Streptococcus viridans*, *Neisseria gonorrhoeae*, *Moraxella* spp, *Proteus* spp, *Klebsiella pneumoniae*, *Streptococcus pyogenes*, and *Serratia marcescens*. *Pseudomonas aeruginosa* has occasionally been isolated.

Treatment with first line topical antibiotics, such as chloramphenicol, may be commenced after swabs have been taken. The prosthesis should be removed before any drugs are administered but can then be replaced afterwards. Ointment used four times daily is usually acceptable for short term treatment and may be more effective than two hourly drops because compliance is likely to be better.

In the rare case of papillary conjunctivitis that is resistant to all other measures the patient may have to be refitted with a hand blown glass eye. Glass provides a better wetting surface than perspex and is also less likely to collect deposits. On the downside, glass eyes quickly become etched by tears and, as they cannot be effectively polished, they have to be replaced frequently. The life of a glass eye can vary from only six months to two years, whereas a well cared for perspex prosthesis will last for many years and is therefore more cost effective. Furthermore, manufacturing glass eyes is a rare skill in Britain, there being only one technician in full time practice.

POST-ENUCLEATION SOCKET SYNDROME

The post-enucleation socket syndrome occurs when the lower eyelid is stretched downwards by the mass of a whole eye prosthesis (fig 5). As the prosthesis sinks lower the upper lid also begins to droop, and a deep hollow forms under the superior orbital rim.

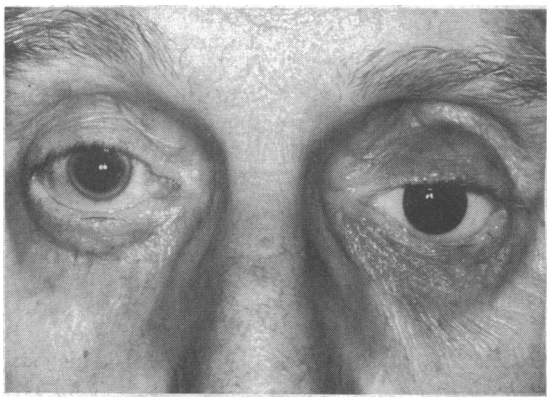

FIG 5—*Post-enucleation socket syndrome in prosthetic left eye. Note upper and lower eyelid ptosis, deep upper palpebral sulcus, and appearance of enophthalmos*

Replacing the artificial eye with one of a new shape may help the appearance in the early stages, but surgery is often ultimately required. Surgery entails correcting the eyelid positions with facial slings and part filling the empty socket by implanting an inert device beneath the superficial orbital tissues. A thin, lightweight shell can then be made to replace the previous prosthesis.

Appendix

A full range of cosmetic and prosthetic services are available from the Ocular Prosthetics Department, Manchester Royal Eye Hospital, Manchester M13 9WH (telephone: 061 276 1234) and the Contact Lens and Prosthesis Department, Moorfields Eye Hospital, London EC1V 2PD (telephone: 071 253 3411). Many other centres offer some facilities.

Details of local artificial eye service centres can be obtained from the main administrative unit at the Artificial Eye Service, Block 1, Room 103E, Government Buildings, Warbreck Hill Road, Blackpool FY2 0UZ.

MATERIA INDOMEDICA

An unsung microbiologist

A special issue of *Current Science** devoted to the life and work of Dr Shambu Nath De makes amends to a hitherto neglected, self effacing scientist.

De was born in the village of Garibato on the west bank of the Ganga river, 30 km north of Calcutta. Funds being scarce, De's initial career was marked by uncertainty. Scholarships helped him through school and college. He attracted the attention of the bacteriologist Professor M N De—no relation then—at the Calcutta Medical College. Professor De was sufficiently impressed by this young man to offer him the hand of his daughter in marriage, despite wide differences in the circumstances of the two families.

Graduating in 1939, De obtained the diploma in tropical medicine in 1942 and joined the department of pathology. At the end of the second world war, on the advice of his father in law, he joined University College Medical School in London to work with Professor G R (later Sir Roy) Cameron. De was asked to work on the experimental production of hydrocephalus. On injecting fibrin forming complexes into the fourth ventricle he found the rats frothing at the mouth and dying. De was disheartened at these "failures," but Professor Cameron recognised the serendipitous findings. Their paper on experimental pulmonary oedema of nervous origin was the consequence. De was awarded a PhD by the University of London.

On his return to India he joined the Nilratan Sircar Medical College, Calcutta. Overthrowing the prevalent notion of an endotoxin produced by *Vibrio cholerae*, he showed that a sterile filtrate of the vibrio was noxious to the small bowel. The resultant paper published in 1953 has since become a citation classic. The University of London awarded him the DSc in 1962. In 1963-4 he was able to show that the El Tor strain that had arrived in Calcutta was relatively benign simply because it was unable to produce an exotoxin.

The death of Sir Roy Cameron in 1955 was a major blow to De. Lack of recognition of his work further depressed him. In 1973 he retired from the Calcutta Medical College (where he had been professor of pathology and bacteriology since 1955) at the age of 58, rejecting suggestions that he seek an extension or appointment as principal and director of health services. While he was ignored in India the Nobel Foundation sought him in 1978 for the 43rd Nobel symposium on cholera. De never went out of his way to enhance his position in academic or professional bodies and maintained a distance from centres of power—unusual attributes in India.—SUNIL PANDYA

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