THE EYE AND THE NEEDLE

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Materials:

A few weeks ago ophthalmic surgery saw the fortieth anniversary of the first intraocular lens implanted into a human eye. That event, on 27th November 1949, took place at St. Thomas Hospital, London, and was carried out by Mr. Harold Ridley on a volunteer. Mr. Ridley had observed that R.A.F. fighter pilots struck by splinters of cockpit canopy showed little reaction in the injured cornea. Thus polymethyl methacrylate (Perspex CQ) has become the main material used in the manufacture of intraocular lenses to this day. The manufacturing process of lens implants has been greatly refined producing a very smooth finish. Rigid lenses have given way to flexible varieties. Softer hydrogel and silicone materials enable a folded lens to be inserted through a very small 4 mm. incision, permitting early patient mobilisation and suitable for the growing popularity of day case cataract surgery. An injectable replacement of the cataractous lens using the patient's own skin collagen has been proposed by Kelman (2).

Extracapsular Extraction:

Over the recent years, the time honoured intracapsular cataract lens extraction has been superseded by extracapsular methods. Intracapsular surgery only permits lens implants to be supported either by the pupil or anterior chamber angle. These produce an unacceptable high incidence of aphakic cystoid macular oedema. By retaining the posterior capsule at least, extracapsular surgery preserves the separate compartments and irreversible macular damage is prevented. The conventional technique involves a circular peripheral incision into the anterior capsule leaving a peripheral frill for the placement of the implant. Fixation is obtained within the capsular bag or at the ciliary sulcus. More recently Galand (3) has introduced the endocapsular or intercapsular technique. This involves a curvilinear incision under a viscoelastic agent into the upper part of the anterior capsule, in the manner of a letter box or an envelope. Separation of the cataractous nucleus from the cortex and capsule is achieved by hydro-dissection using balanced salt solution. The nucleus is then dislocated and delivered by expression. Any residual cortical material is aspirated by means of a two-way cannula until the capsular bag is cleared as completely as possible, care being taken to avoid tearing the posterior capsule. The irrigation takes place between the two leaves of the capsule (hence intercapsular) reducing the loss of corneal endothelial cells which occurs if irrigation is carried out in the anterior chamber. These microsurgical techniques are

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possible with the aid of viscoelastic materials primarily Healonid (Pharmacia) which maintains the anterior chamber and protects the corneal endothelium. It can be injected within the capsular bag to facilitate introduction and placement of the lens implant of appropriate dioptre power, within that bag for secure fixation. A small flap of the anterior capsule is removed by controlled tearing. Healonid is evacuated at the close of the procedure since its retention produces an even greater early postoperative rise in the intraocular pressure. A yellow form of Healonid has just been launched, whereby labelling with Fluorescein facilitates its visualisation within the eye.

Postoperative Inflammation

Since a lens implant must be regarded as foreign material within the eye, it is remarkable how readily the recipient eyes settle. However in a small number, a low grade inflammation may linger for months. Biodegradable materials such as blue flexible polypropylene loops attached to some lens implants may be an aetiological factor. The problem of excessive rigidity of P.M.M.A. has been overcome; it is now recommended to use a one piece lens. Modification of the lens surface by heparin (4,5) reduces the amount of cellular activity, pigment deposits and adhesions. Circular grooves on the surface of multifocal lenses also encourage cellular proliferation. The number of dialling holes drilled in the implant is being reduced or abolished.

The Neodymium - YAG Laser

Prolonged intraocular inflammation may be one factor leading to opacification of the posterior capsule. In about 10% - 15% of eyes undergoing cataract surgery, this capsular thickening is severe enough to interfere with vision and cause glare. Division of the lens capsule is achieved by the Neodymium Yttrium Aluminium Garnet Laser (Nd : Yag). By careful defocussing, damage to the implant itself is avoided.

The YAG laser can also effectively produce a full thickness perforation of the iris in cases of angle closure glaucoma or its prophylaxis, thus avoiding a surgical iridectomy on a hard inflamed eye. Both the YAG (6) and Argon Lasers (7) have been utilised in the management of open angle glaucoma; Laser trabeculoplasty (L.T.P.) is an attractive proposition for glaucoma patients since it is carried out on an outpatient basis. However, most patients will still require medication for their glaucoma.

Vitrectomy

This refined surgical technique has revolutionised the management of vitreoretinal disorders and enable patients with potentially blinding disorders such as diabetes to be treated successfully.

Pars plana vitrectomy permits prolonged procedures to be carried out in a closed eye. Using three separate sclerotomies one can maintain a constant intraocular pressure. The intraocular contents can be viewed through the microscope via a contact lens. This enables the surgeon to excise vitreous and remove intraocular opacities or foreign bodies, sever vitreoretinal adhesions and resect epiretinal membranes. Subretinal fluid can be drained internally; endolaser phototherapy can be carried out. It permits the introduction into the eye of air, gas, drugs or silicone oil.

Refractive Surgery

Radial Keratotomy has received widespread publicity. Its indication in myopia is achieved by making several (usually 8) deep radial incisions into the cornea, thereby weakening it and rendering the eye shorter. It must be appreciated that the procedure carries some risk of perforation and delayed healing. Rupture of the incisions following trauma years later have been reported. The visual results are largely unpredictable and there is a tendency to overcorrection after some years. Glare limits night driving; intolerance to contact lens wear can present real difficulties.

The Excimer Laser

Selective photoablation by the Excimer laser (8,9) of the superficial layers of the cornea can effectively alter the refractive state of the eye, and can be used for hypermetropia, myopia and astigmatism. The equipment is extremely expensive (nearly half a million dollars). At the American Academy of Ophthalmology Meeting in November 1989 the innovators were given a cautious welcome but it must be stressed that this is still largely experimental; the F.D.A. in the U.S.A. will not recommend its use until the risks become negligible.

Advancing technology is complementing the knife in the treatment of major ocular disorders.

REFERENCES

1. *RIDLEY H. INTRAOCULAR ACRYLIC LENSES. TRANS. OPHTHAL. SOC. U.K. 1951; VOL.LXXI: 617 - 621.*

2. *KELMAN C. BINKHORST LECTURE: AMERICAN ACADEMY OF OPHTHALMOLOGY. NOVEMBER 1989;*

3. *GALAND A. A SIMPLE METHOD OF IMPLANTATION WITHIN THE CAPSULAR BAG. AM. INTRAOCULAR IMPLANT SOC. J. 1983; 9 : 330 - 332.*

4. *LARSSON R., LARIN O., OLSSON P. THE SEARCH FOR THROMBORESISTANCE USING UNIOBILISED HEPARIN. ANN. N.Y. ACAD. SCI. 1987; 516 : 102.*

5. *JOHNSON R.N., BALYEAT E., STERN W.H. HEPARIN PROPHYLAXIS FOR INTRAOCULAR FIBRIN. OPHTHALMOL. 1987; 94 : 597.*

6. *DUTTON G. ET AL. EYE 1987; 1, 401 - 405.*

7. *WISE J.B. 'LONG TERM CONTROL OF ADULT OPEN ANGLE GLAUCOMA BY ARGON LASER TREATMENT'. OPHTHALMOLOGY 1981; 88 : 197 - 202.*

8. *MARSHALL J. LASERS IN OPHTHALMOLOGY. EYE 1988; VOL. 2. SUPPL. S98 - 112.*

9. *MARSHALL J., TROKEL S., ROTHERY S., SCHUBERT H. SAN ULTRASTRUCTURAL STUDY OF CORNEAL INCISIONS INDUCED BY AN EXCIMER LASER AT 193NM. OPHTHALMOLOGY 1985; 92 : 749 - 758.*