

Recent advances in ophthalmology

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These are exciting times for ophthalmology with developments in recent years taking place across a spectrum of eye diseases from the front to the back of the eye.

Cataract surgery

There has been a global increase in the rate of cataract surgery to meet the demand of an aging and longer living population. Like other branches of surgery, emphasis has been placed on smaller incision, often sutureless, phacoemulsification techniques using minimal local anaesthesia on a day care basis. There have been modifications to the intraocular lens design and materials with a shift to the use of acrylic foldables. Multifocal lens systems have not so far gained universal appeal but there is a prospect of an accommodating lens. Prevention of haze and opacification of the posterior lens capsule remains a challenge with about 30% requiring the application of the Nd:Yag laser within 2 years. Simultaneous bilateral surgery is not the norm due to concern about the possibility of intraocular infection particularly with the popularity of corneal tunnel incisions. The protocol for prevention of this devastating complication has been undertaken in a multinational study under the auspices of the European Society of Cataract and Refractive Surgeons (ESCRS) with a recommendation for the placement of intracameral cefuroxime.^{1,2}

Keywords

Phacoemulsification; refractive surgery; lasik; phakic intraocular lens; photodynamic therapy.

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Refractive surgery

The quest for dispensing with the wearing of lenses is not novel. An understandable desire to avoid dependence on external devices is what drives patients to seek surgery. Since the cornea is the most powerful ocular refracting surface, most procedures on offer attempt to modify its curvature. The earlier Russian advocated technique of radial keratotomy has been universally abandoned in favour of laser based procedures since the introduction of the excimer laser. With this argon fluoride laser, with a wavelength of 193 nm, corneal tissue can be removed with a high degree of precision. Early treatments by photo-refractive keratectomy with application of the laser after removing the central corneal epithelium were followed by pain, corneal haze lasting several months and unpleasant visual effects by light.

These have now been replaced by treatments under a thin corneal flap produced by a microkeratome, laser in-situ keratomileusis (LASIK). Original nasal hinged flaps had a tendency to become displaced with blinking action; this has been overcome by a superiorly placed hinge. Cutting nerves on both sides however tends to produce a dry ocular surface requiring placement of temporary plugs into the lacrimal puncta and liberal use of lubricants. Interface problems such as diffuse lamellar keratitis are fortunately rare. The procedure can be tailored to treat increasing larger degrees of myopia, hypermetropia and any astigmatism. There is concern however about potential bulging of the cornea and even frank ectasia if too much tissue is ablated in excess of about half the corneal thickness (normally 550 microns).³ This has also been reported after photorefractive keratectomy for low myopia.⁴ The introduction of a femtosecond laser, Intralase, produces a superior cut than can be made with a blade but is currently prohibitively expensive. A more superficial technique of LASEK has its advocates.

Higher degrees of myopia can be approached by procedures on the crystalline lens. Clear lens extraction with or without a low power implant is effectively cataract surgery in the absence of significant lens opacity. Alternatively an intraocular lens or contact lens may be introduced through a small incision and secured to the iris or wedged into the anterior chamber angle. There is a possibility of corneal touch or the development of lens opacities requiring cataract surgery and lens exchange.

These refractive procedures are not without risk and can have unpredictable outcomes which may result in medico-legal

disputes; the medical defence organisations have accordingly raised the premiums for practitioners undertaking this type of surgery,

In search of the ideal pressure lowering agent

The late 1970s saw the introduction of β -blocker drops as a first line treatment for open angle glaucoma by reducing aqueous formation. These have now been superseded by prostaglandin analogues which reduce the pressure by improving outflow. Both drugs may be used in combination in single preparation for improved effect⁵ and more acceptable compliance and minimising exposure to preservatives. Most prostaglandin type drugs produce darkening and elongation of the eyelashes, pigmentation of periorbital skin and occasionally the iris; these are more noticeable if applied to one eye only. However they have fewer systemic side effects.

There has been a fall in demand for glaucoma surgery which may be combined with simultaneous cataract extraction. Trabeculectomy introduced in 1972 became widely adopted but may fail due to propensity for fibrosis at the drainage site, particularly in darker races. Glaucoma surgery may be enhanced by application of antimetabolites such as mitomycin-C or 5-FU in selected cases or after failure of the first procedure.⁶ The use of valves with a plate anchored to the sclera and a tube protruding into the anterior chamber has become more acceptable and effective in recalcitrant cases.⁷ Standard glaucoma procedures often fail in black patients but improved results can be obtained by viscocanalostomy⁸ or non-perforating deep sclerectomy accompanied by a biosynthetic gel implant.⁹

Photodynamic therapy

Macular degeneration is the commonest cause of blindness in advancing years. The dry form is associated with increased pigmentation and gradual atrophy leading to loss of central vision. The wet form is accompanied by subretinal neovascularisation arising from the underlying vascular choroid. These fragile new vessels identified by fluorescein angiography can selectively take up verteporfin (Visudyne) given intravenously to which a laser is applied for their eradication before a significant bleed occurs which inevitably produces disorganisation and fibrosis of this important part of the retina.¹⁰ Anti-vascular endothelial growth factor (VEGF) therapy with pegaptanib is also hopeful but has the disadvantage of requiring intravitreal injections every six weeks for about a year with attendant risks.¹¹ Very few patients are likely to benefit; the availability of the drugs is limited by expense. Dietary factors have been identified; the addition of minerals such as zinc and selenium as well as antioxidant agents such as lutein and zeaxanthine help in retarding the progression of macular disease. Cessation of smoking is also advocated.

An artificial cornea?

Vision drops or becomes distorted when the cornea becomes hazy or opaque. The year 2005 saw the centenary of the first corneal graft from a human donor. Laboratory techniques have

extended the viability of donor tissue but there is still a world wide shortage of available corneae. The major indication for a transplant in young patients is the presence of a conical cornea, a condition known as keratoconus, which may produce marked thinning beyond the scope of satisfactory contact lens fitting. Age related degeneration of the corneal endothelium or accelerated by cataract surgery resulting in decompensation is the major reason why patients come to surgery in the older age groups. Whereas a full thickness disc has been the norm, there is now a shift to lamellar techniques with a lower risk of graft rejection when the endothelium is healthy. Early trials in Perth, Australia on an artificial cornea Alphacor are encouraging.

References

1. Seal D, Barry P, Gettinby G, Lees F, Peterson M, Revie CW, *et al*. ESCRS Study of prophylaxis of postoperative endophthalmitis after cataract surgery: Case for a European multicenter study. *J Cataract Refract Surg* 2006;32:396-406.
2. Barry P, Seal DV, Gettinby G, Lees F, Peterson M, Revie CW. ESCRS study on prophylaxis of postoperative endophthalmitis after cataract surgery. *J Cataract Refract Surg* 2006;32:407-10.
3. Pallikaris IG, Kymionis GD, Astyrakakis NI. Corneal ectasia induced by laser in situ keratomileusis. *J Cataract Refract Surg* 2001;27:1796-802.
4. Malecaze F, Coulet J, Calvas P, Fournie P, Arne JL, Brodaty C. Corneal ectasia after photorefractive keratectomy for low myopia. *Ophthalmology* 2006;113(5):742-6.
5. Barnebey HS, Orengo-Nania S, Flowers BE, Samples J, Mallick S, Landry TA, *et al*. The safety and efficacy of travoprost 0.004%/timolol 0.5% fixed combination ophthalmic solution. *Am J Ophthalmol*. 2005 Jul;140(1):1-7.
6. Gandolfi S, Vecchi M. 5-Fluorouracil in combined trabeculectomy and clear cornea phacoemulsification with posterior chamber intraocular lens implantation. A one year randomised controlled clinical trial. *Ophthalmology* 1997;104:181-6.
7. Lim KS, Allan BD, Lloyd AW, Muir A, Khaw PT. Glaucoma drainage devices: past, present and future. *Br J Ophthalmol* 1998;82:1083-9.
8. Stegmann R, Pienaar A, Miller D. Viscocanalostomy for open angle glaucoma in black African patients. *J Cataract Refract Surg*. 1999 Mar;5:316-22.
9. Sourdille P, Santiago PY, Villain F, Yamamichi M, Tahi H, Paerl JM, *et al*. Reticulated hyaluronic acid implant in non-perforating trabeculectomy. *J Cataract Refract Surg*. 1999 Mar;5:332-9.
10. TAP Study Group. Photodynamic therapy of subfoveal choroidal neovascularization in age-related macular degeneration with verteporfin: one year results of 2 randomised clinical trials. *Arch Ophthalmol* 1999;117:1329-45.
11. Gragoudas ES, Adamis AP, Cunningham ET, Feinsod M, Guyer DR. Pegaptanib for neovascular age-related macular degeneration. *N Engl J Med* 2004; 351:2805-16.