GUEST EDITORIAL

Intraocular lenses in the 21st Century

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Whereas cataract surgery dates back to early civilizations with the Egyptians, Chinese and Indus Valley civilizations all describing primitive methods of cataract extraction, intraocular lenses (IOLs) to replace the optical power of the crystalline lens were not introduced until after the second world war. It was Harold Ridley's experience with aircraft pilots who had had penetrating injuries from their shattered perspex canopes, that convinced him of the potential for implantation of synthetic optical materials. These early lenses required large corneal incisions and many failed due to optical and physiological complications, but formed the basis for the development of the advanced IOLs now available. The demand for these lenses has grown due to improvements in healthcare provision, which has increased life expectancy and, in turn, the visual demands of the ageing population. No longer is it a requirement for patients to have "mature" cataract before removal is considered. As a result, optometrists are exposed to many more patients who are developing cataracts, or who have had cataract extraction and the implantation of an IOL.

Consequently, this Special Issue of *Clinical and Experimental Optometry* has been commissioned to appraise the advancements in IOL optics and the complications that can result from modern cataract surgery. As cataract extraction is the most commonly performed surgery in the Developed world, optometrists have a key role in advising and managing patients. Patients need to be informed of the safety of the procedure, the options available to them and how they can support their lifestyle, and whether the choice of IOL can affect their ocular health. Of course, optometrists are also vital to the monitoring of the eye's post surgical recovery, reducing the effect of any complications that occur.

In their review Chan, Mahroo and Spalton, highlight the overall high safety of cataract surgery, giving a detailed account of the pre-operative risk factors for complications, intra-operative adverse events and post-operative problems that can occur (add ref?). The impact of co-morbidity, relatively common in elderly patients who develop cataract, is also considered. Emphasising the importance of optometrists, they conclude that the appropriate management of complications often still leads to favourable visual outcomes.

In addition to the putative benefit of square edge optics reducing the prevalence of posterior capsular opacification outlined by Chan *et al*, Edwards and Gibson investigate the role of short wavelength filtering IOLs in protecting the retina (add ref?). In their review, they explore the potential reduction in oxidative stress caused by shorter wavelengths, along with the possible detriments of reducing retinal luminance such as on circadian rhythms, scotopic sensitivity and colour perception.

Rosales and colleagues from Susana Marcos' lab in Spain appraise and demonstrate techniques to measure *in-vivo* IOL tilt and decentration in pseudophakic patients (add ref?). A better understanding and control of these aspects of IOL placement within the eye are critical to the visual outcomes of patients, particularly with more advanced IOL designs.

Buckhurst and colleagues review the growing demand for surgical correction of astigmatism during cataract surgery (add ref?). Although astigmatism can be reduced by on-axis corneal incisions and corneal or limbal relaxing incisions, the outcomes are variable due to wound healing. Implantation of toric IOLs offer a more reliable technique with advances in IOL orientation, haptic design and post-surgical evaluation described.

An evaluation of aspheric compared to spherical IOL optics is presented by Landers and Goggin from Australia (add ref?). There data suggest that although spherical aberrations are reduced by aspheric designs, this does not necessarily have an impact on clinical assessment of visual quality.

Multifocal IOL designs are described in a paper from the Universidad Europea de Madrid and the University of Valencia (add ref?). They cover refractive and diffractive optics and how they impact on visual and optical performance, both generally and in patients who have had LASIK or with high ametropia.

Finally Sheppard and colleagues discuss the developments in 'accommodating' IOLs to overcome presbyopia (add ref?). Objective assessment techniques have shown the first generation of single optic accommodating IOLs to move little in the eye, with any subjective benefits appearing to resulting from lens flexure. Dual optic lenses offer the potential of higher levels of accommodative restoration, although there is limited clinical data. Proposed future designs mainly involve methods to change the IOL surface curvature or to fill and seal the lens capsule with a flexible polymer.

Hence, the invited contributors to this special issue clearly highlight the rapid advancements in IOL designs, which will have a significant impact on the healthy ageing of patients and their vision-related quality of life, as well as on the future of optometric practice.

Papers
10-046-RV (R1) IRV 27.03.2010 PRODUCTION 93.6 Chan, Elsie (contact); Mahroo, Omar; Spalton, David Complications of cataract surgery

10-101-RV IRV 01.07.10 REFEREES 93.6 Edwards, Keith (contact) Intraocular lens short wavelength light filtering

10-041-ED (R1) IRV 24.03.2010 W-B 93.6 Rosales, Patricia (contact); De Castro, Alberto; Jimenez Alfaro, Ignacio; Marcos, Susana INTRAOCULAR LENS ALIGNMENT FROM PURKINJE AND SCHEIMPFLUG IMAGING

10-050-RV (R1) IRV 01.04.2010 W-B 93.6 Wolffsohn, James (contact); Buckhurst, Phillip; Davies, Leon Surgical Correction of Astigmatism during Cataract Surgery

10-028-OP (R1) OP 27.02.2010 W-B 93.6 Landers, John (contact); Goggin, Michael Ocular preference following implantation of aspheric and spherical intraocular lenses; an intraindividual comparison

10-051-RV (R1) RV 10.01.2010 PRODUCTION 93.6 Cerviño, Alejandro (contact); Madrid-Costa, David; Ferrer-Blasco, Teresa; Garcia-Lazaro, Santiago; Montes-Mico, Robert Visual and Optical Performance with Hybrid Multifocal Intraocular Lenses

10-049-RV IRV 30.03.2010 REVISION-MINOR 93.6 Davies, Leon (contact); Sheppard, Amy; Bashir, Abar; Wolffsohn, James Accommodating intraocular lenses: a review of design concepts, usage and assessment methods