Welcome to Bausch and Lomb’s monthly research update.

With our background in clinical ophthalmic research, mainly of the anterior eye, Bausch and Lomb have asked us to produce an independent report of some of the interesting findings coming out of the research journals each month. As a busy practitioner, this should allow you to keep more up-to-date with cutting edge clinical research and allow you to locate the articles when you want to know more about a topic highlighted.

The following key clinical peer reviewed journals are reviewed in this update:

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Professor James Wolffsohn is Professor of Optometry, Deputy Dean of Life and Health Sciences at Aston University. James’ research and teaching interests mainly revolve around intraocular lenses, contact lenses, low vision and the measurement of accommodation. He has published over 100 peer reviewed academic papers, written books on Low Vision and Imaging and has given numerous international presentations. James is also a past President of the British Contact Lens Association.

After graduating with a 1st-class B.Sc. (Hons) degree in Optometry from UMIST in 2004, Amit successfully completed the College of Optometrist’s professional qualification examinations in 2005. Amit has worked as an Optometrist in several clinical capacities, including within the field of corneal refractive surgery. He has recently completed a Ph.D. at the University of Manchester researching optical quality in patients with Keratoconus. He is currently working with Prof. Wolffsohn in a post-doc position at Aston University.
The Effect of Lens Care Solutions on Blink Rate, Ocular Discomfort and Visual Performance

This study investigated the ‘wetting’ effect of lens care solutions on blink rate, dry eye symptomology, and visual performance. Three different lens care solutions were investigated (Opti-free, ReNu and ClearCare) in a cross-over study conducted in 65 soft lens wearers. Blink rate was measured with an eye-tracker, ocular symptoms were evaluated with the OSDI questionnaire and visual acuity was measured using the tumbling-E method. All measurements were made after 2 weeks of adaptation to each solution. The results suggested that using lens care solutions with wetting agents resulted in a lower blink rate, provided the least symptoms and best visual performance.

*Ophthalmic & Physiological Optics* 32 412–420.

Glaucoma and Reading: Exploring the Effects of Contrast Lowering of Text

Burton et al.’s study investigated the impact of reducing the contrast of reading text on the reading speed of glaucoma patients (n = 53) compared to age-matched, visually-normal subjects (n = 40). The authors measured reading speed using different sets of fixed-size, non-scrolling texts on a computer screen whose setup incorporated an eye-tracking device. The results revealed that the average reduction in reading speed, caused by a change in letter contrast from 100% to 20%, was significantly more apparent in glaucoma patients than in visually-normal subjects of a similar age and cognitive reading ability.

*Optometry and Vision Science* 89 (9) 1282–1287

Implantation of Intracorneal Ring Segments in Paracentral Keratoconus

Alfonso et al. evaluated the safety, efficacy, and predictability of implanting Ferrara-type intrastromal corneal ring segments (ICRSs) for the visual rehabilitation of 49 patients with paracentral keratoconus. The results revealed a safety index of 1.14 and an efficacy index of 0.60. Snellen decimal uncorrected visual acuity increased from 0.17 ± 0.14 [±1SD] pre-operatively to 0.41 ± 0.28 post-operatively. The authors concluded that ICRS implantation for corneas with paracentral keratoconus provided good visual and refractive outcomes, suggesting that this is a predictable and safe procedure for refractive correction in these patients.

*Journal of Cataract and Refractive Surgery* 38 1576–1582
Near Visual Outcomes with Single-Optic and Dual-Optic Accommodating Intraocular Lenses

Alio and co-workers compared visual and ocular optical performance between eyes implanted with a single-optic (Crystalens HD, 27 eyes) or a dual-optic accommodating (Synchrony, 26 eyes) intraocular lens (IOL). No significant differences were found between groups for either near or intermediate vision; however, the ocular Strehl ratio and contrast sensitivity scores were found to be significantly better in the Synchrony group. The incidence of posterior capsule opacification was found to be significantly higher for patients implanted with the single-optic (41 vs 12%). The authors concluded that both IOLs restored distance visual performance with limited improvements in near vision. However, patients implanted with dual-optic lenses achieved significantly better ocular optical quality than those implanted with single-optic lenses.

*Journal of Cataract and Refractive Surgery 38 1568–1575*

Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) Treatment of Corneal Ectasia

Baran et al. evaluated the success rate of PROSE treatment for 89 eyes with corneal ectasia by examining topographic indices, achievement of a satisfactory fit, device wear status and changes in visual function over a period of 6 months. The results demonstrated that all patients within this cohort could be fitted with a PROSE device, and that PROSE treatment showed a high success rate in terms of achieving a satisfactory fit, providing good visual acuity for at least 6 months after continued wear. The authors concluded that PROSE treatment provides an effective alternative to penetrating keratoplasty for contact lens intolerant patients with corneal ectasia.

*Contact Lens Anterior Eye 35 222–227*
Grading Nuclear, Cortical and Posterior Subcapsular Cataracts Using an Objective Scatter Index Measured With a Double-Pass System

Vilaseca et al. examined intraocular scattering in patients with nuclear (n = 123 eyes), cortical (n = 41 eyes) and posterior subcapsular cataracts (n = 24 eyes) using the objective scattering index (OSI) obtained from double-pass images. Additionally, a control group of 68 healthy subjects (117 eyes) were assessed. Subjects were also evaluated using the lens opacities classification system III (LOCS III). Comparisons between the OSI and LOCS III scores showed good agreement for each of the three types of cataract evaluated. The authors concluded that the OSI was a useful parameter for grading lens opacities in addition to traditional methods.

*British Journal of Ophthalmology 96 1204–1210*

Two-Year Corneal Collagen Cross-Linking Results in Young Patients with Progressive Keratoconus

Vinciguerra and colleagues' study reviewed refractive, topographic and aberrometric outcomes up to 24 months after corneal collagen cross-linking (CCXL) in 40 patients aged between 9 to 18 years with progressive keratoconus. Progression was defined as a change in myopia or astigmatism of at least 3.00 D or a change in mean central keratometry of at least 1.50 D observed between 2 consecutive topographies, during the preceding 3 months. The results showed that CCXL improved uncorrected and best spectacle-corrected distance visual acuity in this cohort of patients, through reductions in corneal asymmetry and higher-order aberrations.

*American Journal of Ophthalmology 15 4520–526*

In-Vivo Positional Analysis of a Posterior Chamber Phakic Intraocular Lens by Optical Coherence Tomography

Perez-Cambrodi et al. used spectral-domain optical coherence tomography (SD-OCT) to investigate 18 eyes with high to moderate myopia, bilaterally implanted with the Phakic Refractive Intraocular Lens (PRL). Although the PRLs provided effective correction of refractive error, this modality showed a trend of nasal decentration or tilt, with respect to the anterior crystalline lens surface, which impacted on the resultant refractive and visual performance. This trend appeared to be more significant in eyes with a deep anterior chamber depth. Therefore, further studies and are needed to optimise the design of the PRL for such patients.

*Journal of Optometry 5 121–130*
Seven-Year Changes in Corneal Power and Aberrations after PRK or LASIK

This study examined long-term changes in corneal power and aberrations in 45 myopic patients randomised to treatment with either photorefractive keratectomy (PRK: n = 20) or laser in situ keratomileusis (LASIK: n = 25). The results revealed that the cornea may not be stable even 7 years after LASIK, as indicated by the continuing increase in corneal power. In contrast, PRK appears to be stable from 1 year post surgery. Coma-like and spherical aberrations are permanently increased after PRK and LASIK.

Investigative Ophthalmology and Visual Science 53 6011–6016

Correction of Undesirable Pseudophakic Refractive Error with the Sulcoflex Intraocular Lens

Falzon and Stewart evaluated the efficacy, short-term safety and visual outcomes of implanting toric (n = 12 eyes) and aspheric (n = 3 eyes) Sulcoflex Intraocular Lenses (IOLs) into the ciliary sulcus to correct residual pseudophakic refractive errors. Patients were followed up for up to 12 months after surgery. The results suggested that implantation of SulcoflexIOLs provided an effective and predictable option for enhancing post-operative refractive surprise and reducing spectacle dependence for distance vision. Furthermore, no significant intra- or post-operative complications occurred.

Journal of Refractive Surgery 28 614–619

Comparison of Visual Outcomes and IOL Position With a Single-optic Accommodating IOL After Femtosecond Laser Capsulotomy

Szigeti et al. evaluated long-term visual outcomes and intraocular lens (IOL) positional parameters in 11 patients implanted with a single-optic, accommodating IOL following either a 5.5-mm (n = 9 eyes) or 6.0-mm (n = 8 eyes) femtosecond laser capsulotomy. Patients were assessed for up for 12 months after surgery. The results revealed no significant differences in best-corrected distance and near acuity between groups. However, a 5.5-mm laser capsulotomy was associated with less IOL tilt and, therefore, may be superior to a 6.0-mm capsulotomy when implanting a single-optic accommodating IOL.

Journal of Refractive Surgery 28 609–613
Comparing Central Corneal Thickness and Anterior Chamber Depth Measurements Using the LenStar LS900, Pentacam, and Visante AS-OCT Instruments

O’Donnell and co-workers compared central corneal thickness (CCT) and anterior chamber depth (ACD) measured in 27 healthy subjects using the LenStar LS900, Pentacam, and Visante anterior-segment optical coherence tomographer (AS-OCT). Reasonable agreement for CCT and ACD measurements were found between the Pentacam and LenStar; however, poorer agreement was found between the Visante and LenStar, and between the Visante and Pentacam. The authors concluded that CCT and ACD measurements from these three instruments should not be used interchangeably.

*Cornea 31* 983–988

Tear Film Aberration Dynamics and Vision-Related Quality of Life in Dry Eye Patients

Denoyer et al. measured corneal higher-order aberrations (HOAs) for 10 seconds after a blink in 40 patients with dry eye disease (DED) and 40 age- and gender-matched control subjects. Vision-related quality of life was evaluated using the OSDI questionnaire. The results revealed that the progressive inducement of corneal HOAs was correlated with subjective patient-reported visual outcomes and with objective clinical findings of ocular surface damage. The authors concluded that objective measurement of changes in HOAs may constitute a new single instrument to evaluate and manage patients with DED.

*Ophthalmology 119* 1811–1818
Most intriguing journal title of the month...

“Dynamic Accommodative Response to Different Visual Stimuli (2D vs. 3D) While Watching Television and While Playing Nintendo 3DS Console”

Oliveira et al. compared the accommodative response to visual content presented in two dimensions (2D) and stereoscopically in three dimensions (3D). A group of twenty-three participants (mean age 20 ± 2 years) viewed a TV screen capable of generating both 2D and 3D images. Additionally, a second group of 15 subjects (mean age 20±2 years) viewed a Nintendo 3DS console (also capable of generating 2D and 3D images). Accommodative responses were measured using a Grand Seiko WAM 5500 autorefractor. The results showed that there were no significant differences between 2D and 3D viewing at the TV screen. Expectedly, the accommodative response when playing Nintendo 3DS in 3D mode was significantly lower than when viewed in the 2D mode.

Ophthalmic & Physiological Optics 32 383–389.

Most fascinating research finding of the month...

Shimizu et al. compared post-operative visual performances achieved after implantation of implantable collamer lenses with (‘hole ICL’) and without a central hole (regular ICL) for the correction of moderate to high myopia. Twenty-nine patients with spherical equivalents of -7.55 ±2.09 D [mean ± 1 SD] who underwent ‘hole ICL’ implantation in one eye and regular ICL implantation in the other eye were recruited. Hartmann-Shack aberrometry and contrast sensitivity were measured before and 3 months after surgery. The results revealed that ‘hole ICL’ implantation gave equivalent aberrometry and contrast sensitivity function results to regular ICL implantation in these patients. These findings suggest that ‘hole ICLs’ may be a viable option for these patients, particularly as they do not require additional peripheral iridotomies and may also reduce the risk of cataract formation.

“Comparison of Visual Performance after Posterior Chamber Phakic Intraocular Lens With and Without a Central Hole Implantation for Moderate to High Myopia”