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.

In the final research update of 2012, the journals listed below are reviewed. In the field of contact lenses and anterior eye, new work shows that mini-scleral contact lenses may provide effective treatment for moderate to severe dry eye, whilst sensitive eyes are shown to be a common problem amongst habitual soft lens wearers. New data is also presented regarding the use of ocular cosmetics and associated ocular comfort.

In keratoconus patients, persistent corneal oedema is highlighted as a possible complication of collagen cross linking treatment, and another study advocates the use of photorefractive keratectomy in some carefully selected cases. Regarding presbyopia and its treatment, interesting work relating to the incidence of presbyopia in Iran, and the use of accommodating intraocular lenses and INTRACOR surgery is summarised. Update 33 concludes as usual with the most fascinating research finding of the month and the most intriguing research paper title.

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Use of mini scleral contact lenses in moderate to severe dry eye

Alipour and colleagues describe use of mini scleral contact lenses for the treatment of moderate to severe dry eye. Seven patients whose symptoms could not be adequately controlled with conventional treatments were fitted and dispensed with the lenses. Four patients had a successful outcome in terms of reduced need for artificial tears, and improvements in symptoms and visual acuity. No contact lens complications occurred during the 15-20 month follow-up period. Mini scleral contact lenses may therefore be helpful in the management of some cases of moderate-severe dry eye.

*Contact Lens and Anterior Eye 35: 272-276*

Eye Sensitivity in Soft Contact Lens Wearers

This UK-based study examined the incidence of self-reported sensitive eyes (SEs) in soft contact lens wearers, and determined the effect of refitting with silicone-hydrogel lenses. Approximately 12% of 2154 contact lens patients reported SEs with their habitual lenses. The prevalence of additional symptoms, including dryness, redness and stinging was significantly greater in patients with SEs, who also demonstrated shorter wearing times. Refitting with senofilcon A lenses resulted in improvements in dryness and stinging symptoms in many SE patients.

*Optometry and Vision Science 89: 1682-1690*

Eye cosmetic usage and associated ocular comfort

Although the use of ocular cosmetics is very widespread, there is little published information on the associated short and long-term effects. Ng and colleagues conducted an online questionnaire consisting of 23 questions relating to demographics and the Ocular Surface Disease Index (OSDI). The 1360 female respondents had a median age of 25 years, and 83% used ocular cosmetics at least 3 times per week, with many using multiple cosmetics. There was no significant difference in OSDI scores between cosmetics users and non-users, although perceived comfort was better when cosmetics were not used. Sixty five per cent of occasional cosmetics users (< 3 times per week) reported a reduction in comfort when cosmetics were used. The data show that the use of ocular cosmetics is associated with a worsening of perceived comfort, with the authors suggesting that more research is required to investigate the clinical effects on the tear film.

*Ophthalmic and Physiological Optics 32: 501-507*
Novel Noncontact Meibography With Anterior Segment Optical Coherence Tomography

The authors evaluated a novel technique, "Hoisik" meibography, imaging the meibomian glands with optical coherence tomography (OCT) in comparison to the more conventional infrared meibography, demonstrating a complete tomogram could be captured. Hence, the authors advocate use of the new OCT-based technique for meibomian gland dysfunction evaluation.

*Cornea 32: 40-43*

Design and validity of a miniaturized open-field aberrometer

A miniature wavefront device, which can be attached to a slitlamp or a surgical microscope is described by Bhatt et al. The “Aston aberrometer” can capture measures of refractive error and ocular aberrations continuously during intraocular lens or corneal surgery, providing feedback to the surgeon. The instrument was shown to have large range of dynamic measurement from -25.0 to +21.0 D, and gave similar results to a conventional Hartmann-Shack aberrometer for mean sphere equivalent, astigmatic components and higher order aberration root mean square, with excellent intrasession repeatability.

*Journal of Cataract and Refractive Surgery 39: 36-40*

Persistent Corneal Oedema after Collagen Cross-Linking for Keratoconus

Sharma and colleagues present findings regarding a new complication of collagen cross-linking (CXL) for keratoconus, a generally safe procedure with few side effects. Three hundred and fifty patients who underwent the CXL procedure were followed up for a mean of 14 months; 10 (2.9%) developed visually significant postoperative corneal oedema which started on day 1 post-surgery in all cases. Five cases failed to improve beyond three months and were offered penetrating keratoplasty, which was performed on two patients.

*American Journal of Ophthalmology 154: 922-926*
**Photorefractive keratectomy in patients with suspected keratoconus**

Guedj and colleagues followed up keratoconus and suspect keratoconus patients (as indicated by the OPD-Scan II Corneal Navigator software) treated with myopic photorefractive keratectomy (PRK), for a period of 5 years post-operatively. Sixty two eyes of 42 patients were included in this retrospective study, which analysed refractive measures and corneal biometry, along with the incidence of complications. Mean pre-operative patient age was 34.6 ± 15.1 years, and the mean sphere equivalent was -3.96 ± 3.05 D, which reduced to -0.53 ± 1.35 D following PRK. Two patients experienced significant myopic regression and required spectacles. There were no cases of corneal ectasia amongst the cohort. The findings indicate that PRK may be a safe and effective treatment for myopia and astigmatism in eyes with suspected keratoconus.

*Journal of Cataract and Refractive Surgery 39: 66-73*

**Femtosecond Laser Correction of Presbyopia (INTRACOR) in Emmetropes Using a Modified Pattern**

Twenty eyes of 20 presbyopic emmetropic patients underwent INTRACOR femtosecond laser treatment of presbyopia, using a modified treatment pattern consisting of 5 central rings and 8 radial cuts in this non-randomised prospective study. Patients were followed up for a period of 12 months post-operatively. At 12 months, there was a significant improvement in uncorrected near visual acuity, from a mean of 0.6 (pre-operatively) to 0.1 logMAR, with a worsening of corrected distance visual acuity, from -0.10 to 0.00 logMAR. Subjective spherical equivalent refraction remained unchanged, as did corneal pachymetry and endothelial cell density. The modified treatment pattern was able to provide an improvement in uncorrected near visual acuity without causing a myopic shift, but was associated with a small reduction (of approximately 1 line) of distance visual acuity.

*Journal of Refractive Surgery 28: 872-878*
Comparison of visual results with accommodating intraocular lenses versus mini-monovision with a monofocal intraocular lens.

In this prospective clinical trial, patients were randomly assigned to undergo bilateral implantation of Crystalens HD accommodating intraocular lens (IOL), Tetraflex accommodating IOL, or a Tecnis 1-piece monofocal IOL. The target refraction for the monofocal group was mini-monovision (-0.25 and -0.75 D), whilst manufacturer recommendations were followed for the two accommodating IOL designs. There were no statistically significant differences between the groups in terms of age, pupil size, anterior corneal spherical aberration, corneal astigmatism or IOL power. All groups showed excellent distance visual acuity (approximately 20/20-), with mean intermediate and near acuities of approximately 20/25 and 20/40- 20/50, respectively. There were no significant differences between the groups in visual acuity or contrast sensitivity measures, indicating that the single-optic accommodating IOLs did not provide any visual advantage over mini-monovision with monofocal IOLs.

*Journal of Cataract and Refractive Surgery 39: 48-55*

Population-based study of presbyopia in Shahroud, Iran

There is limited peer-reviewed information regarding the prevalence of presbyopia in different parts of the world. Previously published work indicates that the age at which presbyopia develops varies across the world. This cross-sectional study, based in northern Iran, recruited 5,190 participants aged 40-64 years using random cluster sampling. The prevalence of presbyopia based on objective measures was lower than some previously published studies, at 58.2%, and interestingly, in the 60-64 age group, 11% of men and 23% of women were found to be non-presbyopic. Further investigation is needed to assess whether these findings are representative of the Middle East as a whole.

*Clinical and Experimental Ophthalmology 40: 863-868*
Comparison of the Progression Rates of the Superior, Inferior, and Both Hemifield Defects in Normal-Tension Glaucoma Patients

In this retrospective study, based in Seoul, the progression rates of defects in different regions of the visual field were examined in 142 normal tension glaucoma patients. All patients included in the study had at least 5 reliable automated visual field plots. The progression of superior visual field defects was found to be significantly faster than inferior defects, especially centrally and nasally. The authors suggest that more careful treatment of normal tension glaucoma patients with superior hemifield defects was required.


Rate of Visual Field Progression in Eyes With Optic Disc Haemorrhages in the Ocular Hypertension Treatment Study

The rate of visual field progression in 2607 eyes included in the Ocular Hypertension Treatment Study (OHTS) was examined in relation to the presence of optic disc haemorrhages. All eyes were followed up for at least 5 years using Humphrey 30-2 visual field testing, with the rate of change in mean deviation (MD) and pointwise linear regression (PLR) analysed. At least one disc haemorrhage was observed in 187 eyes (7.2%), and disc haemorrhage was recurrent in 52 of these eyes. Eyes with disc haemorrhage showed a faster deterioration in both MD and PLR compared to eyes without disc haemorrhage, and change in PLR was more rapid when the haemorrhages were recurrent. Initial randomisation to treatment in the OHTS was associated with a lower incidence of subsequent disc haemorrhage. Eyes with ocular hypertension and disc haemorrhage may therefore benefit from closer monitoring and more aggressive therapy.

*Archives of Ophthalmology* 130: 1541-1546
Intravitreal injections: is there benefit for a theatre setting?

This retrospective study examined the rate of endophthalmitis following intravitreal injections performed in-office (in a dedicated treatment room; n = 3376) or in-theatre (n = 8873), by a single surgeon in Tasmania between March 2006 and March 2012. Four cases of infective endophthalmitis occurred in patients treated in-office compared to no cases in those treated in-theatre; this difference was statistically significant, indicating that the theatre environment may be more appropriate clinically for any intravitreal injection procedures.

*British Journal of Ophthalmology* 96:1474-1478

The Relationship between Growth Spurts and Myopia in Singapore Children

This large-scale study based in Singapore examined 1779 schoolchildren aged 6-14 years on an annual basis; the mean number of visits was 5.7 ± 1.3. The aim was to determine the relationship between puberty and growth spurts, and peak rate of change of spherical equivalent (SE) and ocular axial length. The investigators measured axial length, cycloplegic refractive error, height, and categorised the stage of puberty. Myopia onset and progression were both found to occur earlier in children who had earlier peak height velocity, but the associations were not related to the stage of puberty. Variations in the development of myopia may therefore be partly attributed to height spurts.


Scleral changes induced by atropine in chicks as an experimental model of myopia

The shape of the eye is influenced by the mechanical properties of the sclera, so changes in this layer may be linked to myopia progression. In myopia development, there is a reduced stiffness in the sclera, which is associated with scleral thinning. This study used form deprivation in chicks to induce myopia and investigated the effect of intravitreal atropine on ocular biometry, refractive error and scleral morphology. This is a pertinent area for research given that atropine is currently used as an off-label treatment for myopic children in Southeast Asia. All chicks became myopic with form deprivation, but subsequent atropine treatment resulted in the recovery of refractive error, from myopia to hyperopia, and axial elongation stopped. The histology of the posterior scleral layers was altered by atropine, with a marked increase in thickness of the fibrous layer. The data suggest that the beneficial effects of atropine on myopia progression are in part due to changes in the fibrous layer of the sclera.

*Ophthalmic and Physiological Optics* 32: 478-484

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Activity Limitation due to a Fear of Falling in Older Adults with Eye Disease

A group of 248 older patients with ocular disease (either glaucoma, age-related macular degeneration or Fuch's corneal dystrophy) were compared with an age-matched control group of 97 patients free from ocular disease, to determine whether there was a difference between the 2 groups in terms of self-reported activity limitation due to a fear of falling. Visual acuity, contrast sensitivity and visual fields information were also reviewed in the patients' medical notes. Around 40-50% of patients with ocular disease reported a reduction in activity due to a fear of falling, compared to just 16% in the control group. The Fuch's group were most likely to report activity limitation, which was most strongly linked to a reduction in contrast sensitivity. Whilst activity limitation may help protect older adults with eye disease from falls, it could lead to social isolation.

Investigative Ophthalmology and Visual Science 53:7967-7972

Baseline Characteristics of Nearwork-Induced Transient Myopia

Lin and colleagues present the initial data relating to nearwork-induced transient myopia (NITM) from the 3-year Beijing Myopia Progression Study. Three hundred and eighty six students were enrolled in the study, which used a 5 D task, of 5 minutes duration, to induce NITM. Amongst the myopic children, both the initial NITM magnitude and decay duration were increased, compared to the emmetropic and hyperopic participants. The authors anticipate that the 3 year follow-up period will provide an insight into the relationship between NITM and permanent myopia.

Optometry and Vision Science 89:1725-1733
Most fascinating research finding this month:

Alarcón and colleagues examined the effect of pupil size, initial myopic level and size of optical zone on the final retinal image after corneal refractive surgery in this theoretical study using a schematic myopic eye model. Pupil size only had a negative effect on the retinal image when it was greater than the diameter of the optical zone, and furthermore, the greater the initial myopia, the more pupil size affected image quality. Given the relationship between initial myopic level and the effect that pupil size may have on retinal image quality, the authors suggest that this should be taken into account when selecting patients for refractive surgery, to reduce the possibility of night vision problems.

Theoretical Analysis of the Effect of Pupil Size, Initial Myopic Level, and Optical Zone on Quality of Vision after Corneal Refractive Surgery

*Journal of Refractive Surgery 28: 901-905*

Most intriguing research paper title this month:

**Visual Field Loss and Accelerometer-Measured Physical Activity in the United States**

Adults aged over 40 years who had participated in the clinical component of 2005-6 US National Health and Nutritional Examination Survey were included in this study which sought to determine the effect of visual field loss on walking and other forms of physical activity. In 1468 participants, visual fields were examined using frequency doubling technology, and accelerometers were used to monitor normal physical activity over a 7 day period in each participant. Individuals classified as having no visual field loss were the most active in terms of steps per day (mean 9751) and minutes of moderate or vigorous physical activity (mean 20.8 minutes). Those with unilateral field loss were less active (8023 steps per day, and 14.5 minutes), whilst participants with bilateral field loss were less active still (6840 steps per day and 10.4 minutes). In addition to visual field loss, older age, female gender and systemic health problems were associated with lower activity levels. The authors suggest that patients with bilateral field loss should be encouraged to undertake more physical activity in safe environments.

*Ophthalmology 119: 2486-2492*