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.

Welcome to the May 2013 Research Update, in which the most recent issues of the ophthalmic journals listed below are reviewed. This month’s key research findings indicate that a direct optometric referral scheme can improve cataract surgery rates, and a database study across 15 European countries shows excellent outcomes following cataract surgery. In the field of refractive error and myopia, new work shows that pathological myopic fundus changes are dependent on patient age and a randomised control trial shows no effect of improving accommodative function on reducing myopic progression. The update concludes as usual with the most fascinating research finding of the month and the most intriguing research paper title.

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Ocular physiology and comfort in neophyte subjects fitted with daily disposable silicone hydrogel contact lenses

Morgan and colleagues examined the changes in ocular physiology occurring during the first 12 months of silicone-hydrogel contact lens wear (narafilcon A) in neophytes, compared to a control group of non-lens wearers. Whilst more participants in the lens-wearing group than the control group dropped out before the conclusion of the study, the data indicated that narafilcon A contact lenses can be worn successfully with minimal alterations in ocular physiology; conjunctival hyperaemia, corneal staining and papillary conjunctivitis were equivalent between the 2 groups, although a higher level of conjunctival staining was observed in the lens wearers. Comfort scores improved significantly during the first month of lens wear.

Contact Lens and Anterior Eye 36: 118-125

Blink Rate, Incomplete Blinks and Computer Vision Syndrome

Computer vision syndrome (CVS) is very common and often associated with dry eye. A reduction in blink rate with VDU use has been observed in previous studies. This study videotaped subjects performing extended VDU tasks to determine blink rate and the completeness of blinks, and also examined whether increasing subjects' blink rates improved the symptoms of CVS. In the 21 subjects examined, CVS symptoms were found to be worse in those with a lower blink rate, although subsequently increasing their blink rate did not cause a significant change in symptoms. If blinks are incomplete, they are less effective, thus the authors suggest that to reduce CVS symptoms, patients should not be instructed to blink more frequently, rather actions to achieve complete corneal coverage would be more appropriate.

Optometry and Vision Science 90: 482-487
Corneal Cross-Linking as a Treatment for Keratoconus

In this retrospective study of 400 eyes, Vinciguerra and colleagues examined the mid to long term (4 years) outcomes of corneal cross linking (CXL) for keratoconus, with respect to patient age. Four age groups were examined: less than 18 years; 18-29 years; 30-39 years and 40+ years. LogMAR acuities and corneal shape improved in all age groups, along with a reduction in ocular aberrations. The best functional and morphological results were observed in patients aged 18-39 years.

_Ophthalmology 120: 908-916_

Agreement Between Refractive and Corneal Astigmatism in Pseudophakic Eyes

One-hundred and eleven pseudophakic subjects, with no other ocular abnormality were examined using subjective refraction, automated keratometry and Scheimpflug imaging to determine the agreement between refractive and corneal astigmatism post-cataract surgery. Astigmatism levels were relatively low, with a median subjective cylinder of 0.37 D. Against-the-rule (ATR) astigmatism was indicated in refractive and Scheimpflug measures, but not keratometry. Internal ATR astigmatism, which mainly arises from the posterior corneal surface, adds to anterior corneal astigmatism, causing ATR refractive astigmatism.

_Cornea 32: 783-790_

Comparison of Corneal Flap Morphology Using AS-OCT in LASIK With the WaveLight FS200 Femtosecond Laser Versus a Mechanical Microkeratome

Zhang and colleagues compared flap thickness and morphology of 72 LASIK flaps created with the WaveLight femtosecond laser to 50 LASIK flaps created with the Moria mechanical keratome in this prospective study. The WaveLight is a new femtosecond laser that can create flaps very rapidly (in approximately 6 seconds). The risk of keratectasia increases with lower levels of flap thickness predictability and reproducibility. Anterior segment optical coherence tomography was used to evaluate flaps, and showed that those created with the new femtosecond laser were more accurate, with a smaller difference between intended and actual flap thickness compared to the mechanical keratome, and also demonstrated greater symmetry and regularity.

_Journal of Refractive Surgery 29: 320-324_
Comparative study of Acrysof ReSTOR multifocal intraocular lenses +4.00 D and +3.00 D

Previous work has indicated that spherical multifocal intraocular lenses (MIOLs) may increase spherical aberration leading to undesirable visual symptoms. This 6 month study examined visual performance and wavefront error in 60 eyes implanted with one of three AcrySof IOLs: +4.00 D add spherical, +4.00 D aspheric or +3.00 D aspheric. All of the MIOLs provided good distance and near vision, although the +3.00 D variant restored intermediate vision more effectively. The aspheric designs resulted in lower levels of spherical aberration (measured with a WASCA wavefront analyser) than the spherical design.

Clinical and Experimental Optometry 96: 295-302

Visual outcomes of cataract surgery

Lundström and colleagues describe visual outcomes following cataract surgery in this database study including 368, 256 cataract extractions performed at clinics in 15 European countries. Men were more likely than women to have excellent visual acuity (20/20) post-operatively, and almost two-thirds (61.3%) of patients achieved 20/20 overall. Younger age was associated with better visual acuity, with the 40-74 age group achieving the best outcomes. As might be expected, ocular comorbidity and operative complications had a negative impact on outcomes. Whilst the data show excellent outcomes overall, a limitation of the study was that data could be self-reported by clinics to the registry.

Journal of Cataract and Refractive Surgery 39: 673-679
Nearwork-induced transient myopia (NITM) in anisometropia

Nearwork-induced transient myopia can be an after-effect of near work and cause distance vision blur in some individuals. This interesting study of 43 anisometropic subjects aged 9-28 years examined NITM characteristics in each eye, using an open-view autorefractor after subjects performed a near task. The more myopic eyes of participants typically showed higher levels of NITM, which took longer to return to baseline than the less myopic eyes. The data suggest that NITM may have an important role in the development of interocular differences in myopia, but a causal effect is yet to be established.

*Ophthalmic and Physiological Optics 33: 311-317*

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Modified Monovision with Spherical Aberration to Improve Presbyopic Through-Focus Visual Performance

This lab-based study used a binocular adaptive optics visual simulator to correct the natural ocular aberrations of both eyes of subjects, and then induce traditional monovision (1.5 D of myopia in non-dominant eye) and modified monovision (various amounts of spherical aberration as well as myopia induced in non-dominant eye). Visual acuities, contrast sensitivity and binocular summation were measured through-focus. Positive spherical aberration benefitted intermediate vision, whilst negative spherical aberration had the most beneficial effect at near. Modified monovision improved the through-focus visual acuity and depth-of-focus compared with traditional monovision, with an improvement in binocular summation also seen. The findings have implications for surgical approaches to monovision.

*Investigative Ophthalmology and Visual Science 54: 3157-3165*
A randomised clinical trial to assess the effect of a dual treatment on myopia progression

The authors present findings from a double-blind randomised control trial investigating whether interventions aiming to improve accommodative function impact on myopia progression in teenagers. Interventions consisted of specialist contact lenses to control spherical aberration and therefore optimise the accommodative response, or a vision-training programme using +/- 2.00D flipper lenses to improve accommodative dynamics. Mean myopic progression was -0.33 D over the 2 years of the study; neither treatment group showed slower myopic progression that the related control groups, indicating no significant benefit of these interventions in the retardation of myopia.

*Ophthalmic and Physiological Optics 33: 267-276*

Myopia-Related Fundus Changes in Singapore Adults With High Myopia

Chang and colleagues examined the macular and optic disc changes associated with myopia of -6.00 D or greater, amongst 359 Singapore Asians aged 40 years or over. Subjects were refracted and underwent fundus photography and ocular biometry. Staphyloma (present in 23%) and chorioretinal atrophy (19.3%) were the most common fundus abnormalities detected, whilst peripapillary atrophy (81.2%) and disc tilt (57.4%) were the most commonly-detected disc findings. The results indicate that pathologic myopia is dependent on patient age; a similar previous study of teenagers in Singapore found a high frequency of tilted discs and peripapillary atrophy, but a low prevalence of staphyloma and chorioretinal atrophy.

*American Journal of Ophthalmology 155: 991-999*
Amblyopia in Childhood Eyelid Ptosis

This retrospective study, based in Minnesota, examined the prevalence and causes of amblyopia amongst children with ptosis. Records of 107 patients, diagnosed between 1965 and 2004, were reviewed. The prevalence of amblyopia amongst those with childhood ptosis was lower than might be expected, at 15%, and in only approximately half of these patients, the amblyopia was due solely to eyelid occlusion of the visual axis. Other causes of amblyopia were significant refractive error (3 patients) and strabismus (2 patients).

*American Journal of Ophthalmology 155: 1125-1128*

Test–retest reproducibility of accommodation measurements gathered in an unselected sample of UK primary school children

This interesting UK-based study examined 137 primary school children aged 4-12 years to determine the test–retest reproducibility of the commonly-used push-up test for amplitude of accommodation. Testing was conducted on several different days, by 5 different clinicians. Median accommodative amplitude was 19.1 D. The variation (3.1 D) due to the identity of the tester was substantial and many children demonstrated an increase in amplitude of accommodation measures when retested. The result indicate that push-up testing of accommodative amplitude in this group may be most useful as a pass/fail check for identifying those with a significant deficit (<12 D accommodation) rather than as an accurate measure of accommodative amplitude.

*British Journal of Ophthalmology 97: 592-597*

Findings of perinatal ocular examination performed on 3573, healthy full-term newborns

This paper presents findings from a large-scale neonatal eye examination programme in China. Of the 3,573 infants examined within 42 days of birth, 871 abnormalities were detected (24.4%), of which 769 were retinal haemorrhages. The remaining 109 abnormal findings included (amongst others) subconjunctival haemorrhage, congenital cataract and congenital microphthalmos. Whilst retinal haemorrhages due to birth trauma are frequently considered to be benign, the authors speculate that larger haemorrhages, or those around the macula, could impact upon visual development and be amblyogenic.

*British Journal of Ophthalmology 97: 588-591*
The Relationship Between Cup-to-Disc Ratio and Estimated Number of Retinal Ganglion Cells

Tatham and colleagues, based in California, examined 156 healthy eyes, 53 glaucoma suspects and 127 glaucomatous eyes with automated perimetry, fundus photography and Cirrus spectral-domain OCT to evaluate the relationship between cup-to-disc ratio and number of retinal ganglion cells. The mean estimated retinal ganglion cell count ranged from 1,063,809 in healthy eyes to 218,471 in eyes with advanced glaucoma. The cup-to-disc ratio was 0.45 ± 0.15 in healthy eyes, and 0.80 ± 0.16 in glaucomatous eyes. A non-linear relationship was found between cup-to-disc ratio and retinal ganglion cell estimates, meaning that those eyes with larger cup-to-disc ratios would have to undergo a substantial loss of ganglion cells for a small increase in CD ratio. The data suggest that change in CD ratio is an insensitive method for evaluating progressive glaucomatous loss.

Investigative Ophthalmology and Visual Science 54: 3205-3214

Clinical applicability of the Macular Degeneration Detection Device (MDD-2)

Photostress recovery time describes the length of time required for normal visual function to be restored following exposure to a light source bright enough to bleach the visual pigments and saturate the response of photoreceptors at the macula. It is a very good indicator of retinal integrity and can be used to identify pre-clinical macular disease. The authors describe the clinical application of the MDD-2, a new flash photostress recovery device. Repeated measures amongst the 100 normal participants demonstrated a significant learning effect, indicating that a single "practise" measure is required before taking an accurate reading. Measurements were found to be highly repeatable between eyes, which along with its speed and simplicity, make the device suitable for incorporation into routine optometric practice.

Clinical and Experimental Optometry 96: 295-302
Most intriguing research paper title this month……

“Party Foam-Induced Eye Injuries and the Power of Media Intervention”

This retrospective study examined the clinical features and visual outcomes of eye injuries occurring due to use of artificial snow spray (also called party foam or silly string) during two annual Israeli Independence Day celebrations (2007 and 2008). Ninety-six patients (135 eyes) presented at ophthalmology emergency departments with foam-induced chemical injuries, ranging from mild to severe. Clinical features included chemical conjunctivitis (100%); punctate keratopathy (79%) and corneal erosion (27%). More patients were seen during 2007 than 2008 (85 and 11 patients, respectively) - the reduction was attributed to increased public awareness of the danger, through newspapers, radio and national television.

*Cornea 32: 826-829*

Most fascinating research finding this month……

*Effect of Day Length on Eye Growth, Myopia Progression, and Change of Corneal Power in Myopic Children*

Previous research has indicated that the development of myopia may be linked to ambient light levels. In the northern location of this study (Denmark), the length of the day varies from 7 to 17.5 hours throughout the year. This study followed 235 myopic children, measuring refraction, axial length and corneal power to assess whether eye elongation and myopic progression are increased with reduced hours of daylight. The results showed significant correlations between daylight hours and myopia progression, axial elongation, and corneal power. A small, but statistically significant reduction in both axial elongation and myopia progression occurred when children had more hours of daylight, leading the authors to conclude that children should be encouraged to spend more time outdoors to prevent myopia.

*Ophthalmology 120: 1074-1079*

Next report
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