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.

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.

Dr Amy Sheppard is a lecturer in Optometry at Aston University, with responsibility for the department's professional development courses, including the Doctor of Optometry programme. Following several years in optometric practice, Amy undertook a PhD in the field of human accommodation and ocular imaging, which was awarded in 2010. Amy's current research is centred around accommodation/presbyopia, intraocular lenses and ultraviolet radiation and contact lenses. Amy is an associate of the UK Higher Education Academy and her teaching responsibilities at Aston include undergraduate primary ophthalmic examination and postgraduate lecturing in the field of ophthalmic examination and accommodation and presbyopia.

Issue 41

Welcome to the 41st monthly research update, in which papers from the current issues of the below journals are reviewed. Amongst the findings published this month, studies with paediatric participants have shown that children seem to have longer tear break uptimes than adults, and an interesting link between self-esteem and contact lens use is described. In the field of cataract, new research shows that lens opacification may be delayed by treatment with sulforaphane, and corneal biomechanical properties influence refractive outcomes. UK-based research indicates that spectral filters may be valuable in reducing visual stress following stroke. The most fascinating research finding and paper title of the month are also included.

JOURNAL	VOLUME
British Journal of Ophthalmology	97(9)
Cornea	32(9)
Investigative Ophthalmology and Visual Science	54(8)
JAMA Ophthalmology (Formerly Archives of Ophthalmology)	131(8)
Journal of Cataract and Refractive Surgery	39(8)
Journal of Optometry	6(3)
Journal of Refractive Surgery	29(8)
Ophthalmic and Physiological Optics	33(5)
Ophthalmology	120(8)
Optometry and Vision Science	90(8)

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The non-invasive tear film break-up time in normal children

No previously published studies have extensively examined tear film stability in normal children. This study based in Pittsburgh included 36 children (mean age 7.6 years) with no known ocular surface/anterior segment anomalies and measured non-invasive tear break up time (NITBUT) and lipid layer interferometry using a slitlamp-mounted Keeler tearscope. The mean NITBUT of 21.8 ± 4.1 secs was greater than has been reported in recent studies with adult cohorts. Children seem to demonstrate greater NITBUTs than adults; these normative data will provide a useful benchmark for future research into paediatric tear film instability.

British Journal of Ophthalmology 97: 1129-1133

Effect of Accommodation on Corneal Topography

It is feasible that small changes in corneal curvature or cyclotorsion with accommodation could affect corneal topography readings in young eyes. This prospective study used a Nidek OPD-Scan to obtain corneal topography and refraction values for 18 pre-presbyopic eyes before and during accommodation to a near stimulus. The mean accommodative response was -4.55 ± 2.04 D; there was no significant change in corneal topography between the relaxed and accommodated states. The position of iris landmarks was used to examine cyclotorsion during accommodation with no significant cyclotorsion being demonstrated. The data indicate that the accuracy of corneal topography is unlikely to be influenced by accommodation in young subjects.

Cornea 32: 1251-1254

Entrance Pupil Size Predicts Retinal Illumination in Darkly Pigmented Eyes, But Not Lightly Pigmented Eyes

In this novel study based in Iowa, the authors investigated the effect of entrance pupil size on retinal illumination. Anisocoria was induced using topical pilocarpine in one eye of each participant to assess how this would affect relative afferent pupillary defect (RAPD) compared to baseline measures in light- and darkly-pigmented eyes. Interestingly, anisocoria correlated with RAPD only in darkly pigmented eyes. Retinal illumination in light eyes is therefore relatively independent of pupil size, probably because light is transmitted through the iris and sclera. The finding is relevant to the understanding of the greater susceptibility of lightly pigmented eyes to light toxicity.

Investigative Ophthalmology and Visual Science 54: 5559-5567

Removability of a Small Aperture Intracorneal Inlay for Presbyopia Correction

One of the commonly-stated advantages of small aperture intracorneal inlays for the correction of presbyopia is that they may be simply removed in cases of non-tolerance. However, there are few reports in the literature of removal of inlays. Alió and colleagues followed up 10 patients undergoing removal of one of the Accufocus inlays due to subjective dissatisfaction (e.g. photophobia and glare) or poor near vision. In the majority of patients, uncorrected and corrected distance and near visual acuities were same 6 months post-removal as pre-operatively. Corneal topography and aberrometry values did not change significantly compared to pre-operative measures. The data indicate that intracorneal inlays may be safely removed without significant long-term visual effects in cases of non-tolerance.

Journal of Refractive Surgery 29: 550-556

Anterior segment changes following short-term reading and its correlation with corneal biomechanical characteristics

This interesting study investigated the presence of changes in anterior segment biometry after a 30 minute reading task in 36 healthy volunteers. Scheimpflug imaging was used to measure anterior segment biometry before and after reading, whilst corneal biomechanical data were collected with the Ocular Response Analyser. After reading, significant reductions were observed in central and superior corneal power, anterior chamber depth and anterior chamber volume. A negative correlation between corneal hysteresis and change in inferior corneal power was also observed. The significant changes in some anterior segment parameters after reading may be important in high precision examinations (e.g. before refractive surgery) and in our understanding of the link between near work and myopia.

Ophthalmic and Physiological Optics 33: 592-596

Eyelid Laxity, Obesity, and Obstructive Sleep Apnea in Keratoconus

Previous studies have indicated a high prevalence of floppy eyelid syndrome in keratoconus patients, but the converse relationship has not been reported. In this case-control study, the relationship between keratoconus and floppy eyelid syndrome was examined, along with the prevalence of obesity and obstructive sleep apnoea in keratoconus. Fifteen patients aged over 18 years were recruited into the keratoconus group and the control group. The keratoconus patients showed increased vertical and lower lid pull and palpebral width compared to the controls, as well as a more rubbery tarsus. Medical and ophthalmic history from 50 keratoconus patients showed a high prevalence of obstructive sleep apnoea (24 %) and obesity (52 %) compared to the general population; these associations are important due to the increased risk of stroke and death. The authors suggest that an underlying inflammatory process could explain the link between keratoconus and floppy eyelid syndrome, and also potentially with sleep apnoea.

Cornea 32: 1232-1236

Myopia, contact lens use and self-esteem

This study included over 400 children enrolled in the Correction of Myopia Evaluation Trial (COMET). The Self-Perception profile was conducted on all participants, along with measures of refractive error and questioning regarding contact lens use. Those who chose to wear contact lenses showed higher levels of self-esteem at baseline and at the 6 year visit (after adjusting for baseline values). Age and refractive error were not associated with self-esteem or contact lens use. The data are interesting as they indicate that self-esteem may influence the decision to wear contact lenses and that contact lenses are also associated with higher levels of self-esteem in children.

Ophthalmic and Physiological Optics 33: 573-580

Influence of corneal biomechanical properties on surgically induced astigmatism in cataract surgery

This interesting clinical study enrolled 40 patients (40 eyes) undergoing routine cataract surgery to assess whether corneal biomechanical and morphologic properties are important in the final post-operative refractive outcome. The Ocular Response Analyser was used to assess pre- and post-operative corneal biomechanical properties, whilst aberrometry data were assessed using a Scheimpflug rotating camera. Anterior segment optical coherence tomography was used to profile surgical incisions. Surgically induced astigmatism (SIA) and higher order aberrations were significantly lower after microincision surgery (2.2 mm or less) than after small-incision surgery (2.75 mm). Notably, the SIA was found to be significantly associated with pre-operative corneal hysteresis (CH); as CH increases, SIA reduces. Because CH appears to modulate optical changes, the authors suggest that corneal biomechanical properties should be taken into account in patients undergoing cataract surgery.

Journal of Cataract and Refractive Surgery 39: 1204-1210

Sulforaphane Can Protect Lens Cells Against Oxidative Stress

Protection of the lens from oxidative stress could be of major importance in the prevention of cataract. Compounds such as sulforaphane (SFN) are thought to protect cells against oxidative stress, so Liu and colleagues based in Norwich, UK, studied the ability of SFN to protect porcine and human lens cells in vitro. Treated lens cells were found to be protected from peroxide-induced opacification, whilst SFN also reduced the incidence of DNA strand-breaks. It is feasible that SFN could be useful in delaying the onset of age-related cataract, if it could be safely delivered to the in vivo crystalline lens.

Investigative Ophthalmology and Visual Science 54: 5236-5248

Analyzing Patient-Reported Outcomes to Improve Cataract Care

In a special OVS issue centred on the theme of measuring the patient's perspective (e.g. using questionnaires/ interviews/ focus groups), Lundström and Stenevi analysed patient-reported cataract surgery outcomes to identify areas for possible improvements in care. This retrospective study was based in Sweden and analysed clinical data and patient questionnaires relating to 9,707 cataract operations. Poor patient-reported outcomes after surgery were more common in patients with poor pre-operative acuity in the better eye; good pre-operative self-reported visual function; ocular comorbidity and refractive deviations. The most common reason for a good clinical outcome, but poor patient-reported outcome, was difficulty with near vision. Analysis of poor patient-reported outcomes is a useful way of identifying areas for improvement in quality of care.

Optometry and Vision Science 90: 754-759

Patients' Causal Beliefs about Diabetic Retinopathy

Fenwick and colleagues, based in Australia, conducted focus groups and semi-structured interviews to explore patient understanding of the risk factors and controllability of diabetic retinopathy (DR). Most of the 57 DR patients had undergone previous laser treatment. Patients generally showed a basic understanding of risk factors for DR, such as poor diabetic control, although the effects of blood pressure and blood lipids were not well understood. Interestingly, patients typically attributed their own DR to poor diabetic control or failings in the health system. Diabetic and ophthalmic specialists believed that patients struggled to understand the goals and concept of laser treatment, despite considerable exposure to healthcare professionals. The authors suggest that attempting to fill in the gaps in patient knowledge may result in better visual outcomes in diabetic eye disease.

Optometry and Vision Science 90: 874-882

Associations of refractive amblyopia in a population of Iranian children

In this cross-sectional study, 164 children referred to a hospital eye department with either refractive or non-refractive amblyopia were studied to determine the factors associated with amblyopia in this population. Just over half of the amblyopes had at least 1.00 D of spherical equivalent anisometropia. Amblyopia was also significantly associated with hyperopia or myopia of ≥2.00 D and astigmatism >1.00 D. Prematurity, low birth weight and difficult labours were found to increase the risk of amblyopia. The findings serve as a useful reminder for eye care practitioners of the risk factors for amblyopia.

Journal of Optometry 6: 167-172

Treatment With 9-cis ß-Carotene–Rich Powder in Patients With Retinitis Pigmentosa

Retinitis pigmentosa (RP) has a prevalence of approximately 1 in 3500 individuals and is a leading cause of visual impairment. Previous research has shown that 9-cis β-carotene is a pre-cursor of retinal and may represent a possible treatment for RP. In this randomised, double-masked and placebo-controlled trial, 34 patients with RP received capsules containing either 9-cis β-carotene powder or placebo for 90 days. After a 90 day wash-out period, patients were treated for a further 90 days with the other capsule. Treatment with the 9-cis β-carotene resulted in a significant increase in retinal function, compared to placebo; there was a significant increase in dark-adapted and light-adapted maximal b-wave amplitudes on electroretinography. There were no significant changes in visual field or visual acuity with treatment. The treatment may prove valuable in RP therapy, although larger trials are required to determine the exact therapeutic regimen.

JAMA Ophthalmology 131: 985-992

The effect of spectral filters on reading speed and accuracy following stroke

Recently published research has indicated that stroke patients are susceptible to pattern glare and associated reading impairment. The symptoms of visual stress may be reduced using spectral filters, optimally selected for each individual. In this British study, 17 stroke patients were enrolled to investigate the possible beneficial effects of spectral filters on reading performance. Subjects wore either a grey or optimal spectral filter for 2 weeks before swapping to the other treatment. Reading speed was shown to immediately increase (by around 8 %) with optimum spectral filters, whereas use of the grey filter initially caused a reduction in reading speed. The beneficial effects of the spectral filters showed no further increase with continued use, suggesting that the gains in reading speed and accuracy are achieved soon after initial dispensing.

Journal of Optometry 6: 134-140

Parafoveal Scotoma Progression in Glaucoma

The Humphrey 24-2 visual fields programme is one of the most widely used for monitoring glaucoma. It contains just 12 test points within the central 10° of vision, so may be limited in value in cases of initial parafoveal scotoma, defined as glaucomatous loss only within the central 10°. In this observational study, the authors studied the efficacy of the 24-2 compared to the 10-2 strategy (which contains 68 test points within the central 10°), in 50 eyes of 50 patients with glaucoma. Notably, four of 11 progressing eyes identified on 10-2 analysis were missed with the 24-2 strategy. The authors recommend the use of testing algorithms with closely-spaced grids such as 10-2 in glaucoma patients with initial parafoveal scotoma.

Ophthalmology 120: 1546-1550

Most intriguing research paper title this month.....

Corneal Hysteresis as a Risk Factor for Glaucoma Progression

The commercially available Ocular Response Analyser allows the study of corneal hysteresis. It is feasible that eyes with more deformable corneas could show an increased risk of intraocular pressure (IOP)-induced damage to the optic disc. In this longitudinal study, the investigators followed 68 glaucoma patients (114 eyes) for a mean duration of 4 years to evaluate the role of corneal hysteresis as a risk factor for glaucoma progression. Corneal hysteresis, IOP, central corneal thickness and visual fields data were collected. Interestingly, eyes with lower corneal hysteresis values were found to have significantly faster rates of visual field loss than eyes with higher corneal hysteresis. The data indicate that the association is not just due to the effect of corneal hysteresis on IOP values and that corneal hysteresis is an important factor to take into account when assessing risk of glaucomatous progression.

Ophthalmology 120: 1533-1540

Most fascinating research finding this month.....

Older drivers with intermediate age-related macular degeneration have a reduced risk of motor vehicle collision involvement.

In this retrospective study, the investigators pooled data from 4 previous studies to examine associations between motor vehicle collision involvement and age-related macular degeneration (AMD) presence and severity. Data were compared to those with normal eye health. The rate of motor vehicle collisions was greatest for those with normal eye health and then progressively declined amongst those with early/ intermediate AMD. The incidence of motor vehicle collisions was significantly lower for those with intermediate disease compared to normals. The reasons for this finding are unclear, although the authors suggest that those with AMD may avoid difficult driving situations.

British Journal of Ophthalmology 97: 1173-1176

Next report
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