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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 40

Welcome to the 40th instalment of the Research Update, in which articles published this month in the journals listed below are reviewed. Several articles this month relate to ethnic differences in ocular parameters such as dry eye signs and symptoms; ocular shape and refractive error. In the field of contact lenses, we see that compliance with daily disposable contact lens wear varies from country-to-country, with a significant proportion of wearers admitting to some poor habits. Research into ocular nutrition indicates that antioxidant supplementation may not be useful in preventing age-related cataract, but macular pigment levels may be relevant to the development of glaucoma. As usual, the update concludes with the most fascinating research finding this month and the most intriguing paper title.

JOURNAL	VOLUME
American Journal of Ophthalmology	156(2)
British Journal of Ophthalmology	97(8)
Contact Lens and Anterior Eye	36(4)
Investigative Ophthalmology and Visual Science	54(7)
JAMA Ophthalmology (Formerly Archives of Ophthalmology)	131(7)
Journal of Cataract and Refractive Surgery	39(7)
Ophthalmology	120(7)
Optometry and Vision Science	90(7)

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Ethnic differences in dry eye symptoms

Discomfort, most notably dryness, is a key reason for discontinuation of contact lens wear. Previous data have also indicated that objective measurement and subjective evaluation of dry eye differs between Asians and non-Asians. This fairly large prospective study, based in Berkeley, examined 395 adapted soft contact lens wearers (180 Asian and 215 non-Asian) to assess whether degree of corneal staining and severity of dry eye symptoms were linked with length of contact lens wear and Asian/ non-Asian ethnicity. Asians were found to have significantly higher levels of corneal staining than non-Asians and had more severe symptoms. In non-Asians, dryness symptoms were less severe with increased years of contact lens wear. The data may be useful in managing dryness symptoms amongst diverse patient populations.

[*Contact Lens and Anterior Eye*](#)

A multi-country assessment of compliance with daily disposable contact lens wear

This questionnaire-based study was conducted in the UK, USA, Australia and Norway and examined patient compliance with daily disposable contact lens (DDCL) wear and the practice of re-using lenses. Eight hundred and five patients completed the questionnaire; the mean age of respondents was 38 years. Overall, 9 % of respondents reported re-using lenses (UK figure was 7 %), with saving money cited as the primary reason for this. Re-use of DDCLs was associated with poorer comfort at insertion and prior to removal. Regarding compliance, 75 % reported occasionally napping in their lenses, and 28% had slept overnight in their lenses at least once in the previous month. The data indicate the need for eyecare practitioners to educate their patients on the importance of appropriate lens wear.

[*Contact Lens and Anterior Eye*](#)

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Diurnal Variations in Visual Performance for Disposable Contact Lenses

Montés-Micó and colleagues compared the visual performance over time provided by various brands of daily disposable contact lenses, with ophthalmic lenses. In 15 myopic subjects fitted with several daily disposable lenses or ophthalmic lenses, visual acuity and contrast sensitivity were measured at 2 hour intervals during 12 hours of continual wear. After 12 hours of use, ophthalmic lenses provided better high- and medium-contrast visual acuity than contact lenses, although there were no differences between the types of contact lens. Contrast sensitivity measures did not change with time for any lens type.

[Optometry and Vision Science 90: 682-690](#)

Laser in situ keratomileusis in United States Naval aviators

Whilst many previous studies have indicated that LASIK is a safe and effective treatment for a broad range of refractive errors, US naval aviators represent a special population given their high visual demands and the \$5 million cost associated with training each individual. This study examined outcomes of wavefront-guided LASIK using femtosecond technology in 603 eyes of active-duty US naval aviators. Uncorrected visual acuity (UDVA) was 6/6 or better post-operatively in 98.2 % of treated eyes and no re-treatments were required during the 3 month follow up period. Subjectively, 94.9 % of the aviators reported that their vision was much better following treatment, and none said that their vision had worsened. The majority (98.2 %) would recommend the treatment to a fellow aviator.

[Journal of Cataract and Refractive Surgery 39: 1047-1058](#)

Variations in Corneal Asphericity (Q Value) Between African-Americans and Whites

This prospective cohort study used the Pentacam HR to compare corneal asphericity (Q value, where $Q = 0$ is a perfect sphere) between African-American and white subjects. Eighty subjects were enrolled in each group. Corneal asphericity differed significantly between groups, with African-American eyes significantly more prolate than those of whites. The differences were not significantly altered by age, gender or spherical equivalent refractive error. These data on racial differences in corneal shape may be valuable in improving the accuracy of intraocular lens power calculations, or contact lens designs.

[Optometry and Vision Science 90: 667-673](#)

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Corneal inlay implantation in a young pseudophakic patient

A number of implantable (and reversible) corneal inlays are currently available for the treatment of presbyopia. Such inlays may be implanted in a corneal pocket or underneath a LASIK flap. This interesting case report describes successful use of the Kamra small-aperture inlay in a 32 year old unilateral pseudophakic patient who had undergone surgery for traumatic cataract in the previous year. He had been experiencing problems with asthenopia and headaches and could not tolerate spectacles due to anisometropia. At 6 months post-implantation, the asthenopic symptoms had subsided and the patient had excellent distance and near visual acuities in the implanted eye. He is believed to be the youngest patient implanted with the device.

[Journal of Cataract and Refractive Surgery 39: 1116-1117](#)

Myopia, Axial Length, and Age-Related Cataract

As part of the Singapore Malay Eye Study, which examined 3280 adults aged 40-80 years of Malay ethnicity, this paper reports on the risk factors for nuclear cataract. Subjective refraction and axial length (IOLMaster) were recorded, whilst digital slitlamp photographs were used to grade any cataract present. Myopia, but not axial length, was found to be associated with nuclear and posterior subcapsular cataract. Cortical opacities were not associated with refractive error. The concept of refractive index induced myopia with ageing is supported by the data given that myopia, rather than axial length, is associated with cataract development.

[Investigative Ophthalmology and Visual Science 54: 4498-4502](#)

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Incidence and Progression of Epiretinal Membranes in Eyes After Cataract Surgery

Epiretinal membranes (ERM) are a common age-related eye condition, found in 6- 19 % of eyes in people aged 40 years and over. Previous research has indicated that cataract surgery may increase the risk of developing ERM. It can be difficult to image the retina of cataractous eyes, which may affect the pre-operative detection of ERM, leading to an over-estimation of the incidence of ERM occurring after cataract surgery. Fong and colleagues, based in Sydney, examined 1932 cataract patients, using retinal photography pre-operatively, and at 1 month to 3 years post-operatively. Approximately 11% of eyes that did not have ERM at 1 month post-operatively, developed the condition within 3 years of cataract surgery. Poor agreement in ERM detection and grading was found between the pre-operative and 1 month post-operative images.

[American Journal of Ophthalmology 156: 312-318](#)

Lutein/Zeaxanthin for the Treatment of Age-Related Cataract

Age-related cataract is a leading cause of visual impairment in developed countries. Oxidative damage is important in the development of cataract, so it has previously been hypothesised that antioxidant supplementation may help delay/ prevent cataract, although results of previous studies have been variable. This paper analyses data from the large-scale AREDS2 study, in relation to lutein/ zeaxanthin supplementation and incidence of cataract surgery, amongst 3159 participants aged 50- 85 years. In this placebo-controlled, double-blind and randomised study, no effect of lutein/ zeaxanthin supplementation on the need for cataract surgery was found. It is possible that if antioxidant supplementation is protective against cataract, then intervention is needed from a younger age.

[JAMA Ophthalmology 131: 843-850](#)

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Correction of Ocular Shape in Retinal Optical Coherence Tomography and Effect on Current Clinical Measures

Kuo and colleagues compared retinal optical coherence tomography (OCT) scans of healthy eyes with magnetic resonance imaging (MRI) images, to assess how the shape of the retina may be misrepresented in OCT scans. Retinal curvature was found to be substantially flatter with OCT than MRI, with retinal thickness also misrepresented in the peripheral regions of OCT images. The authors attribute these problems to the rectangular display which is used in commercially-available OCT systems, and suggest correction algorithms which may be applied to OCT images. Such correction makes OCT data more consistent with other imaging techniques and shape correction is recommended in future development of advanced image-based morphometric measuring tools.

[American Journal of Ophthalmology 156: 304-311](#)

Lactation, female hormones and age-related macular degeneration: the Tromsø Study

Some risk factors for age-related macular degeneration (AMD) are known to differ between males and females, so this Norwegian study examined the associations between female hormones, reproductive history and AMD. The cohort consisted of 1512 women aged 65-87 years who underwent physical examination, blood testing, retinal photography, and completed questionnaires. Interestingly, the data showed that a longer duration of lactation was associated with a reduced risk of maternal late AMD after other factors were controlled for. No associations between late AMD/ large drusen and factors such as use of contraceptives/ HRT; age at first childbirth; age of menopause and reason for menopause were identified.

[British Journal of Ophthalmology 97: 1036-1039](#)

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Development and Validation of a Predictive Model for Non-adherence with Once-Daily Glaucoma Medications

Chang and colleagues describe the development of a model to estimate the probability of a patient being non-adherent to topical glaucoma medications (prostaglandin eye drops). Data from 603 patients in two previous studies were used to develop the model. Six factors were associated with being non-adherent: younger age; black race; poorer general health; shorter duration of therapy; lower self-reported adherence and admittance of not following doctors' orders. The final simple predictive model requires just basic demographic data and patient responses to 4 questions to estimate the probability of being non-adherent.

[*Ophthalmology 120: 1396-1402*](#)

Evidence of lower macular pigment optical density in chronic open angle glaucoma

Macular pigment is important in protecting the retina from oxidative damage and a significant amount of research has been directed at macular pigment levels and the development of AMD. It was previously unknown whether macular pigment levels may be important in the development of glaucoma, so this study measured macular pigment optical density (MPOD) in 40 subjects with open-angle glaucoma and 54 age-matched controls. Median MPOD was found to be significantly lower in glaucoma patients, compared to the controls, although MPOD values did not correlate with disease severity. More research is needed to confirm the significance of macular pigment in glaucoma, and to assess whether increasing macular pigment levels could play a role in the management of glaucoma.

[*British Journal of Ophthalmology 97: 994-998*](#)

Effect of Age on Individual Retinal Layer Thickness in Normal Eyes

This OCT-based cross-sectional study of 120 Caucasian subjects investigated the effect of age on the thickness of individual retinal layers. Subjects were aged between 18 and 81 years. Several macular layers showed a reduction in thickness with age, whilst the thickness of the foveal retinal pigment epithelium increased significantly with age. The data may need to be taken into account when studying retinal diseases and glaucoma.

[*Investigative Ophthalmology and Visual Science 54: 4934-4940*](#)

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Reading Speed Improvements in Retinal Vein Occlusion After Ranibizumab Treatment

Retinal vein occlusion (RVO) is the second most common retinal vascular disease, and can cause moderate/ severe visual loss due to macular oedema. Previous studies have shown that visual acuity may be improved following Lucentis treatment for RVO. This study was undertaken to assess whether VA gains translate into measurable improvements in visual function and included 789 participants with macular oedema secondary to RVO who received either Lucentis or sham intravitreal injections. Best corrected visual acuity and reading speed were measured at baseline and at up to 6 months. Patients who received the Lucentis injections showed greater improvements in reading speed, compared to those who received the sham treatment. The greatest gains in reading speed were found in cases of branch (rather than central) RVO. The data confirm that the VA improvements with this treatment lead to functional gains in vision.

[JAMA Ophthalmology 131: 851-856](#)

Prevalence and 5- to 6-Year Incidence and Progression of Myopia and Hyperopia in Australian Schoolchildren

This interesting study of school children in Sydney, Australia included 5/ 6 year longitudinal data from over 2000 children aged 12 or 17 years at baseline. All children underwent cycloplegic autorefractometry to determine refractive error. The overall myopia prevalence (at least -0.50 D) of 14.4 % in the younger children and 29.6 % in the older participants was lower than has been reported in other locations. However, amongst European Caucasians, there was a significant increase in the prevalence of myopia at age 12 between the two periods of data capture, in line with international trends. Of note was that the prevalence of myopia in East Asian children living in Australia was lower than has been reported amongst East Asians living in East Asia, highlighting the likely impact of environmental and lifestyle factors on myopia progression.

[Ophthalmology 120: 1482-1491](#)

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

Distribution and Determinants of Eye Size and Shape in Newborn Children

An MRI study of 173 newborn children in Singapore has investigated ocular shape in infants, finding that most children are born with prolate eyes, rather than spherical or oblate. Interestingly, children of less educated mothers had significantly longer axial lengths. Malaysian children had larger eye volumes and surface areas at birth than Chinese or Indian newborns. A longitudinal study is required to evaluate whether globe shape at birth impacts on refractive changes in childhood.

[Investigative Ophthalmology and Visual Science 54: 4791-4797](#)

Most fascinating research finding this month.....

Factors Accounting for the 4-Year Change in Acuity in Patients Between 50 and 80 Years

Some large-scale studies have previously reported on the longitudinal change in visual acuity with age, but have not identified the cause of acuity loss over time. This 4-year longitudinal study examined 148 subjects aged 50-80 years and included measures of wavefront quality; visual acuity; classification of lens opacities and forward scatter metrics. On average, subjects lost 1.6 ± 4 letters of visual acuity during the follow-up period, which agreed with previously published studies. The main reasons for age-related loss of acuity were posterior subcapsular cataract development; trefoil aberration and change in point spread function entropy.

[Optometry and Vision Science 90: 620-627](#)

Next report
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James S Wolffsohn
Professor of Optometry,
Deputy Dean of Life and Health Sciences
Aston University
Birmingham, UK

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