

# Academy of Vision Care™

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.



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.

## Issue 19

The following key clinical peer reviewed journals will be reviewed:

JOURNAL	VOLUME
American Journal of Ophthalmology	152(3)
Archives of Ophthalmology	129(10)
British Journal of Ophthalmology	95(10)
Clinical and Experimental Ophthalmology	39(7)
Clinical and Experimental Optometry	94(5)
Cornea	30(11)
Investigative Ophthalmology and Visual Science	52(10)
Journal of Cataract and Refractive Surgery	37(11)
Ophthalmology	118(9)
Ophthalmic and Physiological Optics	31(10)
Optometry and Vision Science	88(10)

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## Computer-aided techniques to quantify corneal vascularisation and scarring

Tatham *et al.* devised a semi-automated, computerised system to quantify corneal scarring and vascularisation, using features such as edge detection and colour segmentation. The results show that this image analysis software was more reproducible than 3 experienced ophthalmologists grading 20 digital photos of corneal scarring and vascularisation from 20 patients. Such imaging techniques may be useful in investigating the effect of corneal treatments of corneal disease.

*British Journal of Ophthalmology 2011; 95:1379-84*

## Analysing wettability for soft contact lenses

Haddad *et al.* have developed a new technique to assess the wettability of hydrogel contact lenses. Contact angle measurements have historically been made in-vitro using methods such as the 'sessile drop' and 'captive-bubble' techniques. The results of this study showed that the Novel On-Eye Wettability Analyser (NOWA) provided repeatable measurements of the contact angles of 10 different Etafilcon A lenses (worn by 10 different patients). Moreover, the device also provided repeatable results for a new wettability metric, the index of liquid spreading (ILS).

*Optometry and Vision Science 2011 88: 1188-1195*

## Phacoemulsification with IOL implantation alters anterior chamber parameters

This investigation was conducted in a study population of 63 eyes, 26 of which showed 'narrow' anterior chamber angles pre-operatively (of grade 2 or less in at least 3 quadrants - using Schaffer's method), with the remaining 37 eyes exhibiting 'open' angles. The results showed that phacoemulsification with foldable IOL implantation resulted in a deepening of the central anterior chamber and widening of the anterior chamber angle using OCT imaging in both study groups. Moreover, the resulting reduction in IOP post-operatively was found to be significantly correlated to the increase in anterior chamber angle width in both patient groups.

*Archives of Ophthalmology 2011 129: 1283-1290*

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## Contact lenses and peripheral aberrations

The Hartmann-Shack technique was used to evaluate higher-order aberrations peripherally along the horizontal meridian (up to 30 degrees from the primary position) whilst wearing Acuvue-2 and Menicon Z lenses in 9 myopic patients. The results showed that contact lenses increased higher-order aberrations peripherally, with the exception of 3rd-order coma. The increase in higher-order aberrations with contact lens correction was found to reduce optical image quality dependant on the eye's manifest aberrations. The authors suggest that contact lens designers and manufacturers should aim to improve the correction of higher-order aberrations whilst simultaneously providing best the sphero-cylindrical correction for the eye across the visual field.

*[Optometry and Vision Science 2011 88: 1196-1205](#)*

## Repeatability of ocular aberrations in keratoconus

Jinabhai *et al.* used a commercially available Hartmann-Shack aberrometer to investigate the repeatability of lower-order and higher-order aberrations in 31 patients with varying degrees of keratoconus. The results revealed that defocus and astigmatism showed substantially poorer repeatability compared to previous studies of visually-normal subjects. Similarly, higher-order aberrations and higher-order RMS error also showed poorer repeatability compared to previous data measured in normal subjects. The authors hypothesised that the high variability in aberrations is most likely to be due to spot imaging errors at the wavefront sensor.

*[Ophthalmic and Physiological Optics 2011; 31: 588-594](#)*

## Changes in straylight and contrast sensitivity after Orthokeratology

This report showed a significant improvement in intraocular straylight (measured using the Oculus C-Quant device) measured one month after beginning corneal refractive therapy in 30 young subjects. However, the authors found no correlations between intraocular straylight and either high-contrast or low-contrast visual acuity. Equally, the data presented showed no correlation between intraocular straylight and either photopic or scotopic contrast sensitivity (measured using the vision contrast test system 6500 instrument).

*[Optometry and Vision Science 2011 88: 1245-1251](#)*

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## Reduction of corneal astigmatism with shorter arc length INTACS in keratoconus

The authors compared the correction of astigmatism in patients with keratoconus using single segment 150-degree INTACS versus shorter arc-length 90-/120-degree asymmetric INTACS. Each study group contained 16 keratoconic patients. The results showed that the asymmetric shorter arc-length INTACS provided significantly better correction of manifest corneal astigmatism, whilst still providing comparable improvements in corrected and uncorrected visual acuity between both study groups.

*[Cornea 2011 30: 1201-06](#)*

## Are elliptical pupil transformations necessary when evaluating peripheral aberrations?

Hartwig *et al.* measured ocular higher-order aberrations for peripheral gaze positions of up to 20 degrees horizontally in 20 visually-normal subjects. The data were analysed with and without applying an elliptical pupil transformation. The results interestingly showed no significant differences between the circular and elliptical pupil aberrations at either a 3.5 mm or 6 mm diameter over this eccentricity range. However, the authors concluded that it is likely that pupil recalculation would be necessary at eccentricities beyond 20 degrees.

*[Clinical and Experimental Optometry 2011 94: 443-451](#)*

## Economic impact of POAG in Australia

This fascinating review uses a dynamic model to investigate the current and future economic impact of POAG in Australia thereby enabling comparisons of the cost-effectiveness of future interventions. The report suggests that the prevalence of POAG is anticipated to increase by a further 80% by 2025 due to an ageing population. The total cost of POAG in Australia in 2005 was calculated at \$AU 1.9 billion, this is estimated to rise to around \$AU 4.3 billion in 2025.

*[Clinical and Experimental Ophthalmology 2011 39:623-632](#)*

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## Visual outcomes with toric multifocal IOL implantation

Visser *et al.* evaluated visual and refractive outcomes, contrast sensitivity and patient satisfaction after toric diffractive multifocal IOL (AT lisa) implantation in 45 eyes of 25 patients with crystalline lens opacification and corneal astigmatism. The data showed that 98% of patients achieved an uncorrected distance visual acuity of 20/40 or better. Refractive astigmatism was found to reduce from 2.36 +/- 1.41 D pre-operatively to 0.71 +/- 0.42 D post-operatively. The authors reported that spectacle independency for distance and near vision was achieved by 95% of patients and 79% of patients respectively.

*Journal of Cataract and Refractive Surgery 2011 37: 2034-2042*

## Macular Pigment and visual performance in glare conditions

Macular pigment (MP) significantly impacts on three aspects of visual performance under glare conditions. The results from 26 normal subjects showed shorter photostress recovery periods, lower disability glare contrast thresholds and lower visual discomfort levels in patients with the highest MP optical densities. The data also showed that patients with greater pupillary constriction under glare conditions presented with higher levels of visual discomfort. The authors hypothesised that this finding may therefore be related to the sensation of pain elicited by bright light.

*Investigative Ophthalmology and Visual Science 2011 52: 5029-5033*

## Comparing aspheric and spherical IOLs

Thiagarajan *et al.* compared the visual performance of aspheric (Akreos Adapt Advanced Optics) and spherical (Sensar AR40e) IOLs implanted in 40 patients over the age of 50 years. Interestingly the results showed significantly better uncorrected distance visual acuity with the spherical lens (average = +0.12 +/- 0.11 [SD] log units) compared to the aspheric lens (average = +0.20 +/- 0.14 log units); however, this difference was not deemed to be clinically important. Moreover, the data showed no significant differences in contrast sensitivity, dysphotopsia, range of accommodation or subjective patient eye preference between the two lens types evaluated.

*Journal of Cataract and Refractive Surgery 2011 37: 1993-2000*

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## Flap displacement after LASIK

Clare *et al.* investigated the incidence of epithelial flap displacement (EFD) in 81,238 eyes which underwent LASIK. The flaps were created using either a femtosecond laser (INTRA-Lase FS 60) or a ONE-use automated microkeratome (Moria). This retrospective study involved post-surgical follow-up for up to 1 year. The data demonstrated that the prevalence of EFD was extremely low in this cohort (~0.012% of all treated cases). In the cases where EFD occurred, all 10 patients presented within a period of 48 hours post-treatment. Of these 10 cases 8 were hyperopic and 2 were myopic. Statistical analyses showed that hyperopic subjects undergoing epithelial flap creation using the microkeratome were ~19 times more at risk of an EFD than hyperopic patients where the epithelial flap was created using the femtosecond laser.

[Ophthalmology 2011 118; 1762-1765](#)

## Most fascinating research finding this month...

Iida *et al.* evaluated the implantation of a monofocal IOL (AQ310Ai) in the dominant eye and a diffractive multifocal IOL (Technis ZM900) in the non-dominant eye of 32 patients with an average age of 61 +/- 15 [SD] years. Mean uncorrected binocular visual acuity was found to be at least +0.10 log units at distances of 5 m, 3 m, 0.7 m, 0.5 m and 0.3 m. The results also showed that over 60 % of the study patients achieved near stereopsis results within the normal range (median = 60 arcsec) using the Titmus Wirt test. The authors suggested that hybrid monovision could provide alternative to bilateral multifocal IOL implantation in young presbyopes.

[Journal of Cataract and Refractive Surgery 2011 37: 2001-2005](#)

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## Most intriguing journal paper title this month...

This study investigated the possible relationships between cardiovascular disease (CVD) and corneal arcus in South Asian Indians adults aged between 40 and 80 years. The results showed that the presence of corneal arcus was independently associated with CVD while adjusting for potential confounders and cardiovascular risk factors. The link between corneal arcus and CVD was found to be strongest in patients less than 50 years of age. The occurrence of corneal arcus also was independently related with other cardiovascular risk factors such as male gender, increased age, raised blood cholesterol levels, the use of lipid-lowering medication, and smoking. Moreover, corneal arcus was also associated with CVD even in low-risk groups such as young, non-smoking, non-diabetic subjects with normal blood cholesterol levels.

*[American Journal of Ophthalmology 2011 152: 864-871.e1](#)*

### *Next report*

November 2011

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