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 39th edition of the monthly Research Update, in which the current issues of the peer-review journals listed below are reviewed. In anterior eye research, a new paper describes the age-related optical changes occurring in the human cornea, whilst other articles explore the risk factors for pterygium development and the use of argon laser photocoagulation for the treatment of pingueculae.

In the field of intraocular lenses, the application of multifocal implants in cases of unilateral cataract is investigated and phakic IOLs are shown to be a potential treatment for anisometropic amblyopia. Several notable papers relating to age-related macular degeneration are included this month. As ever, the update concludes with the most fascinating research finding of the month and the most intriguing research paper title.

**Issue 39**

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The Effects of Vertical Yoked Prisms on Gait

Yoked prisms are pairs of equally powered prisms, with the same base direction, that shift the apparent position of an observer’s object of regard towards the apices of the prisms. They may be prescribed by behavioural optometrists for numerous visual problems, some related to gait and posture. The use of yoked prisms is controversial, with a lack of published rigorous research in this field. Errington and colleagues, based in Australia, investigated the influence of base up and base down yoked prism wear on gait, compared to plano lenses, in 31 healthy young adults. Base up yoked prisms did not significantly affect gait, compared to plano lenses, but base down yoked prism wear caused a decrease in walking velocity, lower cadence and reduction in step length. It is possible that a perceived increase in height when wearing base down yoked prisms causes this more cautious gait.

*Investigative Ophthalmology and Visual Science* 54: 3949-3956

Optical Changes of the Human Cornea as a Function of Age

Navarro and colleagues examined the effect of age on the surface and optical properties of the anterior and posterior cornea. Scheimpflug imaging was used to analyse corneal shape in 407 normal eyes of 211 subjects (aged 4-79 years) and subsequent surface model fitting was applied. The data indicated that there is a constant misalignment between the anterior and posterior corneal surfaces, which may have a beneficial optical effect. Corneal spherical aberration is higher than total spherical aberration, indicating that the lens partially compensates for this, and both forms of spherical aberration increase throughout life.

*Optometry and Vision Science* 90: 587-598

Risk Factors Associated With Pterygium and Its Subtypes in Korea

This large-scale study included over 14,000 participants from a Korean national health and nutrition survey. Patients underwent additional ophthalmic examination to detect pterygia and were questioned regarding their lifestyle habits. In those aged 30 or over, the prevalence of pterygium was 6.7%. Independent risk factors for the condition were older age, male sex, lower educational level and sunlight exposure. The data show socio-economic differences in pterygium prevalence, and indicate that education is required regarding the risks of excessive sunlight exposure.

*Cornea* 32: 962-970

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One-Year Outcome of Argon Laser Photocoagulation of Pinguecula

In this retrospective study, the efficacy of pinguecula treatment using argon laser photocoagulation (21 eyes) was compared to surgical excision (23 eyes). Complete removal of pingueculae was more successful in the photocoagulation group compared to excision group, whilst cosmetic outcomes were similar for both groups. Subconjunctival haemorrhages and conjunctival scarring were less common in the photocoagulation group. The authors suggest that argon laser photocoagulation is a suitable treatment for cosmetic removal of pingueculae and that as the extent and depth of removal can be carefully controlled, the risk of complications is low.

*Cornea* 32: 962-970

Binocular visual function with a diffractive multifocal intraocular lens in patients with unilateral cataract

Middle aged patients with some remaining accommodation who develop cataract may struggle binocularly when implanted with a unilateral monofocal IOL. In this prospective comparative study, Hayashi and colleagues compared binocular visual function in cataract patients aged 40-69 years implanted unilaterally with either a monofocal IOL or a diffractive multifocal design (Restor +3.0 D). At three months post-operatively, the multifocal group had better intermediate and near visual acuity than the monofocal group, with the majority of patients (97 %) achieving spectacle independence, compared to only 13 % in the monofocal group. Complaints of glare did not differ between the groups, although more in the multifocal group experienced haloes. The data indicate that unilateral multifocal IOL implantation in middle-aged cataract patients leads to higher levels of patient satisfaction and spectacle independence than with monofocal IOLs.

*Journal of Cataract and Refractive Surgery* 39: 851-858
**Posterior Chamber Toric Phakic IOL Implantation for the Management of Pediatric Anisometropic Amblyopia**

Althomali reports on outcomes of toric posterior chamber IOL implantation in 6 children aged 5-15 years, for the treatment of anisometropic amblyopia. Patients were followed up for a mean period of 23 months. Mean spherical equivalent refractive error reduced from -10.21±4.62 D pre-operatively to -0.42±0.39 D at the end of follow-up, whilst the range of corrected distance visual acuities improved from 20/40-20/200 pre-operatively, to 20/20-20/60 post-operatively. All eyes remained healthy and quiet, with well-centred IOLs, throughout the follow-up period. The author suggests that posterior chamber IOL implantation may be particularly useful in children with anisometropic amblyopia who comply poorly with spectacle or contact lens wear.

*Journal of Refractive Surgery 29: 396-400*

**Efficacy of split hours part-time patching versus continuous hours part-time patching for treatment of anisometropic amblyopia in children**

In this prospective non-randomised study, Sachdeva and colleagues compared the efficacy of continuous part-time patching (Group A) versus split-hours part-time patching (Group B) in 68 children with anisometropic amblyopia aged 4 to 11 years. Children were assigned to treatment groups based on the wishes of their parents, and were followed up for 6 months. The baseline mean best corrected visual acuity (BCVA) in the amblyopic eye was similar between the two groups at 0.99±0.32 and 0.95±0.23 logMAR for groups A and B, respectively. After 6 months, a significant improvement in mean BCVA was observed in both groups, with similar improvements in acuity. The 6 month BCVAs were 0.51±0.25 and 0.59±0.25 logMAR for groups A and B respectively, suggesting that both patching regimens were very effective treatments for anisometropic amblyopia in children.

*British Journal of Ophthalmology 97: 874-878*
High Myopia–Partial Reduction Ortho-k

Ortho-k seems to slow myopic progression in children, although the technique is generally aimed at low to moderate myopes only. The efficacy of partial-reduction overnight orthokeratology (ortho-k) combined with daytime spectacle wear for correcting residual refractive error in highly myopic (at least -5.00 D) children was investigated in this single-masked randomised study. Fifty two children aged 8-11 years were recruited and randomised to either the ortho-k or control group. Compared to the control group, the mean increase in axial length was 0.32 mm less in the ortho-k group over the course of the 2 year follow up period. Whilst this investigation was performed on a relatively small scale, with just 28 children completing the study, partial ortho-k shows promise for the retardation of myopia progression in highly myopic children. The reduction in myopic progression observed here was more dramatic than previous ortho-k studies on children with lower levels of myopia.

Optometry and Vision Science 90: 530-539

Ranibizumab Treatment Outcomes in Phakic versus Pseudophakic Eyes

Intravitreal injections of ranibizumab, a VEGF inhibitor, are an established and successful method of treating exudative age-related macular degeneration (AMD). It is possible that the efficacy of treatment may be different in pseudophakic eyes compared to phakic eyes due to differences in the flow of injected drugs through the anterior chamber and increased vitreous volume (and therefore volume of drug distribution). This meta-analysis included data from 1137 patients from 2 phase 3 clinical trials and examined visual outcomes in phakic eyes compared to pseudophakic eyes receiving monthly intravitreal ranibizumab for exudative AMD. Pseudophakic eyes were found to be more likely to have lost 15 or more letters of vision than phakic eyes at 12 months follow-up, but not at 24 months. The results indicate that significant beneficial effects of the treatment are found in both phakic and pseudophakic eyes, but pseudophakic eyes may have a slightly increased risk of severe vision loss.

Ophthalmology 120: 1278-1282
A Systematic Review on Zinc for the Prevention and Treatment of Age-Related Macular Degeneration

Vishwanathan and colleagues included ten studies in this systematic review of the efficacy of zinc supplementation in the prevention and treatment of AMD. Whilst the age-related eye disease study (AREDS) showed zinc treatment to significantly reduce progression to advanced AMD, results from 6 cohort studies on zinc intake and AMD incidence were inconclusive. It is therefore unclear whether zinc treatment can lower the incidence of AMD, but the available evidence indicates it is useful in reducing the risk of progression to the advanced stage.

*Investigative Ophthalmology and Visual Science 54: 3985-3998*

Blue-Light Reflectance Imaging of Macular Pigment in Infants and Children

Macular pigment has been studied in detail in adults, but little is known regarding lutein and zeaxanthin in the developing eye. Bernstein and colleagues, based in Utah, used blue light reflectance to image the macular pigment in 51 children aged from pre-term to 7 years. Interestingly, all premature infants showed undetectable macular pigment, with the majority also having low concentrations of carotenoids in the skin and serum. The authors suggest that carotenoid supplementation may be valuable in the prevention of retinopathy of prematurity and other such disorders, and that more research is required in this area.

*Investigative Ophthalmology and Visual Science 54: 4034-4040*

Macular Xanthophylls and -3 Long-Chain Polyunsaturated Fatty Acids in Age-Related Macular Degeneration

One hundred and forty five subjects with non-exudative AMD completed this 12 month randomised double-blind study investigating the effect of lutein, zeaxanthin and long chain polyunsaturated fatty acids (LC-PUFAs) supplementation. Compared to the placebo group, those receiving the supplement showed increases in macular pigment optical density, plasma antioxidant capacity and circulating macular xanthophyll levels. These beneficial changes may protect against AMD progression.

*JAMA Ophthalmology 1315: 564-572*
Association between Depression and Functional Vision Loss in Persons 20 Years of Age or Older in the United States

Zhang and colleagues analysed data from 10,480 US adults aged 20 years and above, participating in the National Health and Nutrition Examination Survey. The estimated prevalence of depression was 11.3% amongst adults with self-reported loss of visual function, compared to 4.8% in those without. After controlling for other factors including age, sex, ethnicity and employment status, self-reported visual loss was still associated with depression, whereas reduced visual acuity was not. The authors suggest that health professionals should be aware of the risk of depression in patients reporting visual loss, rather than those who show reduced acuity only.

*JAMA Ophthalmology 131: 573-581*
Most intriguing research paper title this month……

“How does glaucoma look?”

Images used for patient education purposes generally indicate that glaucomatous visual field loss is akin to looking through a black tunnel, yet research evidence suggests that this is unlikely to be how glaucoma patients see the world. This interesting study, based at Moorfields Eye Hospital, London, included 50 patients with bilateral glaucoma, with a range of levels of visual field loss. Patients were asked to describe in their own words how glaucoma affected their vision, and to explain how their visual field loss looks when they are aware of it. Patients were also shown 6 computer-generated images depicting different types of visual loss, and asked to indicate which they felt was most similar to their vision. Twenty six per cent of patients reported being completely unaware of their visual field loss, and no patients chose the image depicting a black-tunnel of visual field loss. Verbal responses indicated that blur and missing features were most commonly experienced. The data show that glaucoma patients do not perceive a black tunnel; these findings are important for patient information purposes and raising awareness for glaucoma detection.

*Ophthalmology 120: 1120-1126*

Most fascinating research finding this month.......

*Precursors of Age-Related Macular Degeneration*

This cross-sectional study of 888 subjects aged 30-60 years examined the association between obesity-related risk factors and macular drusen (both small and hard, and larger forms). Subjects completed questionnaires regarding physical activity levels, whilst clinical assessments included fundus photography, blood sample analysis and anthropometric measurements. The results indicated that precursors of age-related macular degeneration were associated with obesity-related risk factors which are modifiable. Most notably, low levels of physical activity were linked with larger drusen, whilst elevated serum triglycerides and lower serum HDL were associated with multiple hard drusen. An active, heart-healthy lifestyle may therefore prevent the early manifestation of AMD.

*Investigative Ophthalmology and Visual Science 54: 3932-3940*