Vision of the future

Speakers at this year's BCLA conference outlined the latest developments in myopia control and presbyopia correction. **Alison Ewbank** and **Bill Harvey** report from Manchester

Delegates at last year's BCLA conference were among the first to hear early results of studies with 'anti-myopia' lenses, designed to slow myopic progression. One year on, interest has shifted to the potential for myopia control in clinical practice and commercialisation of the concept in the Far East where at least four products are now available.

Professor Bernard Gilmartin (Aston University) provided a structural perspective on how eyes became myopic. Axial stretch was the key structural change in the myopic eye and it was peripheral hyperopic image shells that drove axial growth. Modulating peripheral shells while correcting central vision inhibited axial growth and was the crux of myopia control, said Gilmartin. But he warned that translating this concept into clinical practice would be difficult because there was a very subtle gene/environment interaction in the development of myopia.

Specialist in paediatric optometry **Dr Jeff Walline** (Ohio State University) examined why some theories of myopia control had failed and others succeeded. Of the various approaches taken, reduction in myopia progression (or 'treatment effect') ranged from 75-100 per cent with atropine to no change or an increase in myopia with conventional RGP lenses or with under-correction of the refractive error.

Corneal reshaping contact lenses and soft bifocal contact lenses with a distance centre were 'probably the best bet', said Walline. Children did well with both types of lenses and if they derived the value-added benefit of myopia control then 'why not try them'. Many studies had also shown that outdoor activity slowed myopic progression; bright light (and possibly vitamin D) might have a protective effect.

But what constituted a clinically meaningful effect? A poll of the audience revealed the answer to be 25-50 per cent, although Gilmartin suggested that outcomes might be an issue if the maximum effect was only around 2D.

Dr Chi Shing Fan (Hong Kong Polytechnic University) provided an update on the situation in Hong Kong, the most developed market for anti-myopia lenses where four products were available: three spectacle lenses – the Carl Zeiss MyoVision lens and Essilor's Myopilux Pro progressive and Myopilux Max bifocal – and the CooperVision MiSight dual-focus contact lens.

A survey across six Asian markets found that, of 254 practitioners, nearly three in four (73 per cent) were prescribing some form of myopia control. Asked about their reasons for prescribing anti-myopia lenses, six in 10 practitioners said they believed the products worked and nearly half (49 per cent) said they used them because parents asked about them.

Various prescribing criteria were applied; some recommended the lenses as soon as the child became myopic, but a more likely reason was if myopia had progressed more than 1D in

Dr Arthur Back: Why do some children's eyes respond while others don't?

the previous year. Interestingly, practitioners ranked regulatory approval as the least important factor in the decision to prescribe.

What do we need to know?

According to **Dr Graeme Young** (Visioncare Research) there are at least 12 myopia control lenses in the patent literature. Since the regulatory process in the US was likely to require at least three years of clinical data on more than 500 subjects, it might be 4-5 years before products were launched there, although one lens already had approval in Europe. No FDA guidelines had been issued as yet but regulation was likely to be strict. It was noticeable that current claims made for the MiSight lens were 'fairly conservative', he said. Study design was crucial with myopia research and most would be parallel group studies with various possible outcome measures. Useful websites to track research findings were www.myopiaprevention.org and www.clinicaltrials.gov

Contact lens options included ortho K and centre-distance soft bifocals (such as Acuvue Bifocal, Proclear D Multifocal, Biofinity Multifocal) as well as custom-designed myopia control lenses, the first of which would soon be available in Europe.

Young's advice was to prepare your practice by making it child-friendly, identify children at risk of myopic progression and develop a protocol for management. Measure cycloplegic refraction, accommodative lag and binocular vision, use best-form spectacle lenses and avoid under-correction. Children should be seen at six-monthly intervals so their progression could be monitored.

Dr Arthur Back (CooperVision) outlined the future for myopia control. Clinical trials of anti-myopia to date involved monocular defocus, dual-focus soft lenses and other dual-focus designs, as well as ortho K, but there was 'a long way to go to complete our understanding'. It seemed that peripheral refraction was probably a consequence of eye growth rather than a driver, he said. Results with dual-focus soft lenses were encouraging but many questions remained, among them: Are we just delaying onset of myopia? How long does the effect last? Are these lenses applicable to late-onset myopia? And why do some children's eyes respond while others don't? Maximum clinical data at present was over two years, but 5-10 years were needed for research and 3-5 years for clinical trials. For Back, the ideal product would be a daily disposable lens prescribed prior to the onset of myopia. Different approaches would be needed for different ages and appropriate dosage determined.

Reshaping the future

Orthokeratology was the other approach that had so far shown promise for myopia control. In the scientific sessions, **Dr Pauline Cho** (Hong Kong Polytechnic University) described a study in which myopic children aged 6-10 years were prescribed either the Menicon Z Night Lens or spectacles. A total of 45 children completed 24 months of the study. Myopia progressed significantly ▶

faster in children wearing spectacles; increase in axial length of children wearing spectacles and ortho K lenses was 0.67 ± 0.29mm and 0.39 ± 0.27mm respectively.

Delivering the Irving Fatt Memorial Lecture, **Dr Jacinto Santodomingo** (Menicon) reviewed the safety and efficacy of ortho K for myopia control. He included a useful comparison of treatment effects over one year for various therapies, showing that otho K was the most successful approach other than atropine.

Kate Johnson (Brisbane), with more than 100 paediatric ortho K wearers, was one practitioner who needed no convincing. Ortho K was the most consistent performer in myopia control, she said, and research had shown it could stop axial elongation over short periods of up to a year. For Johnson, the clinical considerations were the safety of extended wear, ethnic influence on fitting success and managing the paediatric contact lens wearer.

Ageing contact lens wearers

At the other end of the age scale, non-spectacle correction of presbyopia was the topic for another themed session. Setting the scene with an overview of presbyopia, **Professor Neil Charman** (University of Manchester) said that loss of accommodation started in the early teens, although these early changes had been poorly investigated.

Distance refraction in the phakic eye typically showed significant change after the onset of presbyopia and any method of correction needed to take this into account. Surgical methods of correcting presbyopia that worked at 50 years might not work later in life, he warned. Visual acuity also declined with age due to light scattering and neural changes.

Many presbyopes would be happy with a less than perfect visual solution, which was just as well since all methods of correction had their limitations. All spectacle options had constraints in direction of gaze and aspheric contact lenses would have little or no effect on eyes with high positive spherical aberration. Not all multifocal lenses would work on every eye was Charman's assessment, based on a career in research spanning more than 40 years.

Contact lens prescribing for presbyopes has some way to go before it reaches its potential, but **Jayne Schofield** (CIBA Vision) reported UK industry data showing that, in 2010, there were more than 5,000 new multifocal contact lens wearers each quarter. Many designs were now available to achieve simultaneous vision with soft lenses although success rates tended to depend on practitioner fitting experience.

Schofield's recommendation was not to 'over-theorise' with soft multifocal designs. 'They just work,' she said, and practitioners should be very confident in fitting these lenses to their patients.

Jonathan Walker (CooperVision) had some useful advice on fitting techniques. Before starting to fit a soft multifocal lens, read the fitting guide then make sure you prescribe the maximum positive power at distance and give the lowest reading addition. Increasing power by just +0.25D could make a big difference to near vision, he said.

Other tips were to binocular balance with the Humphriss technique, always use the correct power when trialling soft multifocals and ensure accurate centration since when a lens decentred the resulting optics changed.

To avoid ghosting with higher add powers it was best to err on the side of myopic defocus; www.visionsimulations.com was a useful website for demonstrating visual effects to patients). Ocular dominance problems could present as slight blurring and blur tests for dominance tended to give better results than sighting tests.

Night driving remained a major issue with soft multifocals and compromised tear film in the ageing eye could be a factor, exacerbated by air flow deflected off the windscreen. Walker suggested improved blinking to enhance lipid flow from the meibomian glands and treating any evaporative dry eye.

Staining studies

Aside from the themed sessions, solution compatibility and corneal staining was a prominent topic again at this year's BCLA as it was at the Manchester conference four years ago when Dr Gary Andrasko's findings and their clinical relevance were hotly debated.

Eric Papas (Brien Holden Vision Institute) described a study investigating whether solution-induced corneal staining (SICS) signalled the presence of corneal inflammation. Subjects wore balafilcon A lenses pre-soaked in a 0.0001 per cent polyaminopropyl biganide multipurpose solution (test) or inserted fresh from the blister (control). Staining was evaluated at two hours and tear samples taken.

All subjects presented with SICS on test visits but had minimal staining on control visits. Concentration of inflammatory cytokines was higher at test visits, suggesting that an inflammatory process was taking place. It was unclear whether this was mediated by apparent changes in epithelial cell morphology or the direct action of the solution on the cornea.

In an Alcon-sponsored study, **Lee Hall** (Visioncare Research) had applied Andrasko's methodology to solutions available in Europe, such as Synergi, Regard and All Clean, used with a range of silicone hydrogel lenses. Some lens/solution combinations induced more SICS than others two hours after insertion, and staining correlated in some instances with reduced comfort. Lower levels of corneal staining could only be provided at the expense of antimicrobial efficacy, he said.

The latest generation of multipurpose solutions (MPS), their clinical performance and efficacy, particularly against *Acanthamoeba*, was also the subject of a series of company-sponsored studies presented in the poster session.

Away from the main programme, a Bausch & Lomb-hosted meeting with speaker **Dr Frank Bright** (University of Buffalo) examined the uptake and release of preservatives from soft lenses, possible mechanisms for corneal staining and whether SICS posed a risk for patients. Fluorescein bound to both PHMB (polyhexamethylene biguanide) and PQ-1 (polyquad) but, at low concentrations, only PHMB interacted with a human corneal epithelial model, said Bright.

Dr Philip Morgan (University of Manchester) observed that as the use of PHMB-preserved solutions increased in the 1990s, the rate of microbial keratitis did not rise. The relative risk of infection with MPS appeared to be lower than with either one or two-step peroxide systems. 'In the hands of real people, MPS are probably safer than peroxide,' he argued.

Cheryl Donnelly (B+L) concluded that the signal from binding of fluorescein and MPS preservatives (known as PATH, preservative-associated transient hyperfluorescence) was not the same as corneal staining and was a 'benign transient phenomenon' of varying intensity. Her assessment was unequivocal: 'SICS is not pathologic corneal staining, not a measure of biocompatibility, not associated with infiltrative keratitis or infection, not indicative of cell damage and not associated with inflammatory cascade.'