A dual-optic accommodating intraocular lens design may be more effective than current single-optic alternatives, and its mechanism of action appears stable over the long term. Studies presented at the XXVIII Congress of the ESCRs once again showed that the Synchrony dual-optic IOL (Abbott Medical Optics) typically provides accommodative range beyond what is achieved by single-optic designs or that can be explained by pseudo-accommodation.

In addition, evidence showed that true physiological accommodation persists for at least three years in many patients implanted with the dual-optic Synchrony lens. Observation of accommodative tonus in Synchrony-implanted eyes bolsters earlier ultrasound and aberrometry findings confirming movement of the optics during accommodation.

**Advantages of dual lens**

The Synchrony single-optic lens consists of a 5.5mm, 32.0 D anterior lens attached by a spring-like mechanism to a posterior 6.0mm lens of a correct power for the patients’ needs. The anterior optic moves forward axially with accommodative effort, resulting in up to 3.0 D of accommodation without splitting light. By comparison, the Crystalens HD is a hinged single-optic lens designed to move the entire lens forward to produce accommodation. It also incorporates a central area that amounts to 1.5 D add, noted George H H Beiko BM BCh, FRCSC, St Catherine’s, Canada.

In theory, the dual-optic design holds a couple of significant advantages over the single-optic, Dr Beiko said. The separate anterior lens produces a greater degree of accommodation for a given amount of axial movement; about 2.5 D per 1.0mm. Also, the amount of accommodative power for the dual-optic lens is independent of its total power, whereas the stronger a single-optic lens, the more accommodation it produces as it moves.

In practice, the dual-optic lens may also have an advantage. It has repeatedly been shown to move in response to accommodative effort, with accommodation correlating. In other words, true accommodation. On the other hand, several investigators have been unable to confirm movement of single-optic designs. However, up to 1.5 D to 2.0 D of accommodative power can be derived from pseudo-accommodation, Dr Beiko pointed out. Pinhole effect, residual myopia, with-the-rule astigmatism, and corneal multifocality due to higher order aberrations such as spherical aberration all contribute to pseudoaccommodation without lens movement.

These pseudo-accommodative factors appear to be responsible for much of the single-optic’s design’s performance, Dr Beiko said. In a prospective randomised study reported at the ESCRs meeting, he found no significant difference in distance, intermediate and near vision, or in contrast sensitivity, for the Crystalens HD or Tetraflex (Lenstec, St Petersburg, Florida, US) single-optic accommodating IOL compared with a standard nonaccommodating lens and mini-monovision (-0.25 D dominant, -0.75 D non-dominant).

“The 1.5 D advantage you get with Crystalens because of the button certainly was compensated for by the mini-monovision in the other two groups, and quality of vision was the same.”

In another study comparing the performance of the Synchrony with the Crystalens HD, Dr Beiko controlled for pseudo-accommodation by carefully matching 10 patients from the Crystalens arm of the single-optic study with 11 patients implanted with the Synchrony. The groups were similar in mesopic and photopic pupil sizes, and IOL power, though the Synchrony group was about 10 years older on average. At six months, distance and intermediate vision differences were not statistically significant between the two groups, but the Synchrony group achieved 20/20 near vision compared with 20/40 for the Crystalens HD (p = 0.002).

“We were able to show the Synchrony lens gives 20/20 at all distances, and this despite a 10-year greater age for the study group.”

**Latent accommodation observed**

Observation of accommodative tonus, or latent accommodation, in patients three years after bilateral implantation of the Synchrony lens provides further evidence that the dual-optic approach provides true accommodation, said Victor Bohorquez MD, Bogota, Colombia, who disclosed he is an AMO consultant. He noted that in the absence of stimulation, a healthy 20-year-old eye exhibits about -1.5 D and 0.75 D hyperopic shift from its normal objective refraction to complete relaxation, or loss of normal accommodative tonus, of the ciliary muscles. If the Synchrony lens accommodates by a similar mechanism, latent accommodation should be observable.

To measure accommodative tonus, Dr Bohorquez used an iTrace aberrometer to measure objective far refraction and cycloplegic refraction over a 3mm pupillary area in each of 28 eyes. Baseline far refraction was measured with the patient fixating on an internal target at optical infinity. Cycloplegic refraction was measured 30 minutes after introduction of one per cent cyclopentolate. Accommodative tonus equalled the cycloplegic minus the far measurement. To measure range of accommodation, each patient’s distance and distance-corrected near visual acuity was recorded using an ETDRS chart.

Dr Bohorquez found not only that the majority of patients demonstrated more than 0.25 D of accommodative tonus, but that more latent accommodation corresponded with better near visual acuity. Of the 16 eyes, or 57 per cent, showing 0.25 D to 1.25 D accommodative tonus, near visual acuity averaged -0.02 logMAR. The 12 eyes with less than 0.25 D averaged 0.13 logMAR, a difference of about 1.5 lines that is statistically significant.

These results confirm Dr Bohorquez’s one-year ultrasound and two-year iTrace observations confirming lens movement as the mechanism of action. He also reported at the 2010 AAO meeting that these patients retain accommodation after four years. Along with a low rate of PCO formation, and five-year studies of early dual-optic prototypes, they also suggest that fibrosis does not interfere with lens movement over medium- to long-time frames. This may be due in part to the fact that the dual-optic lens fills the entire capsule, leaving little room for cellular infiltration. Dr Bohorquez recommends meticulous polishing of capsules at surgery and complete removal of viscoelastics in the capsule and between the dual lenses to prevent opacification and ensure unimpeded movement of the lenses.

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**We were able to show the Synchrony lens gives 20/20 at all distances, and this despite a 10-year greater age for the study group.**

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**REFRACTIVE LENS**

**DUAL-OPTIC IOL**

Patients exhibit latent accommodation at three years

*by Howard Larkin in Paris*

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Situation during accommodation.

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George H H Beiko BM BCh FRCSC

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Synchrony is a dual-optic accommodating IOL that features two optics connected by haptics that have spring-like action.