REVIEW of Ophthalmology

What's Next in Accommodative IOLs

New dual-optic, deformable and injectable IOL technology is in various stages of development.

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Currently, the Crystalens (Eyeonics, Inc., Aliso Viejo, Calif.) is the only Food and Drug Administration approved accommodating intraocular lens. Its clinical results have been promising, and accommodating IOLs offer several advantages over other types of IOLs. "Despite improvements in their design, the latest generation multifocal IOLs still have significant trade-offs," says David F. Chang, MD, who is a clinical professor at the University of California, San Francisco, and in private practice in Los Altos, Calif. "Multifocality produces significant aberrations and an inherent reduction in contrast. There will always be halos or ghost images produced by the secondary focal zone. Finally, a multifocal lens cannot provide excellent vision across the entire range of intermediate to near zones. Therefore, accommodating IOLs offer the promising prospect of better contrast, fewer aberrations and ghost images, and a better range of intermediate to near focus."

I. Howard Fine, MD, agrees. "The trend will be toward accommodative lenses, especially as the technology improves," adds Dr. Fine, who is a clinical professor, Oregon Health and Sciences University, and in private practice at Drs. Fine, Hoffman, and Packer, in Eugene, Ore.

Following is a look at some of the newest accommodative IOL designs.

Synchrony

According to Dr. Chang, who is the medical monitor for the Synchrony IOL (Visiogen Inc., Irvine, Calif.), this lens is a single piece, dual-optic accommodating IOL made of the latest-generation silicone. It features a 5.5-mm high-power anterior optic and a 6-mm negative-power optic. The optics are connected by haptics that act like springs.

Figure 1: The Synchrony IOL and injector.

The refractive shift produced by any optic movement is proportional to the dioptric power of the lens. "Therefore, the anterior moving optic of the Synchrony is a 32 D (+) lens in order to maximize the near shift produced by its forward movement. The rear optic is a minus lens that has varied power in order to achieve the net IOL power required for emmetropia," he says.

The design of the Synchrony relies on the Helmholtz theory of accommodation - ciliary muscle contraction reduces zonular tension, allowing the capsular bag to become lax. This allows the spring-like connecting struts to push the anterior optic forward. "Ultrasound biomicroscopy imaging has confirmed that the front optic does move enough to produce the approximately 2.5 D of accommodation measured with defocus curves," adds Dr. Chang.

Clinical trials are ongoing in Europe and South America, and the FDA Phase II trial began in November 2005, with five study sites in the United States. Ten lenses were implanted in 2005 in the United States, and more than 200 lenses have been implanted outside the United States.

Ivan Ossma, MD, MPH, a clinical professor of ophthalmology, Universidad Industrial de Santander, Bucaramanga, Colombia, has compiled two-year follow-up data on 24 eyes im-planted with the Synchrony lens. At three months, 63 percent had uncorrected distance vision of 20/40 or better, and 100 percent had uncorrected near visual acuity of 20/40 or better. At six months, 79 percent had 20/40 or better uncorrected distance vision. At both 12 and 24 months, 83 percent had uncorrected distance vision of 20/40 or better, and 100 percent had un-corrected near visual acuity of 20/40 or better. Study results were reported at the American Academy of Ophthalmology meeting in Chicago.

Additionally, Burkhard Dick, MD, conducted a prospective clinical trial on 15 eyes of 12 patients.1 He performed surgery on all 12 patients, and there were no intraoperative complications. All eyes have at least six months of follow-up, and no case of interlenticular opacification has occurred. He has not seen any serious complications, and no lenses have been explanted. "All patients were very satisfied with the visual functioning and achieved accommodation ranges between 0.5 D and 2.5 D," says Dr. Dick, who is a professor of ophthalmology at Johannes Gutenberg University, Mainz, Germany.