**Synchrony Dual Optic IOL compares favourably with multifocal IOLs in early trials**

**Dr Pietrini observed that control of astigmatism could be obtained by reducing the incision size. Staying below a 2.0mm incision size, for both cataract surgery and IOL implantation, produces 0.2 D surgically induced astigmatism, at most, he said. In addition to avoiding surgically induced astigmatism, surgeons need to correct any pre-existing astigmatism.**

With pre-existing astigmatism, Dr Pietrini tries to reduce it to below 1.0 D by doing paired limbal relaxing incisions at a constant depth of 600 µm, with the incision length varying according to the cylinder. He determined pre-existing astigmatism through pre-operative topographic analyses.

“Focusing on secondary astigmatism is an extremely important aspect of the success of multifocal IOLs. Those patients who choose clear lens exchange have high expectations,” said Christian Ohrlöff MD, who co-chaired the session on new phaco-procedures. He pointed out that astigmatism is a major postoperative complicating factor and needed to be avoided.

Dr Pietrini maintained that if a lens worked for one patient it should work for all patients. When it does not work, the problem is usually either biomeetry or astigmatism. The main difficulty is to control astigmatism and anticipate the degree of postoperative astigmatism. Microincision surgery is a key factor in reducing induced astigmatism, especially in multifocal implant surgery, he noted.

He explained that candidates for microincision presbyopic lens exchange with Acri.Lisa implantation were chosen for their very good pre-operative visual acuity, which promised a very good potential visual acuity. Also, most patients were between 45 and 60 years old. This allowed him to measure the capacity of the IOL independent of the pathologies that can be associated with older patients.

“We know that most patients after 50 years of age have optical aberrations, particularly vertical and horizontal coma. These patients showed substantially reduced higher order aberrations and achieved emmetropia,” Dr Pietrini said.

He observed that patients with Acri.Lisa, a diffractive, aspheric lens, showed constancy of the sphere along the optic of the lens, with small and large pupil size. There was no refraction variation, the lens was pupil-independent, and it did not induce night vision problems. By contrast, results of spherical, monofocal lenses have shown a variation of the sphere with pupillary dilation of 0.5 D sphere/3.0mm to -0.5 D sphere/6.0mm, and a -1.0 D myopic shift causing increased night myopia and halo, he observed.

The Acri.Lisa 366 D IOL is a one-piece hydrophilic, acrylic IOL with a hydrophobic surface. Its overall length is 11.1mm, with a 6.0mm biconvex optic. The haptics and optic have square edges and there is no angulation. The IOL is not ultra-thin but highly compressible and can be implanted through a 1.5mm incision.

This lens differs from other lenses of this generation in some interesting ways. In terms of light distribution, this lens has 65 per cent for far distance and 33 per cent for near. Additionally, it is aspheric which is especially important for multifocality. The diffractive structure of the lens also differs from other lenses by the smoothness of the steps on the optic compared to other IOL models.

Overall, surgical results showed quite good intermediate vision and contrast sensitivity, as well as very low rate of side effects. Longer follow-up times are needed, especially to follow the rates of secondary cataract and retinal detachment, Dr Pietrini commented.

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Surgeons expect use of accommodating IOLs to grow

Devon Schuyler

In Las Vegas

ALTHOUGH they may have gotten off to a slow start, accommodative intracocular lenses will grow as companies continue to refine the technology, according to I Howard Fine, MD, clinical professor of ophthalmology at Oregon Health and Science University in Oregon.

“Accommodating IOLs, and presbyopia IOLs in particular, are the wave of the future for ophthalmology,” he told EuroTimes.

In a presentation on accommodative lenses at the annual AAO meeting, Dr Fine said that he expects accommodative IOLs to completely replace multifocal IOLs and become the dominant refractive surgery option.

Multifocal IOLs do have the advantage of requiring no accommodative effort, he said. However, they do require central nervous system adaptation, will always produce halos or blur circles, result in some loss of contrast sensitivity, and may be a bad choice for people with age-related macular degeneration.

Accommodative IOLs have numerous advantages over multifocal IOLs, he said. First of all, they mimic the patient’s experience before presbyopia sets in. Another advantage is that all light comes from and is focused as a single focal point. Finally, they provide the potential for continuous, excellent vision at all distances, and produce no unwanted retinal images, no loss of light energy, no loss of contrast sensitivity, and no central nervous system adaptation. The disadvantages are that they require adequate amplitude of accommodation to avoid reading fatigue and that they require adequate capsule clarity and elasticity.

The best-studied accommodative IOL is the CrystaLens (Eyeonics), which is approved for use in the US and Europe. Dr Fine’s clinic took part in the study that earned US FDA approval for the lens. For one part of the study, his centre looked at uncorrected binocular vision in 24 people and found that 73 per cent had distance vision of 20/25 or better, intermediate vision of J2 or better, and near vision of J2 or better 11 to 15 months after surgery.

In the overall FDA clinical results on uncorrected binocular vision in 124 patients, 92 per cent had distance vision of 20/25 or better; 98 per cent had intermediate vision of 20/25 or better, and 73 per cent had near vision of 20/25 or better 11 to 15 months after surgery. In addition, 73.5 per cent either did not wear spectacles or wore them almost none of the time.

The other accommodating IOL that is available in Europe is the 1CU (HumanOptics). Currently under development are dual-optic IOLs such as the Synchrony (Visogen) and the Sarfrazai (Bausch & Lomb), deformable IOLs such as NuLens, PowerVision, FlexOptic, and the SmartIOL (Medennium), and a light adjustable IOL (Calhoun Vision).

The advantage of dual-optic IOLs is that they yield more accommodative amplitude for the same amount of lens movement compared with single-optic IOLs. Deformable IOLs offer the possibility of much greater amounts of accommodative amplitudes, and light-adjustable IOLs will allow for sequential enhancements.

A natural choice for baby-boomers Sandy T Feldman MD, who also spoke at the meeting, said that accommodating IOLs were a natural choice for baby-boomers, “who all want young bodies and perfect vision.”

Dr Feldman, of ClearView Eye & Laser Medical Center in San Diego, California, cited the excellent results with the CrystaLens as a good reason for their increasing popularity. For example, in clinical results submitted to the Food and Drug Administration, 24.8 per cent of 242 primary eyes and 31.6 per cent of 124 bilateral subjects had near visual acuity of 20/25 or better one year after surgery. Accommodating IOLs also have demonstrated results superior to those with standard IOLs in push up, defocus, and dynamic refraction studies.

He said that the CrystaLens has several mechanisms of action. The first is translational movement, which occurs in an anterior/posterior direction. The second is “accommodative arching,” in which the IOL arches or curves. The third is asymmetric tilting of the lens.

In summarising the strengths of accommodating IOLs, Dr Feldman said that they provide high-quality distance vision without loss of contrast sensitivity, excellent intermediate vision, and high quality near vision that improves over time. In addition, wavefront studies have revealed that the power changes mimic those of the younger, natural lenses. He also pointed out that most studies have demonstrated power changes greater than the purported 1.0 D of monococular accommodation.

Current limitations

Accommodating IOLs do have several limitations and weaknesses, however. For example, they must have zones because the IOLs cannot be placed in the sulcus. Problems with capsular contraction syndrome occurred in early models, and there may be unknown effects of capsule, effort, and placement on the IOL. For example, the forward movement of the optic may be inhibited by a small capsulorhexis.

Dr Feldman also pointed out that patients must go through a learning curve when they first receive the implants, and that posterior capsular opacification may occur. Finally, he pointed out that accommodating IOLs appear to increase negative spherical aberrations and coma.

Despite these drawbacks, he described accommodating IOLs as a “win-win-win” for patients, physicians and manufacturers, and said that he was “looking forward to continuing improvements” in the lenses. Joseph Colin, MD, who moderated the AAO session, told EuroTimes he agrees that the use of accommodating IOLs and presbyopia IOLs in particular, are the wave of the future for ophthalmology. The only question, said Dr Colin, is when.

He pointed out that the optical and visual performance of the current accommodative IOLs is not ideal, and a lot of concerns remain about the long-term stability of the accommodative properties and complications such as capsular bag contraction and posterior capsule opacification.

He said that the new models under development are bulky – which may lead to astigmatism – but seem to have improved optical characteristics.

“They are necessary steps in the long way towards the optimal IOL,” said Dr Colin, who is head of the ophthalmology service at the Pellegrin-Tripode Hospital in Bordeaux, France.

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cataract patients, 17 of whom were bilaterally implanted with the Synchrony IOL, 11 with the ReZoom and 14 with the ReSTOR lens. All patients were closely matched for age, residual refraction and pre-operative photopic pupil size.

Patient evaluations included binocular uncorrected visual acuities at various testing distances: 30cm and 40cm for near distance, 50cm and 80cm for intermediate, and four metres for distance vision. Contrast sensitivity and reading speed tests were also carried out for the three groups of patients and subjective testing included a quality of life questionnaire that was cultural sensitive to Dr Osma-Gomez’s patients.

The results after six months postoperatively showed that 94 per cent of patients implanted with the Synchrony IOL achieved binocular distance vision of 20/40 or better compared to 100 per cent of subjects in both multifocal groups. Binocular uncorrected near visual acuities were 20/40 or better in all Synchrony patients and 92 per cent and 82 per cent of the ReSTOR/ReZoom subjects respectively.

Contrast sensitivity was higher for all frequencies in the Synchrony group. Intermediate vision proficiency showed comparable reading speeds between Synchrony and ReZoom patients with a slight advantage compared to the ReSTOR subset of patients. Spectacle independence was attained by 91 per cent, 88 per cent and 100 per cent of patients in the ReSTOR, ReZoom and Synchrony groups respectively, noted Dr Osma-Gomez.

Discussing the properties of the Synchrony lens, Dr Osma-Gomez, assistant professor of ophthalmology at the Instituto para Niños Ciegos y Sordos, Cali, Colombia, described it as a single-piece silicon lens with dual optics that is implanted into the eye using a proprietary preloaded injector through a 3.7mm to 3.8mm clear corneal incision.

He noted that use of the injector dramatically reduces the incidence of surgically induced astigmatism and enables a controlled delivery of the dual-optic IOL into the capsular bag.

To achieve its ‘accommodative’ effect, the Synchrony IOL works by movement of the anterior optic, which is highly powered via a spring system coupled with the ciliary muscle contraction. The springs connect a 5.5mm high-power anterior optic and a 6.0mm negative power posterior optic; the spring action moves the front optic and changes the eye’s focus from near to far. This unique combination of positive and negative powered optics is customised for each individual patient, said Dr Osma-Gomez.

While Dr Osma-Gomez said that he was encouraged by the results thus far of the Synchrony, he acknowledged the limitations of his study.

“Obviously we have to consider the selection bias, because the Dual Optic IOL group came from a controlled clinical trial whereas the other two multifocal cohorts came from my regular surgical population. The sample size is also too small to quantitatively measure certain differences, and also there are no published standardised protocols to measure range of vision.

Likewise, it is difficult to properly assess intermediate vision because of the lack of a standardised chart or agreed system,” he said.

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