

# Combining the Best of Both Worlds

Merging asphericity with multifocality.

BY ERIC D. DONNENFELD, MD

For better or for worse, we now know that human visual performance peaks at 19 years of age.<sup>1,2</sup> Studies have shown that at this age, naturally occurring supernormal vision (20/15 or better) is attributable to an average spherical aberration of the combined lens and cornea of 0.0  $\mu\text{m}$ .<sup>1,2</sup> This quality of vision is achieved by balancing the positive spherical aberration of the cornea with the negative spherical aberration of a young crystalline lens. For the average adult whose cornea has +0.27  $\mu\text{m}$  of spherical aberration, this discovery has made superior, youthful vision attainable through IOL implantation.<sup>3</sup>

The Tecnis aspheric monofocal IOL (Advanced Medical Optics, Inc., Santa Ana, CA) was the first aspheric IOL designed. With its wavefront design adapted for asphericity, it is a superb technology that improves a patient's quality of vision following cataract surgery. A new IOL, which debuted in the United States in the beginning of this year, provides this same visual potential by transposing the aspheric design onto a multifocal lens. The Tecnis Multifocal IOL (Advanced Medical Optics, Inc.) has been available for the past 4 years in Europe. With its recent FDA approval, this multitasking aspheric and multifocal lens is now a refractive option for US patients as well.

## MULTIFOCAL IOLs MEET ZERO SPHERICAL ABERRATION

Until now, IOLs that have targeted zero spherical aberration have been predominantly monofocal lenses. The Rezoom IOL (Advanced Medical Optics, Inc.), a multifocal refractive lens, deserves credit as the first unofficial aspheric multifocal IOL. Its two aspheric transition zones, however, create a negative spherical aberration, a byproduct that fluctuates with the pupil's size. The AcrySof Restor Aspheric multifocal IOL (Alcon Laboratories, Inc., Fort Worth, TX) was the first aspheric diffractive multifocal IOL.

The Tecnis Multifocal IOL draws on the established Tecnis platform to create a lens that not only aims for

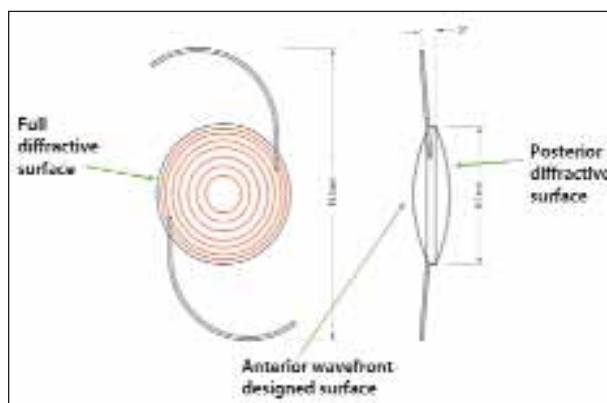


Figure 1. The new aspheric IOL at work.

zero spherical aberration but also offers patients the versatility of a multifocal. The wavefront-designed anterior surface gives the lens its aspheric properties, while the entirely diffractive posterior surface affords the recipient visual acuity that is pupil independent (Figure 1).

Advantages of the lens' multifocality include good Snellen visual acuity, fine monocular and binocular contrast sensitivity, substantial stereopsis, a full visual spectrum, and low rates of postoperative complications. Surgeons do not have to change their surgical technique to implant this lens. Superior depth perception is what sets multifocal IOLs apart from other presbyopia-correcting lenses; good stereopsis is actually sacrificed for monovision with current accommodating IOLs.

One drawback to multifocal IOLs for which surgeons need to be prepared is a small increase in glare and halos, but these symptoms significantly improve with time.

## FDA CLINICAL TRIALS

The FDA conducted a multicentered, masked, comparative clinical investigation of the Tecnis Multifocal IOL and its effect on patients' vision. The FDA recently released its 1-year results from this 13-investigator, 143-participant

study, and the findings revealed significant visual potential for the new lens, which led to its approval.

Of the 112 Tecnis Multifocal patients available for follow-up at 1 year, 88% had 20/20 or better binocular corrected distance visual acuity (mean of 20/18). Ninety-three percent of the patients achieved simultaneous 20/25 or better visual acuity at distance and 20/32 (J2) or better visual acuity at near. The vast majority of patients were able to see comfortably without glasses at all distances.

It is important to note that neither excimer laser enhancements nor limbal relaxing incisions were performed on the study participants. Because postoperative corrections like these were not a part of the clinical trial, the results primarily reflect the worst-case scenario and should improve once the patients undergo refractive enhancements. Despite the fact that the trial subjects did not undergo correction for residual refractive error or astigmatism, 84% of them reported never wearing their glasses postoperatively. Although they described some halos and glare early after surgery, the total occurrence significantly improved by the 1-year follow-up. When queried, a remarkable 95% of subjects said that they would choose the same lens again.

## CREDIBLE EVIDENCE

European clinicians have 4 to 5 years of experience with the Tecnis Multifocal IOL, and their investigations echo the FDA's clinical trials. Research conducted by Toygar, for instance, showed 95% spectacle independence in participants.<sup>4</sup> Goes found in a study with the Tecnis Multifocal that 90% of subjects saw J1 near uncorrected, 90% achieved 20/30 uncorrected distance vision, and 93% had spectacle independence.<sup>5</sup>

Aspheric IOLs have set the standard for visual performance for cataract surgery, and physicians and their patients now have an additional aspheric multifocal option. Although multifocal IOLs have traditionally been viewed as a lesson in precision, their ability to provide full visual function makes them a natural partner for the aspheric design. ■

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1. Artal P, Alc4n E, Villegas E. Spherical aberration in young subjects with high visual acuity. Paper presented at: The 24th Congress of the ESCRS; September 13, 2006; London, England.
2. Holzer MP, Mannsfeld A, Limberger IJ, Auffarth GU. Functional results and patient satisfaction following refractive lens exchange and multifocal intraocular lens implantation. Paper presented at: The 12th ESCRS Winter Refractive Surgery Meeting & Cornea Day; February 9, 2008; Barcelona, Spain.
3. Holladay JT, Piers PA, Koranyi G, et al. A new intraocular lens design to reduce spherical aberration of pseudophakic eyes. *J Refract Surg.* 2002;18:683-691.
4. Toygar B. Patients highly satisfied with bilateral diffractive multifocal IOLs. *EuroTimes.* 2006;9(suppl 2):2.
5. Goes FJ. Refractive lens exchange with the diffractive multifocal Tecnis ZM900 intraocular lens. *J Refract Surg.* 2008;24(3):243-250.