

# Advanced IOL Technology for Presbyopes

Latest diffractive technology offers presbyopic patients high quality vision and spectacle independence

by Stephen Hannan, MCOptom

Presbyopia correcting IOL technology has been revolutionary for patients. In the midst of correcting a problem—cataract—patients also have the unique opportunity to improve their vision without glasses. For many, post-cataract vision is the best they have ever seen.

As the largest provider of premium spherical, toric and presbyopia-correcting IOLs in the UK, Optical Express is committed to staying abreast of current technology and to investigating any new advances that can benefit our patients. In our model, the examining optometrists conduct the preoperative examination and educate the patient about the risks, range of potential outcomes, alternatives and benefits of various surgical options.

In further discussion with the patient, the surgeon makes the final lens decision and completes the informed consent process, most commonly on the day of surgery. All patients are recommended to see the patient in advance of surgery, however the vast majority elect to meet their Surgeon on the day. Both eyes are typically treated on sequential days, with routine follow-up at 1 day, 1 week, 3 months, and annually thereafter.

We currently offer choices ranging from premium aspheric monofocal lenses to functional (low) add lenses to high-add multifocals. The middle category includes both low-add multifocal IOLs and the relatively new Tecnis Symphony extended range of

vision IOL (Abbott Medical Optics), which incorporates compelling new technology.

### Optics advances

The Symphony lens has diffractive optics, but it is not a traditional multifocal that splits light into two or three focal points. Instead, its “echelette” design produces a novel pattern of light diffraction that elongates the focus in the eye (Fig 1) to produce a continuous range of vision (Fig 2). The US Food and Drug Administration (FDA) has even created a new lens category based on the unique optical properties of the Symphony, calling it ‘extended depth of focus’. Unlike a multifocal, it directs all of the incoming light to the retina. And because the focus is elongated rather than having distinct peaks, the brain doesn’t have to suppress the secondary focal points, reducing the chance of ghosting or halos. In clinical studies and in our own experience, the incidence of glare and halo is similar to that of a monofocal IOL.

The tradeoff of the extended range is some loss of acuity at the very near range. We have found, however, that this has little impact on patient satisfaction.

The optical quality is another technological advance that bears explaining. Tecnis Symphony incorporates achromatic optics that reduce the eye’s natural chromatic aberration—the small degree of blur that comes from the difference in how light at opposite ends of the visible

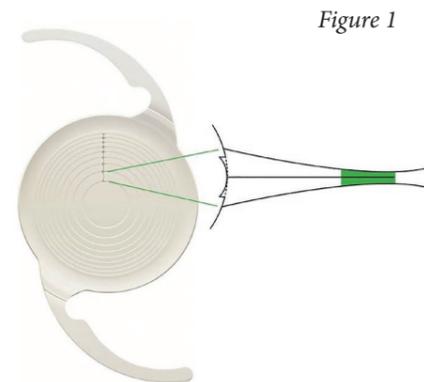


Figure 1

spectrum focuses on the retina (Fig 3). By bringing red and blue/violet light into tighter focus, achromatic technology (especially when combined with correction of spherical aberration), enhance retinal image quality without any negative effect on the depth of focus.<sup>1,2</sup>

The result is a lens that provides very sharp distance vision with near to intermediate vision that is very functional for using a mobile phone or computer, reading the newspaper, and many other daily tasks. We spend less time counseling patients about glare and halo and about adaptation, because patients seem to adapt to this lens faster than they do to multifocal technologies. And, because it is also available in the UK in a toric version, we can offer it to a wide range of patients.

### Clinical results

After one year of experience with the Tecnis Symphony, we can report excellent results.

The lens has been implanted in 4,464 eyes of 2,702 patients at Optical Express, including more than 300 eyes

with the toric version of the lens.

The mean age of patients implanted is 56.9 years (range, 36 to 88 years). Eyes with a wide range of refractive error, from -14.13 D to +8.38 D, with up to 3.75 D of astigmatism, were treated.

Postoperatively, the mean manifest spherical equivalent for all eyes was  $-0.27 \pm 0.56$  D. At the last follow-up exam, the mean monocular uncorrected distance visual acuity (UCDVA) was  $0.06 \pm 0.18$  (20/20-3) and mean binocular UCDVA was  $-0.03 \pm 0.11$  (20/20+1), with 99% of patients seeing well enough to pass their driving test without correction.

Uncorrected near visual acuity was  $0.31 \pm 0.17$  monocularly and  $0.24 \pm 0.14$  binocularly at the last visit, with the majority seeing N5 or better (Fig 4). Patients were very satisfied with these outcomes: 92% said they would recommend surgery with the Symphony lens to a friend.

Whilst Ophthalmic Surgeons at Optical Express have a range of Intraocular Lenses that they can choose to implant, with these results the Tecnis Symphony has become our premium lens of choice for many patients. Each patient’s clinical and lifestyle requirements are taken into careful consideration during the consultation process, of course. For most people, the combination of achromatic lens technology and advanced diffractive optics means that we can promise them the kind of functional vision they want without the side effects they would prefer to avoid.

There are still exciting advances to come in presbyopia correction. We may, for example, see further developments in optical quality and lenses that can fit through smaller incisions. Farther into the future, one can envision a time when the multifocality of a lens could be adjusted or removed or when we could offer patients a truly accommodative IOL. In the meantime, we already have presbyopia correcting technology that is a marked improvement over the multifocal technology of just a year ago.

Mr. Hannan is Clinical Services Director for Optical Express.

Figure 2

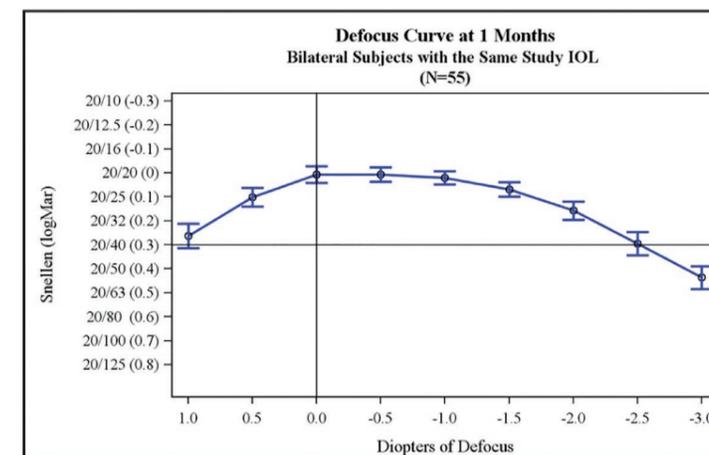


Figure 3

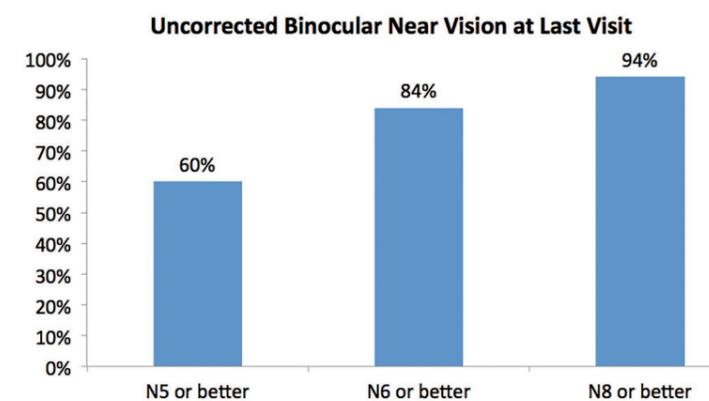
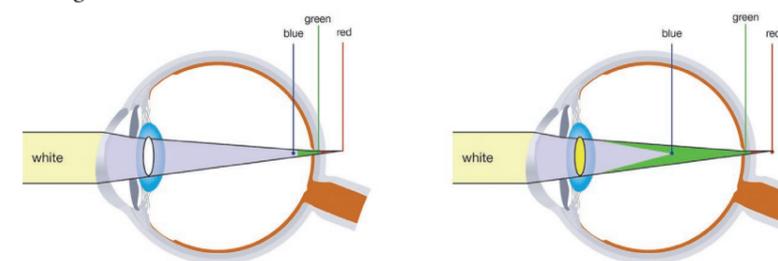


Figure 4



References:  
 1. Weeber HA, Piers PA. Theoretical performance of intraocular lenses correcting both spherical and chromatic aberration. *J Refr Surg* 2012;28 (1):48-52.  
 2. Artal P, Manzanera S, Piers P, Weeber H. Visual effect of the combined correction of spherical and longitudinal chromatic aberrations. *Opt Express* 2010;18(2):1637-48.

Figure captions:  
 1. An echelette design produces a novel pattern of light diffraction that elongates the focus in the eye.  
 2. The Symphony IOLs defocus curve demonstrates a continuous range of vision, rather than several distinct focal points.  
 3. Achromatic technology sharpens the retinal image by bringing red and blue/violet light to more similar focal points.  
 4. In patients implanted with the Symphony lens at Optical Express, 84% have N6 or better uncorrected binocular near vision.