

Partnering multifocal IOLs with LASIK to achieve perfect vision

Eradicating residual ametropia with the bioptics combination

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Today many cataract and refractive lens exchange (RLE) patients desire, and sometimes even demand, perfect vision postoperatively. I find the best way to ensure this is to offer pseudophakic surgery as part of a “bioptics combination package” with wavefront-guided LASIK.

Offering this bioptics package can be beneficial because lens power calculation will not achieve emmetropia in all patients. In addition, any residual ametropia will require patients to use glasses, which counteracts the planned benefits of potential spectacle independence with multifocal intraocular lenses (IOLs).

The combination approach in practice

Data from 22 eyes of 19 of my recent patients (average age: 54 years), show that multifocal IOLs can be successfully

combined with wavefront-driven ablations to achieve excellent visual results that satisfy the very high expectations of modern cataract patients.

Three-month follow-up data on these patients (nine with an Intralase flap preoperatively) with

multifocal IOL implants (Tecnis; AMO, ReZoom; AMO & ReStor; Alcon) and subsequent wavefront-guided CustomVue LASIK (AMO) for fine-tuning showed tremendous improvement in vision and full spectacle independence.

The preoperative sphere and cylinder before the IOL implantation were significantly reduced postoperatively. The average spherical error dropped from 3.71 D to 0.85 D after implanting the IOL, dropping even further to just 0.12 D after customized LASIK. Similarly, the average cylindrical error dropped from 2.04 D to 1.04 D after IOL implantation and to 0.23 D after LASIK (**Figure 1**).

The customized LASIK did not significantly change higher-order aberrations, such as coma, trefoil and spherical aberrations. For example, coma changed from 0.11 to 0.14 RMS, trefoil remained unchanged at 0.15 RMS and spherical aberration was slightly reduced from 0.11 to 0.09 RMS (**Figure 2**). We observed no surgical complications and none of the patients lost two or more lines of spectacle-corrected visual acuity (VA).

Patient selection is very important when using multifocal IOLs. These IOLs are designed to provide spectacle independence but have some side effects, including halos and glare at night. Therefore, they are indicated only in patients who do not want to use glasses. Ideal candidates are presbyopic hyperopes and presbyopic high myopes. Traditionally speaking, the poor candidates are likely to be low myopes.

A recent case of a 56-year old male patient illustrates our bioptics results. Preoperatively, refraction in the left eye was +5.50 D sphere. After cataract extraction, I implanted a Tecnis multifocal IOL. Postoperatively 1.50 D of residual hyperopia remained and his uncorrected visual acuity (UCVA) was only 20/40. Following wavefront-guided LASIK with the VISX CustomVue system, his refraction was +0.50 -0.25x10, with UCVA exactly as I wanted it at 20/20 and N1 (better than J1).

This patient's wavefront data show that his residual sphere was corrected and coma, one of the higher-order aberrations, was also significantly reduced. There was also a significant improvement in the point-spread function (both for all aberrations and for only higher-order aberrations) from preoperatively to postoperatively.

How do we time the procedures?

At our clinic, the bioptics combination package for cataract surgery includes the lens exchange surgery, with or without

Without performing LASIK, 85-90% of [multifocal IOL] patients may achieve spectacle independence. However, with LASIK success rates are about 99%

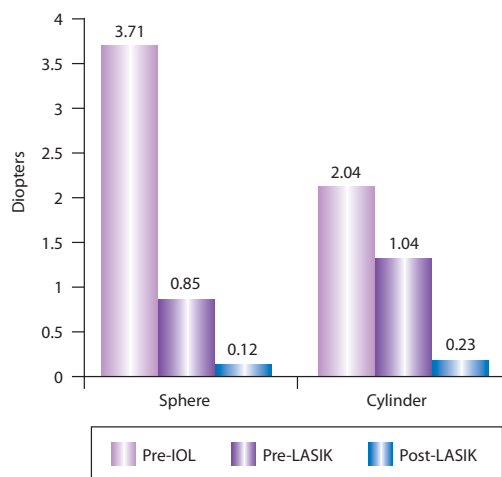


Figure 1: Multifocal bioptics refraction.

Importance of patient selection

cataract, and customized LASIK, Epi-LASIK or another method of corneal refractive surgery for fine-tuning.

These procedures are usually done a few months after the initial lens replacement surgery. The interval between the two procedures should be at least three months for patients receiving a posterior limbal or scleral incision and at least three to six months for those receiving a clear corneal incision. This time interval allows for wound healing, because the incision may open during the LASIK flap creation. If there is any doubt about wound stability, the surgeon should use surface ablation techniques.

Cataract or lens replacement patients can receive a standard monofocal lens, or as we prefer in our practice, the aspheric Tecnis monofocal IOL. Studies with this lens have shown that night vision and contrast vision are better than with standard monofocal IOLs.

Another option is to replace the crystalline lens with a multifocal IOL to correct presbyopia and provide good near and distance vision without the need for spectacles. This is my preferred option as spectacle independence is usually our goal. Currently, I implant the Tecnis multifocal IOL and the ReZoom IOL as my preferred choices.

The ReZoom refractive lens provides excellent distance and intermediate vision; and the Tecnis aspheric multifocal, which features a prolate anterior surface and diffractive back-side, provides both excellent near and distance vision.

Usually I mix and match two different lenses, depending on the patients' requirements. As a standard for patients who require excellent distance and intermediate vision, I recommend placing the ReZoom in the dominant eye. If the patient is happy with his vision at near distances, a ReZoom lens is placed in the second eye too. If the patient reports good intermediate vision but some difficulties at near, I will implant a Tecnis multifocal IOL in the second eye. If this IOL is not available (such as in the US market), I recommend the ReStor IOL in the non-dominant eye.

Adding wavefront for spectacle independence

Although I consider implanting a multifocal IOL essentially as a promise of spectacle independence to my patients, there

is always some loss of contrast inherent to the technology.

There is no way to guarantee an emmetropic outcome with multifocal calculations. Therefore, I perform customized laser surgery on our laser refractive surgery patients, using the VISX Star S4 laser with iris registration (AMO) in those patients in whom emmetropia is not achieved (approximately 15% of cases). In some cases, patients with even a small degree of residual refractive error postoperatively will be unhappy with their vision, which underscores the need for a LASIK enhancement.

A wavefront-driven ablation is desirable in pseudophakes (as in non-lensectomy patients) because it allows us to correct not only the sphere and cylinder, but also any higher-order aberrations.

The VISX system's Fourier-based wavefront evaluation provides greater detail than the previous Zernike-based analysis in my opinion and the iris registration also provides perfect alignment of WaveScan measurement and laser ablation. These are both critical components to the success of the procedure.

In addition to the pupil-based eye tracking, the alignment with the VISX system compensates both for eye rotation and pupil centroid shift. Therefore, a perfect match is achieved between the laser treatment and the wavefront measurement. This will result in higher precision of the astigmatism correction, providing an advantage of customized LASIK even if there are only few higher-order aberrations.

Initially I expected to encounter problems performing custom LASIK following a multifocal implant, especially with capturing a wavefront image. However in our experience, about 80% of eyes with multifocal implants can be reliably captured by the WaveScan aberrometer, compared with nearly 100% of "normal" eyes or even eyes with monofocal implants. It is important to note, however, that only diffractive multifocal IOLs such as the Tecnis multifocal or the ReStor multifocal can be measured. One should never use a wavefront-guided ablation with refractive multifocals such as the ReZoom as these cannot be measured reliably with current aberrometers.

Even with a successful capture, I recommend performing a wavefront-guided ablation only when the manifest

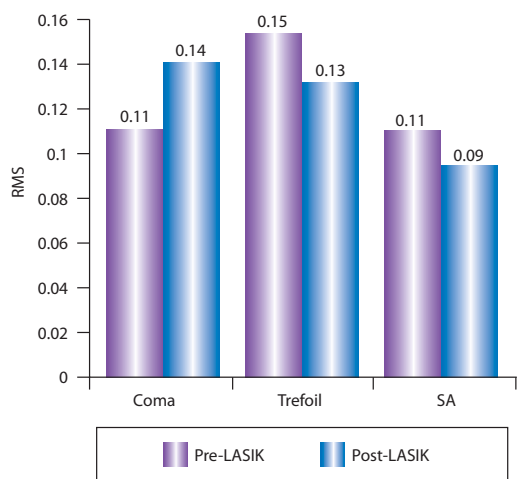


Figure 2: Multifocal bioptics higher-order aberrations.

In short...

Professor Michael Knorz believes that the success rate of multifocal IOLs can be greatly enhanced by offering patients a package, which he terms the bioptics combination package, which includes wavefront-guided LASIK. According to Professor Knorz, in the absence of LASIK enhancement, 85-90% of his multifocal IOL patients achieve spectacle independence. However, wavefront-guided LASIK enhancement has yielded spectacle-independence in around 99% of patients receiving the procedure so far. He does advise, however, that wavefront-guided LASIK should be used with diffractive multifocal IOLs only.

refraction and WaveScan refraction match very closely (± 0.5 D). Assuming that one encounters neither of these problems, there does not seem to be any problem with the interaction of the multifocal implant and the treatment pattern designed by the laser. If in doubt, I recommend the use of the PreVue lens.

A perfect match

Overall, the success rate of multifocal IOLs can be greatly enhanced by offering them as a package with wavefront-guided LASIK. Without performing LASIK, 85-90% of patients may achieve spectacle independence. However, with LASIK success rates are about 99%.

Therefore, adding multifocal IOLs to your practice should also include the potential for LASIK enhancements provided either by the surgeon or a partnering LASIK centre. When this approach is presented to patients as a package from the initial consultation, they understand and accept it as the best way to get the visual result they desire.

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