As patient demands for quality of vision and spectacle-independence increase, wavefront-guided corrections will assume an ever-growing role in meeting their visual needs.

Douglas D. Koch, M.D.

Achieving the Optimal Refractive Outcome in All Patients

Matching corneal and lenticular technologies with lifestyle choices to maximize vision

INSIDE:

- Maximizing Wavefront-Guided Laser Vision Correction Outcomes with Iris Registration Technology
- Enhancing Wavefront-Optimized Results with Wavefront-Guided LASIK
- Mixing and Matching Multifocal IOLs: Best of Both Worlds?
- Achieving Spectacle Independence with Premium Lens Technology
- Understanding Refractive Lenticular Patients
- The Role of Intermediate Vision in the Aging Population
- Aiming for Emmetropia: How to Manage Residual Sphere and Cylinder After Lens Implantation
- Understanding Options for Non-Candidates for Multifocal IOLs

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Supported by an unrestricted grant from Advanced Medical Optics, Inc.
Cyclotorsional Rotation versus Pupil Centroid Shift

was off by 2.1° and, interestingly, the IR system. "Even with marking I was off by 2.1° and, interestingly, the IR system of the VISX S4 laser. Dr. Koch was very careful to mark every one of the patients by hand and align each on the table before engaging the IR system. "Even with marking I was off by 2.1° and, interestingly, in some cases by as much as 6.6°," Dr. Koch said.

Investigators here also considered the magnitude of pupil centroid shift that occurred in these patients. They found a mean pupil centroid shift of 0.27 mms.

Investigators decided to look at what would have happened had there been no IR system to determine what clinical significance such cyclotorsional registration and decentration errors might have. To do this they generated 50 maps of corneas that they wanted to ablate.

Using the VOL-CT program (Starver and Associates) investigators were able to take a corneal map, import it, and create a wavefront map which could be manipulated.

"We would then go through a theoretical ablation of these corneas with a perfect ablation," Dr. Koch said. "We would then do an ablation with a rotated eye and also an ablation, which was centered to see what had the greatest impact."

To evaluate residual wavefront aberrations investigators used both root mean square (RMS) values and Strehl ratios. "Strehl ratios are the ratio of the peak focal intensities in the aberrated point spread function relative to the ideal or diffraction limited point spread function," Dr. Koch said. With a perfect treatment, which is ideally aligned and centered, investigators would get an RMS value of zero and a Strehl ratio of one.

"If you have an imperfect treatment, then your RMS value will start to creep up because you have residual error, and the Strehl ratio will decrease," Dr. Koch said.

When investigators applied the mean rotational error of 2.1° and the 0.27 mms of mean decentration from study results to the corneal maps, they were able to determine how patients would have fared clinically with these errors. "When it came to total RMS, lower-order RMS, and higher-order RMS values, in every case they did more poorly with the decentration than they did with the rotational error," Dr. Koch said.

"What that suggests is that the key factor here, or the biggest benefit, is actually the pupil centroid shift."

Likewise, Strehl ratio values also pegged the pupil centroid shift as the more clinically significant. "For a rotation of 2.1° the Strehl ratio is about 0.79 compared to 0.4 mm for a 0.27 mm decentration," Dr. Koch said. "The value is higher so they were less aberrated by the rotational error than by the small amount of decentration."

Looking at residual aberrations

Investigators also looked at the residual aberrations that resulted from cyclotorsion compared to those from decentration. They found that for cyclotorsion, residual aberrations included radial coma, trefoil, and secondary astigmatism. (Figures 1 and 2) "Most of these aberrations tend to be more toward the periphery," Dr. Koch said. "This may explain why there is less of a visual impact for rotation as opposed to decentration."

For decentration, horizontal coma was the primary problem along with small amounts of astigmatism and trefoil.

Overall, from a clinical perspective it appears as though IR can be most beneficial in helping to prevent errors of decentration. Results suggest it is only in instances in which a patient has significant astigmatism that cyclotorsional rotation may play an equally significant role.

"For eyes with astigmatism of less than 2D clearly the pupil centroid shift is the more important feature," Dr. Koch said. "However, for eyes with more than 2D of astigmatism, compensating for both cyclotorsional rotation and pupil centroid shift are likely to be important to optimize visual results."
Iris Registration: Experience with Iris Registration and Non-Iris Registration Wavefront-Guided LASIK Patient Outcomes

Real world experience with wavefront-guided LASIK with and without Iris Registration shows the added benefit of IR.

By David Schneider, M.D.

Preliminary data on the first 504 eyes of patients who received wavefront-guided LASIK with Iris Registration (IR) show that all patients except those with surface problems such as dry eye with resultant superficial keratitis have excellent vision post-operative Day 1. These eyes fared better than exceptional CustomVue LASIK eyes without IR.

Custom treatment with IR yields more accurate ablations and, therefore, better post-operative visual acuities. Although a retrospective analysis of the previous 100 eyes that had custom LASIK without IR also demonstrated excellent results, IR has brought patients to an even higher level of visual acuity. In particular, patients with unusual prescriptions such as high degrees of astigmatism or a significant amount of higher-order aberrations tend to benefit most from custom treatment with IR.

In addition, anxious patients who may not be good fixators benefit from IR. Anxiety plays a key role in the amount of rotational cyclotorsion and fixation difficulty that occurs in some individuals. Matching the iris under the laser with the position captured by the wavefront is extremely important.

IR also provides surgeons with a higher comfort level in knowing that they are putting the ablation pattern as close as possible to the measured wavefront. The VISX system with IR is by far the most accurate mechanism currently available.

Optimizing iris registration
Iris registration is necessary to compensate for the cyclotorsion that occurs when a patient goes from the upright to supine position. Success with IR depends on a multitude of factors, including the WaveScan acquisition, IR ready exam, patient positioning, focus, illumination, patient cooperation, fixation, a clear surgical field, surgeon awareness, patience, and attention to details.

Acquisition of high-quality WaveScan images is critical to the success of IR, though it is not a guarantee that the laser will be able to find matching landmarks.

Follow the standard WaveScan acquisition procedures. The WaveScan eye image must be in clear focus with iris details visible to facilitate iris capture. The WaveScan eye image must have maximum exposure to facilitate iris capture. Make sure there are no eyelid artifacts, little or no cilia, and small lacrimal menisci. Also, a distance of at least 1 mm (preferably more) is recommended between the pupil boundary and the upper and lower eyelids.

Proper operative illumination also is a key to success. Adjust the operative illumination to keepoperative pupil diameter as close as possible to WaveScan pupil diameter (between 5 mm and 7.5 mm). Use the lowest level of illumination possible to allow patient comfort and to help with patient fixation on the flashing fixation target.

Change illumination as little as possible or, preferably, not at all after the Activetrak System and IR have been engaged. If illumination is changed after engaging the ActiveTrak System and IR, consider restarting the ActiveTrak System and IR.

Recommended steps to follow if unable to engage IR

1) Adjust illumination levels.
2) Adjust patient positioning and remove any impediments to IR camera imaging.
3) Replace the flap, irrigate surface, and reengage IR tracker. Confirm position against limbal position marks.
4) Carefully lift the flap and observe for any cyclotorsional rotation. Confirm position against limbal position marks.
5) If acceptable, begin laser treatment.
6) If not acceptable, repeat process.
7) If totally unable to engage IR after all these steps, then use limbal marks as 0° reference and treat.

Start with the patient under the VISX scope prior to laser treatment. Center the patient’s eye under the laser and focus on the corneal surface. The pupil and iris detail will be slightly out of focus when the laser is properly focused on the corneal surface. The IR infrared camera is focused on the iris even though the surgeon is focused on the corneal stromal surface.

Then engage IR to insure applicability and mark the horizontal limbus accordingly (rotate marks clockwise or counterclockwise to an approximate 0° rotation). This marking process supplements the former method of marking at the slitlamp prior to bringing the patient to the laser. After marking the horizontal limbus create the flap with your microkeratome of choice. Engage IR, lift the flap, and observe for any rotation. Engage IR again, confirm position, and perform treatment.

If unable to engage IR once the flap has been lifted, attempt these steps:
1) Adjust illumination levels.
2) Adjust patient positioning and remove any impediments to IR camera imaging.
3) Replace the flap, irrigate surface, and reengage IR tracker. Confirm position against limbal position marks.
4) Carefully lift the flap and observe for any cyclotorsional rotation. Confirm position against limbal position marks.
5) If acceptable, begin laser treatment.
6) If not acceptable, repeat process.
7) If totally unable to engage IR after all these steps, then use limbal marks as 0° reference and treat.

My IR Wavefront-guided LASIK results are considerably better than my results prior to IR. I have been able to successfully engage IR for treatment in 99+% of eyes by using the steps outlined above. The keys to success at the end are surgeon awareness, patience, and attention to details throughout the entire process.

David Schneider, M.D., is in practice at the MidWest EyeCenter in Cincinnati, Ohio.

Custom treatment with IR yields more accurate ablations and, therefore, better postoperative visual acuities.

David Schneider, M.D.
Patients who are unhappy with their WaveLight optimized results can be successfully re-treated using CustomVue wavefront-guided LASIK

By Jeffrey J. Machat, M.D.

It happens to us all. Occasionally, there are patients who are unhappy with their quality of vision after LASIK. But what can you do?

Until recently there has been no solution. However, in our practice, we have found that we are able to convert unhappy Allegretto (Erlangen, Germany) wavefront-optimized patients to happy ones by re-treating them with the wavefront-guided VISX (AMO, Santa Ana, Calif.) S4 CustomVue platform.

We worked with the WaveLight system since 2001. We found that there were a number of patients that just did not do well with the wavefront-optimized approach. Patients would tell us they were not happy, even when their acuity was in the 20/20 to 20/25 range.

They would use words such as “filmy,” “blurry,” or “unclear” to describe their vision and would complain that they were just not happy.

We went back and compared patients’ results to their pre-operative readings using the WaveScan because we routinely had performed the Wavefront measurements in all cases. We noticed in the cases in which patients had complaints that their coma, trefoil, and sometimes even their spherical aberration rates had risen. Patients clearly were noticing these.

CustomVue re-treatments

Because we found that many of the patients who were voicing complaints had problems with coma and trefoil that could not be addressed with the optimized approach, we decided the only way to treat these unhappy patients was by using a wavefront-guided CustomVue.

Probably the most telling case that we encountered involved one of my partner’s patients. Pre-operatively the patient was a low myope who needed -2.50D of correction in the left eye and -2.75D in the right. His bilateral acuity was 20/20 after undergoing optimized LASIK.

The patient should have been thrilled with his vision. Instead, he talked about feeling incapacitated and as if he could not function at work anymore even despite his 20/20 acuity.

He complained that he had what seemed like a film over his vision. We decided (although quite reluctantly) to retreat his left eye first.

The patient’s coma had more than doubled from a pre-operative level of 0.16 microns in the eye to a post-operative level of 0.37. We tested the patient with the PreVue lens, and then using CustomVue re-treatment we were able to bring his coma levels down to 0.23 microns in the eye. (Figures 1, 2 and 3)

The patient was transformed on day one—he talked about how the film was gone and how everything was much brighter. He couldn’t wait to have his second eye done. One month later my partner re-treated the patient’s second eye—far less reluctantly—with the same dramatic improvement in vision quality.

After witnessing other cases like this it became apparent to me that while the re-treatments work great, it makes more sense to use the CustomVue on these patients initially. The wavefront-optimized approach, which cannot address asymmetrical higher-order aberrations, only will exacerbate problems with quality of vision for some patients.

Based on the improved results and reduced enhancement rates, we have shifted to CustomVue in 100% of our cases.

Jeffrey J. Machat, M.D., is co-medical director of TLC Laser Eye Center in Toronto, Ontario, Canada.
Wavefront-Guided Surgery Reduces the Need to Retreat

Wavefront-guided, Fourier-based treatments with Iris Registration led to significant reductions in one surgeon’s enhancement rate compared to conventional or wavefront-optimized treatments

by Mark E. Whitten, M.D.

A refractive surgeon’s enhancement rate is directly linked to patient satisfaction; therefore, it reveals more about the surgeon’s success than visual acuity outcomes, wavefront error, or any other metric.

I began performing nearly 100% wavefront-guided CustomVue surgery with the AMO VISX laser after comparing my outcomes, especially my enhancement rate, to the Wavelight Allegretto and VISX S4 lasers.

I’m a relatively aggressive enhancer. Years ago, when I was performing conventional surgery, my enhancement rate was 20% to 25%. When the VISX CustomVue software became available, that rate dipped into the high teens—a significant improvement but a lot of patients still were being retreated. It also was still a bit higher than the 10% to 15% enhancement rate I achieved with Allegretto wavefront-optimized treatments.

After the Fourier upgrade my CustomVue enhancement rate dropped to about 10%. Iris registration allowed me to align treatments more precisely than I could with marking alone. In my opinion that makes a big difference in the accurate correction of cylinder.

Now that I use iris registration on nearly every case my CustomVue retreatment rate is less than 5%.

Though the Allegretro rate has stayed about the same, VISX’s technology improvements have continued to reduce enhancements and improve outcomes for me. I think VISX supplying free re-treatment cards for CustomVue cases is indicative of how well the company feels its software works.

The impact of reducing my enhancement rate is huge, both financially and logistically. As wavefront-optimized software has progressed, it has changed the number of cases I do each day. Fewer re-treatments means I can see a higher number of the more lucrative new patients because my schedule isn’t filled up with enhancements.

Wavefront-guided surgery takes a little longer initially because you have to obtain wavefront images, and the surgeon has to develop a treatment plan rather than just plug a refraction into the laser. But in the long-run it saves me time and money because I rarely have to go back to enhance the custom patients.

I also don’t have the energy drain of constantly dealing with patients complaining about their qualitative vision. As any surgeon or referring optometrist or ophthalmologist knows, just one patient with night-vision problems can mess up an entire day’s schedule. Going through the process of reassuring that patient, restezing him, and doing what it takes to fix his problems is enormously time consuming and stressful for the patient, too.

A better fix

My preference, of course, is to avoid the need for enhancement in the first place. My outcomes data show that wavefront-guided surgery with Fourier-driven ablations and iris registration is the best way to do this.

There will always be patients who for some reason don’t heal as expected and need a retreatment, but that number can be drastically reduced with the latest custom technology. Fortunately, custom enhancements also are very effective when you need to do them. We still are retreat- ing patients with qualitative visual problems from conventional surgery years ago as well as high myopes who had wavefront-optimized surgery more recently.

The good thing with CustomVue is that you can actually treat these patients who have quality-of-vision problems, regardless of how they came about. Wavefront-guided re-treatment is a must for anyone who exhibits problems with night vision or other qualitative vision issues related to higher-order aberration. A wavefront-optimized treatment that treats every eye the same way certainly fixes these problems.

Every patient who sits in my chair is unique. I believe the future of laser-vision correction lies in treatments that are individualized for each patient, not similar treatments for similar prescriptions.

Mark E. Whitten, M.D., is the Regional Medical Director of TLC Laser Eye Centers—Rockville, Reston, and Fairfax, in greater metropolitan Washington, D.C. He is not a consultant to VISX/AMO or Wavelight.

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Figure 1: Technological evolution has resulted in a consistent reduction in retreatment rate.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Enhancement Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Ablation</td>
<td>20-25%</td>
</tr>
<tr>
<td>Wavelight Ablation (“Wavefront-Optimized”)</td>
<td>10-15%</td>
</tr>
<tr>
<td>VISX CustomVue with Fourier Upgrade</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>VISX CustomVue with Fourier &amp; Iris Registration Upgrades</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

Figure 2: One patient with a negative outcome can have a far greater impact on word of mouth versus those with a positive experience.

“Wavefront-guided re-treatment is a must for anyone who exhibits problems with night vision or other qualitative vision issues related to higher-order aberration.”

Mark E. Whitten, M.D.
Combining the ReZoom and ReSTOR Multifocal technologies instead of using two ReSTORs can provide superior results, especially regarding intermediate vision.

The results of a recent study in which cataract surgery and lensectomy patients received either bilateral ReSTOR IOLs (Alcon, Fort Worth, Texas) or a ReZoom multifocal IOL (Advanced Medical Optics [AMO], Santa Clara, Calif.) in the non-dominant eye and a ReSTOR multifocal IOL in the dominant eye demonstrates that the bilateral uncorrected intermediate vision with the ReZoom/ReSTOR (RZ/RS) combination was statistically and clinically superior to the RS/RS combination.

Patients had improved intermediate vision without sacrificing any bilateral near vision, and the quality of their daytime distance vision also improved.

The combination approach of using ReZoom and ReSTOR was the result of a growing number of complaints related to intermediate vision in patients who received bilateral ReSTOR IOLs. Fourteen of the 55 RS/RS patients had complaints related to their intermediate vision. Of the first 39 RZ/RS patients, there was only one complaint related to intermediate vision.

**Results**

The mean bilateral uncorrected intermediate vision with the RZ/RS combination (J 2.99) was statistically and clinically superior to the RS/RS combination (J 3.81). This excellent intermediate vision was achieved without sacrificing any bilateral near vision. We also found that while 25.5% of the RS/RS patients volunteered complaints regarding their intermediate vision, the combination of RZ/RS essentially eliminated the intermediate complaints.

In addition, intermediate visual complaints in the RS/RS patients were much more frequent in younger patients with elective lensectomy compared with the incidence observed in cataract surgery patients (Figure 1). The relative risk of an intermediate visual complaint from patients who received bilateral ReSTOR multifocal IOLs increases with decreasing patient age.

The mean bilateral Jaeger near vision in the RS/RS patients and the RZ/RS patients was not significantly different (J 1.33 RS/RS vs J 1.56 RZ/RS). The mean unilateral Jaeger intermediate vision for the 110 ReSTOR eyes in Cohort I was J 4.49 compared to J 4.21 in the 39 ReSTOR eyes in Cohort II. (Figure 2). The mean unilateral intermediate Jaeger vision in Cohort II (RZ/RS) for the 39 ReZoom eyes was J 3.03. This was statistically significantly better than the J 4.21 observed in the individual ReSTOR eyes in Cohort II.

In one case, a 58-year-old administrative Marine officer with 4.50D of myopia first received a ReSTOR multifocal IOL in his left eye. Following this surgery, he had 20/20 uncorrected distance vision and J1 at 11 inches. His uncorrected intermediate vision was J6.

He indicated that he could not "tolerate two eyes like this." Two weeks following the implantation of a ReZoom multifocal IOL in his right eye, he had 20/20 uncorrected distance vision in both eyes and J1 uncorrected near vision bilaterally. His uncorrected intermediate vision was J2 in the ReZoom eye and J6 in the ReSTOR eye. The uncorrected bilateral intermediate vision was J1. The patient was extremely happy with the functional visual result achieved with the ReZoom/ReSTOR combination.

**Visual Complaints**

In general, older cataract surgery patients who experience improved vision are less likely to complain than younger baby boomer lensectomy patients who have paid $7000 - 10,000 for their surgery. Placing a ReZoom multifocal IOL in the non-dominant eye essentially eliminated intermediate complaints without inducing intolerable increases in nighttime light phenomena.

The combination of these implants brought about other benefits. While the ReSTOR IOL has exceptional reading capabilities in bright light, the ReZoom IOL has outstanding reading capabilities in moderate and dim light. The ReZoom IOL also has excellent distance vision in bright daylight, and the ReSTOR IOL contributes to distance vision while driving at night without significantly adding to the amount of halos. The ReZoom has excellent intermediate vision, while the ReSTOR has sacrificed the intermediate to achieve excellent reading vision.

Together these two new multifocal implants provide a significant improvement in the multifocal technology available to both surgeons and patients in the United States.

Frank A. Bucci, M.D., is the medical director at Bucci Laser Vision Institute, Wilkes-Barre, Pa.
Combining IOLs for Spectacle Independence

The combination of a refractive lens in one eye and a diffractive lens in the other may be especially powerful, according to study results.

Mixing and matching different IOLs allows the surgeon to combine the advantages of both refractive and diffractive lens technologies, according to Brazilian ophthalmologists Pedro Paulo Fabri, M.D. and Leonardo Akaishi, M.D. They presented data comparing refractive outcomes, reading speed, spectacle independence, and quality of vision using various multifocal IOL approaches during the February World Ophthalmology Congress in Sao Paulo, Brazil. Refractive IOLs such as the AMO ReZoom lens offer excellent intermediate and distance vision as well as 100% transmission of light. Incoming light is directed across the entire focal plane of the lens to provide vision at all distances.

However, near vision is not as strong with these lenses as with some other technologies, so patients may have more difficulty reading up close, they said. These lenses are also pupil dependent, so there may be mild night-vision symptoms.

Refractive lenses are ideal for light to moderate readers who drive mostly during the day. Patients who play sports, use a computer frequently, or enjoy activities such as playing cards—activities that all rely heavily on intermediate vision—will benefit from refractive lenses, Akaishi and Fabri said.

Diffractive IOLs such as Alcon’s ReSTOR lens and Advanced Medical Optics’ Tecnis Multifocal IOL offer excellent near and distance vision as well as good reading speed. They are pupil independent, so patients experience fewer problems with night vision. However, there is a gap in intermediate vision as well as a loss of transmitted light and, therefore, a loss in contrast sensitivity with these lenses.

Diffractive lenses are ideal for patients who spend a lot of time reading or doing detailed craft work. Those who like to go to the movies and those who often drive at night are also good candidates for these lenses because they function independently of pupil size.

However, the authors noted that not all patients fit neatly into one. Some individuals love sports and movies. Others aren’t big readers but often drive at night. For this reason they decided to compare the results of bilateral implants of the same IOL to a mix-and-match diffractive/refractive approach.

In the study, four groups of patients were compared: 100 patients with bilateral ReSTOR implants, 100 patients with bilateral ReZoom implants, 88 patients with ReSTOR in the non-dominant eye and ReZoom in the dominant eye, and 15 patients with a Tecnis multifocal implant in one eye and ReZoom in the other.

**Study results**

Most notably, patients in both of the mixed lens groups achieved 100% spectacle independence, compared to 75%-89% in the bilateral implant groups.

Distance acuity was weakest in the bilateral ReSTOR patients but very good across all the study groups. Intermediate vision was best with the ReZoom/Tecnis Multifocal combination but also was excellent in the bilateral ReZoom group. Average near vision in the patients with at least one ReSTOR lens was J 1.40-1.50. However, the ReZoom/Tecnis Multifocal group achieved even better near visual acuity of J 1.10. The authors measured the number of words per minute (wpm) patients could read with a 3.5-mm pupil. Although reading speed is not something ophthalmologists typically measure, Akaishi and Fabri have found it to be an important component of patient satisfaction with their near vision abilities.

Reading speed varied from 125 wpm with bilateral ReZoom implants to 185 wpm with the ReZoom/Tecnis Multifocal combination.

The authors measured the distance acuity of each group and found that the ReZoom/Tecnis Multifocal combination offers good bilateral near vision in lower light situations. The typical reading distance is a more comfortable one, and there is greater bilateral contrast sensitivity than when ReSTOR and ReZoom are combined. Finally, having a Tecnis Multifocal IOL in at least one eye reduces spherical aberration.

Every patient’s visual needs and expectations are unique. Mixing and matching refractive and diffractive IOL styles can offer patients binocular vision that is excellent at all distances: near, intermediate, and far. This approach, the doctors said, provides a greater chance of spectacle independence and fulfills all the patient’s lifestyle expectations.

Table 1: Comparison of Bilateral vs. Mix-and-Match Results

<table>
<thead>
<tr>
<th>No. patients</th>
<th>Bilateral ReSTOR 100</th>
<th>Bilateral ReZoom 100</th>
<th>ReSTOR + ReZoom 88</th>
<th>Tecnis MF + ReZoom 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean follow up</td>
<td>4 mos.</td>
<td>4 mos.</td>
<td>2 mos.</td>
<td>1 mos.</td>
</tr>
<tr>
<td>Near VA*</td>
<td>J 1.40 (30 cm)</td>
<td>J 2.30 (38 cm)</td>
<td>J 1.50 (39 cm)</td>
<td>J 1.10 (42 cm)</td>
</tr>
<tr>
<td>(reading distance)</td>
<td>J 3.85</td>
<td>J 2.15</td>
<td>J 2.30</td>
<td>J 2.10</td>
</tr>
<tr>
<td>Intermediate VA*</td>
<td>20/25</td>
<td>20/20</td>
<td>20/20</td>
<td>20/20</td>
</tr>
<tr>
<td>Distance VA*</td>
<td>165</td>
<td>125</td>
<td>155</td>
<td>185</td>
</tr>
<tr>
<td>Reading speed (wpm with a 3.5-mm pupil)</td>
<td>89%</td>
<td>75%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Spectacle independence</td>
<td>1+</td>
<td>2+</td>
<td>1+</td>
<td>1-</td>
</tr>
<tr>
<td>Halos/glare</td>
<td>1+</td>
<td>2+</td>
<td>1+</td>
<td>1-</td>
</tr>
</tbody>
</table>

*Visual acuity was measured binocularly

Pairing ReZoom and Tecnis Multifocal lenses is proving a successful option for improved vision.
Optimizing Acuity with Bilateral Multifocal Lens Implantation

For presbyopic cases, bilateral multifocal lens implantation can help to maximize results

By Farrell C. Tyson, M.D.

Since the Food and Drug Administration (FDA) approval of multifocal lens implants such as the ReZoom and ReSTOR multifocal lenses, I have had the opportunity to implant both technologies in my patients. While both lenses are indicated for bilateral implantation, my experience has been that they can be successfully implanted in some monocular situations as well. The key to success with these lenses is proper patient selection and careful management of patient expectations.

Proper patient selection

The strategy that I use for bilateral implantation begins with good patient selection. While multifocal lenses can offer patients excellent near, intermediate, and distance acuity, the approach is not for everyone.

You need to be certain that you’re picking the patient who sees the glass half full, not half empty. Multifocal lenses make sure my patients are the first to admit having already tried the lens only in cases in which patients have a good size cataract so that they won’t notice any drop off in their perception of brightness.

Before implanting a multifocal lens, it is important to check for dry eyes. Almost inevitably those patients who end up having glare issues are the same ones who had dry eyes pre-op, so it is vital to correct this problem upfront.

You also want to be prepared to do a limbal relaxing incision (LRI) in some cases to minimize any astigmatism because this ultimately adds to the patient’s visual perception.

When implanting bilateral lenses, I find it preferable to first implant one lens and then wait a week before implanting the second. If possible, I try to aim for plano on my calculations.

However, if I have to choose between being a little on the minus side and a little on the plus side, I opt for a little minus. This offers me a bit of a fudge factor in the post-operative period to do an LRI if necessary. Also, I have found that the ReZoom lens tends to behave like a monofocal lens, so distance acuity is much better in cases where it is a little bit on the minus side as opposed to being on the plus side. With the ReZoom lens, patients see very well on day one, just like with a monofocal IOL, but they have the added benefit of gaining the near and intermediate vision.

Bilateral results

My results with bilateral implantation of the ReZoom lenses have surpassed my expectations. I have implanted the ReZoom in 50 bilateral cases. So far all of my patients have 20/30 uncorrected distance acuity or better. Nearly all, about 92.3%, have attained 20/25 acuity or better, and the majority, 65.4%, has 20/20 acuity or better.

When it comes to near acuity, I’ve also had excellent results with the lens. Nearly all of my patients, 96.2%, have J3 or better uncorrected binocular acuity; 80.8% have J2 or better acuity; 57.7% are at J1 or better, and 15.4% are at J1 or better.

I’ve also found that these bilateral patients do get a boost from implantation of the second ReZoom lens. While patients’ monocular results are excellent, they do not enjoy quite as good acuity as they do with binocular lens implantation with the ReZoom. So far all my monocular patients have 20/40 or better distance acuity. However, just 82% have 20/30 or better acuity; 56% have reached the 20/25 or better mark; and 26% are 20/20 or better.

It is clear to me that while these ReZoom lenses can offer good acuity alone, they work better in pairs.

I’ve been surprised by how well patients have done with the lens. I was not expecting intermediate or near vision to be nearly as good as it has proven. I was particularly concerned about my low myopes—in the -2D to -3D range—whom I thought might not be satisfied with their postoperative reading vision. I was worried that I was going to give them good distance vision, but that they were going to tell me that their near vision wasn’t nearly as good as before surgery.

However, these patients are telling me that with the ReZoom their reading is every bit as good as it was pre-op, but they now have better distance vision.

Patient satisfaction levels with the lens have been very high. Nearly all would have the procedure done again. I find that most patients adapt to the ReZoom very quickly.

If glare or halos are present, they usually take about three months to subside. While this is a relatively rare occurrence, I prepare all patients for the possibility. I believe in always underselling and over delivering.

Overall, I urge practitioners to consider bilateral implantation of the ReZoom lens, in particular those patients who value their intermediate vision. These patients will be rewarded with excellent acuity that surpasses what they are likely to attain with one multifocal lens alone.

Farrell C. Tyson, M.D. is medical director of the Cape Coral Eye Center, Cape Coral, FL. He has no financial relationship with the manufacturers of products discussed in this article.
Spectacle Independence with Multifocal IOLs

New-generation multifocal lenses provide surgeons with several options to meet the specific visual needs and desires of their patients.

By Kerry Assil, M.D.

With careful patient selection, many patients can achieve spectacle independence with the new generation of multifocal IOLs. I have implanted more than 200 bilateral patients with the ReZoom multifocal IOL. Following a primary procedure, often including AK, about 85% are spectacle independent and report a high level of satisfaction. The percentage of spectacle independence increases with a LASIK enhancement to fine-tune the prescription.

Patient selection

Multifocal IOLs can be used on cataract patients as well as refractive lens exchange patients.

Cataract patients who have 2+ or greater nuclear sclerosis or subcapsular cataract are the best candidates for the ReZoom multifocal IOL. In the refractive lens exchange category hyperopes who are 50 years old and older and 3D hyperopic or more (or 60 years old and > 2D hyperopic) are also excellent ReZoom candidates. I find that the patients who have subtle cataracts do better with the Tecnis lens unless they have a relatively large refractive error.

Talking with patients

I talk with each patient regarding visual desires. I ask if they mind wearing glasses after surgery. If the patient indicates that he does not care if he wears glasses, I skip the refractive IOL category. However, if he shows an interest in seeing without glasses after surgery, I discuss the option of a new generation multifocal IOL.

During our conversations I mention to patients that the multifocals will provide them with a larger range of vision than they have had in many years. For example, they will most likely be able to drive, read a menu, play tennis, and work on the computer without glasses, but they might need a pair of drug store glasses to read fine print.

With all the new generation multifocal lenses I talk to patients about spacial summation and the benefits of getting their second eye treated relatively quickly. In addition, I mention the likely need for a LASIK touch up to fine-tune the prescription.

The majority of patients will not need drug store readers or a LASIK enhancement. However, a high percentage of them does need a subtle refinement, so I include the readers and LASIK enhancement as a routine part of the process in case they become necessary.

Surgeons who want to minimize the need for LASIK enhancement should aim for a plano result in the distance dominant eye and a -0.50D result in the non-dominant eye.

Procedural pearls

Surgeons should be cautious with their patient selection. Keeping within the aforementioned patient selection range yields excellent results. If surgeons proceed outside that range, more patients may express concerns about nighttime glare and halos. I find that the patients who are complaining of visual symptoms in the face of mild cataracts tend to be the ones least likely to tolerate nighttime glare and haloes.

I tell all patients that they are going to have nighttime glare and haloes with the multifocal IOLs. I inform them that glare and halo are natural occurrences with these lenses and remind them they are not harmful to their eyes. They should expect car lights to look like Christmas lights. Using this approach and screening process has yielded a high patient satisfaction rate.

I consider using ReSTOR in one eye and ReZoom in the other, or using the CrystaLens, in a subset of the patients who have very miotic pupils. I find the combination of ReSTOR and ReZoom works well for the patients who have miotic pupils because through a small pupil the ReSTOR eye does not see as well far away, while the ReZoom eye does. Through the same pupil the ReZoom eye doesn’t see very clearly up close, while the ReSTOR eye does. Even patients with miotic pupils enjoy excellent near and far vision with that combination.

Surgeons can make a large capsulorhexis with the ReZoom because the three-piece lens sits nicely back in the bag—even with a large capsulorhexis. In addition, because the ReZoom is a three-piece lens, it is a good option in IOL exchange—the haptics sit in the ciliary sulcus as opposed to the one-piece ReSTOR and the CrystaLens, for which sulcus fixation is not an option.

Furthermore, the three-piece ReZoom lens easily can be placed in the ciliary sulcus in the event of any noted zonular weakness or vitreous loss at the time of surgery.

The availability of new-generation multifocal lenses provides surgeons with many options to meet the specific visual needs and desires of their patients. Spectacle independence with these lenses is a big benefit to many patients seeking freedom from reading glasses.

Kerry Assil, M.D., is medical director of the Assil Eye Institute in Santa Monica, California.

"Surgeons should be cautious with their patient selection … I find that the patients who are complaining of visual symptoms in the face of mild cataracts tend to be the ones least likely to tolerate nighttime glare and haloes."

By Kerry Assil, M.D.

Eye on monocural cases

Although in most cases I opt for binocular implantation of the ReZoom lens, I find that there are select instances where the monocular approach is warranted. In particular, I have had six cases involving young patients who have had either a large posterior subcapsular cataract (PSC) or a traumatic cataract in one eye.

Because these patients are still accommodating in the second eye, I like to avoid use of a monocular lens in these cases. I have tried using the ReSTOR lens here. Unfortunately, for the most part I have not had success with the ReSTOR in these monocular cases.

I find that with the ReSTOR the patient really needs to have the second eye done to enjoy the maximum benefit of the lens, so in these cases, I opt to implant the ReZoom lens.

So far patients have done extremely well. All of my patients enjoy 20/25 uncorrected acuity, and most are J1 or better at near. I even have one patient who has 20/15 uncorrected acuity in one eye and is reading at the J1+ level.

None of the individuals has had any trouble focusing. This was a concern of mine because these patients are in a unique situation with the multifocal ReZoom in one eye while still accommodating with the second eye.

Patients have been extremely satisfied with the approach. Several have even asked me to implant the ReZoom in the second eye so that they can avoid wearing a contact in the eye. But I’ve suggested they hold off on this because the eye does not yet have a cataract and they are doing very well as things stand.

By Farrell C. Tyson, M.D.
More than 65% of Americans 50 to 64 years of age are going online with their home computers, according to The AARP's 2006 “The State of 50+ America”—up from 31% in 1998. The report also notes that 45% of Americans age 65 to 74 use the Internet, up from a mere 12% in 1998. About 25% of those 75 years and older also are surfing the Web as well, up from just 4% in 1998.

The AARP report points out just how many older patients, many of whom are retired, use computers and the Internet in their daily lives. This survey found that Americans over age 50 rely increasingly on the Internet to communicate with friends and family, keep abreast of the news, search for health and medical information, pay bills, make purchases, track investments, engage in work-related activities, and more. The Internet is rapidly becoming an essential tool of modern life for this age group.

Visual needs
As ophthalmic surgeons, we want to be sensitive to a patient's intermediate vision for computer use, cooking, and hobbies. When I talk to patients about intermediate visual tasks, they are likely to be pleasantly surprised if this does not happen. If they suddenly have to start taking glasses on and off for different tasks, they will be disappointed. The active visual tasks, which take place 18 inches to 30 inches away from a person's face, or approximately arm's length, can pose the greatest hassle for patients if intermediate vision is ignored in the selection of an IOL.

For this reason it's important that ophthalmologists begin to look at the properties of the new presbyopic IOLs in order to make lens choices that fit our patients' needs. The optics of the ReZoom IOL (AMO), for example, have been specifically adapted to use 100% of the transmitted light. Depending on the pupil size, between 10% and 17% of the light is directed toward intermediate vision. In clinical studies 93% of ReZoom patients have achieved spectacle independence for intermediate visual tasks.

Multifocal vision
As they approach the point of needing cataract surgery, many patients already take multifocal vision for granted because they've been wearing transitional or variable-add bifocals for years. For example, many patients think that bifocals provide near vision. Today, most patients use no-line bifocals and, therefore, a lot of patients did not go through the transition from bifocal to trifocal, which really stresses the importance of that intermediate vision.

Many patients go into a bifocal and know they need an increasingly stronger bifocal over time. They start to need an intermediate add, but the no-line bifocal has taken away some of the stress—and awareness—of moving from a bifocal to a trifocal. These patients tend to assume that cataract surgery will “take care of” their vision at all distances, and they are likely to be pleasantly surprised if this does not happen. If they suddenly have to start taking glasses on and off for different tasks, they will be disappointed. The active visual tasks, which take place 18 inches to 30 inches away from a person's face, or approximately arm's length, can pose the greatest hassle for patients if intermediate vision is ignored in the selection of an IOL.

For this reason it’s important that ophthalmologists begin to look at the properties of the new presbyopic IOLs in order to make lens choices that fit our patients’ needs. The optics of the ReZoom IOL (AMO), for example, have been specifically adapted to use 100% of the transmitted light. Depending on the pupil size, between 10% and 17% of the light is directed toward intermediate vision. In clinical studies 93% of ReZoom patients have achieved spectacle independence for intermediate visual tasks.

Customizing the IOL to the patient
Not every patient needs strong intermediate vision without spectacles. When I talk to patients about presbyopic corrections, I look at their glasses to give me clues about their visual needs and expectations and to set the stage for a meaningful discussion. For example, if I see a 70-year-old patient wearing a lined bifocal with no trifocal component, I know that intermediate vision is probably not very important to that patient unless he is very dissatisfied with his current vision (or has another pair of glasses). When I see a younger patient who has chosen lined bifocals or trifocals over transitional bifocals, that tells me he may have a specific high-demand near or intermediate task. For example, a 55-year-old stockbroker who spends most of his day at the computer may have a very specific intermediate vision need.

There are several other good options in IOLs for your cataract surgery, but not all of them can meet the distinct intermediate visual needs of these patients.

David R. Hardten, M.D., is adjunct associate professor of ophthalmology, department of ophthalmology, University of Minnesota, Minneapolis.
A ny practice that wants to be successful implanting refractive IOLs must understand that it is dealing with a unique patient group. These patients' needs, perceptions, and expectations are different from those of LASIK patients and cataract patients.

There are at least two distinct groups of refractive IOL candidates: those indicated for cataract surgery whose standard procedure will be covered by Medicare or insurance and private pay patients who are a bit younger and may have some lenticular changes.

Patients in the Medicare-eligible category may present for a simple cataract consultation. It is entirely possible that they have never heard of multifocal IOLs. Chances are it also hasn't occurred to them that they might be asked to pay a premium for new IOL technology. But just because patients aren't used to this idea doesn't mean they aren't interested.

As soon as it is clear that cataract surgery is indicated, you can begin to discuss the patient's options. I recommend that practitioners start by asking whether the patient ultimately chooses. It's a big difference in which option the patient expresses an interest in having presbyopia resolved, that option and eager to get rid of their glasses-again. Most of these patients probably won't be ready for intraocular surgery, but a discussion about LASIK, IOLs, conductive keratoplasty, and other "gap" options is warranted.

The context and the way physicians and staff describe various refractive procedures make a big difference in which option the patient ultimately chooses. It's important to rehearse how you present the options and, ideally, get feedback from patients on how your explanations are perceived.

"To build a successful refractive IOL practice, you must make a commitment to improve quality—not only in refractive outcomes, but at the point of service."

Shareef Mahdavi

400 Phone Calls to 77 LASIK Practices
Average Scores by Topic
1=poor, 3=good, 5=excellent

Figure 1: Less than one-third of the practices achieved call scores that averages a "good" or better rating.

Achieving the Optimal Refractive Outcome in All Patients — ASCRS San Francisco Show Supplement
T
he first step to achieving emmetropia with a multifocal or monofocal IOL is talking with patients about their refractive goals. Do they want to be mostly distance independent of spectacles, intermediate, or near, or a combination of the three?

If the patient wants distance, intermediate, and near vision, the best choice is a multifocal IOL. A good keratometry reading, accurate anterior chamber (AC) depth and axial length measurements, and careful selection of an IOL and IOL formula all are essential factors.

Be sure the keratometer is calibrated. Many people suggest using manual keratometry, although in some patients who have certain asymmetries of their cornea, corneal topography or tomography is a good confirmatory test. It also is helpful to look at the power of the cornea.

Accurate AC depth can be obtained using immersion ultrasound, Orbscan, Ocular Coherence tomography, and the Pentacam. Ultrasound also can be used as a way of gaining accurate axial length measurements. It does require contact with the eye, but it can be used in almost every patient.

IOL Master also is accurate, but in some patients—those with denser cataracts or posterior sub-capsular cataracts, for example—it may be difficult to get the reading. There are many good IOL formulas. For the most part I use the SRK-T formula in normal and longer eyes and the Holladay 2 in shorter and hyperopic eyes. We personalize the A constant for the instrumentation and technique that is used.

WFG-correction
Many patients come close to emmetropia post-op, and they are satisfied. If they are not, residual astigmatism may be the problem. If there is a low level of myopia, astigmatism or hyperopia and astigmatism and the target prescription needs to be adjusted, the most accurate way to manage this is with laser vision correction (LVC).

If an image can be captured on the wavefront, it will help with obtaining a good result with LVC. Yet with the multifocal IOLs it may be difficult to obtain a reliable wavefront in some patients.

Check to make sure the wavefront matches the distance portion of the refraction. In addition, make sure any pattern of irregularity matches any topographic corneal irregularity.

By using the wavefront in these cases surgeons also are able to take advantage of other benefits of the wavefront correction such as iris registration and pupil centroid shift. In cases in which it is impossible to obtain a reliable wavefront standard LVC procedure is a reasonable option.

Assessing the capsule
Make sure that the implant is well-centered and the capsule is clear to assess the status of the implant and capsule. If there is significant capsular opacity or fibrosis, it may be worthwhile to open the capsule with the YAG laser before performing LVC because opacity can interfere with the refraction and the wavefront. It also can be a source of dissatisfaction if the patient has a relatively low refractive error. Even a mild amount of capsular haze can be visually symptomatic, especially in patients with multifocal IOLs.

I wait three to six months before opening the capsule to increase confidence that there will be no IOL dislocation or cystoid macular edema that might develop as a result of opening the capsule. After assessing the capsule I decide whether to perform LVC, piggyback IOL, or IOL exchange. I typically decide to perform LVC due to a well-centered IOL with a low spherical correction or mainly astigmatic correction needed.

To determine the best LVC procedure to use—surface laser procedure or LASIK—look very carefully for anterior basement membrane dystrophy (ABMD), which is more common in the older patients.

Also look at whether a previous astigmatic keratotomy (AK) has been performed. If I have performed previous AK, or if the patient has ABMD, I will lean toward a surface laser procedure such as LASEK or PRK. A surface laser procedure has the advantage of not developing epithelial ingrowth in patients with prior AK or ABMD.

LASIK provides faster visual recovery than PRK in normal cases with a healthy cornea. Most of these cases need a fairly small refractive adjustment, and the treatment and post-op care are done in typical fashion.

Exchanges
In infrequent cases in which a relatively high degree of refractive adjustment is needed the surgeon has several options, including piggyback IOLs and lens exchange.

For example, in a case in which the patient is +4D post-op it may be difficult to correct with LVC; therefore, the implant may need to be modified or exchanged. If an acrylic implant is well-centered in the bag a piggyback implant can be used through a small incision.

My favorite calculation for the piggyback implant is the Holladay 2 formula, which is on Holladay 2 software. You typically will need a low-power IOL, and the Clariflex comes in low power.

Some patients need an IOL exchange due to the anatomy of the eye. For those patients rotate the implant out of the capsular bag and then put the new implant underneath it in the capsular bag before removing the old implant. The implants are easier and safer to remove when there is something in the capsular bag holding the capsule back.

If a post-op refractive adjustment is needed after a multifocal IOL implantation, standard or wavefront-guided LVC is usually the first choice for enhancement—to be performed three to six months after the IOL implantation.

David R. Hardten, M.D., is adjunct associate professor of ophthalmology, department of ophthalmology, University of Minnesota, Minneapolis.
Wavefront-Guided versus Incisional Correction of Astigmatism

Incisional procedures to treat astigmatism are outdated technology

By John Vukich, M.D.

Today it is possible to deliver the best quality of vision as well as correct preexisting astigmatic errors and higher-order aberrations in patients who are undergoing custom cataract surgery.

This concept is applicable for both standard IOLs as well as the newer generation of multifocal IOLs. With multifocals, delivering a specific endpoint that is as close as possible to the patient’s desired outcome is an important aspect of bringing the patient satisfaction.

Cataract surgery is becoming a refractive procedure. The advent of the new multifocal IOLs, which are not covered by Medicare and are thus an out-of-pocket expense, have brought about a different way of presenting this option to cataract surgery patients. This is a consumer-driven market, familiar to refractive surgeons but perhaps new territory to cataract surgeons who want to look at this as an option.

Cataract surgeons who provide dispensing services have some familiarity with this retail concept. For example, patients who pay for their glasses will return if they are not happy with them. They will expect some correction or restitution if there isn’t a satisfactory delivery of what they paid for out of their own pocket.

This is now what surgeons need to deliver with our cataract-refractive operations if we are going to start providing this value-added service—good uncorrected vision or improved uncorrected vision.

As surgeons, we can anticipate that the patient’s expectations will be higher because we are setting our goals higher. Traditionally, we have looked at astigmatic keratotomy (AK)—simple, relaxing incisions to reduce remaining astigmatism. However, these corneal-weakening procedures are not very accurate.

Although wavefront-guided LASIK has eclipsed that first generation of refractive correction, our adoption of the newer techniques for astigmatic control has lagged behind. We still employ the dated method of handling astigmatic correction in a world in which the expectations are increasing.

Our cataract patients can enjoy the same quality or accuracy of endpoint, and we are encouraging our patients to expect this. The way to handle that is clearly moving toward excimer laser.

**Astigmatic correction**

The new generation multifocal IOLs do not correct astigmatism. At least one-third of the patients who have one diopter or more of astigmatism is most likely going to require some adjustments intraoperatively or postoperatively to achieve that uncorrected acuity.

In my practice, I offer patients a package of tiered options regarding astigmatism and enhancements, including: astigmatic control, wavefront custom vision enhancement, and the multifocal IOL.

Patients can decide which is right for them after the options are presented.

The first option is an astigmatic correction with limbal incisions or AK. Physicians can offer patients this simple procedure, done at the time of surgery, for a reasonable fee.

The second option is custom laser vision correction. Cataract surgery is offered as a package with LASIK or Epi-LASIK. This option includes a standard monofocal IOL, usually covered under the standard insurance program.

Custom LASIK is performed six weeks after lens surgery to optimize vision in individuals who have preexisting astigmatism.

They are corrected to plano with a custom-driven WFG ablation. Not only is their astigmatism more accurately corrected, they also have a more defined endpoint of plano or other specified endpoint. (Custom LASIK is not covered by Medicare.)

The third option is the premium package, which includes new generation multifocal IOLs such as ReZoom. Patients receive an endpoint adjustment if necessary, and the deliverable is the best opportunity for near and far vision in one procedure.

The new generation multifocal IOLs can provide spectacle independence while having a low incidence of halos. Hyperopes with cataract are the best candidates for the multifocal IOLs.

We are converting many of our patients to a better endpoint, thereby providing a better service and extremely satisfied patients. As such, we have the ability to deliver a better product, a better service, and a better economic situation for the physicians—all while providing an excellent value to the patient that is acceptable and worthwhile.

**The outlook**

Using wavefront-driven custom corrections to treat astigmatism is a much more accurate and effective method. It becomes increasingly apparent that the era of relaxing incisions using diamond blades is simply no longer state of the art.

John Vukich, M.D., is surgical director of Duehr Dean Center for Refractive Surgery, Madison, Wis.
Managing Non-Candidates for Multifocal IOLs

Some patients are not concerned with spectacle independence and can be served best with a high-quality monofocal IOL

By Mark Packer, M.D.

With all the IOL options available today it is possible to customize the implant based on the patient’s visual desires.

We ask patients if it would be a benefit if they had an implant that would reduce or eliminate their need for reading glasses. Generally, about 50% of patients say they would like to be spectacle independent, while the other 50% say that is not a top priority for them.

Some people prefer wearing glasses. For example, one patient told me she prefers her glasses because her nose is slightly crooked and she doesn’t like the way she looks without them. Therefore, if the most important thing to patients is that the quality of their vision is clear, crisp, and high contrast and they don’t mind wearing reading glasses, then the Tecnis lens is the best choice. If someone wants spectacle independence and is willing to tolerate having halos around lights, a multifocal, such as the ReZoom, is the best choice.

Talking with patients

I explain to my patients who are not looking for spectacle independence that they can be provided with an implant that gives the highest optical quality of any implant today. I tell them there is a very good chance (greater than 90%) they will be able to drive and do other outdoor recreational activities without glasses, yet when they need to read they will wear glasses. They seem very happy with that.

Many of these patients initially come in for cataract surgery complaining about trouble driving at night. Night driving is one of the very first areas in which people have visual difficulty. Based on our investigations, the Tecnis lens will improve their night driving and make them feel more confident.

In February 2006 the Tecnis IOLs (Z9000, Z9001, and ZA9003) qualified for New Technology Intraocular Lens (NTIOL) reimbursement under the new category of “Reduced Spherical Aberration.” This new NTIOL reimbursement status means that reimbursement increases $50 in ambulatory surgery centers. NTIOL status is intended for products with proven outcome benefits for Medicare beneficiaries.

No one IOL fits everyone. People like different things for different reasons. And with the increasing variety of IOLs available individuals can have their IOLs customized. At our practice we spend significant time talking to patients to ensure they get the results they want. As a result, the number of happy patients at our practice has increased.

Then they send their friends and relatives in to see us.

Mark Packer, M.D., is assistant clinical professor of ophthalmology at Oregon Health & Science University, and is in private practice in Eugene, Ore.

New NTIOL Designation for Tecnis IOLs

As of Feb. 27, 2006, Tecnis IOLs (Z9000, Z9001, and ZA9003) qualified for New Technology Intraocular Lens (NTIOL) reimbursement under the new category of “Reduced Spherical Aberration.” This new NTIOL reimbursement status means that reimbursement increases $50 in ambulatory surgery centers. NTIOL status is intended for products with proven outcome benefits for Medicare beneficiaries.

Only Tecnis IOLs have unique, FDA-approved claims for:

- decreased spherical aberration
- improved functional vision
- improved performance on a night driving simulator

“The importance of the NTIOL status is two-fold. First, the Center for Medicare and Medicaid Services (CMS) recognized the significance of the results of the FDA-monitored clinical study, which showed an advantage for patients using the Tecnis implant in terms of their safety in night driving,” says Mark Packer, M.D., assistant clinical professor of ophthalmology at Oregon Health & Science University, who’s also in private practice in Eugene, Ore.

“The second area of importance of the CMS decision is the increased reimbursement to ambulatory surgery centers for NTIOLs. This serves as an incentive for facilities to use new technology with a proven benefit,” he said.

CMS announcement in the Federal Register, Jan. 26, 2006
A pilot study comparing the three non-spherical monofocal IOLs approved by the Food and Drug Administration (FDA) - demonstrated that the Tecnis IOL was the superior lens in terms of reducing spherical aberration to zero, regardless of the patient’s pre-operative spherical aberration.

The study
The purpose of our study was to evaluate the three FDA-approved non-spherical monofocal IOLs: the Tecnis, the IQ lens, and L166 AO from Bausch & Lomb (B&L). The Tecnis lens is designed to reduce spherical aberrations to zero, thus improving quality of vision, night driving, and safety. The IQ lens has a similar claim, although it does not correct as much spherical aberration inside the eye as the Tecnis. Finally, the B&L lens is designed to reduce the spherical abd Drug Administration by the IOL, but it is not designed to correct for spherical aberration inside the optical system of the eye.

For the prospective, randomized double-masked trial patients were randomized to the three lenses in general population to determine if the lenses were beneficial or detrimental to them. They were not screened out, and the lens was not customized based on pre-operative spherical aberration, refraction, or vision.

The two main measures of the study, in addition to visual acuity, were contrast sensitivity and post-operative wavefront measurements for spherical aberration. The data are still being collated, but in the pilot study, which looked at wavefront aberrations, not contrast sensitivity, we found that the Tecnis lens was the superior lens in terms of reducing spherical aberration to zero regardless of the pre-operative spherical aberration. (Figures 1 and 2)

The IQ lens placed second. It corrected less spherical aberration in the eye, but it performed better than the B&L lens, which functioned similar to a spherical lens. The B&L lens doesn’t induce spherical aberration, but it functions like a spherical lens.

We look forward to obtaining and reporting on more thorough data once the other patients are fully enrolled and followed up.

Customizing lenses
In the future we may be able to customize a lens based not just on axial length or lens power, but on a patient’s degree of pre-operative spherical aberration.

Right now, considering the three different non-spherical monofocal IOL choices, the Tecnis appears to be the best choice for 96% of the population. There is perhaps a smaller population for which the IQ may be a little better.

I would be careful about putting in a Tecnis lens for the smallest percentage of patients -maybe 5% that have an unusual spherical aberration value due to a previous hyperopic refractive surgery. Instead, I would implant a spherical lens -in this case probably a B&L lens.

This is the one situation in which the hyperopic treatment induced negative spherical aberration. The Tecnis gives negative spherical aberration, so it would not be a good choice.

Choosing an IOL
We choose the Tecnis for a monofocal aspherical lens unless the patient has had previous hyperopic corneal surgery. We do not pres-elect based on a patient’s pre-operative spherical aberration. In the future ophthalmologists most likely will start doing that as people learn more about the asphericity of the eye and the asphericity of these lenses.

We have an array of IOL choices as clinicians, including multifocal, monofocal, and accommodating IOLs. When I talk to patients, I present all the choices to them in terms of the presbyopic IOLs, the multifocal IOLs, and the accommodating IOLs. We discuss their visual needs and we try to determine how important is it for them to be free from reading glasses.

If they desire spectacle independence, we spend time talking multifocal and accommodating lenses. If they say spectacle independence is not a priority, I go into the monofocal lens talk, and then we discuss the benefits of the Tecnis and how it improves night vision and quality of vision in general.

Cataract-refractive surgery
The Tecnis is an excellent stepping stone for surgeons with cataract practices who are looking to expand into refractive IOLs like the presbyopic correcting IOLs. This lens was designed with the latest wavefront refractive technology, and it has the NTLIO (New Technology Intraocular Lens) status.

Cataract surgeons can tell their patients and staff that they are using the latest wavefront technology for all their cataract patients, just like they would for their refractive patients.

Y. Ralph Chu, M.D., is medical director, Chu Vision Institute, in Edina, Minnesota.

By Y. Ralph Chu, M.D.