Strategies for Success With Five Refractive IOLs

Crystalens HD

BY STEPHEN G. SLADE, MD

The Crystalens (AT-45; Bausch & Lomb, Rochester, NY) has evolved over time to provide not only better results for the patient but also an improved experience for the surgeon. Introduced in 2008, the Crystalens HD (Bausch & Lomb) features a modified central optic that provides a greater depth of field while maintaining excellent quality of vision (Figure 1). The implantation of this model of the lens differs little from the placement of a standard IOL. Moreover, there does not seem to be a significant increase in complications (eg, posterior capsular opacification, residual ametropia) with the Crystalens HD. This article shares a few important pearls for improving results with this accommodating lens.

PATIENT SELECTION

I have found that, when properly used, the Crystalens HD provides excellent surgical results and high patient satisfaction. Seventy percent of my total cataract surgery population receives this lens. The HD is now the overwhelming Crystalens model of choice for all eyes suited to its power range (Figure 2).

My rule is to select patients with visually significant cataracts and treat them like refractive surgery patients. Although the Crystalens HD is an excellent choice for high myopes or hyperopes undergoing refractive lens exchange, my most satisfied patients are those for whom surgery removes cataracts and addresses presbyopia as well as any refractive errors. Patients with clear crystalline lenses who are presbyopic with a plano or slightly myopic refraction are the most challenging to please. It is important to remember that these individuals have healthier eyes than traditional cataract surgery patients, they are paying out of pocket for much or all of the surgery, and they have the expectations of a refractive surgery patient.

THE CONSULTATION

Perhaps the most important part of the consultation about premium IOLs involves ensuring that patients have realistic expectations for the technology. It is important to find out what they expect and want from the procedure. For which tasks do they want to give up glasses, and for which are they more willing to use them? I discuss with patients their targeted refraction and need for glasses postoperatively. I find that it is better for patients to expect to wear glasses after surgery and be pleasantly surprised not to need them than to be disappointed with an outcome that they

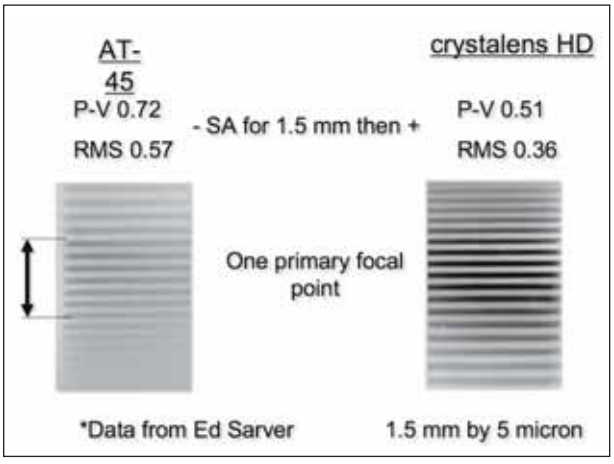

Figure 1. Although the Crystalens HD provides superior near vision, it does not appear to reduce quality of vision compared with the AT-45 lens, which has a conventional monofocal optic.

were not told was possible. One technique I use to set realistic expectations for patients is to have them note in their chart before surgery the frequency with which they use reading glasses. I also have them mark the smallest line they can read preoperatively on a printed near card, which is also placed in their chart. After surgery, we can compare this information to their postoperative outcome.

Surgeons should describe to patients all of their practical options. They should understand the risk and benefits of their chosen procedure and technology. Surgeons should also review with patients any unique characteristics that could influence their visual outcome such as astigmatism, ocular surface disease, and reduced retinal potential. They need to understand that, in most cases, IOL surgery is part of a larger process that will include follow-up visits and, perhaps, glasses, a YAG laser procedure, and enhancement surgery.

Finally, it is important to make sure that patients understand that they might not receive the planned lens. For example, the Crystalens HD should not be implanted in a significantly torn capsule.

SURGICAL PLANNING

I recommend operating first on the eye for which surgery has the best chance to improve the patient's overall vision. It could be the dominant eye or the worse-seeing eye. Of course, IOL calculations should be as accurate as possible. Surgeons should measure keratometry before instilling any drops and after the eye has stabilized from contact lens wear. I suggest using the IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA) or immersion A-scans and making sure that the readings correlate with the patient's oldest refractions. I use the SRK-T formula for eyes with axial lengths over 22 mm and the Holladay formula for eyes with axial lengths of less than 22 mm plus keratometry readings outside of 42.00 to 47.00 D. I still aim for a small degree of monovision, between -0.25 and -0.50 D, in most cases.

SURGICAL TECHNIQUE

My surgical technique with the Crystalens HD is essentially the same as my standard cataract technique. Certainly, implanting this accommodating lens is no harder and takes no longer than placing a spherical monofocal lens. As with all cataract surgery, it is important to construct a watertight incision. I make a near-clear corneal incision with a tunnel that is 3 mm wide and at least 3 mm long. I make sure that the stab incision is also a long tunnel and watertight. I create a round capsulorhexis of at least 6 mm, although this diameter is fairly forgiving. I want the haptics covered

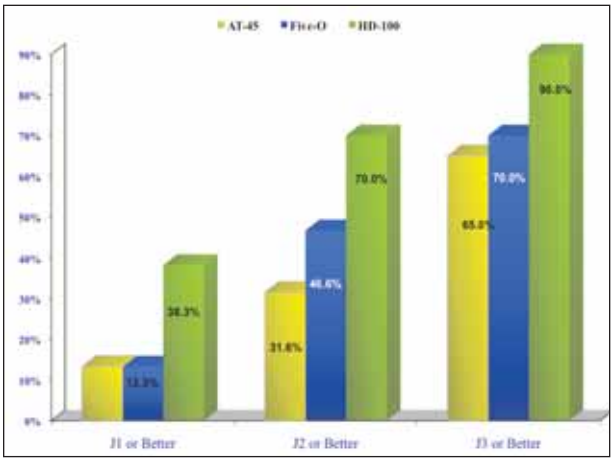

Figure 2. The Crystalens HD offers a significant improvement in patients' ability to read without glasses, as shown in this comparison of monocular distance-corrected near visual acuity between three models of the Crystalens.

by the capsule but the capsule off the optic. As with all my cataract cases, I try to clean the capsule of all residual cortex.

Perhaps my top surgical pearl is to ensure that the lens vaults posteriorly and stays that way. I rotate the IOL vertically after its temporal implantation (I use an inserter). I rock the lens to make sure its haptics are positioned in the equator of the capsular bag and the optic is posteriorly positioned. At the end of the case, I check the main incision as well as the paracentesis to ensure that they are watertight. Hydroinflation and/or a suture may be used as necessary. I, and most users of the Crystalens HD I know, do not use drugs to dilate or constrict the pupil.

POSTOPERATIVE COURSE

I encourage patients to read at all distances after surgery. I instruct them to use steroids and an NSAID for 6 to 8 weeks after surgery. I do not prescribe postoperative atropine. I tend to treat clouded posterior capsules with the YAG laser a bit earlier after premium lens surgery than standard cataract surgery. It is best to delay any enhancement procedure until after the YAG procedure, however, so that the lens is in its final position for the best final refractive result. I keep the capsular opening within the diameter of the optic to prevent vitreous from coming forward around the lens.

In my experience, patients who receive premium IOLs are less tolerant of a decrease in vision after surgery than those who receive standard spherical lenses. I therefore aggressively investigate any decrease in acuity with retinal examinations and optical coherence tomog-

raphy, if needed. I make sure the ocular surface is optimal, and I am more aggressive in treating residual refractive errors. I rely much more on LASIK or PRK than incisional refractive surgery with my cataract patients. If needed, I will show patients the paper indicating their preoperative use of readers and their preoperative near card, and I will compare them with their current results. This demonstration is helpful, because patients are typically quite impressed with their improvement. Finally, surgeons should congratulate their patients; they had a lot to do with their results and certainly had a lot on the line.

CONCLUSION

I often wonder why ophthalmologists implant so few premium IOLs. I do not think the obstacle is resistance to pricing from patients. Although they must weigh value versus cost, patients only get one chance to have a premium lens implanted at the time of cataract surgery—not the situation with refractive surgery. I think the issue is surgeons do not feel confident that they can deliver the results patients want. I believe improved technology like the Crystalens HD and future technical enhancements such as cataract removal with a femtosecond laser will change this situation.

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ReZoom Multifocal IOL

BY PARAG A. MAJMUDAR, MD

The ReZoom multifocal IOL (Advanced Medical Optics, Inc., Santa Ana, CA) is a valuable tool in the arsenal of the refractive cataract surgeon. The lens represents a technological advance compared with first-generation multifocal IOL technology. Although the first-generation multifocal IOLs were composed of silicone, the ReZoom multifocal IOL is made from a hydrophobic acrylic material with Balanced View Optics technology and a patented OptiEdge Design (Figure 1).

With Balanced View Optics, the optical zones are proportioned to provide good visual function across a range of distances in various lighting conditions. In addition, an aspheric transition between zones provides critical intermediate vision, which is important for tasks such as using a computer. The lens' near add is greater than that of the Crystalens Five-O (Bausch & Lomb, Rochester, NY) but less than that of the AcrySof IQ Restor IOL +4.0 D (Alcon Laboratories, Inc., Fort Worth, TX). The advantage of the ReZoom over other lenses is that, when used in properly selected patients, it provides good visual function at distance, intermediate distance, and near. The low-powered AcrySof IQ Restor IOL +3.0 D (Alcon Laboratories, Inc.), which recently received FDA approval, attempts to capture more intermediate vision than its predecessor and may provide intermediate vision similar to that offered by the ReZoom.

The OptiEdge Design allows the ReZoom lens to have a rounded anterior edge, which reduces internal reflections, a sloping side edge, which helps to lessen edge glare, and a square posterior edge that facilitates 360° capsular contact and may minimize the incidence of posterior capsular opacification.

The ReZoom is a three-piece lens that allows for stable fixation in the capsular bag or in the ciliary sulcus. The latter positioning is important in rare instances of intraoperative capsular compromise following the lens' implantation. In this situation, the ReZoom IOL can be safely and quickly fixated in the sulcus, whereas a single-piece IOL would require explantation and replacement.

PATIENT SELECTION

The ReZoom lens delivers a high rate of spectacle independence, with more than 92% of patients never or rarely wearing glasses.[1]

As with all refractive IOLs, there are a number of issues with which the refractive cataract surgeon must be intimately familiar. A failure to adhere to these principles will most likely result in an unhappy patient (and surgeon).

When I first began practicing refractive surgery in 1997, a major point of any LASIK course was careful patient selection based on psychosocial factors. Although physical criteria, such as topography to rule out keratoconus suspects, still hold a prominent place in refractive surgery circles, physicians have discussed psychosocial factors in refractive surgery less frequently over the years. Those issues are of paramount importance, however, in the candidacy of patients for premium IOLs. Although the majority of patients undergoing cataract surgery will physically qualify for these lenses, surgeons should not implant the IOLs without careful consideration.

Each prebyopia-correcting IOL has unique advantages and disadvantages. Matching the properties of the lens to the needs and desires of the patient is the true chal-

lenge that refractive cataract surgeons face today. For example, a 52-year-old hyperope either develops cataracts or is interested in refractive lens exchange. He is active in the workforce and spends much of his time behind a computer. This patient may be unhappy with a lens that does not provide sharp vision at intermediate distance.

It is imperative to understand the limitations of each lens type and to choose the IOL that best meets the visual requirements of the patient.

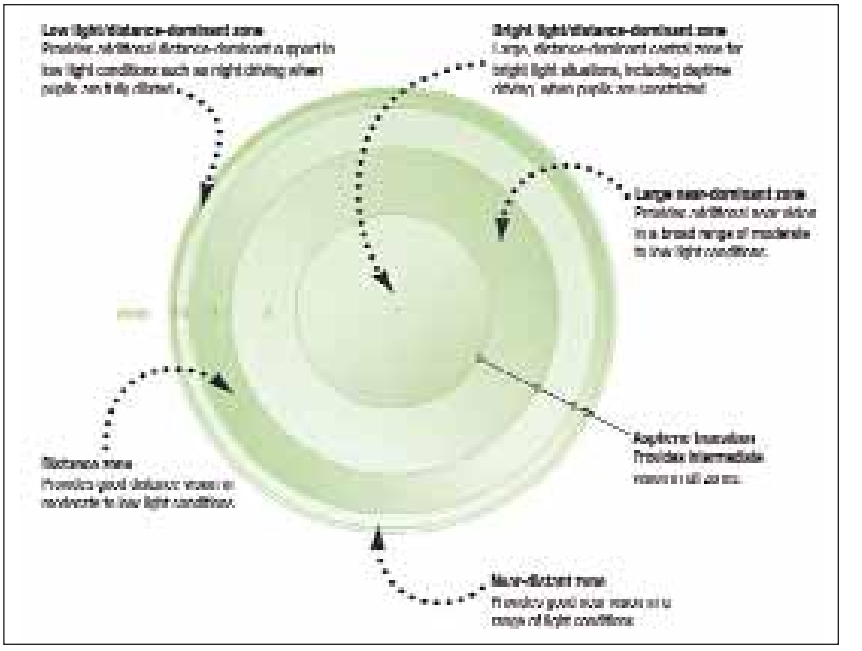

Figure 1. The schematic of the ReZoom multifocal IOL.

CONSIDER PATIENTS' EXPECTATIONS

Regardless of the selected IOL, patients must have realistic expectations. The goal of premium IOL surgery is to reduce, not eliminate, their need for reading glasses. A careful preoperative discussion of realistic goals with the patient by the surgeon and staff will help ensure that postoperative problems will arise with much less frequency. A questionnaire may help facilitate this discussion with the patient. I ask patients to fill out the survey in the office prior to seeing me so that I can tailor the conversation to their needs.

PROS AND CONS

Although the ReZoom's major benefit is its ability to improve a patient's spectacle independence for tasks at intermediate distance, the main limitation of this lens (and many multifocals) is its propensity for creating unwanted visual symptoms at night, such as glare and halos. It is important for surgeons to disclose preoperatively the potential for halos. In addition, although the majority of patients with the ReZoom lens will experience improvement in their symptoms during the first 6 to 12 months postoperatively due to neuroadaptation, I would advise patients who require excellent visual acuity at night for occupational reasons to consider an accommodating lens or monovision (ie, not with multifocal implants) for their presbyopic correction.

OPTIMIZING OUTCOMES

Precise biometry is critical, as the final refractive error may result in less-than-optimal results. Immersion A-scan or laser interferometry such as the IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA), rather than contact A-scan, is the preferred method for obtaining the most accurate measurements of axial length. It is important to know the specific refractive target for each lens type, as it may differ. For the ReZoom lens, I typically target a postoperative refraction of plano to -0.25 D. Another important tip is to control astigmatism, both preexisting and surgically induced.

CONCLUSION

My experience with presbyopia-correcting IOLs in general, and the ReZoom multifocal IOL in particular, has been excellent. In the carefully chosen patient population, these lenses, even at this early stage in their evolution, have exceeded my expectations. More lenses will become available in the near future. It is a great time to be a refractive cataract surgeon!

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AcrySof IQ Restor IOL

BY SAMUEL MASKET, MD

Given appropriate patient selection, meticulous surgery, and the attainment of emmetropia with a postoperative optical enhancement as needed, you can achieve marked success and spectacle independence for your patients with the AcrySof IQ Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX). This article shares 10 tips based on my experience for attaining the desired outcome with the +4.0 D IOL. No one step is more important than another. Although this article was written before the release of the +3.0 D model, its advice should be applicable to that lens as well.

No. 1. UNDERSTAND HOW THE LENS WORKS

The optic consists of a 6.0-mm lens, with the central 3.6 mm containing the apodized diffractive component and the peripheral portion providing monofocal distance correction; 10 µm of negative asphericity is added to the anterior peripheral surface. When the pupil is small, light energy is approximately equally divided between distance and near functions. This is an intuitive design concept, as the pupil constricts when patients read the newspaper, for example. During tasks requiring distance vision, such as night driving, the pupil dilates, allowing more of the light energy to be employed for distance vision while the aspheric aspect improves the quality of vision in dim light.

Approximately 20% of light energy is lost due to scattering in a diffractive optical system, so do not expect the AcrySof IQ Restor IOL to work as well in eyes that have reduced contrast sensitivity function. Also bear in mind that patients with atypically large pupils may have difficulty with reading.

Neuroadaptation is a factor with this multifocal lens as with others. In a study by Souza et al,[1] patients demonstrated improved visual function over time with the original AcrySof Restor lens (Alcon Laboratories, Inc.) but not the monofocal control. The eyes that received the multifocal lens were noted to have improved vision at both far and near 4 to 6 months after surgery, whereas the eyes with the monofocal control IOL revealed no change in visual function over time.

No. 2. IMPLANT THE SAME IOL BILATERALLY

Current presbyopia-correcting IOLs represent a compromise between the quest for best vision and the desire for spectacle independence. None offers perfect (or seamless) vision over the full range of functional distances, so patients may occasionally need spectacles.

Cerebrocortical summation of binocular visual input allows both of the patient's eyes to achieve a higher quality of vision than either eye alone can provide. Summation is lost if the two eyes have different images. I feel that this loss is deleterious to the quality of vision and affects patients with monovision or a different presbyopia-correcting IOL in each eye. As shown in Figures 1 and 2, there is a marked improvement in visual acuity with the AcrySof IQ Restor IOL when the patient uses two eyes versus one.

No. 3. CORRECT FOR OR CONTROL ASTIGMATISM

Because multifocal IOLs divide light energy between distance and near visual functions, there is a predictable loss of contrast sensitivity and an increased requirement for emmetropia. It is therefore important to address corneal cylinder in order to maximize the performance of the AcrySof IQ Restor IOL. Most eyes do not require astigmatic treatment, but the surgical induction of significant corneal astigmatism can produce unsatisfactory outcomes with this lens. For that reason, I routinely

Figure 1. Six-month data on uncorrected distance visual acuity with the AcrySof Restor IOL.[2]

remove the cataract with microcoaxial phacoemulsification and implant the single-piece AcrySof IQ Restor IOL through a 2.2-mm temporal corneal incision, which I find to induce significantly less cylinder than 3.0-mm incisions.[3]

Peripheral corneal relaxing incisions can address up to 2.00 D of preexisting astigmatism. Eyes with greater degrees of presurgical corneal astigmatism will likely require laser vision correction after the healing period in order to achieve satisfactory results. It is important to explain the probable need for an additional procedure to patients before cataract/IOL surgery. In some cases, it may be appropriate to create the LASIK flap prior to cataract surgery so it may be lifted as early as desired postoperatively, thereby avoiding a prolonged optical rehabilitation.

No. 4. USE ACCURATE BIOMETRY AND THE LATEST-GENERATION IOL POWER FORMULAE

I find partial coherence interferometry with the IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA) to be the most reliable device for measuring axial length, although immersion A-scan ultrasonography is also very accurate. I use the axial length value to determine which IOL power formula to apply. In general, I prefer the Hoffer Q for eyes that are shorter than 22.5 mm, the SRK-T for eyes that are longer than 24.0 mm, and the Holladay I for eyes of average length. The Haigis formula, however, which is available with the IOLMaster, is valuable for all axial lengths, as is the Holladay II. I do not hesitate to implant the AcrySof IQ Restor IOL in eyes that have undergone laser vision correction. I employ my personalized regression formula when data on the laser vision correction are available and use the Haigis-L formula when these details are unavailable.[4]

No. 5. BE WILLING AND ABLE TO ADJUST OR ENHANCE THE OPTICAL RESULTS OF SURGERY

All IOL power formulae are potentially flawed, and a given percentage of patients (generally 10% to 20% in my experience) will require an additional procedure(s) in order to achieve freedom from spectacles, the primary goal for the use of the AcrySof IQ Restor IOL.

Enhancements may include any procedure designed to achieve spectacle independence. You and your patients must be aware that an enhancement is an integral part of success with premium IOLs. I have found that some patients have simple optical errors that are not easily discernible with standard clinical refraction. The use of wavefront analysis helped to uncover these errors in a few cases.

In my experience, in the absence of pathology, emmetropic patients will uniformly see well at distance and near with the AcrySof IQ Restor IOL. I believe that the phenomenon termed *waxy vision* that some surgeons have attributed to the AcrySof Restor IOL most likely represents unrecognized ametropia rather than higher-order aberrations. Surgeons who offer a full array of refractive procedures will personally be able to manage most patients' needs in relation to enhancements. Those who do not will need to share the management of patients with other specialists.

No. 6. KNOW THE PATIENT

A careful and complete ocular evaluation is necessary to rule out certain, sometimes subtle, conditions that could make the outcome less than desirable. Examples include corneal anterior basement membrane dystrophy, significant heterophorias that require prismatic correction, epiretinal membrane, diabetic maculopathy, significant glaucomatous damage to the optic nerve, and unusually large pupils.

A working knowledge of the patient's lifestyles, hobbies, and employment is essential to success, particularly in regard to patient selection. For instance, individuals who drive at night as part of their profession are not

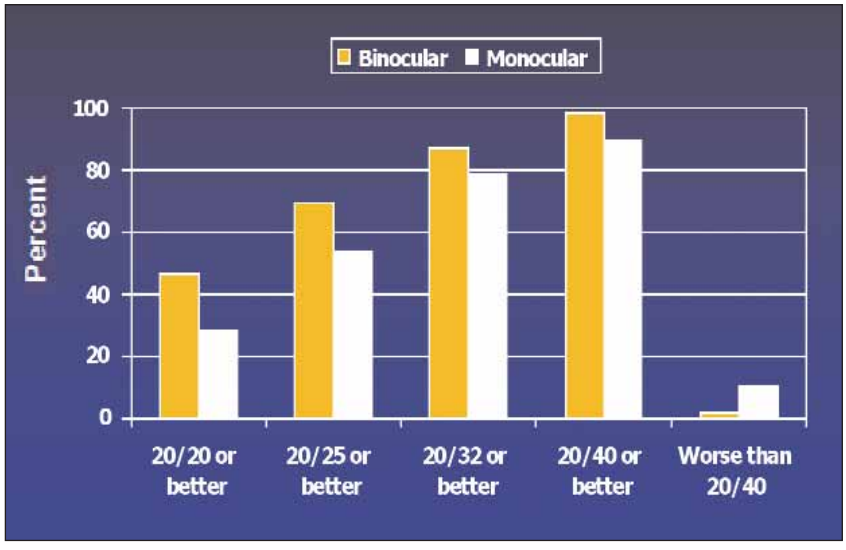

Figure 2. Six-month data on uncorrected near visual acuity with the AcrySof Restor IOL.[2]

ideal candidates for the AcrySof IQ Restor IOL. In general, highly demanding or negative personality types are poor candidates for any multifocal lens.

No. 7. EXPLAIN THE LENS' STRENGTHS AND WEAKNESSES

Patients must have an objective view of the benefits and drawbacks of any IOL technology, particularly when they are paying a premium for it. I inform them of the FDA trial results for the AcrySof IQ Restor IOL in terms of spectacle independence, patients' satisfaction, and the incidence of unwanted visual phenomena.

No. 8. ESTABLISH CREDIBILITY WITH BOTH STAFF AND PATIENTS

Teaching aids are valuable but serve only a partial role in the education of patients. They look to their physician for information on premium IOLs and which design is best for them. Often, patients ask whether I would implant a given device in my relatives. Knowing that I implanted the AcrySof IQ Restor IOL in my sister's eyes greatly augments patients' confidence in the technology and enhances my credibility.

I also recommend holding educational seminars for your office staff so that they are fully aware of the lens and your belief in it. When possible and appropriate, it could be beneficial to implant the IOL in the eyes of a staff member or his close relative.

No. 9. PERFORM IMPECCABLE SURGERY

The quality of surgery can have a definite impact on surgical outcomes and, in turn, patients' satisfaction. It is essential to limit postoperative corneal astigmatism to less than 0.50 D in all cases. Measure outcomes with regard to the mean amount of astigmatism induced by your incisional method and create clean, reproducible incisions, preferably without sutures, which have an effect on postoperative astigmatism. The capsulorhexis must be well centered and correctly sized (approximately 5 mm) so that it fully covers the edge of the lens.

It is beneficial to align the center of the optic with the patient's visual axis. After removing the viscoelastic at the end of the surgery, I ask the patient to look directly toward the microscope light's filament (it is a good idea to reduce brightness at this stage of the surgery), and I nudge the IOL with a small cannula through the side-port incision to facilitate the process.

No. 10. UNDER PROMISE AND OVER DELIVER

Paying for premium IOLs can strongly affect patients' view of the procedure. Some patients may not adapt well to their new vision until after the surgery on their second eye, and a significant number of them will require an enhancement procedure for best results. For these reasons, it is important to foster a comfortable partnership with patients. They should feel confident that you are concerned about their welfare, capable of managing problems, and able to adjust the optical outcome of their surgery if necessary. The more consultative chair time you spend prior to surgery, the less will be needed afterward.

Adapted from Masket S. Alcon Restor multifocal clinical pearls. In: Chang DF, ed. Mastering Refractive IOLs: The Art and Science. *Thorofare, NJ: Slack Inc.; 2008:125-129.*

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Tecnis Multifocal IOL

BY FARRELL "TOBY" TYSON, MD

The Tecnis Multifocal IOL (Advanced Medical Optics, Inc., Santa Ana, CA) (Figure 1) has been available in Europe and Canada for several years, and it has now been approved for clinical use in the United States. This article describes the design of the Tecnis Multifocal IOL and presents tips for its successful use.

DESIGN

The three-piece hydrophobic acrylic Tecnis Multifocal IOL consists of a 6.0-mm diffractive optic designed with a square posterior edge and a round anterior edge. The latter feature is intended to minimize dysphotopsias that can occur with square-edged optics. In addition, the optic incorporates a +4.00 D add for near vision (approxi-

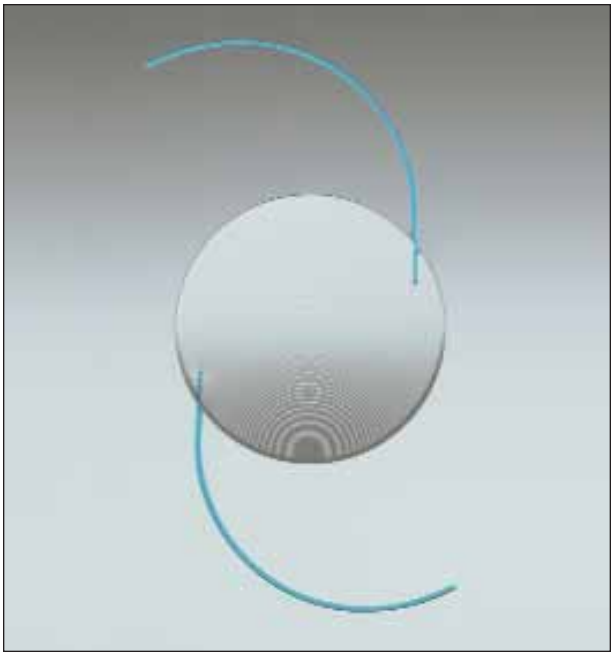

Figure 1. The Tecnis Multifocal IOL.

mately 3.25 D add at the spectacle plane) and an anterior modified prolate aspheric design that corrects for 0.27 µm of positive spherical aberration. The designers chose this value to correct fully the 0.27 µm of positive spherical aberration that naturally occurs in the cornea of the average cataract patient.[1] Studies have shown that reducing spherical aberration increases contrast sensitivity and the quality of vision.[2]

PATIENT SELECTION

The first step in evaluating patients is to decide if they are potential candidates for multifocal technology. I recommend starting with patients whose ocular pathology is limited to cataract and expanding your patient pool as you become more comfortable with the lens.

Although the full diffractive optic of the Tecnis Multifocal IOL facilitates near vision over a wide range of pupillary sizes and lighting conditions, patients whose pupils are fixed and miotic probably will not benefit from the lens' aspheric design. The lens also may not be suitable for patients who previously underwent refractive surgery for high hyperopia, because its aspheric design could exacerbate the negative spherical aberration of their cornea and cause glare and halos. In contrast, myopic refractive surgery tends to cause a high degree of positive corneal spherical aberration. Patients who previously underwent this procedure could therefore benefit from the negative spherical aberration provided by the Tecnis Multifocal IOL, as long as you consider the potential for variable refractive outcomes or refractive surprise. In some cases, patients who had refractive surgery to correct myopia might benefit more from an aspheric monofocal IOL than from a multifocal IOL.

PREOPERATIVE EVALUATION

The accuracy of preoperative biometric measurements can make or break your refractive cataract surgery practice. Instead of performing contact ultrasound, which exerts inconsistent amounts of pressure on the cornea and allows for too much variability in measurements, I recommend evaluating every patient with immersion ultrasound or the IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA).

Although keratometric readings do not need to be as precise as biometric measurements, the former must be reproducible. I have found that optimized third- or fourth-generation IOL formulas will adjust for slight inaccuracies and provide the most predictable postoperative refractive outcomes.

When I select a lens power for a patient, I usually target a plano refraction. A slightly hyperopic result will not significantly affect the patient's distance vision, and it will provide a more relaxed reading position. A small amount of residual myopia also affects distance vision minimally and requires the patient to use a slightly closer reading position. I do not like to target residual myopia; too much will leave the patient with poor distance vision and an unacceptably close reading position.

If you cannot target plano and must choose between a slightly hyperopic or myopic result, I suggest erring on the side of undercorrection. This option will leave a fudge factor if the patient needs limbal relaxing incisions to resolve residual astigmatism. Limbal relaxing incisions maintain spherical equivalence but induce a perceived hyperopic shift.

THE MECHANICS OF IMPLANTATION

The Tecnis Multifocal IOL can be implanted through a 2.5-mm corneal incision with the Emerald Series injector (Advanced Medical Optics, Inc). The injector uses a screw-drive mechanism to deliver the IOL into the capsular bag in a slow, controlled manner. The capsulorhexis should measure approximately 5.5 mm and overlap the edge of the optic to allow for good centration and minimize dysphotopsias. The placement of the diffractive zones on the posterior surface of the optic allows the surgeon to manipulate the lens inside the patient's eye without damaging the diffractive rings.

CLINICAL OUTCOMES

As an investigator in the FDA's clinical trials of the Tecnis Multifocal IOL, I implanted the lens in both eyes

of 38 patients. None of them was allowed to undergo a postoperative refractive enhancement for 12 months.

By 4 to 6 months postoperatively, 24% of my patients had UCVAs at distance of 20/16 or better, and 97% saw 20/32 or better uncorrected at distance. Because the patients' uncorrected near vision was optimal at 37 cm (vs the predicted 33 cm), their reading vision was closer to the range of 40 to 44 cm that would be seen in a 2.25 to 2.50 D bifocal add. At a 37-cm reading distance, 22% of my patients had uncorrected vision of at least 20/16, and 100% saw 20/32 uncorrected.

A comparison of the patients' postoperative monocular versus binocular near vision showed that they gained approximately 1.5 lines of vision through cerebral summation. Their vision at intermediate distance was quite functional and appeared similar to that provided by the ReZoom Multifocal IOL (Advanced Medical Optics, Inc.).

Postoperatively, 87.5% of my patients stated that they never wore glasses. Although patients did describe seeing glare and halos (primarily at night), only one patient was bothered enough by glare to state on a questionnaire that, given a second chance, he would not have chosen to have the Tecnis Multifocal IOL implanted in his second eye. I found that the nighttime glare reported by my patients who received the Tecnis Multifocal IOL was similar to that described by my patients who have received the AcrySof IQ Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX) despite the two lens' different designs.

The AcrySof IQ Restor IOL is more distance dominant with large pupillary sizes compared with the Tecnis Multifocal IOL. The latter IOL reduces 2.7 times more spherical aberration than the AcrySof IQ Restor IOL and therefore should reduce glare more effectively. The Tecnis Multifocal IOL's full diffractive optic appears to offset the lens' ability to reduce glare, which would explain why I did not observe a noticeable difference in the number of complaints I received from patients implanted with this lens and those with the AcrySof IQ Restor IOL.

MORE OPTIONS, BETTER OUTCOMES

The Tecnis Multifocal IOL provides another option for treating presbyopia in patients undergoing cataract surgery. Currently, no IOL is right for every patient, so surgeons still need to customize the choice of IOL to meet each individual's visual needs. The Tecnis Multifocal IOL's ability to reduce spherical aberration (reportedly improving contrast sensitivity), provide an expanded working range, and cause less perceived glare compared with other multifocal IOLs may translate into a higher degree of satisfaction among surgeons and patients.

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Tetraflex Lens

BY WILLIAM B. TRATTLER, MD

Refractive cataract surgeons have a number of options for patients desiring a presbyopia-correcting IOL. Over the past few years, many of the currently available FDA-approved IOLs have been enhanced, as evident in the AcrySof IQ Restor IOL +3.0 D (Alcon Laboratories, Inc., Fort Worth, TX) and the Crystalens HD (Bausch & Lomb, Rochester, NY). The newer versions of these multifocal and accommodating IOLs appear to provide improved visual outcomes with fewer adverse events than the earlier models.

Several presbyopia-correcting IOLs are in development and, one hopes, nearing FDA approval. The Tecnis Multifocal lens (Advanced Medical Optics, Inc., Santa Ana, CA) just reached this goal. The next year or so may bring two accommodating lens technologies to the US market, the Tetraflex IOL (Lenstec, Inc., St. Petersburg, FL) and the Synchrony IOL (Visiogen, Inc., Irvine, CA).

During the past 2 years, I have had the opportunity to observe the patients in whom I implanted the Tetraflex lens as part of the US phase 3 clinical trial (Figure 1). Overall, the lens has performed well in terms of uncorrected distance and near vision. This article shares some advice based on my experience for maximizing success with this IOL.

ABOUT THE LENS

The Tetraflex is an acrylic single-piece PCIOL (Figure 1) that features an ultraviolet-light blocker. Unlike the posteriorly vaulted Crystalens HD, the Tetraflex is anteriorly vaulted. It has a 5.75-mm optic, which is significantly larger than that of the Crystalens AT-45 IOL (Bausch & Lomb). The Tetraflex lens has square edges and is designed for insertion through an incision as small as 2.20 mm. The lens is theorized to accommodate based on vitreous pressure. As the eye accommodates, contraction of the ciliary body increases vitreous pressure, leading to an increase in the anterior vault of the IOL.

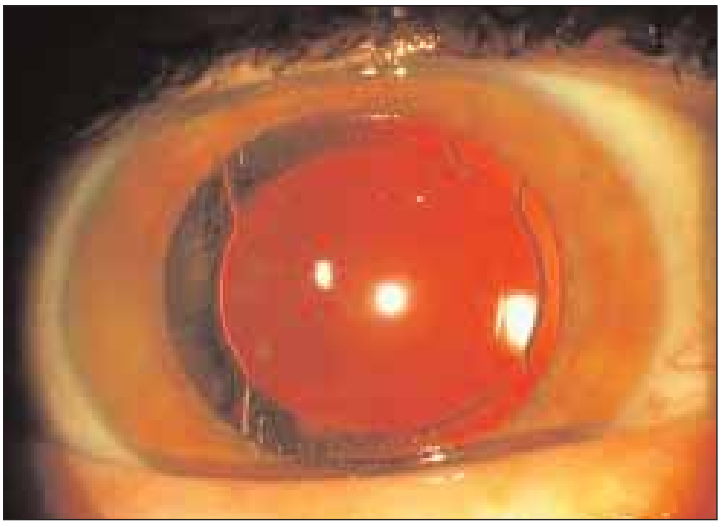

Figure 1. The Tetraflex lens after implantation.

The process of accommodation therefore causes the IOL to vault forward and induce some myopia while the pupil constricts.

As part of the multicenter phase 3 study, investigators have been performing a variety of tests to help determine the degree of accommodation provided by the Tetraflex lens as well as its ability to improve near vision compared with a monofocal IOL. MN Read Functional Vision testing illustrates the impact of a presbyopia-correcting IOL on the activities of daily living. This test times patients while they read various sizes of print. Subjects with bilateral Tetraflex IOLs were tested with their distance correction in place at their 1-year postoperative visit, and their results were compared to those for a control group that had received bilateral monofocal STAAR collamer IOLs (STAAR Surgical Company, Monrovia, CA).

There was a statistically significant difference in reading speed between the two groups at the 20/40 Snellen line, which is smaller than the text used in classified advertising and telephone directories. Patients with bilateral Tetraflex IOLs had an average reading speed of 63 words per minute compared with an average of 26 words per minute in the control group. The smallest line that could be read in the control group was 20/32, whereas some patients in the Tetraflex group could read the 20/20 line, even though subjects were tested when wearing their distance correction. Investigators administered the MN Read Functional Vision test 6 months, 1 year, and 2 years postoperatively. The reading speeds in patients with bilateral Tetraflex lenses were stable over this time period.

The current American National Standards Institute's standard for accommodating IOLs suggests that the proportion of patients reading at a speed of 80 words per minute or faster is a clinically significant endpoint. The study found that the proportion of patients reading at least 80 words per minute was both clinically and statistically significantly better with the Tetraflex IOL than with the control IOL for the 20/32, 20/40, 20/50, and 20/80 lines.

ADVICE

One of the keys to success with patients in the clinical study of the Tetraflex lens was patient selection. Subjects had less than 1.00 D of preoperative astigmatism, healthy maculas, and a healthy ocular surface.

Overall, my patients have reported that their distance vision is excellent and that their vision at intermediate distance and near is functional. As with all IOLs, a percentage of recipients will develop posterior capsular opacification (PCO). Following YAG capsulotomies, patients with reduced vision due to PCO noted a return of their vision at distance, intermediate distance, and near. I therefore find that identifying and treating PCO allows patients to avoid experiencing a significant decline in their visual function.

It is important to pay close attention to patients' ocular surface, tear film volume, and lid margins. Dry eye and meibomian gland dysfunction can negatively affect the tear film and potentially degrade the performance of any presbyopia-correcting IOL, including the Tetraflex. Identifying and treating patients who have a compromised tear film prior to surgery has improved my success with presbyopia-correcting IOLs.

CONCLUSION

My 2 years of experience in the study of the Tetraflex IOL has given me confidence in this lens' ability to provide better visual results at distance, intermediate distance, and near than the monofocal control IOL. I look forward to having this lens as an option for patients interested in presbyopic correction. As with other IOLs, patient selection and an attention to ocular health will be key to success with the Tetraflex lens once it becomes available. ■

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