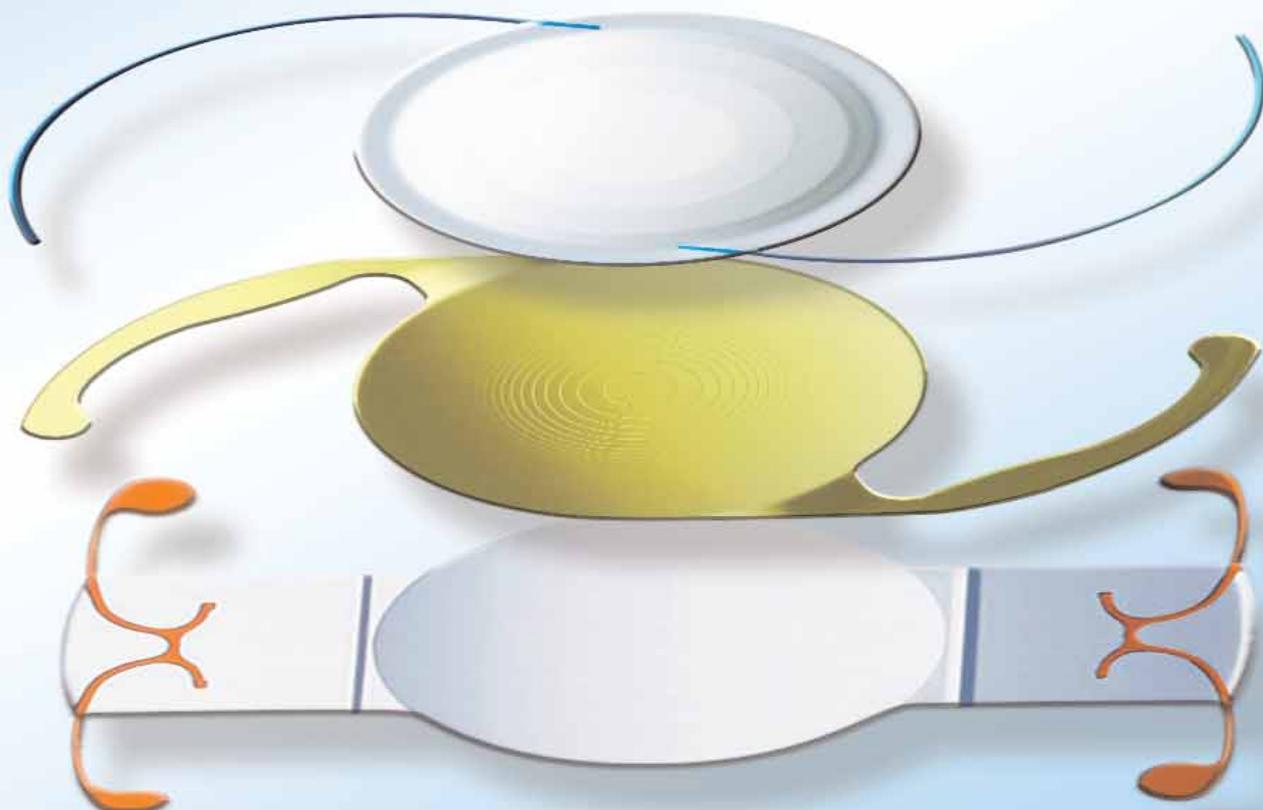


# Annual IOL Issue

## IOL Options in 2008

Every year, *Cataract & Refractive Surgery Today* convenes a roundtable of opinion leaders on IOLs without any sponsorship from industry. Our goal is to discuss controversial topics with surgeons who have differing opinions and experiences. This year, we gathered several leading refractive IOL surgeons at the AAO Annual Meeting in New Orleans to talk about what is new and different in their practices.

—David F. Chang, MD, Chief Medical Editor



## PARTICIPANTS



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## CURRENT PRACTICE

**Chang:** As has been the case for the past several years, presbyopia-correcting IOLs are the foremost topic on every cataract and refractive surgeon's mind. Let me begin by asking everyone to summarize his current preferences with these IOLs.

**Tipperman:** I focus on cataract and anterior segment surgery, and I have primarily been using the AcrySof Restor Aspheric IOL (Alcon Laboratories, Inc., Fort Worth, TX) bilaterally.

**Pepose:** My practice is mostly cornea, cataract, and refractive surgery. I prefer accommodating lenses, but sometimes I will mix IOL types.

**Knorz:** I offer refractive surgery, both corneal and intraocular. My patients receive phakic IOLs or undergo refractive lens exchange, for which my standard protocol is to mix lenses. I am using the ReZoom Multifocal IOL (Advanced Medical Optics, Inc., Santa Ana, CA) predominantly and the Tecnis Multifocal IOL (not available in the US; Advanced Medical Optics, Inc.).

**TABLE 1. A COMPARISON OF THE CRYSTALENS 4.5 AND THE CRYSTALENS FIVE-O**



**Crystallens 4.5  
(AT45SE)\***

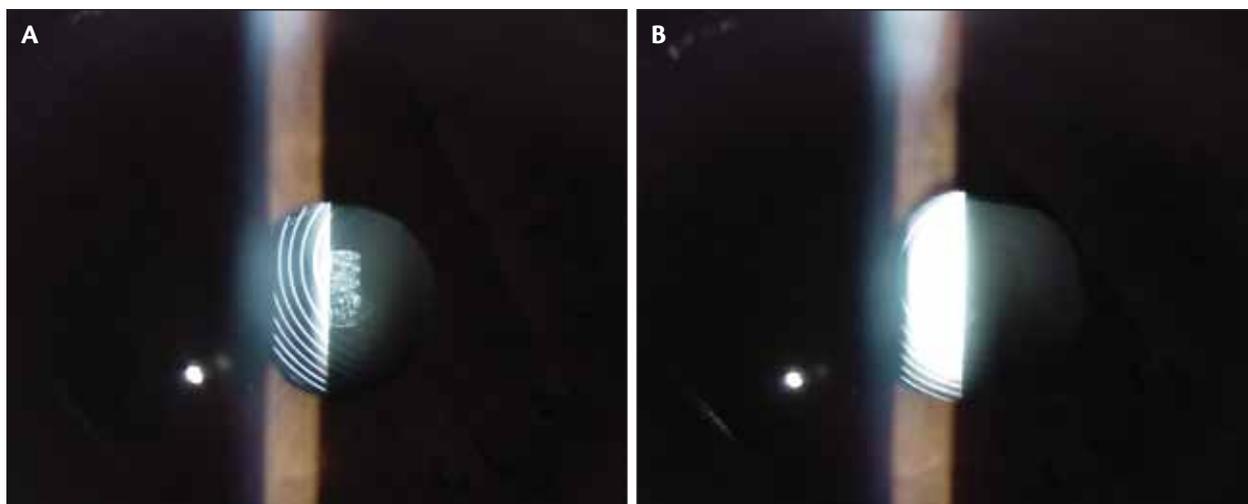


**Crystallens Five-O  
(AT50)\***

<b>Diameter</b>	4.5 mm	5.0 mm
<b>Shape</b>	Biconvex	Biconvex
<b>Material</b>	Biosil	Biosil
<b>Powers</b>	4.00 to 10.00 D in 1.00 D steps 10.00 to 33.00 D in 0.50 D steps 16.00 to 27.00 D in 0.25 D steps	4.00 to 10.00 D in 1.00 D steps 10.00 to 16.00 D in 0.50 D steps 16.00 to 27.00 D in 0.25 D steps 27.00 to 33.00 D in 0.50 D steps 4.00 to 16.75 D available in 12.0-mm length 17.00 to 33.00 D available in 11.5-mm length
<b>A-constant</b>	119.24	119.00
<b>Refractive index</b>	1.428	1.428
<b>Theoretical anterior chamber depth</b>	5.69 mm	5.55 mm
<b>Overall length</b>	11.5 mm	11.5 mm
<b>Material</b>	Polyimide	Polyimide
<b>Nomogram</b>	Yes	Yes
<b>Incision—forceps</b>	3.0 to 3.2 mm	3.2 to 3.5 mm
<b>Incision—STAAR Blue Injectort†</b>	2.8 to 3.0 mm	2.8 to 3.0 mm
<b>Capsulorhexis</b>	5.0 to 5.5 mm	5.0 to 5.5 mm

\*According to Eyeonics, Inc., compared with the Crystallens 4.5, the Crystallens Five-O has a larger 5.0-mm optic and an 11.5-mm loop-to-loop design for a 27% wider arc of the loops. The haptics were designed for smoother plate movements, and they fold inward for ease of use with an inserter. The new model reportedly offers more stable positioning and predictability (90% more plate arc length and 17% greater surface area contact between optic/plates and the capsular bag).

†Manufactured by STAAR Surgical Company (Monrovia, CA).



(Courtesy of Eric D. Dornenfeld, MD)

**Figure 1.** The AcrySof Restor IOL is visible with slit-lamp biomicroscopy before (A) and after (B) treatment of the eye with argon laser iridoplasty.

**Hardten:** My practice is a combination of cornea; refractive surgery, including LASIK and PRK; and cataract/IOL surgery. I perform probably 10% refractive lens exchange and 90% cataract surgery. I use all of the presbyopia-correcting lenses that are available in the US, and I mix them occasionally. In general, however, I implant the ReZoom IOL bilaterally when the patient does well with the ReZoom lens in his first eye.

**Donnenfeld:** I am a cornea-trained ophthalmologist and a comprehensive anterior segment surgeon whose real interest is refractive corneal and cataract surgery. I perform LASIK a little more frequently than I do cataract surgery, but I have become excited by refractive IOL surgery. I have been involved in several clinical trials. I use all three of the refractive IOLs available in the US, and I had a good experience with the Tecnis IOL (Advanced Medical Optics, Inc.) during its clinical trials. I continue to mix lenses most of the time based on my patients' experiences.

**Chang:** I am predominantly a cataract and IOL surgeon. Like Eric, I use the AcrySof Restor IOL (Alcon Laboratories, Inc.), the Crystalens (Eyeonics, Inc., Aliso Viejo, CA), and the ReZoom IOL regularly, mostly with matching but occasionally with mixing.

## DEVELOPMENTS IN 2007

### Crystalens Five-O

**Chang:** Several new modifications to presbyopia-correcting IOLs were introduced in 2007. Jay, how does the Crystalens Five-O differ from the earlier 4.5 model?

**Pepose:** There were a number of changes, the most obvious of which is that the optic is now 5.0 mm instead of 4.5 mm (Table 1). There is more adherence between the haptics and the capsule with the new model as well. The Five-O design was based on some of the initial prototypes by J. Stuart Cumming, MD, that showed the greatest movement of the plate by the creation of a uniform, rectangular pocket in the capsular bag, which promotes sliding during accommodation. The newly fashioned haptic plates and loops provide additional capsular-bag support and excellent optic centration. The haptics of the Crystalens Five-O are designed to fold inward toward the optic, thus facilitating their folding in an insertion device.

I think the new design achieves superior refractive outcomes in terms of distance correction. I also find that the amount of vaulting is more consistent. The improved predictability is due, in part, to greater surface-area contact between the plates and the capsule. This greater consistency in the estimated lens position is also a reflection of the lens' coming in an 11.5-mm diameter for IOLs greater than 19.00 D and a 12.0-mm overall diameter for dioptric powers of up to 19.00, because more myopic patients tend to have larger eyes and capsular bags. There is a difference in the A-constant in this lens in comparison to the Crystalens 4.5 that reflects a different degree of posterior-optic vaulting. In my experience, patients have somewhat better near vision with the Five-O than the 4.5.

**Donnenfeld:** For me, the biggest advantage of the Five-O over the 4.5 is that I have fewer complications after the perfect insertion of the lens. My biggest com-

plaints with the 4.5 were z syndromes, decentrations, and a lot of refractive instability. My enhancement rate with the Crystalens was exorbitantly higher than with multifocal IOLs. My enhancement rate continues to be higher with the Crystalens due to refractive uncertainty, because the lens moves in the capsular bag, but it is now maybe 50% versus three times higher than with the other IOLs.

I am not certain if my patients are better able to read with the Crystalens Five-O. I think that their distance visual acuity is better with the larger optic. I have had no cases in which the IOL migrated.

**Hardten:** My biggest frustration with the Crystalens 4.5 was the z syndrome, which I have not observed with the Five-O. The new lens also seems to sit more evenly in the capsular bag. I think the sizing of the anterior capsulorhexis and the capsular bag is more forgiving with the Five-O, and glare and halos at nighttime seem to be less of an issue. Although the Crystalens 4.5 sat fairly far posteriorly, my patients generally had a similar level of glare and halos as with the multifocal IOLs. Unwanted visual phenomena do not seem to be as much of an issue with the Five-O.

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**We look forward to  
hearing from you!**

**Chang:** With the Crystalens 4.5, I think many of us were surprised at our inability to achieve emmetropia as predictably as we could with other IOLs. The likely reasons for this make sense: the axial position of a hinged optic is going to vary depending upon the size of the bag and capsulorhexis. Personalizing your A-constant improves your average but does not reduce the standard deviation. The larger optic, the broader haptics, and the greater overall length of the Crystalens Five-O for lower powers have improved this platform's refractive predictability in terms of a tighter standard deviation around the refractive target.

**Knorz:** In Europe, studies are showing there is virtually no movement of the so-called accommodating lenses.<sup>1</sup> The perception is that, if an accommodating lens does not move, it does not work. I am not using the Crystalens.

**Chang:** Jay, do we understand the mechanism of the accommodative or pseudoaccommodative effect any better?

**Pepose:** We do not fully understand the mechanisms that may underlie patients' improved near and intermediate vision with this lens design, and they are likely to be multifactorial. If the sole mechanism were anterior movement of the optic, then you would expect a higher dioptric lens power to produce a greater accommodative effect. I do not think any studies support this relationship between IOL power and near vision with the Crystalens. I therefore think it is probably a combination of pseudoaccommodation due to the posteriorly vaulted optic's being closer to the nodal point of the eye along with changes in the optic's shape and axial movement. The change in the optic's shape may produce a central power gradient in the lens, and this phenomenon (observed during accommodation of the crystalline lens) has been referred to as *accommodative arching*.

### AcrySof Restor Aspheric IOL

**Tipperman:** In my experience, it is often difficult to discern a big clinical difference in the vision of patients with an aspheric monofocal lens in one eye and a non-

## FUNCTIONAL VISION IN PATIENTS WITH MULTIFOCAL IOLS

In the past, conventional means to evaluate patients' near visual acuity consisted of perceptive letters or numbers on a near card. A person's ability to distinguish the near card's figures may have no bearing, however, on his capacity to read functionally.

A study presented at the 2007 AAO Annual Meeting in New Orleans evaluated functional near vision in patients with multifocal IOLs using the NPReading Test.<sup>1</sup> The test, developed with the collaboration of *The Post and Courier* of Charleston, South Carolina, is a practical examination system designed to simultaneously determine reading acuity, reading speed, and functional vision.

In the study, a total of 56 patients were enrolled and divided into four groups. Group 1 (n=15) had received the AcrySof Restor lens (Alcon Laboratories, Inc., Fort Worth, TX) in one eye and the ReZoom lens (Advanced Medical Optics, Inc., Santa Ana, CA) in their fellow eye. Group 2 (n=14) received the AcrySof Restor IOL bilaterally; group 3 (n=15) had blended AcrySof Restor (postoperative target refraction in dominant eye was plano; non-dominant eye, 1.00 D); and group 4 (control; n=12) underwent the implantation of monofocal IOLs with near correction.

The investigators compared all of the patients' reading speeds in words per minute with different font sizes at 3 months postoperatively.

Those who had received multifocal IOLs and were measured with or without their best distance correction were capable of reading faster than those subjects in the control group using their best near correction. Patients in groups 1, 2, and 3 were able to read faster (193.5, 201.6, and 184.9 words per minute, respectively) than those in group 4 (118.8 words per minute). The number of subjects able to read in all groups decreased as the font size decreased.

The investigators concluded that the slower reading speed of the monofocal group compared with the multifocal IOL groups indicated that the latter lenses provide good functional vision.

1. Solomon KD, Fernández de Castro LE, Vroman DT. Functional vision in patients with multifocal IOLs. Poster presented at: The AAO Annual Meeting; November 11, 2007; New Orleans, LA.

### BILATERAL IMPLANTATION VERSUS MIXING THE CRYSTALENS, ReZoom, AND ACRYSOFT RESTOR IOLS

Recent research found that bilateral Crystalens (Eyeonics, Inc., Aliso Viejo, CA) implants elicited fewer nighttime glare symptoms compared with bilateral ReZoom (Advanced Medical Optics, Inc., Santa Ana, CA) or AcrySof Restor (Alcon Laboratories, Inc., Fort Worth, TX) IOLs. Combining an accommodating and a multifocal lens produced fewer photic disturbances than either multifocal IOL implanted bilaterally, but more than patients with a Crystalens in both eyes. Whether implanted bilaterally or combined with another IOL, the Crystalens provided patients with the best intermediate vision. The AcrySof Restor lens in one or both eyes provided the best near vision. The Crystalens and AcrySof Restor grouping achieved better overall uncorrected distance, intermediate, and near vision than the other four combinations. Jay Pepose, MD, presented the study's results at the 2007 AAO Annual Meeting in New Orleans.<sup>1</sup>

The prospective, nonrandomized study compared the visual performance of patients who either underwent the implantation of a presbyopia-correcting IOL bilaterally or who received a combination of the Crystalens and ReZoom IOLs or the Crystalens and AcrySof Restor lenses. Specifically, the 49 patients enrolled in the five-arm study received the Crystalens IOL bilaterally (n = 14); the AcrySof Restor IOL bilaterally (n = 12); the ReZoom IOL bilaterally (n = 14); a combination of the Crystalens and AcrySof Restor IOLs (n = 6); or a combination of the Crystalens and ReZoom IOLs (n = 3). Diagnostic testing at 4 to 6 months postoperatively included UCVA and BSCVA at distance, intermediate, and near; contrast-sensitivity function; and quality-of-life questionnaires (6 months postoperatively).

Eyes with the Crystalens had statistically better BSCVA, uncorrected and distance-corrected intermediate, and best corrected near vision compared with eyes in the other study groups. Crystalens eyes also had better contrast sensitivity with and without glare under mesopic conditions. According to patients' responses to subjective quality-of-vision and quality-of-life questionnaires, the bilateral Crystalens group received the highest scores. Eyes with the AcrySof Restor IOL achieved better uncorrected near vision, needed the lowest reading add, and had the lowest uncorrected and distance-corrected intermediate vision.

1. Pepose JS, Qazi M, Davies J, et al. Evaluation of the bilateral versus combination Crystalens, ReZoom and Restor. Paper presented at: The AAO Annual Meeting; November 12, 2007; New Orleans, LA.

aspheric in the other. I have been incredibly impressed, however, by the difference in performance when asphericity is combined with a multifocal platform.<sup>2</sup> The visual clarity achieved with the AcrySof Restor Aspheric IOL is remarkable when compared with that of the other multifocal and accommodating IOLs on the market. I think that patients' nighttime and distance vision is crisper in general, and my patients seem to have more functional vision. They are happy after receiving the IOL in their first eye, and the lens is just more forgiving clinically than the other presbyopia-correcting platforms.

**Donnenfeld:** Surgeons' adoption rate of refractive IOLs has not been high, perhaps because the refractive outcomes must be extraordinarily precise to satisfy patients. The advantage of aspheric optics is a wider sweet spot. Patients who receive the AcrySof Restor Aspheric IOL or the Tecnis Multifocal lens do not require a plano or +0.25 D result to be very happy.

**Knorz:** My experience is mostly with the Tecnis Multifocal lens. Both spherical and multifocal IOLs are associated with halos at night. An aspheric optic eliminates some of the halos, which are the most significant side effect of multifocal IOLs. Asphericity is therefore an advantage in a multifocal IOL.

**Donnenfeld:** I think I agree with you, Michael. Halos and glare are reduced. Their biggest cause is not asphericity, however, but refractive defocus. If you can eliminate the higher-order aberration, you have a little more wiggle room in terms of defocus.

**Chang:** Some surgeons mention their impression that the aspheric optic improves near performance, but the aspheric surface really affects the periphery of the IOL's optic and not its center.

**Tipperman:** Why an aspheric optic affects near vision is fairly complex. I do not propose to fully describe the phenomenon, but it has to do with the asphericity and greater depth of field.

**Donnenfeld:** That would be unexpected. Less spherical aberration means less depth of field with sharper vision at the desired focal distance. I have been happy with my patients' near vision after receiving the AcrySof Restor Aspheric IOL; they have a crisp view at the 4.00 D reading add. What about midrange vision, however, where depth of field is really the issue? The Crystalens has positive spherical aberration, which slightly decreases

quality of vision at distance but gives greater depth of field for more midrange vision. Eliminating spherical aberration may compromise midrange visual acuity.

**Knorz:** We need more clinical data to prove that asphericity increases depth of field. It is counterintuitive.

#### **Tecnis Multifocal IOL**

**Knorz:** I conducted a prospective, randomized, masked comparison of the AcrySof Restor and the Tecnis IOLs.<sup>3</sup> Both lenses were implanted bilaterally, and my colleagues and I initially found that they were similar in terms of contrast sensitivity and distance vision. The differences we observed related to visual acuity at near and in dim light, as one would expect due to the smaller optical zone of the AcrySof Restor lens. Additionally, we found that subjects' reading speed was significantly higher even in bright light with the Tecnis Multifocal lens than with the AcrySof Restor IOL.

**Chang:** To what do you attribute the difference in the two subject groups' ability to read in bright light?

**Knorz:** I do not know. My colleagues and I did not observe a significant difference in contrast sensitivity between the groups, even in low light, which was another unexpected finding. We anticipated that the Tecnis Multifocal IOL would perform better because of its asphericity. On the other hand, the AcrySof Restor lens has no near add in the periphery, which allows it to perform better in dim light. Perhaps these qualities balanced each other. The results of our study demonstrate that surgeons should not base their choice of IOLs on their theoretical performance. They need clinical data.

**Hardten:** The point of focus is slightly farther out with the Tecnis Multifocal IOL versus the AcrySof Restor lens. The greater reading speed with the former may be due to the wider field of view. In a sense, patients can look ahead at more words and therefore read even faster. Most people do not read at 12 to 14 inches but at around 16 inches when they are trying to read typically sized print quickly as opposed to reading very small print.

**Knorz:** The patients who received the Tecnis Multifocal lens preferred that their reading material be 2 to 3 cm farther away than did those with the AcrySof Restor lens despite the same near add (the average distance for reading was 35 cm with the Tecnis Multifocal IOL and 32 cm with the AcrySof Restor lens<sup>3</sup>).

## ARGON LASER IRIDOPLASTY FOR RECENTERING THE PUPIL OVER AN IOL

By Eric D. Donnenfeld, MD

The decentration of a multifocal IOL can cause significant optical aberrations. When the rings of a multifocal IOL are not properly aligned with the patient's pupil, their refractive or diffractive pattern becomes asymmetric, and patients therefore may complain of reduced quality of vision in the daytime and asymmetric halos around lights at night.

In a study my colleagues and I presented at the 2007 AAO Annual Meeting in New Orleans described the result of argon laser iridoplasty to center the pupil over the multifocal IOL in 14 eyes of 11 patients.<sup>1</sup> By 1 month postoperatively, the patients' mean BCVA improved from 20/32 to 20/24 ( $P < .05$ ), and their mean UCVA improved from 20/40 to 20/31 ( $P < .05$ ). The patients also achieved an improvement in subjective visual quality from 3.0 to 7.9 on a scale from 1.0 to 10.0 (where 10.0 is excellent). They experienced a statistically significant ( $P < .05$ ) improvement in photopic and scotopic contrast sensitivity after argon laser iridoplasty. Digital photography showed a mean pupillary shift of 0.55 mm.

We found that decreased quality of vision may occur in some patients following implantation of a multifocal IOL. These patients should be carefully examined for the cause of their visual complaints. The most common reasons for decreased visual quality are residual refractive error, posterior capsular opacity, cystoid macular edema, and ocular surface disease. When these potential problems have been eliminated or treated and the problem remains, pupillary centration over the IOL should be evaluated. When there is decentration, an argon laser iridoplasty is a safe and effective technique for improving quality of vision.

1. Solomon R, Donnenfeld ED, Perry HD, et al. Argon laser iridoplasty to improve visual function following multifocal IOL implantation. Poster presented at: The AAO Annual Meeting; November 12, 2005; New Orleans, LA.

**Donnenfeld:** Your findings reaffirm my impression of the Tecnis Multifocal lens. The take-home message from your study was that both IOLs produce great outcomes. Patients achieved slightly better reading vision with the Tecnis Multifocal lens, and I have found that clinically as well. The only issue that I think remains to be resolved is which lens provides better distance vision, especially at night.

**Knorz:** Our study did not show any difference between the Tecnis Multifocal IOL and the AcrySof Restor lens regarding distance vision. When comparing the refractive ReZoom lens with the Tecnis Multifocal IOL or the AcrySof Restor lens, however, patients had one more line of best corrected distance vision with the ReZoom lens, which is distance dominant, than with the Tecnis Multifocal and AcrySof Restor IOLs based on my clinical experience. Most patients tolerate the loss of one line, but some do not, especially in their dominant eye.

**Chang:** Unlike with the Tecnis Multifocal IOL, the periphery of the AcrySof Restor's optic is purely distance. With large pupils, the Tecnis Multifocal IOL therefore presents many more diffractive rings than the AcrySof Restor lens. Was there a difference in the number of subjective complaints about halos or rings between the two subject groups?

**Knorz:** Interestingly, there was not. As I said, we found no difference between subject groups in terms of contrast sensitivity, distance vision, glare, and halos in dim light. Maybe the Stiles-Crawford effect is responsible.

### Waxy Vision and Higher-Order Aberrations

**Chang:** The quality of vision with diffractive IOLs is highly subjective, but it is a matter of concern for a lot of surgeons. What has your experience been with so-called waxy vision?

**PePOSE:** Some of my patients who have received the AcrySof Restor lens have complained of waxy vision. If you look at the way the AcrySof Restor lens splits light at a small pupil, there is an energy continuum focusing about 40% of the light at a near focus and about 40% at distance, and you are losing about 20% to higher diffractive orders. This wasted 20% of light energy is a consequence of the overall interaction of light with the diffractive steps of the AcrySof Restor IOL. With this lens design, it is not possible to direct 50% of the light to each of the two primary foci. There are also a lot of unknowns in terms of the position of the lens in relation to the visual axis. As you start to get more higher-order aberrations, you start to become really sensitive to residual second-order aberrations like defocus and astigmatism, thus increasing the likelihood that laser vision enhancement will be needed.

In our comparative study, my colleagues and I found that the Crystalens was superior to the AcrySof Restor IOL in terms of best corrected distance vision when tested monocularly or binocularly. Regarding uncorrected vision at distance, there was no statistical difference between the Crystalens, ReZoom, and AcrySof Restor lenses<sup>4</sup> (see *Bilateral Implantation Versus Mixing the Crystalens, ReZoom, and AcrySof Restor IOLs* on page 46).

**Harden:** Because waxy vision does not happen frequently, it is not the first problem that you consider when a patient complains. Instead, you go through a long list of possibilities such as ocular dryness, cystoid macular edema (CME), capsular opacity, and residual sphere or cylinder.

**Chang:** Waxy vision associated with a multifocal IOL is a diagnosis of exclusion in other words.

## UPDATE ON THREE TECHNOLOGIES



### NULENS

#### What It Is

The NuLens (NuLens Ltd., Herzliya Pituah, Israel) is composed of two pieces. The first is a HEMA plate that is placed on top of the collapsed capsular bag after the cataract's removal. The second is a rigid haptic system containing a soft silicone gel center that is placed atop the HEMA plate and is held in place by patented sulcus fixation haptics. The rigidity of the haptics creates an effective reference plane that permits the deformation of the silicone gel as the HEMA plate is pressed anteriorly by the movement of the capsular diaphragm (consisting of the ciliary processes, zonules, and collapsed capsular bag). The anterior and posterior pressures displace the soft silicone forward. Power is generated in accordance with the forces developed by the ciliary muscles in response to the naturally occurring blur stimulus for accommodation.

#### Status

The NuLens is in development. NuLens Ltd. plans to initiate clinical trials this year with the goal of European regulatory approval in 2009 and FDA approval by 2012. The company is currently evaluating the possibility of placing the haptic system on pseudophakic eyes in order to restore accommodation to patients who have received traditional IOLs.



### SYNCHRONY DUAL OPTIC ACCOMMODATING IOL

#### What It Is

The single-piece Synchrony Dual Optic accommodating lens (Visiogen, Inc., Irvine, CA) features a high-powered anterior optic connected to a minus-powered optic by haptics that have a spring-like action. According to the company, the lens' mechanism of action is based on the classic Helmholtz theory of accommodation. For distance vision, the two optics rest close together. When the patient focuses on a near target, the ciliary body releases tension on the capsular bag and zonules, which translates into forward movement of the front optic that causes an increase in effective IOL power. As the ciliary body relaxes, tension on the capsular bag brings the front optic back to the resting state, thus returning emmetropic distance focus.

#### Status

The Synchrony received the CE Mark in June 2006. Postmarketing research studies to further evaluate the lens are currently underway in Europe, Canada, and Latin America. In November 2007, Visiogen, Inc., announced that the enrollment for a phase 3 FDA clinical trial was closed. Investigators will evaluate the Synchrony's safety and efficacy as well as subjects' potential for functional near, intermediate, and distance vision with the lens. The study includes more than 300 patients at 20 investigational sites in the US. The company is currently focusing on follow-up and the future submission of a premarket approval application.



### TETRAFLEX

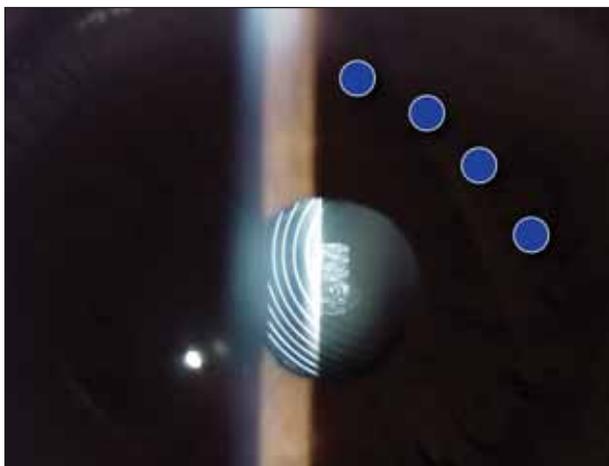
#### What It Is

The Tetraflex IOL (Lenstec Inc., St. Petersburg, FL) has a vaulted anterior optical surface and soft, pliable haptics. The idea behind the design is to provide patients with good near vision and excellent intermediate and distance vision. The IOL's proposed mechanism of action is the combined effect of the lens' movement and the bending of the optic as vitreous is displaced during accommodation.

#### Status

The Tetraflex received the CE Mark in 2004. The IOL has been approved in Australia since 2006, and it was approved in China and Taiwan in 2007. At press time, Lenstec, Inc., had nearly completed enrollment for a phase 3 FDA clinical trial.

(Courtesy of Eric D. Donnenfeld, MD.)



**Figure 2.** The surgeon places argon laser iridoplasty spots in the midperipheral iris according to the following parameters: 5,000 mW of energy; 500- $\mu$ m diameter; and 500-millisecond duration.

**Donnenfeld:** Waxy vision definitely exists. It is mostly associated with the AcrySof Restor lens, but I have also encountered it with the ReZoom lens. My colleagues and I have been looking at the effect of the IOL's centration relative to the pupil. The capsular bag does not sit directly behind the pupil, and the difference in location is known as angle kappa. If an IOL is decentered relative to the pupil but is right in the middle of the capsular bag, the resultant higher-order aberrations are going to create waxy vision. Jack Holladay, MD, and I have actually developed some models to study this phenomenon, and we think this scenario explains a lot of the problems with quality of vision that are not correctable through normal means after the implantation of refractive IOLs. By simply performing argon laser iridoplasties to center the iris over the IOL (Figures 1 and 2), we have been able to improve the quality of vision significantly in almost all of these patients and eliminate waxy vision<sup>5</sup> (see *Argon Laser Iridoplasty for Recentering the Pupil Over an IOL* on page 48). One such patient experienced an improvement from 20/40 BCVA to 20/25 UCVA after the procedure.

**Chang:** Paolo Vinciguerra, MD, used the Nidek OPD Scan (Nidek, Inc., Fremont, CA) to measure the total ocular wavefront in a few patients who were complaining about their quality of vision and in whom the AcrySof Restor lens was decentered relative to the pupil. After he surgically recentered the AcrySof Restor lenses, the measured aberrations and the patients' symptoms improved. Apparently, diffractive optics that are decentered relative to the pupil can induce coma and other higher-order aberrations.

**Donnenfeld:** More aberration is induced by diffractive than refractive multifocal IOLs. Diffractive lenses split light in a different way than refractive IOLs.

**Chang:** Based upon Dr. Vinciguerra's recommendations, for the past 2 years, I have positioned the AcrySof Restor lens with its haptics at the 6- and 12-o'clock positions, and I take advantage of the tacky hydrophobic material to slightly nudge the lens a little nasally (Figure 3). This technique has been surprisingly effective for aligning the diffractive optic with the pupil, which is always a bit nasally decentered relative to the capsular bag.

**Tipperman:** I do the same thing. Actually, I have begun to take digital photographs of patients' eyes without dilating their pupils while they are in the exam lane and create an acrylic tracing of the limbus and pupil. I then overlay the tracing on the TV in the OR at the time of surgery so I can see where the center of their undilated pupil is in relation to the limbus. My most successful multifocal patients have a spherical error preoperatively. A patient with 1.50 D of cylinder who receives limbal relaxing incisions (LRIs) to achieve a plano result with no astigmatism postoperatively never seems to attain the same quality of vision as someone who does not require LRIs. There is no question that multifocal lenses are demanding in terms of achieving the targeted refraction and eliminating cylinder.

**Hardten:** I also use wavefront diagnostic testing to capture that limbus-to-pupil relationship. The wavefront provides a really good picture of this relationship.

**Donnenfeld:** I have a large refractive corneal practice, and I see many patients who have had PRK or LASIK, have developed cataracts, and want to undergo IOL surgery. Early on, I frequently implanted refractive IOLs. I am now more conservative. I will rarely choose a diffractive multifocal IOL for a post-LASIK eye but feel comfortable implanting a refractive multifocal IOL like the ReZoom. Refractive IOLs perform better in these patients, because they induce fewer higher-order aberrations. Alternatively, I implant a Crystalens in these cases when the previous treatment was for high myopia, the cornea is extremely oblate, or the ablation was decentered.

**Knorz:** Because refractive surgery induces a large number of higher-order aberrations, it does not make sense to implant a multifocal IOL in these eyes.

**Chang:** Many surgeons perform laser vision enhancement to address the residual refractive error after the implantation of a multifocal IOL in an eye that has undergone myopic LASIK. The point is that a patient might see 20/25 and J2 after an enhancement procedure for his spherical refractive error, but the surgeon really has no idea what the aberrations and the quality of vision are.

**Hardten:** Another advantage of the refractive IOL in that post-LASIK patient is that you can manipulate the pupil's size postoperatively to reduce visual symptoms or higher-order aberrations, because the center of a refractive IOL is emmetropic.

**Chang:** To summarize everyone's comments, the term *waxy vision* describes a variety of conditions that diminish visual quality. Is the problem any less with the Tecnis Multifocal IOL?

**Knorz:** Substantiating data are needed, but my colleagues and I did not find any difference between the Tecnis Multifocal and the AcrySof Restor lenses in terms of BCVA and UCVA. Both IOLs provide excellent distance and near vision. It is important to remember, however, that all multifocal lenses, especially those with an equal distribution between distance and near vision, require a certain sacrifice, which means that there is a small loss of BCVA compared with a monofocal IOL.

**Pepose:** Aberrations of the anterior corneal surface are a major component in the degradation of the retinal image, but we do not routinely measure them preoperatively.

**Chang:** That is a great point, because we all ultimately would like to predict which patients will have problems with their quality of vision with a multifocal IOL.

## PROMISING TECHNOLOGIES

**Chang:** Which refractive IOL technologies hold the most promise for the future?

**Donnenfeld:** The NuLens in development by NuLens Ltd. (Herzliya Pituah, Israel) is an accommodating IOL with deformable optics. It is an exciting new technology. I have used the lens in eye-bank eyes. I think the entire panel will agree that the future is accommodating lenses. The real question is, which will be the best accommodating IOL? I am looking forward to improvements to the Crystalens, but I believe that the NuLens

with deformable optics represents the best hope for providing patients with an excellent quality of vision.

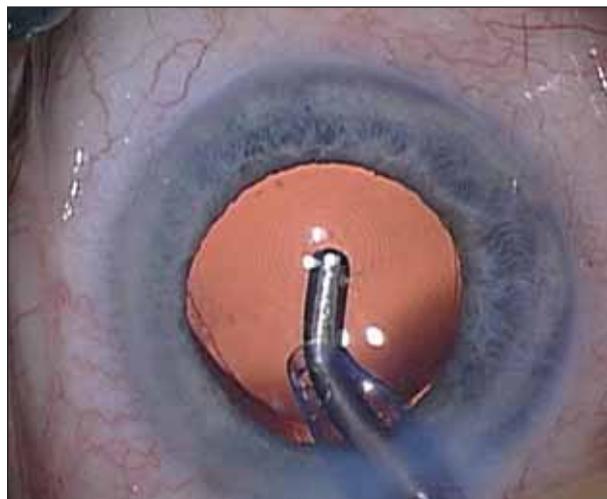
**Chang:** An IOL that provided 6.00 to 8.00 D of accommodation would trump all of the other presbyopia-correcting IOLs that we have, but no such lens is close to starting a US clinical trial. Does anyone want to talk about the next version of the Crystalens, the HD-100 lens (Eyeonics, Inc.), which is in development?

**Pepose:** Based on the data I have seen, subjects with the HD-100 lens appear to be gaining almost one line of near vision over the standard Crystalens in the preliminary trials. Data from 60 patients showed 55% reading J1 or better, 80% reading J2 or better, and 100% with J3 or better uncorrected monocular near visual acuity (data on file with Eyeonics, Inc.).

**Tipperman:** Short of a true accommodating IOL, I think the AcrySof Restor Toric lens (Alcon Laboratories, Inc.) currently in development is going to be a big advantage, because the final refractive result from LRLs is hard to control. Certainly, the monofocal AcrySof Toric IOL (Alcon Laboratories, Inc.) seems to be robust.

**Chang:** How soon might variable add powers be available for multifocal IOLs?

**Knorz:** Perhaps we will see them in the next few years. I believe that true accommodating lenses will be the final solution to presbyopia, but they will not be available for another 10 to 15 years. In the meantime,



**Figure 3.** The AcrySof Restor IOL is oriented with its haptics along the 6- to 12-o'clock axis. The surgeon nudges the lens slightly nasally during the ophthalmic viscosurgical device's removal.

(Courtesy of David F. Chang, MD)

new multifocal designs that distribute light differently and have various add powers will become available. In addition, I anticipate the development of corneal implants such as the AcuFocus Inlay (not FDA approved; AcuFocus, Inc., Irvine, CA) that we can place in presbyopic eyes or in pseudophakic eyes with a monofocal IOL.

**Hardten:** An issue has been the relationship of new-style accommodating IOLs with the capsular bag. It will take 4 to 5 years to sort that out as well as to see what happens as these patients age, capsular contraction occurs, or posterior capsular opacity becomes manifest.

**Knorz:** I have been implanting the Tecnis Multifocal lens for a couple of years. Several patients have complained about their vision at intermediate distance, and they had to sit closer to their computer screens. At their 1-year follow-up visits, all of them have reported moving their computer monitors back to their original position. When you look at the defocus curve of the Tecnis Multifocal lens, you understand why. The IOL provides 20/20 vision at distance and at near. The lowest point is 20/40, and patients perceive the difference. Initially, they think they only see well at 20/20, but 20/40 is sufficient for reading the computer screen. Over time, many get used to their vision.

**Chang:** In the nearer term, the Tetraflex accommodating IOL (Lenstec, Inc., St. Petersburg, FL) is in phase 3 clinical trials. Visiogen, Inc. (Irvine, CA), has now completed enrollment for the phase 3 clinical trial of its Synchrony lens. Certainly, everyone would welcome having new accommodating IOL options such as these.

## PRESBYOPIA-CORRECTING IOLs IN PRACTICE

### Getting Started

**Chang:** Let's address another topic. Presbyopia-correcting IOLs still account for fewer than 5% of all of the lenses currently implanted in the US. There are many surgeons who have yet to begin offering these IOLs, but their interest is growing. What advice would you give them?

**Tipperman:** Ophthalmologists who want to begin offering presbyopia-correcting lenses should select one model and become comfortable with it before branching out to other IOL designs.

**Donnenfeld:** In addition, beginning surgeons must be very careful in their selection of patients. Once oph-

thalmologists learn to set reasonable expectations for their patients, perform expert refractive and cataract surgery, and understand how to deal with unhappy patients and resolve their issues, they can offer the technology to a wider range of people.

**Pepose:** A staff trained to perform expert biometry is also important.

"A surgeon's confidence is a lot more fragile than we typically acknowledge."

—David F. Chang, MD

**Chang:** A surgeon's confidence is a lot more fragile than we typically acknowledge. You may be enjoying initial success with multifocal IOLs when, all of a sudden, you have a few patients whose surgery was flawless but who are angry about and dissatisfied with their intermediate vision, seeing halos at night, or waxy vision. This is very traumatic for the surgeon, who may feel that implanting these IOLs is not worth the risk and aggravation. I think you should start with cataract surgery patients who have minimal astigmatism and are highly motivated to see without glasses. These individuals will be fairly easy to please, and your confidence will grow as you accumulate successful experiences over time.

As cataract surgeons, we are used to routinely exceeding our patients' expectations. They are continually surprised at the speed of the surgery and visual recovery, their lack of discomfort, the unexpected clarity and color of their vision, and the correction of their preoperative myopia or hyperopia. When a refractive IOL patient instead expresses disappointment, we suddenly feel as though we have failed.

**Hardten:** Part of the problem is that we are used to waiting for the patient to ask us for the correction of a problem or to request a certain technology. The people who spontaneously ask for presbyopia-correcting IOLs have very high expectations, and some have even had LASIK. These are not the individuals with whom you want to start. It is hard, however, for surgeons just beginning to offer these IOLs to, in a sense, push them on people who do not express an active interest in them. These patients with lesser expectations are the ideal ones to grow comfortable and succeed with, and

they represent the best training for your staff. Then, you can move on to more demanding individuals.

**Chang:** What is the most common reason that surgeons hesitate to implant presbyopia-correcting IOLs?

**Hardten:** I believe that surgeons hesitate, because there is no easy cookbook approach to making them work in an individual practice. Moreover, it is a lot of work to educate patients, manage their expectations, and perform enhancements.

**Pepose:** A big mistake that some surgeons make early on is to present patients with a menu of IOL options rather than be the doctor and make a recommendation. The patient just goes away confused.

**Knorz:** In addition, you need to offer laser refractive surgery or partner with someone who performs it. I would estimate that, even for the best surgeons, approximately 5% to 10% of patients will not have an emmetropic result after IOL implantation. These patients need additive laser vision correction. If you cannot achieve spectacle independence, then they will not be happy.

### Patient Selection and Counseling

**Chang:** What tips do you have regarding selecting and counseling patients?

**Tipperman:** My advice is to start slowly. We all have patients whom we told would need reading glasses after receiving monofocal IOLs, but they are still unhappy about wearing spectacles postoperatively. They are ideal candidates for presbyopia-correcting IOLs.

**Hardten:** Another issue is the mismatch between patients who are ideal physical candidates and those who are ideal emotional candidates, meaning the ones who really desire presbyopic correction. For example, an 85-year-old lady who sees 20/100 with cataracts and whose husband does all the driving would do well physically with presbyopia-correcting IOLs, but she is not motivated to pay for them. In contrast, a 48-year-old race car driver who has had LASIK and sees 20/20- but is frustrated with early presbyopia may be highly motivated but would be tough to please with these lenses.

**Tipperman:** Patients in their late 60s or early 70s who have worn glasses for 40 years typically do not initially consider presbyopia-correcting IOLs to be attractive. They are the easiest to please with this technology,

however, because they have forgotten what it is like not to be presbyopic. Any amount of near vision postoperatively pleases them.

**Knorz:** If I want to give patients an idea of what their vision will be like postoperatively, I have them wear multifocal contact lenses. In my experience, low myopes are the most likely to be dissatisfied. Individuals who like the multifocal contact lenses are almost always happy with multifocal IOLs.

“Patients who present with minimal cataracts but complain bitterly about halos and glare are really tough to please with multifocal IOLs.”

—David R. Hardten, MD

**Hardten:** Patients who present with minimal cataracts but complain bitterly about halos and glare are really tough to please with multifocal IOLs. Those who tolerate their cataracts reasonably well will probably be satisfied by these lenses.

**Tipperman:** When counseling patients, I tell them that standard cataract surgery will enable them to see well at distance without glasses, but they will wear glasses for reading. I then say, “If that result is not acceptable to you, I have something better.” That is all I sell my patients. I tell patients who want perfect vision without ever wearing glasses to choose another surgeon.

**Donnenfeld:** Ophthalmologists should hold an open preoperative discussion with patients in which they explain the procedure’s risks and benefits, but they should emphasize that problems can be resolved.

Patient selection is certainly key, but it is more important to do all you can preoperatively to guarantee a successful outcome. I seek to optimize the ocular surface by ensuring that the patient has a healthy tear film. In addition, I prescribe an NSAID 3 days preoperatively and 1 month postoperatively to avoid CME.

### Mixing or Matching Lenses

**Chang:** One of the hottest topics this past year has been whether to mix different refractive IOLs. In fact, we devoted the August 2007 issue of *Cataract & Refractive Surgery Today* to 12 articles on the subject. What are you all currently doing?

**Pepose:** I participated in a study that compared 49 patients' vision with (1) bilateral Crystalens implants, (2) bilateral ReZoom lenses, (3) bilateral AcrySof Restor IOLs, (4) a Crystalens in their dominant eye and a ReZoom lens in their nondominant eye, and (5) a Crystalens in their dominant eye and the AcrySof Restor IOL in their nondominant eye.<sup>4</sup> My colleagues and I found that the Crystalens was superior in terms of distance BCVA, intermediate UCVA and BCVA, and near BCVA. The AcrySof Restor lens provided the best near UCVA. For the subjects who received a combination of IOLs, those with a Crystalens and an AcrySof Restor IOL had the best overall vision in terms of uncorrected Snellen visual acuity at distance, intermediate distance, and near. Based on subjects' responses to quality-of-life and quality-of-vision questionnaires, the multifocal lenses did not perform quite as well as the accommodating lens. If you mixed the two, photic phenomenon (such as complaints of nighttime glare) was in the middle—not as severe as in patients with bilateral multifocal IOLs but worse than in patients with bilateral Crystalens implants.

**Knorz:** I originally thought that patients should receive the same bifocal lens in both eyes in order to achieve visual summation. When I looked at my clinical

“Each IOL platform has strengths and weaknesses, which provides the logic behind mixing lenses.”

—Richard Tipperman, MD

data, however, I found that many of these patients were dissatisfied with their intermediate vision and a few were unhappy with their distance vision. I therefore started to mix presbyopia-correcting IOLs with the distance-dominant lens (ReZoom IOL) in their dominant eye and a near-dominant lens (Tecnis Multifocal IOL) in their contralateral eye. This strategy eliminated my patients' complaints about their distance and intermediate vision.

**Pepose:** Why would you risk sacrificing some contrast sensitivity rather than implant an accommodating lens in the patient's dominant eye?

**Knorz:** I am not sure if my answer is the right one. For me, however, there would be too great a difference in vision between the two eyes. It is like a monofocal

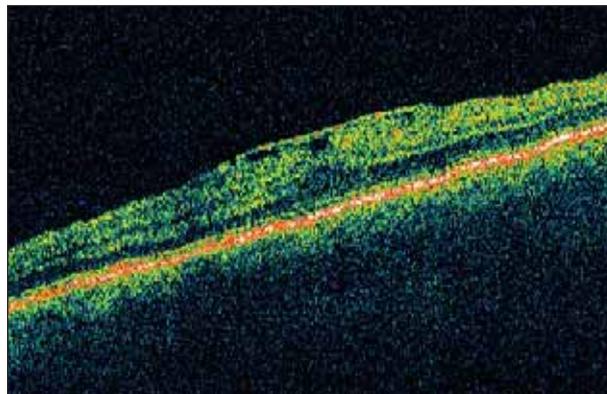
and a multifocal lens. If there is too much difference, it will impede neural adaptation. That is why I prefer to use differently balanced multifocal lenses rather than combine a so-called accommodating lens with a near-dominant multifocal lens, as you did with the Crystalens and the AcrySof Restor IOL. This is, however, just a theoretical concern. I have not used the Crystalens IOL yet.

**Tipperman:** Each IOL platform has strengths and weaknesses, which provides the logic behind mixing lenses. The AcrySof Restor Aspheric IOL has a crisper modulation transfer function than the Tecnis IOL and the Crystalens for distance.<sup>2</sup> As surgeons gain experience with the AcrySof Restor Aspheric IOL, I think they will move back to bilateral implantation.

**Knorz:** Mixing IOLs is just one option in a dynamic process. For example, I implant the ReZoom lens in the patient's dominant eye first and then ask him to read and evaluate his vision. In my experience, patients like their near vision 60% to 80% of the time. If they are satisfied with their near vision, they receive a ReZoom lens in their second eye. Otherwise, I implant a Tecnis Multifocal IOL in their second, nondominant eye. Other surgeons use this general approach but with their preferred lenses.

**Donnenfeld:** David Hardten and I have been working together on an international multicenter clinical trial using this approach, and we plan on presenting data at the upcoming annual meeting of the ASCRS. Our goal is to provide patients with the best quality of vision by basing our selection of the second IOL on the patients' evaluation of their quality of vision after their first eye has a lens implant. You can never predict how patients are going to respond to a multifocal IOL until they have one. At that point, why not listen to what they have to tell you?

I have completely changed my way of managing refractive IOL patients. In the past, no matter what happened with their first eye, I implanted the second IOL 2 weeks after the first. Now, I place my preferred IOL in the patient's first eye and follow up with him 1 week later. I resolve any complaints he has before implanting the second IOL. I will treat a residual refractive error with LASIK or LRIs. Optimizing the first eye's result enables the patient to tell me if he needs more distance, intermediate, or reading vision. If he is satisfied with the first operation, then I implant the same lens in his second eye. If not, I choose a different IOL for his second eye to provide the vision that the patient desires.



(Courtesy of Eric D. Donnenfeld, MD)

**Figure 4.** The surgeon performs ocular coherence tomography on a patient with an epiretinal membrane and CME.

**Hardten:** I take a similar approach. I place a distance-dominant refractive IOL in patients' dominant eye and assess their result before proceeding with the second implant. Most of the time, my patients have a reasonable range of focus in their first eye with a distance-dominant refractive IOL and can receive the same implant in their second eye.

**Tipperman:** All of you are drawing on your experience. What advice do you have for surgeons just beginning to offer presbyopia-correcting lenses to their patients?

**Knorz:** You need to listen to the patient. If he is happy with his first eye, then you continue. If there are deficiencies and you think you can fix them, you cure the deficiencies. If you think you cannot fix them, you explant the lens.

**Hardten:** I agree with Rich that it is hard to determine whether patients are happy. They are never superbly happy, so you have to help them understand that they are probably going to be happy when both of their eyes have implants and they are finished with any enhancements.

**Chang:** A staged approach is extremely logical. We have three different presbyopia-correcting lenses in the US that are complementary in terms of their advantages and disadvantages. You do not want to make the process of selecting an IOL unnecessarily complicated, so you recommend what should work best for each individual. You would likely match the second IOL if they are happy with their first surgical outcome. If, however, they are unhappy about halos or with their vision at one particular distance, you have an opportunity to

improve or address this problem with a different IOL in their second eye. Knowing that they have this option helps a lot of patients who otherwise would worry about being trapped with having a lens they did not like (eg, because of halos) in both eyes.

**Donnenfeld:** When patients come in for surgery, they have concerns, they are scared, and they have done research. You exponentially increase their worries when you start talking about operating on both eyes. I tell them that I am only concerned about their first eye and that they are going to tell me what to do with their second eye. This approach creates a partnership with the patient.

**Pepose:** The real question is, what data do we need to gather upfront to maximize the patient's satisfaction with his first eye? For example, if we are implanting a zonal progressive lens, should we measure pupillary dynamics? If we know the patient has a small dynamic range, what is the probability that he will be happy with his near vision?

**Knorz:** The biggest challenge is determining what these patients want and what they are willing to sacrifice. I think the clinical measurements are secondary. Of course, patients must have the potential for 20/20 vision and no macular degeneration or amblyopia. Besides this, it is basically what do you want, and what are you willing to "pay" for? I tell them that patients usually lose a little distance and near vision, but they see without glasses. I use the analogy of all-weather tires. They will never perform as well as tires designed for summer or winter, but they allow people to drive year round. If patients are not willing to make any sacrifices, then presbyopia-correcting lenses are not for them.

### Managing Unhappy Patients

**Chang:** What advice can you offer about people who are unhappy with having a different IOL in each eye?

**Hardten:** Educating patients does not prevent them from comparing the vision of their two eyes. Eventually, they get used to the differences.

**Knorz:** You need to have an exit strategy. During the initial consultation, I explain to patients that they may not be happy postoperatively, in which case the procedure can be reversed. In such instances, I will implant a monofocal lens. They will need glasses but will have perfect vision. Fortunately, I have had no complaints

from patients about the mixture of different lens designs, but some have not been happy with their overall postoperative vision. In the three such cases I have had, I replaced the multifocal lens in their dominant eye with a monofocal lens. All of the patients were satisfied.

"The real question is, what data do we need to gather upfront to maximize the patient's satisfaction with his first eye?"

—Jay S. Pepose, MD, PhD

**Donnenfeld:** Patients who are unhappy will generally have most of their symptoms resolved by a monofocal IOL. That shows that patients need sharp distance visual acuity. The saying goes, patients expect good distance vision, but they pay for near vision. If you have not achieved a quality visual result in their first eye with a multifocal IOL, you should make certain that the IOL in their second eye resolves the problem to give them the best quality of vision. Patients will accept a refractive multifocal IOL if they have good driving vision and can see far away but have to wear glasses some of the time. They are particularly unhappy when they cannot see far away or cannot drive at night. Ophthalmologists need to optimize patients' distance vision and then give them as much reading vision as they can achieve.

**Chang:** I have seen two people in consultation who have preferred their refractive to their diffractive multifocal IOL. You must counsel people upfront that each eye will see differently but that their brain will successfully blend the strengths of each eye as long as they do not constantly compare or overanalyze the vision of their two eyes.

**Knorz:** For a refractive IOL patient, operate on his dominant eye first and only place the second implant after resolving any problems with the first procedure. If the patient really does not like the multifocal implant, you exchange the lens. If a cataract surgery patient does not like the multifocal lens, select a monofocal IOL for his second eye. If the patient is still not happy, explant the lens from his first eye.

**Tipperman:** You need to slow down and take time with unhappy patients. Let them know that you are just as concerned as they are. That alone goes a long way toward smoothing things over.

**Donnenfeld:** When a patient returns to my office unhappy with his surgical outcome, my technicians see him first and perform an evaluation that includes ocular coherence tomography of the macula (Figure 4), a refraction, and topography. I can then tell the patient as I enter the room that he should be unhappy, because we found the problem. Next, I describe how I am going to address it. I act before he has a chance to become angry with me.

“Most of the individuals who receive presbyopia-correcting IOLs are the happiest patients in my practice.”  
—Eric D. Donnenfeld, MD

**Hardten:** One of the worst things to do is to tell patients they should be happy, because they see 20/20 and J2. In the early postoperative period, I try to find a minor problem and blame their symptoms on it. I then address the problem with some active therapy. If they are still unhappy after the first problem is resolved, I find and fix another problem. One of the most frequent issues when patients see well objectively but are not happy is dry eye. Management with artificial tears, cyclosporine, and lid hygiene can be extremely helpful.

**Knorz:** Patients are frequently more likely to accept a problem if they understand it. For example, I explain why they are seeing halos or experiencing double vision after the implantation of a multifocal IOL. I ask their patience to allow neural adaptation to occur and say that we can explant the lens in a few months if they are still unhappy. I rarely have to remove a multifocal IOL.

**Pepose:** Some patients are hypercritical after surgery on their first eye. When they say they see some halos at night, I have them cover their operated eye and look at my penlight. I ask if they see any halos. This exercise demonstrates that their unoperated eye has imperfections as well.

**Tipperman:** Every patient with a multifocal lens who has any symptoms will begin to think the IOL is defective. Giving him a reason for his symptoms stops him from thinking that way.

**Chang:** A common problem is that we normally do not schedule a lot of time for a postoperative cataract

examination, because we are so accustomed to happy patients. If a patient is dissatisfied for any reason after receiving a presbyopia-correcting IOL, however, the worst thing to do is quickly dismiss his concerns and rush off to the next patient. In such a situation, I try to have the patient return when I have more time to spend with him. To buy more time, I may increase the frequency of his NSAID or prescribe artificial tears. I schedule a return visit for the end of my day in 1 to 2 weeks so that we can have plenty of time to discuss his concerns without my appearing rushed or uninterested.

**Knorz:** Patients have to adapt to their new vision. If you ask them to return in 1 year, however, they will feel deserted. Instead, I schedule follow-up visits for 8 weeks and 3 months. They are much more patient when I see them regularly.

**Hardten:** I have to be reasonably certain that I can make a patient happy with his first operated eye before I implant an IOL in his second. Most often, the problem lies with the ocular surface. I compare the pre- and postoperative topographies. I manage problems with the ocular surface aggressively. Next, I perform ocular coherence tomography to look for CME or an epiretinal membrane. If none of these is the problem, it may be that the patient is extremely sensitive to capsular opacity.

If I have a reasonable suspicion that the capsule is causing the patient's waxy vision or symptoms of glare, I will open it. Most of the time, this procedure will resolve the problem. If it does not, however, you are stuck with an open capsule and trying to exchange the lens, which is a little more difficult.

**Tipperman:** Patients often share their experiences after cataract surgery in order to determine if they are normal, not to lodge a complaint. For example, those of my patients who are most successful with the AcrySof Restor lens tell me that their intermediate vision is not sharp. Because they see 20/20 at distance and J1 at near, they notice a drop-off in their midrange vision. I reassure them that their experience is normal and that the lens is purposely designed this way to provide clear night vision. Explaining these phenomena makes them more comfortable.

**Donnenfeld:** We have spent a lot of time talking about unhappy patients, but most of the individuals who receive presbyopia-correcting IOLs are the happiest patients in my practice. They have sharp vision, usu-

ally for the rest of their lives, and that gives them an extraordinary sense of independence and safety.

## EVOLUTION

**Chang:** Tell me what you have changed during the past year that has really made a difference for you in terms of success with refractive IOLs. For example, 1 year ago, I had not done much mixing of different lenses. I am now impressed by how well tolerated this approach is, as long as I explain to patients why I am implanting different IOLs and what they should expect. It has often given both the patient and me more confidence to try a presbyopia-correcting IOL while knowing that we have a contingency plan in the event that they are somewhat disappointed with the performance of the first IOL.

“I am increasingly using multifocal contact lenses to show patients what their postoperative vision will be like.”  
—Michael Knorz, MD

**Hardten:** I have simplified my educational process. I used to have a complex questionnaire. Now I ask (1) are you interested in seeing well at distance without glasses after cataract surgery? (2) are you interested in seeing well at near without glasses? and (3) are you willing to tolerate some glare and halos to achieve this lesser dependence on glasses and contact lenses? My use of refractive IOLs has increased, partly because it is easier to understand the patients’ answers to these less complicated questions.

**Donnenfeld:** I became a better doctor in 2007, because now I make certain that I have a relationship with every patient before I implant a refractive IOL. I spend more time with patients, I create reasonable expectations, and I ensure that I feel comfortable that they understand those expectations before surgery. I make certain that patients understand that I am their partner throughout the procedure. This approach has greatly reduced my stress level.

In addition, I now use video systems to help teach patients about the lenses and IOL surgery. Seeing what they can expect has really improved patients’ level of comprehension. I use a system from Eyemaginations, Inc. (Towson, MD). The video is customized to each of my patient’s needs.

**Tipperman:** I have changed how I talk to high astigmats. I describe surgery as a two-staged procedure. Because the degree of correction obtained with LRIs for high levels of astigmatism is variable, I explain to these patients that they will likely require laser vision correction to eliminate any residual refractive error.

**Pepose:** I simplified my approach. I ask patients if they would be interested in what I call *walk-around vision*. That means they could drive to the supermarket, see what is on the shelf, and read the labels on cans. I tell them up front that they may still require low-powered reading glasses to see the small print listing the ingredients on the back of a can. I explain that they might need their glasses in dimly lit rooms but that they will depend on their spectacles a lot less than they would with monofocal lenses.

Additionally, I now perform staged surgery and operate on the patient’s dominant eye first. This approach is simpler and more effective than beginning with the nondominant eye.

**Knorz:** I changed to operating on the patient’s dominant eye first and implanting a distance-dominant multifocal IOL. Then, I base my selection of the second IOL on the patient’s feedback. Additionally, I am increasingly using multifocal contact lenses to show patients what their postoperative vision will be like. If they like it, I proceed with surgery.

**Chang:** I want to thank everyone for his comments. Ours is an incredibly dynamic field, because, every year, we are each clearly doing things differently than the preceding year. The one thing we probably all can agree on is that there is no single best IOL or approach for every patient. I am always impressed by how much we can all learn from sharing our experiences—both our successes and our failures. ■

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