

Cataract & Refractive Surgery **TODAY**

Strategies for Refractive Cataract Surgery

Featured material from the Atlanta SOURCE symposium.

Postoperative Problem Solving With
Presbyopia-Correcting IOLs
BY ROGER F. STEINERT, MD

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BY Y. RALPH CHU, MD

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Mixing and Matching Case Studies
BY STEPHEN G. SLADE, MD



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Strategies for Refractive Cataract Surgery

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TARGET AUDIENCE

This activity is designed for anterior segment ophthalmologists.

LEARNING OBJECTIVES

Upon successfully completing this learning program, participants should be able to:

- identify key differences between various types of presbyopia-correcting IOLs
- better discuss the choices of presbyopia-correcting IOLs with potential candidates
- manage patients' expectations about the outcomes achievable with presbyopia-correcting IOLs
- perform a thorough examination to determine the source of a refractive IOL patient's postoperative visual complaints

METHOD OF INSTRUCTION

Participants should read the continuing medical education (CME) activity in its entirety. After reviewing the material, please complete the self-assessment test, which consists of a series of multiple-choice questions. To answer these questions online and receive real-time results, please visit <http://www.dulaneyfoundation.org> and click "Online Courses."

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ACCREDITATION AND DESIGNATION

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the

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CONTENT VALIDATION

In compliance with ACCME standards for commercial support and the Dulaney Foundation's policy and procedure for resolving conflicts of interest, this CME activity was peer reviewed for clinical content validity to ensure the activity's materials are fair, balanced, and free of bias; the activity materials represent a standard of practice within the medical profession; and any studies cited in the materials upon which recommendations are based are scientifically objective and conform to research principles generally accepted by the scientific community.

FACULTY CREDENTIALS

Y. Ralph Chu, MD, is Founder and Medical Director of the

Chu Vision Institute in Bloomington, Minnesota. He is also Adjunct Associate Professor of Ophthalmology at the University of Minnesota in Minneapolis and Clinical Professor of Ophthalmology at the John Moran Eye Institute, University of Utah, Salt Lake City. Dr. Chu may be reached at (952) 835-0965; yrchu@chuvision.com.

Stephen G. Slade, MD, is in private practice at Slade and Baker Vision in Houston. Dr. Slade may be reached at (713) 626-5544; sgs@visiontexas.com.

Roger F. Steinert, MD, is Professor and Chair of Ophthalmology, University of California, Irvine, Professor of Biomedical Engineering, and Director, Gavin Herbert Eye Institute. Dr. Steinert may be reached at (949) 824-8089; steinert@uci.edu.

FACULTY/STAFF DISCLOSURE DECLARATIONS

Y. Ralph Chu, MD: Grant/research support from Abbott Medical Optics Inc., Bausch & Lomb, Inc., Glaukos, Ista Pharmaceuticals, Inc., OcuSoft, Ophthalmic Innovations International, Sirion, Refractec, Inc., Allergan, Inc., GuidePoint Global, Ocusoft, and Visiogen.

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Roger F. Steinert, MD: Consultant for Abbott Medical Optics Inc., and Revision Optics, Inc.

All those involved in the planning, editing, and peer review of this educational activity have indicated that they have no financial relationships to disclose.

STATEMENT OF NEED

As the use of presbyopia-correcting IOLs grows and manufacturers introduce new designs into the market, refractive cataract surgeons must be able to explain their benefits to interested patients and also be well versed in the surgical and functional details of these lenses (recommended reading: *Raising the Bar With Refractive IOLs. Cataract & Refractive Surgery Today*, February 2009). Then, the surgeon must be familiar with all the subtleties of each type of presbyopia-correcting IOL in order to make an informed recommendation to the patient.¹⁻⁸

In addition to preoperative considerations, presbyopia-correcting IOLs require particular surgical techniques to optimize their performance. As with any IOL implantation, considerations such as sizing of the capsulorhexis,⁹⁻¹¹ pupillary diameter,¹² centration, axis alignment, power calculations,¹³ and astigmatism management¹⁴ (recommended reading: *Astigmatic Treatment Required. Cataract & Refractive Surgery Today*, February 2008) all factor into postoperative refractions.

Ophthalmologists who offer presbyopia-correcting IOLs need a strategy for treating postoperative complications and performing refractive enhancements, either themselves or through referrals with other physicians.¹⁵⁻¹⁷ They also must know the standard pre- and postoperative dosing regimens for preventing infection¹⁸⁻²⁰ and alleviating dry eye syndrome.^{21,22}

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Postoperative Problem Solving With Presbyopia-Correcting IOLs

Strategies for identifying and solving visual complaints.

BY ROGER F. STEINERT, MD



Admittedly, figuring out how best to treat the complaints of postsurgical refractive IOL patients takes a lot of investigative work. The following outlines a process of examination that may expedite the diagnosis and increase its accuracy. The most effective

strategy, however, is sincerely listening to the patient and conveying sincere concern for his complaints. Multifocal recipients are refractive patients much more than they are cataract patients, and creating a sense of partnership with them is critical to a successful treatment. If they feel you are on their side, then they are much more compliant about conservatively pursuing their options.

STEP 1: HISTORY AND REFRACTION

The successful management of unhappy refractive IOL patients starts with taking a careful medical history. It is particularly important to ask nonleading questions of these patients, because they often try to please you or read into the question and then do not respond with meaningful answers. Next, it is critical to obtain a careful refraction. One trick for this is to examine the patient's eyes both before and after dilation to help you differentiate between issues of clarity and postsurgical side effects such as halo and glare. If the patient has been dilated before you are able to see him, you will have to examine him again on a separate occasion. Remember to conduct the defogging technique during the refraction. If the person taking the refraction does not know that the patient has a presbyopic IOL, he may ignore the patient's distance vision and compromise the refraction's accuracy.

STEP 2: TOPOGRAPHY

The following is often repeated but cannot be overstated: Always perform corneal topography,¹⁻⁴ especially when planning an enhancement. This screening often identifies the source of the patient's visual complaint, and

"The following is often repeated but cannot be overstated: Always perform corneal topography, especially when planning an enhancement."

it can also help you determine whether his distance vision needs tweaking. If his clarity is poor but his distance vision is satisfactory, the problem is fairly easy to treat by adjusting his intermediate or near vision (or, more rarely, both at the same time). Another approach is to try to customize the IOL in the second eye to achieve the vision the patient desires. You can use either the same style of implant modified for power, or a different type of implant. This stage of the preoperative evaluation is also the best time to set the patient's expectations about wearing glasses for a few specific activities.

STEP 3: CHECK THE TEAR FILM

If the patient's clarity is poor at both distance and near, the correction will be much more challenging. It seems that an increasing number of practitioners believe that this problem often stems from ocular surface dryness.⁵⁻⁷ Remember the answer to the trick question we all learned in residency: What is the main optical element in the eye? It is the tear film, not the cornea. It is very easy to underestimate the influence of dryness on a patient's visual acuity if you have not addressed it previously.

Examining the surface begins at the slit lamp. It includes using dyes such as lissamine green and rose bengal, as well as paying particular attention to the meibomian glands, which we believe are a significant component of dry eye. If lid hygiene is indicated, treatments ranging from punctal plugs to topical tear products can make a big difference.

STEP 4: THE CORNEA

If the tear film seems healthy and you suspect that the problem is located a little deeper, then go down one layer to the cornea itself. Again, topography can be your best friend. When in doubt, refraction with a hard contact lens will identify any issues in this system. Because these refractions need to be accurate, partner with an optometrist or someone experienced in administering these tests if you are not comfortable.

STEP 5: GO DEEPER

Once you have ruled out the aforementioned areas of concern, you can begin examining the back of the eye. The problem could be the macula, cystoid macular edema, an epiretinal membrane, or the optic nerve itself.⁸ If optical coherence tomography testing is normal, do not forget the old mainstays of visual fields and color vision testing. Only after exhausting all of these possibilities should you start focusing on the posterior capsule.

STEP 5: THE POSTERIOR CAPSULE

Evaluating the posterior capsule is tricky, because the slit lamp will only show a reflection of the back of the eye. You want to see what the retina sees, which is impossible to do with the red reflex. A retroillumination examination can be the most important diagnostic tool in this situation. Do not consider an Nd:YAG capsulotomy unless you are convinced that the problem is in the posterior capsule, because if the patient's symptoms still persist afterward, you will have to do a refractive lens exchange with an open posterior capsule.

DIAGNOSTIC POINTERS

If the patient's acuity is good but his symptoms of glare and halo are strong, perhaps he is confused about which eye is the problem. This is not uncommon, particularly if only one eye has undergone surgery. Have the patient draw what he sees, and then attempt to recreate the conditions in the examination room. Remember that refractive problems can cause halo and glare, so again, look at the cornea for abnormalities, the correct cylinder, and higher-order aberrations. One other trick is to push the patient's vision a little to the minus side. If he is only experiencing symptoms while driving at night, prescrib-

ing glasses that are slightly over minus will push his light reception toward the retina a little bit and thereby reduce the severity of the halos. This strategy has helped me satisfy the patient and avoid an IOL exchange in several instances.

IS IT THE PUPIL?

If you think it is possible to improve the patient's symptoms by changing the pupil's size and shape, you can try pharmaceutical manipulation. Brimonidine tartrate ophthalmic solution 0.1% (Allergan, Inc., Irvine, CA) works great for exuberant overdilation (an off-label use), but it does not constrict the pupil *per se*. For true constriction, you can dilute commercial 0.5% pilocarpine.

Lasers can be used in a lot of indications.⁹ Sometimes, the multifocal IOL has been placed perfectly, but the pupil is somewhat off from the center of the implant. Eric D. Donnenfeld, MD, of Rockville Centre, New York, has described being able to pull the pupil and center it over the multifocal with his *rule of 500*: an argon laser using a 500- μ m spot, for 500 milliseconds, at 500 mW.¹⁰ With these settings, the surgeon creates an arc of four spots in the midperiphery that will pull the pupil in the desired direction and may perhaps make a big difference in the optical quality provided by the multifocal IOL.

FINAL POINTERS

It is important to allow sufficient time between treating the first and the second eye with multifocal corrections. I think more surgeons are moving toward a staged implantation so that they can custom-treat the second eye. Also, a refractive lens exchange is the last option, which makes a posterior capsulotomy your second-to-last option. ■

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Putting Premium IOLs Into Practice

Statistics and strategies.

BY Y. RALPH CHU, MD



The plethora of IOL technologies now available to us has made the discussion and decision about which ones we should adopt in our practices much more arduous for us practitioners and our staffs. As soon as we begin to understand the differences between multifocal, diffractive, refractive, and accommodating IOL technologies, manufacturers come out with something new, such as lenses with HD and toric correction. So, how do we decide between using accommodating or multifocal IOLs? My partners and I have experience implanting all the FDA-approved IOL models as well as several of the newer-generation models currently in FDA clinical trials, such as the Synchrony IOL (Visiogen, Inc., Irvine, CA) and the Tecnis Multifocal IOL (Abbott Medical Optics Inc., Santa Ana, CA). The following describes a strategy I devised to help my staff keep in mind the attributes of each IOL we use, as well as some market data that illustrate how surgeons across the country are using these lenses.

IOL USE IN THE US

It may interest surgeons to know the current statistics regarding the implantation of presbyopia-correcting IOLs across the country. According to data from Market Scope LLC (St. Louis, MO),¹ approximately 60% of surgeons in the United States are using presbyopia-correcting IOLs, a number that remained fairly stable during 2008 (Figure 1). The premium IOL channel has grown since 2006 from 5% to 7% of the total IOL market in the United States, which is still a low level of penetration relative to the total market.

Market Scope also examined the use of multifocal versus accommodating lenses. The percentage of US surgeons implanting multifocal IOLs declined from Q2 2007 over 2008, but the use of accommodating lenses rose fairly steeply (Figure 2).¹ I suspect the reason for the difference between these numbers is that patients place equal value on quality of vision and range of focus. Therefore, those of us who are going to implant presbyopia-correcting lenses need to be familiar with all the

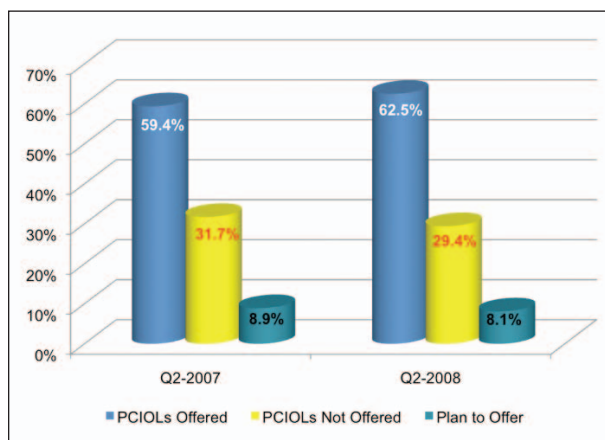


Figure 1. Market Scope data show surgeons' use of multifocal versus accommodating IOLs from Q2 2007 to Q2 2008.

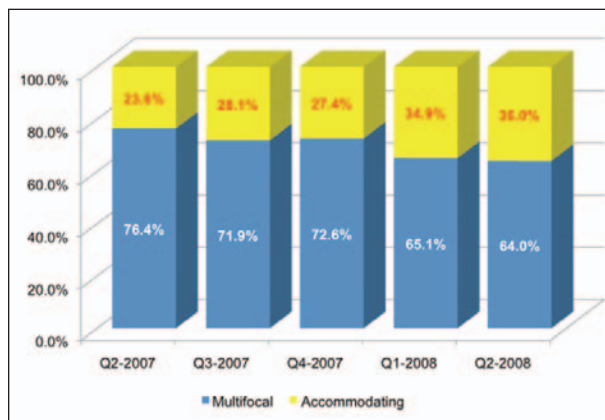


Figure 2. According to Market Scope, the use of accommodating IOLs among US surgeons rose steeply while the use of multifocal IOLs declined between 2007 and 2008.

platforms, and I think we should use quality of vision to guide our decisions about matching patients with IOLs.

IOL IDENTIFICATION CHART

My mantra is that we should be familiar with all the IOL platforms, because at the very least, every patient must be educated about their options. To that end, I have developed

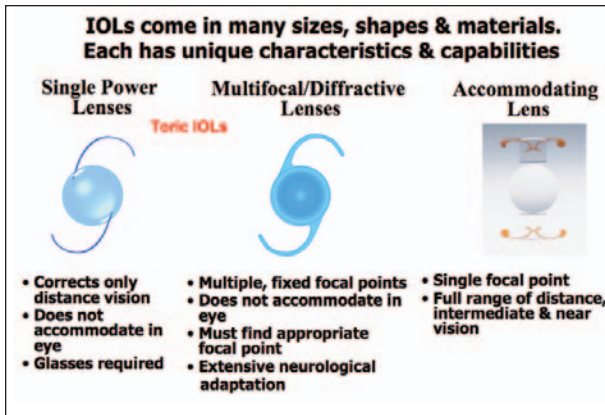


Figure 3. Dr. Chu uses this chart to help his staff remember the qualities of the various presbyopia-correcting lenses.

a crib sheet of sorts to help my staff and me provide the right IOL technology to the right patient. I have created a visual chart of presbyopia-correcting IOLs for my staff, including the optometrists in our practice, to help identify each one and how it works (Figure 3). This chart simply shows a picture of each lens and a brief summary of how it works. For example, the accommodating and diffractive multifocal lenses are so successful because they capitalize on the sharp points of focus inside the eye. A monofocal lens provides sharp focus but no range of vision, because it does not move. An accommodating lens gives good depth of focus because it is flexible inside the eye and because its optical surface does not have any diffractive rings. The diffractive lenses provide near and distant points of focus, but because their intermediate range is somewhat blurred, they are not ideal for working at a computer. A refractive multifocal IOL may give 20/20 acuity, but it wastes incident light and may compromise patients' contrast sensitivity (Figure 4).

MIXING AND MATCHING RATES

The idea of mixing and matching premium IOLs to optimize patients' vision has attracted a lot of attention lately, but my impression is that very few physicians are doing it routinely. Market Scope's data show that 80% to 90% of patients are receiving the same lens in both eyes, and the rate of mixing has remained stable at 10% or less.¹

LENS ANATOMY

Beyond being able to identify them, we must familiarize ourselves with the technical aspects of all the presbyopia-correcting lenses so that we can properly educate our patients about them. There is a refractive multifocal acrylic lens, the ReZoom multifocal IOL (Abbott Medical Optics Inc.), which has aspheric transition zones. The AcrySof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX) is a diffractive multifocal IOL with an apodized surface and

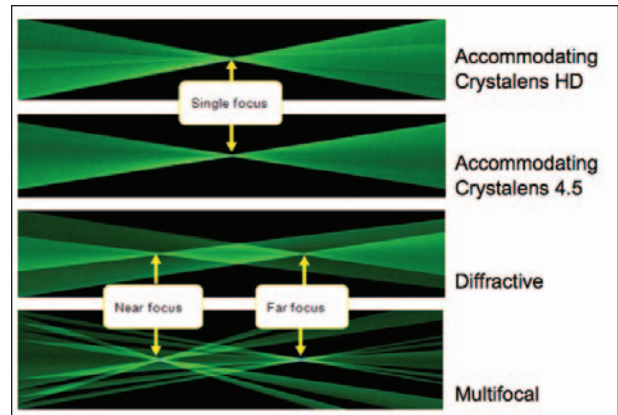


Figure 4. This slide presents simulated images generated using a custom paraxial beam tracing program. Both the Crystalens AT-45 and the Crystalens HD show a single point of focus, unlike multifocal technologies.

Based on research by Edwin J. Sarver, PhD, Sarver and Associates, Inc. Carbondale, Illinois, USA.

has a 3.6-mm diffractive zone surrounded by a smooth refractive outer zone. This lens is pupil dependent. When the pupil enlarges, the reading vision decreases. Finally, the Crystalens accommodating IOL has been updated to the Crystalens HD (both from Bausch & Lomb, Inc., Rochester, NY), which features an optimized optic that is designed to improve depth of focus and near vision.

THE CRYSTALENS HD

My practice was one of the first clinical investigative sites for the Crystalens HD and also for the Tecnis Multifocal IOL. The Crystalens' platform is a silicone lens designed for the treatment of cataracts. The HD version of the lens is an addition to the Five-O platform. Beyond the increase in depth of focus, the 5-mm optic increases the lens' stability and predictability by changing the area of the haptics and the contact area between the haptics and the capsule itself. This modification to the 1.5-mm-diameter center of the optic results in a 3- μ m increase in central thickness. This central thickness raises the Crystalens' spherical aberration centrally so that when the pupil constricts during convergence, the patient has better reading ability and depth of focus. This is not a multifocal effect; there is no loss of contrast or decrease in distance acuity. It is still a single point of focus, just over a wider range. The Crystalens requires no neuroadaptation or multifocality. This bump on the center of the lens is polished and blended and is difficult to see, even at the slit lamp.

The Crystalens HD expands the zone of focus around the target refraction, which should be plano. There is no loss of contrast sensitivity or mesopic results compared with a monofocal IOL. Figure 5 summarizes why I think accommodating IOLs are gaining momentum. It shows monocular data among the Crystalens 4.5, the Five-O, and the HD. The percentage of J2 reading ability increased tremendous-

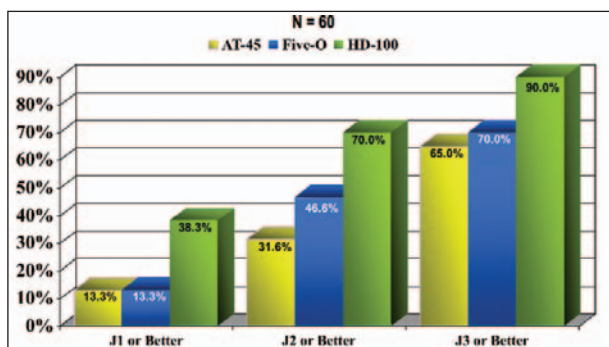


Figure 5. Monocular Distance-corrected near visual acuity with the AT-45, the Five-O, and HD 100 versions of the Crystalens, within ± 1.00 D of intended target refraction 4 to 6 months postoperatively.

ly with the introduction of the HD to approximately 70%. Clinically, the Crystalens HD may provide perhaps 1 to 1.5 lines of better reading versus previous generations of the lens (data on file with Bausch & Lomb, Inc.).

THE TECNIS MULTIFOCAL IOL

I do not think we can exclude multifocal lenses from our practices if we want to have a successful, comprehensive presbyopia-correction service. The Tecnis Multifocal lens has diffractive rings that fully cover the posterior side of the optic. Not all aspheric multifocal lenses are the same, and the Tecnis' surface is patented. With small pupils, the Tecnis Multifocal and the AcrySof ReSTOR aspheric IOL perform similarly and show virtually no difference in quality of vision. With an enlarged pupil, however, the quality of vision is slightly better with the Tecnis Multifocal IOL than the AcrySof ReSTOR lens (data on file with Abbott Medical Optics Inc.).

One of the downsides of diffractive lenses is loss of distance acuity, and data on the Tecnis show 20/20 or better distance BCVA in 88% of patients.² Nevertheless, the majority of patients did not lose significant amounts of distance vision. Furthermore, 94% of the subjects in the Tecnis Multifocal IOL's FDA trial achieved 20/30 or better vision at near with their best-corrected distance vision. Patients also experienced the incredible reading ability that we expect from a diffractive multifocal IOL (93% of subjects had 20/25 distance and J2 or better reading, simultaneously). Functional acuity was also good; reading speed was better with the Tecnis Multifocal lens than the monofocal control. It is important to note that we investigators in the Tecnis' FDA trial were not allowed to correct patients' astigmatism.

The incidence of glare and halos with the Tecnis Multifocal IOL was very similar to what we see with the other aspheric and diffractive multifocal lenses on the market. However, visual symptoms are less of an issue with these lenses than contrast sensitivity.

PRESBYOPIA-CORRECTING LENSES IN PRACTICE

How do we integrate these lenses into our practices? Now is the time to intensify our focus on what patients want. We must talk to patients about their lifestyles (are they still working, and what hobbies do they keep?), and we must try to match their lifestyles to the lens technology we have available. I think the key to making patients happy with presbyopia-correcting IOLs is to give predominance to one zone of vision that patients can use extremely well (usually, they prefer distance). I have altered my surgical planning so that I now implant the dominant eye first in order to ensure good distance vision. I check the patient's vision at 1 week, and then I customize the second eye's vision based on the patient's response to his first eye. I implant the second eye 1 to 2 weeks after the first.

It seems that most surgeons who are succeeding with presbyopia-correcting lenses have moved away from relying on Snellen acuity as a measurement of patient satisfaction. As other surgeons have stated at the podium, 20/20 does not describe every aspect of a patient's vision; they can be 20/20 J1 and unhappy. Therefore, I try to use real-world examples to show patients the type of vision they can expect from these lenses. For example, I tell them that J5 is the size of the print in *USA Today*, which they would have trouble reading without spectacles if they chose a monofocal implant. Again, because most patients are focused on 20/20 vision as a standard of success, we must show them real-world examples rather than depend on Snellen acuity.

DISCUSSING OPTIONS WITH PATIENTS

When discussing IOL options with patients, I break them into three categories. I begin by saying, "This is an exciting time for you to have a cataract, because now you have a choice of lenses." Then, I explain the first category of lenses, monofocal IOLs. I'll say, "Monofocal IOLs are the kind of lens you are used to hearing about. They will clear your vision of a cataract and are excellent lenses, but you will need glasses for both distance viewing and reading." Category 2 is for people who have astigmatism: "We can give you a toric IOL, which is your best bet for distance vision, but you will still need glasses for reading." For category 3, I will say, "The premium IOL lenses provide the best chance for getting the widest range of vision," and I will continue explaining each lens from there.

In summary, we refractive cataract surgeons must familiarize ourselves with all the presbyopia-correcting IOL platforms, and we must pay attention to all measures of visual quality. Finally, refractive surgery is about communication and education—not selling. ■

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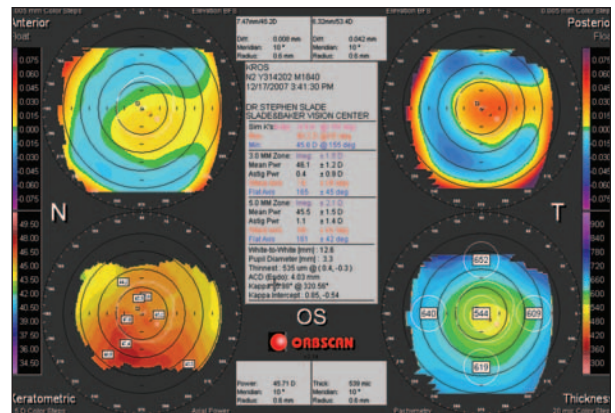
2. U.S. Food and Drug Administration. Tecnis® Multifocal Foldable Posterior Chamber Intraocular Lenses (IOLs), Models ZM900 and ZMA00 - P080010.

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfTopic/pma/pma.cfm?num=P080010>. Accessed April 8, 2009.

BY STEPHEN G. SLADE, MD



In this case, LASIK was combined with a different technique. A 68-year-old male first presented to my office in



Based on these findings, I decided to replace the flap without treating patient. Despite significant multifocality, his vision is satisfactory (Figure 1). ■

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CME QUESTIONS

- In patients with multifocal IOLs, which of the following nondescript postoperative complaints is often an indicator of corneal dryness?**
 - halos
 - poor vision quality at all distances
 - poor vision quality at distance only
 - poor vision quality at near only
- In multifocal IOL patients experiencing halo and glare only while driving at night, which of the following can be a simple solution?**
 - prescribing driving glasses with a slightly positive correction
 - prescribing driving glasses with a slightly negative correction
 - treating corneal dryness
 - none of the above
- Which presbyopia-correcting IOL design is pupil dependent?**
 - multifocal refractive
 - accommodating
 - multifocal diffractive
 - all of the above
- When examining a patient who is unhappy after receiving presbyopia-correcting IOLs, it is important to obtain a refraction both before and after pupil dilation.**
 - true
 - false
- Which of the following tests is the best method to investigate corneal surface problems after implantation of a presbyopia-correcting lens?**
 - refraction with a hard contact lens
 - wavefront refraction
 - Snellen acuity testing
 - none of the above
- What should be the surgeon's last option when trying to solve visual complaints following implantation of a presbyopia-correcting lens?**
 - posterior capsulotomy
 - refractive lens exchange
 - treating corneal dryness
- What refraction should the surgeon target with the Crystalens?**
 - 0.50 D
 - 0.25 D
 - plano
 - +0.25
- According to Market Scope data, what percentage of patients are receiving mixed presbyopia-correcting IOLs?**
 - 5% or less
 - 10% or less
 - 15% or less
 - 20% or less

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