Refractive Surprises Are Inevitable

The best offense is a good defense.

BY JOHN A. HOVANESIAN, MD

Refractive surprises are possible with any IOL, but predictability is lower in patients who previously underwent LASIK or another cornea-altering procedure. When they elect a presbyopia-correcting IOL, however, patients' expectations are higher. In such cases, a winning strategy entails careful preoperative management of both their expectations and the ocular surface, precise corneal measurements and IOL power calculations, and a commitment to top-notch outcomes.

I do not recommend a multifocal lens for patients who have had prior refractive surgery, because usually, their contrast sensitivity is already reduced and any lens that further decreases contrast is likely to result in unwanted visual symptoms. IOLs that provide a single point of focus are a much safer choice. I therefore implant a Crystalens (Bausch + Lomb, Rochester, NY) if a patient who has had refractive surgery desires a presbyopia-correcting IOL. This scenario appears to be playing out in clinical practices across the country. According to the SurgiVision DataLink IOL Edition (SurgiVision Consultants, Inc., Scottsdale, AZ), a database of premium IOL outcomes and usage information, the rate of cataract patients who have had prior refractive surgery and received IOLs is about 3% for other premium IOLs and double that (ie, approximately 6%) for the Crystalens (data on file with SurgiVision Consultants, Inc.; http://IOLreports.surgivision.net).

In the SurgiVision database, the mean refractive outcome is plano among patients with a history of refractive surgery who receive a Crystalens—right on target. There is a greater standard deviation, however, than among patients who have not had prior refractive surgery. The primary imperative for patients who choose presbyopia-correcting implants is excellent uncorrected distance vision. Their secondary expectation is some degree of spectacle-free near vision. Surgeons cannot deliver either if they do not hit the refractive target.

PREOPERATIVE PREPARATION

Corneal Measurements

Although refractive surprises are inevitable in a portion of postrefractive surgery patients who receive a premium IOL, it is nevertheless essential for surgeons to strive to minimize this complication. The first step is to obtain precise corneal measurements, which requires optimizing the ocular surface. I encourage patients to use eyelid hygiene and artificial tears before preoperative measurements. If the tear breakup time is less than 7 or 8 seconds or manual keratometry does not reveal crisp, reproducible mires, I normalize the tear film with a course of artificial tears, a 5-day course of b.i.d. AzaSite (Inspire Pharmaceuticals, Inc.), or both. To ensure reliable measurements, I recommend calibrating the manual keratometer using the steel calibration balls that accompany the instrument and properly setting up the eyepiece for precise focus.

Axial Length

The IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA) is helpful for most eyes but only if a reasonably high (above 10) signal-to-noise ratio can be attained consistently. In other cases, immersion ultrasound biometry using a water bath may be warranted. Although this method is slightly more involved than alternatives (such as contact biometry), it has the advantage of offering the most reproducible measurements of axial length.

IOL Power Calculations

Using the proper IOL calculation formula is another essential step toward minimizing refractive surprises. For most eyes receiving the Crystalens, the SRK/T or the Holladay II formula works well. For shorter eyes, the Hoffer Q formula is a good choice (see *IOL Power Calculations/Formulas for the Crystalens*).

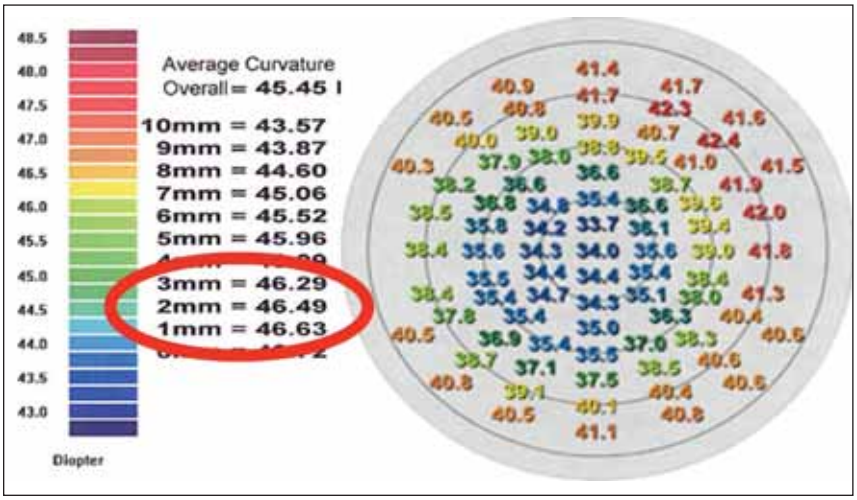

Figure 1. Corneal topography systems that give average values for corneal curvature within fixed radii provide useful information for IOL power calculations.

Ultimately, the difficulty in postrefractive surgery eyes is the absence of a surefire method for measuring the cornea's actual power. It is helpful to use readouts provided by some corneal topography systems that report the average corneal power within certain radii of the center of the cornea (Figure 1). The reports offer a reasonable prediction of the cornea's power, and then those numbers can be plugged into a publicly available postrefractive surgery IOL calculator that is available at http://www.ascrs.org. In the future, intraoperative wavefront aberrometers may allow surgeons to modify their choice of IOL during the surgery itself after they remove the cloudy crystalline lens.

Refractive Target

Careful and informed refractive targeting is the cornerstone of the preoperative process. With the Crystalens AO, I target the distance side of plano to be slightly hyperopic. In the end, I want a refractive result of plano. I do not want it to be more than very slightly myopic, because with a myopic result comes a rapid falloff in uncorrected distance vision. If patients are even a little bit nearsighted, they lose sharpness at distance and become less satisfied with their outcome. For the nondominant eye, I typically aim for about -0.40 D or -0.50 D with the Crystalens AO. I find that this target ultimately results in comfortable uncorrected near vision, although patients should be forewarned that they may not achieve their full range of near vision for a few months.

IOL POWER CALCULATIONS/FORMULAS FOR THE CRYSTALENS

- The SRK/T formula is useful for eyes with axial lengths of 22.01 mm or greater. The recommended starting A-constant is 119.1 for the Crystalens AO, 118.8 for the Crystalens HD, and 119.0 for the Crystalens Five-O (all IOLs from Bausch + Lomb, Rochester, NY).
- The Holladay II formula is appropriate for eyes with axial lengths of 22.0 mm or less. It is also suggested for eyes with keratometry readings flatter than 42.00 D or steeper than 47.00 D independent of axial length. The manufacturer's recommended starting anterior chamber depth is 5.61 for the Crystalens AO, 5.43 for the Crystalens HD, and 5.55 for the Crystalens Five-O.

Astigmatic Correction

Whenever more than 0.50 D of postoperative astigmatism is expected, the surgeon should plan to correct it. A detailed step-by-step description of how to predict postoperative astigmatism and correct it with limbal relaxing incisions is available at http://www.eyetube.net/video/4-steps-to-astigmatism-correction-during-cataract-surgery.

Patients' Expectations

After optimizing the ocular surface and taking measurements, the best way to handle unexpected outcomes is to discuss realistic expectations with the patient. It is the surgeon's responsibility to convey to the patient and ensure that he or she understands that, if his or her eye was previously altered surgically, its corneal power is impossible to calculate accurately, the eye will almost always behave somewhat unpredictably, and it will take longer than average to realize its true visual capabilities.

I also clearly state that the patient has an increased likelihood of an enhancement. I bundle the price of enhancements into that of a presbyopia-correcting implant. In doing so, I eliminate the possibility of a financial surprise in addition to a refractive surprise.

REFRACTIVE ENHANCEMENTS

With the Crystalens, I typically prefer to perform enhancements after a YAG capsulotomy because of the rare possibility of a minor YAG-associated refractive shift. I also like to wait at least 3 months before performing the YAG capsulotomy to avoid cystoid macular edema. Therefore, I typically perform enhancements no sooner

than 3 and as late as 6 months after the primary surgery.

Clearly, performing an enhancement when one is needed is the right thing to do, but the specific procedure is up to the surgeon. I prefer PRK, because it is less likely to produce dry eye syndrome than LASIK. In addition, PRK is highly precise and can be performed over any prior refractive surgical procedure.

My enhancement rate for all premium IOL surgeries is approximately 20%, but my enhancement rate for premium IOLs implanted in eyes that previously had refractive surgery is double that number. Despite the trend in refractive surgery to congratulate oneself for a low enhancement rate, the reality is that surgeons who have an enhancement rate of less than 20% may be doing a disservice to themselves and their patients. With any lens implant, the likelihood of a residual refractive error of 0.50 D or more in either sphere or cylinder is high enough that a 20% enhancement rate is realistic. Anything less than that suggests that the surgeon might not be finishing the job of hitting the refractive target in a significant proportion of patients.

Too many surgeons close the book on patients who receive premium IOLs a few weeks postoperatively, when the ideal time to ascertain their visual capabilities is 6 months after surgery. Ophthalmologists who strive to maintain a low enhancement rate and finish observing their premium IOL patients too soon may be harming the market. A patient who has a good result will tell two or three friends. A dissatisfied patient (eg, one who needs glasses to drive due to a result 0.50 D off target) will tell 10 friends. When a surgeon misses the refractive target and then lets the refractive surprise go uncorrected, he or she shoots him- or herself in the proverbial foot and then must bear the burden of a disgruntled patient. ■

A video on this subject is available at http://eyetube.net/?v=tukos.

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