

FOCUS ON THE FUTURE

Ophthalmologists should keep future lens surgery in mind when performing corneal refractive surgery.

BY GEORGE O. WARING IV, MD



Most ophthalmologists practice both corneal and lens-based refractive and cataract surgery. Whether we subscribe to the catch-and-release or retain-and-hold model, we are all aware that patients who undergo laser vision correction (LVC) early in life will eventually seek vision correction opportunities as they age. In addition, there will

be an estimated 4.2 billion presbyopic people worldwide by the year 2020,¹ and many of them will undoubtedly be looking for solutions to their presbyopia. The decision to perform a corneal- or lens-based surgery is not always easy. When planning corneal LVC, we should keep future lens surgery in mind.

LESS IS MORE

The human eye comprises two lenses, and we refractive and cataract specialists have a beautiful opportunity to optimize a patient's vision by accessing both. Of course, safety is paramount, so the least invasive procedure that will provide the desired outcome is the the most desirable choice. As in life, less is often more when it comes to surgery, which can mean opting for the less invasive procedure (eg, refractive lens exchange). Surgical decision making is often complex, but advanced diagnostics can help guide surgical decisions.

Because corneal LVC alters the curvature of the cornea, future IOL measurements will require special considerations. Those of us who perform corneal refractive surgery should provide an LVC treatment card for patients' medical records, much like we do with an IOL card, to aid in postrefractive surgery IOL calculations. Also, it is important to counsel patients that, eventually, they will require another procedure. Now, with advanced postrefractive surgery IOL calculators, high-resolution optical coherence tomography, and intraoperative aberrometry, we have become better at postrefractive IOL measurements (see the article by Drs. Devgan and Weikert on p. 71).

Altering the corneal curvature also changes the aberration profile. I recommend bearing this in mind when planning IOL surgery. Specifically, the more myopia that is treated with corneal LVC, the more positive spherical aberration is induced, and the more negatively aspheric the IOL

should be to compensate. The more the hyperopia treated with corneal LVC, the more negative spherical aberration is induced, making an aberration-neutral IOL or a lens that has slight positive aberration an appropriate choice. Rocha et al described using depth of focus with spherical aberration and went on to simulate and quantify the amount with adaptive optics.^{1,2}

TIP FOR SUCCESS

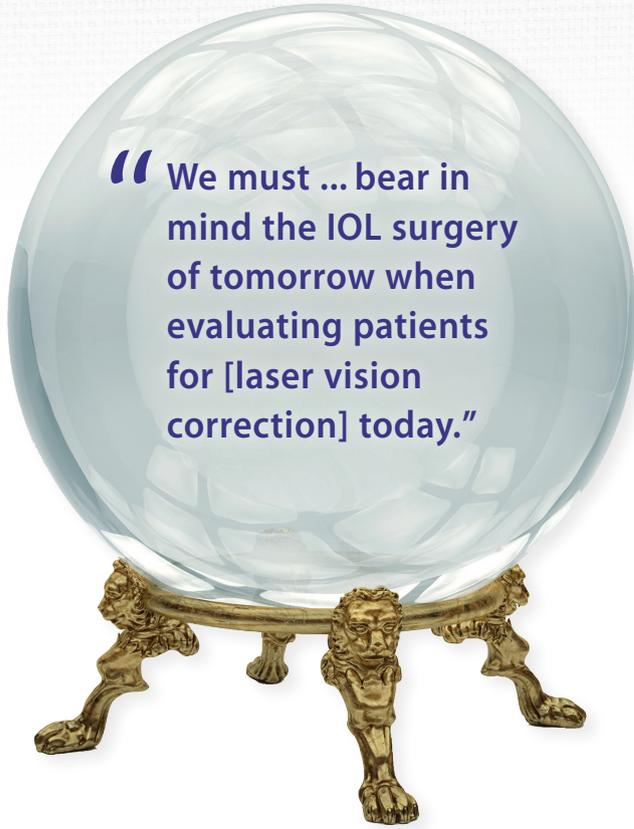
When patients have a history of hyperopic LASIK, I have had success in IOL surgery by targeting plano or slight myopic defocus with excellent uncorrected distance and near visual acuity by using the patient's negative spherical aberration to enhance depth of focus.

We have recently demonstrated this objectively with ray-tracing aberrometry and shown that this is a viable



AT A GLANCE

- Because corneal laser vision correction (LVC) alters the corneal curvature and aberration profile, future IOL measurements will require special considerations.
- The more myopia that is treated with corneal LVC, the more positive spherical aberration is induced, and the more negatively aspheric the IOL should be to compensate. The more hyperopia is treated with corneal LVC, the more negative spherical aberration is induced, so an aberration-neutral IOL or a lens with slightly positive aberration is recommended.
- The author has had success treating patients who had prior hyperopic LASIK by targeting plano or a slightly myopic defocus target with excellent uncorrected distance and near vision by using the patient's negative spherical aberration.



“ We must ... bear in mind the IOL surgery of tomorrow when evaluating patients for [laser vision correction] today.”

technique for creating extended depth of focus with aspherically neutral IOLs and corneal negative asphericity.³

CONCLUSION

Corneal LVC is one of the most successful elective surgical procedures to date. As a result, large numbers of postrefractive surgery patients will present to our clinics for evaluation and management of their cataracts. We must therefore bear in mind the IOL surgery of tomorrow when evaluating patients for LVC today. ■

1. Rocha KM, Soriano ES, Chamon W, et al. Spherical aberration and depth of focus in eyes implanted with aspheric and spherical intraocular lenses: a prospective randomized study. *Ophthalmology*. 2007;114(11):2050-2054.
2. Rocha KM, Vabre L, Chateau N, Krueger RR. Expanding depth of focus by modifying higher-order aberrations induced by an adaptive optics visual simulator. *J Cataract Refract Surg*. 2009;35(11):1885-1892.
3. Rocha KM, Saraiva JO, Waring GO. Analysis of pseudoaccommodation in IOL profiles using ray-tracing aberrometry and double-pass wavefront. Paper presented at: ASCRS/ASOA Annual Meeting; May 5, 2017; Los Angeles, CA.

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- financial interest: none acknowledged