THE RLE DECISION TREE

WHEN IS A LENTICULAR SOLUTION PREFERRED OVER A CORNEAL PROCEDURE? MANY FACTORS AFFECT THE CHOICE.

BY LANCE KUGLER, MD

As new refractive surgical technologies and techniques become available, selecting the most appropriate solution for each patient becomes increasingly challenging. There are now eight types of refractive surgical procedures: LASIK, PRK, small-incision lenticule extraction (SMILE), corneal inlays, phakic IOLs, refractive lens exchange, refractive cataract surgery, and CXL (Figure). Each procedure has particular advantages and disadvantages for a given patient. The decision process for patients around age 50, who are now entering the second stage of dysfunctional lens syndrome (DLS), is particularly complex, as there is significant overlap among available options in this age group (see *Is Dysfunctional Lens Replacement LASIK for Baby Boomers?*). This cohort includes many natural plano presbyopes or post-LASIK patients who have enjoyed excellent distance vision for many years, so they often have high expectations.

Refractive lens exchange (RLE) has gained acceptance in recent years as advances in IOL design, ocular biometry, and the ability to enhance postoperative refractive error have led to LASIK-like precision and the ability to correct near and intermediate vision in addition to distance. RLE has significant benefits over corneal refractive surgery, including a larger range of treatable refractive errors, elimination of age-based crystalline lens scatter and future cataracts, the ability to provide bilateral near vision, and less disruption of the corneal surface.

With proper patient selection, these advantages can lead to excellent outcomes and extremely satisfied patients. This article details the decision-making process we use in our practice to determine an individual's suitability for refractive surgery, and specifically for RLE.

PATIENT SELECTION

Needs evaluation. As with any refractive surgery patient, the process of determining whether the patient is an appropriate candidate for RLE begins with a thorough assessment of his or her visual needs, including occupational requirements, leisure activities, hobbies, and any anticipated changes to those needs in the near and distant future. Understanding the patient's expectations of what the surgery will provide to him or her is also crucial.

Objective testing and examination. In our practice, we divide the patient evaluation process into two phases. In phase 1, we determine visual acuities, eye dominance, and manifest refraction, and we perform topography/tomography (Pentacam, Oculus

Optikgeräte), endothelial spectroscopy, optical scatter index (OSI) measurement with the HD Analyzer (Visiometrics), meibomian gland imaging, tear-film aberrometry, and anterior segment slit-lamp examination.

Pertinent findings in phase 1 include magnitude of refractive error, BCVA, keratometry measurement, axis and magnitude of astigmatism, topographic regularity, corneal pachymetry, dry eye status, lens clarity, OSI measurement, and presence of corneal disease. With this information, we can determine whether the patient is a candidate for a corneal refractive procedure such as LASIK, a lens-based procedure such as RLE, both, or neither. An in-depth discussion and review of testing takes place with the patient, and a decision is made as to which procedure and technique will most likely be used.

In phase 2, we obtain Placido-disc topography and wavefront aberrometry (iTrace, Tracey Technologies), macular OCT, optical biometry with the Lenstar (Haag-Streit) or IOLMaster (Carl Zeiss Meditec), and any specific testing that may be needed based on phase 1 findings. IOP is checked with an Icare tonometer (Icare USA), and the eyes are dilated. After cycloplegic refraction is obtained, slit-lamp and posterior segment examinations are performed.

Pertinent findings in phase 2 include lens clarity, higher-order aberrations arising from the corneal surface and internal optics, macular health, peripheral retinal health, and axial length. Armed with this additional information, the surgical plan is refined.

The ultimate decision as to which of the eight procedures will be used is complex and involves a multitude of subjective and objective considerations. However, certain objective considerations may help clarify the decision (Table).

For patients at increased risk for retinal detachment, such as those with long axial lengths and/or retinal conditions such as lattice degeneration, an evaluation by a retina subspecialist is recommended. This consultation may identify areas requiring prophylactic laser treatment, and it also helps patients understand the importance of retina health and attention to retinal symptoms.

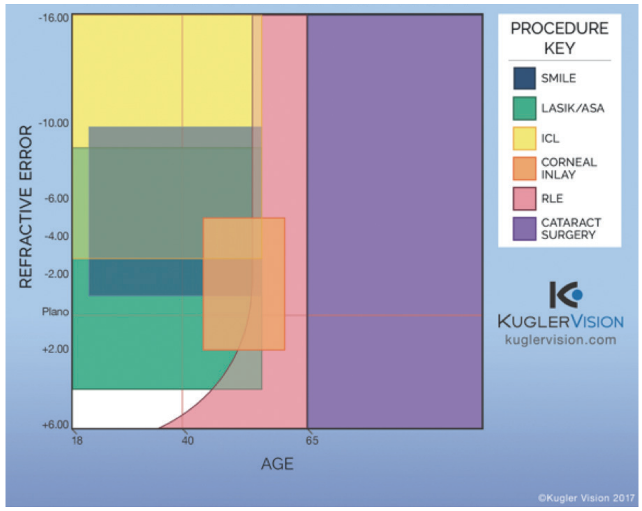

Figure. The refractive surgery procedure spectrum. (*Abbreviations: SMILE, small-incision lenticule extraction; ASA, advanced surface ablation; RLE, refractive lens exchange.)*

TABLE. CORNEAL PATHOLOGIES AND CORRESPONDING INTERVENTIONS

Finding	More Likely to Recommend	
	Corneal Procedure	RLE
Age (years)	<50	>55
Refraction	Low Myopia	Hyperopia, High Myopia
Topography	Normal, Regular	Irregular
DLS Stage	1	2, 3
OSI	<0.7	>1.0
Aberrometry	Low Total	High Internal
Tear Film	Normal	Abnormal
PVD	None Present	Present
Axial Length	Long	Short

Abbreviations: RLE, refractive lens exchange; DLS, dysfunctional lens syndrome; OSI, optical scatter index; PVD, posterior vitreous detachment

SURGICAL PLAN

Once a definitive decision has been made to pursue RLE, the next step is to determine which technologies and techniques will be used to achieve the desired result. For patients with strong distance or night vision demands, bilateral monofocal or toric IOLs are excellent options. For patients with a desire for spectacle-free near and/or intermediate vision, extended depth of focus (EDOF) IOLs, multifocal IOLs, or a combination of the two may be used. Blended vision, or monovision, with monofocal or toric IOLs is also an excellent approach. It is well tolerated, particularly in patients with a history of using blended vision with contact lenses.

In all cases, existing astigmatism must be managed. There are many techniques available to manage astigmatism, including performing limbal relaxing incisions (LRIs) or on-axis paired corneal incisions, implanting toric IOLs, or combining the RLE procedure with a corneal procedure such as LASIK or PRK. *(Editor's note: For more information on managing astigmatism, see* Toric IOLs for Astigmatism Correction, *by Sneha Konda, BS; and Balamurali K. Ambati, MD, PhD, MBA, on pg 63.)*

POSTSURGICAL PLAN

Perhaps just as important as the surgical plan is the postoperative plan. Despite tremendous advances in IOL calculation technology, including improved formulas, more accurate biometry, and the availability of intraoperative aberrometry, an enhancement rate of 10% or higher is reasonable and expected.

IS DYSFUNCTIONAL LENS REPLACEMENT LASIK FOR BABY BOOMERS?

BY GEORGE O. WARING IV, MD, FACS; AND LARISSA GOUVEA, MD

Many early presbyopic patients, bothered by their new reading glasses or bifocals, come to us in hopes of reducing their dependence on spectacles. Today, we have several procedures that can make this a reality. Laser vision correction (LVC) procedures at the corneal plane have never been better. Furthermore, presbyopia-correcting corneal inlays are now approved by the FDA. In some ways, cornea-based procedures could be viewed as less invasive than intraocular procedures; however, most of us noticed a trend some time ago: Patients who underwent cornea-based presbyopic LVC were returning years later, stating that their vision correction had worn off. (In actuality, they had progressed through the natural aging changes of the crystalline lens.)

Enter the concept of *dysfunctional lens syndrome (DLS)*: a spectrum of changes characterized by a dysfunctionality of the lens due to loss of accommodation, early opacities, and increased higher-order aberrations (HOAs). Although many patients with DLS (Figure) may still have 20/20 distance UCVA, advanced diagnostic devices objectively quantify the characteristics and visual function of an aging lens, including Scheimpflug imaging (Pentacam, Oculus Optikgeräte) for lens densitometry, double-pass wavefront technology (HD Analyzer, Visiometrics) to quantify and analyze ocular light scatter and retinal image quality, and ray-tracing devices (iTrace, Tracey Technologies) to create a dysfunctional lens index. These diagnostics can streamline the clinical decision-making process and improve patient education of DLS.

Once patients are diagnosed and staged with DLS, we reassure them that this is a normal aging process. Our patients are taken on a digital tour of their eyes, where we demonstrate that we can perform vision correction on the cornea or on the internal lens. In patients with presbyopia only—stage 1 DLS—we typically suggest a cornea-based solution, unless they are moderate to high hyperopes, in which case we suggest a lens-based procedure. In patients with an early opacity and increasing HOAs—stage 2 DLS—we typically recommend a lens-based procedure, unless they are high axial myopes (due to risk of retinal detachment), in which case we may defer to a corneal-based procedure. In patients with advancing opacity and HOAs affecting their daily activities—stage 3 DLS—we recommend a cataract procedure.

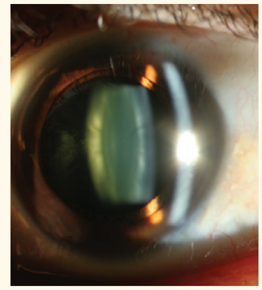

Figure. DLS is characterized by loss of accommodation, early opacities, and increased HOAs.

Patients with stage 2 DLS are informed that they can either wait to develop cataracts or pursue a lens-based procedure, which addresses their congenital ametropia, presbyopia, and visual quality and prevents future cataract formation. Keep in mind that, in general, these patients presented to us for vision correction options.

We have moved toward lens-based refractive procedures earlier in life, particularly in our hyperopic patients. It is a multifactorial decision-making process in order of: safety, optics, lifestyle, and cost. We ensure our stage 2 DLS patients understand that, although they may be candidates for a laser cornea-based procedure, a laser lens-based procedure addresses the source of the problem, if that is what they are interested in. Furthermore, dysfunctional lens replacement (ie, refractive lens exchange) is a single procedure that can preserve binocularity, prevent cataract formation, improve image at the retinal plane, and restore depth of focus with presbyopia-correcting IOLs. In our practice, dysfunctional lens replacement, when it makes sense, has in many ways become LASIK for the baby boomers.

GEORGE O. WARING IV, MD, FACS
- Founder and Medical Director, Waring Vision Institute, Mount Pleasant, South Carolina
- *CRST* Executive Advisor
- gwaring@waringvision.com
- Financial disclosure: None acknowledged

LARISSA GOUVEA, MD
- Waring Vision Institute, Mount Pleasant, South Carolina
- gouveaalarissa@gmail.com
- Financial disclosure: None acknowledged

Patients undergoing RLE must be educated before surgery that there is a high likelihood that they will need an enhancement procedure of some sort following their RLE, and surgeons must be prepared to offer such procedures if needed, even if that means referring to a colleague for additional expertise.

Enhancements may include LRIs, LASIK, PRK, SMILE, piggyback IOL implantation, or IOL exchange. Patients should also be aware that there will be a nearly universal need for Nd:YAG capsulotomy at some time over the course of their lives. *(Editor's note: For more information on piggyback IOL implantation, see* Piggyback IOL as an Enhancement Technique, *by David A. Goldman, MD, on pg 69.)*

SUMMARY

Refractive surgeons have at their disposal a complex array of procedures and techniques that they can employ to achieve their patients' desired outcomes. Whether patients are in DLS stages 1, 2, or 3, the decision process begins by determining whether the outcome is best achieved with a cornea- or lens-based procedure. Astigmatism management and a postoperative enhancement plan are critical to success. ■

LANCE KUGLER, MD
- Surgeon and Physician CEO, Kugler Vision, Omaha, Nebraska
- Director of Refractive Surgery, University of Nebraska Medical Center
- lkugler@kuglervision.com
- Financial disclosure: None acknowledged