Choosing the Right Treatment for Hyperopia

Refractive lens exchange versus LASIK.

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Hyperopia is caused by a short axial length, a flat cornea, or a combination thereof. It can be categorized into low (≤ 2.00 D), moderate (2.00-4.00 D), and high (> 4.00 D). Two common surgeries to treat hyperopia are refractive lens exchange (RLE) and excimer laser ablation (LASIK or PRK). Factors to consider when deciding between these options include the degree of hyperopia, the patient's age, lens opacification, accommodative ability, keratometry (K), corneal topography, and endothelial status.[1]

REFRACTIVE LENS EXCHANGE

RLE is identical to cataract surgery, so ophthalmologists can use a familiar surgical technique. Due to the loss of accommodation with RLE, presbyopic or "peripresbyopic" patients are more likely to benefit from the procedure than pre-presbyopes. Progressive improvement in presbyopia-correcting IOL designs means that these technologies can significantly improve the visual function of hyperopic patients with presbyopia. The literature suggests that 35 to 39 years should be the lower limit of the age range considered for RLE.[2,3] This holds true in practice; a young hyperopic patient often will not tolerate his or her quality of near vision after a pseudophakic loss of accommodation compared to natural lens function.

RLE has been shown to be safe, effective, and predictable. In a study of 20 eyes in 12 patients, Lyle and Jin reported that 89% of eyes achieved a UCVA of 20/40 or better and that all eyes had 20/25 or better BCVA.[2] Preetha and colleagues had 70% of patients within 0.50 D of the intended refraction, and three eyes gained lines of BCVA out of 20 eyes in the study.[3]

Despite the generally successful outcomes, it is important to consider the safety profile of RLE. Advances in technology and cataract surgery techniques have minimized complications and improved safety. The risks of RLE are similar to those of cataract surgery and include endophthalmitis, a loss of accommodation, vitreous loss with posterior capsular rupture, and retinal detachment. Additional risks, typically due to the short axial length found in hyperopic patients, are angle-closure and malignant glaucoma as well as uveal effusion syndrome.[2]

LASIK

Excimer laser ablation for hyperopia flattens the paracentral cornea in order to steepen the central cornea. The FDA cleared the WaveLight Allegretto Wave Eye-Q Laser (Alcon) and the STAR S4 IR Excimer Laser System (Abbott Medical Optics) for the treatment of patients older than 18 years of age with hyperopia between +1.00 and +6.00 D spherical equivalent.[4] Although the devices are cleared to treat up to +6.00 D, most studies report an upper limit of +4.00 to +5.00 D.[5-7]

LASIK for patients with low degrees of hyperopia has been shown in numerous studies to be safe, effective, and predictable.[5-17] In patients with higher degrees of hyperopia, the results are less predictable, and regression of effect is more common. In one 5-year study of patients with +0.75 to +7.00 D of hyperopia, LASIK was moderately effective for correcting low degrees of hyperopia, but regression occurred throughout the follow-up period.[5] In naval aviators, hyperopic LASIK was effective and safe to +3.75 D, and other studies reported upper limits of +5.00 and +6.25 D.[8-10]

We do not treat patients with more than 4.00 D of hyperopia. Studies have reported that high hyperopes (> 5.00 D) are at greater risk of losing 2 lines of BSCVA, and the treatment effect is neither consistent nor sustained.[5,11]

When considering hyperopic LASIK, cycloplegic refraction and K readings are very important. Hyperopic individuals often have high accommodative ability and may have hyperopia that is unmasked by cycloplegia. It is very important to discuss regression with patients, especially those who have latent hyperopia. Additional consideration should be given to the anticipated postoperative K reading. The average corneal power is about 43.00 D. Corneal steepness will increase after hyperopic

TABLE. COMPARISON OF REFRACTIVE LENS EXCHANGE AND LASIK FOR THE IDEAL TREATMENT OF HYPEROPIA

	Refractive Lens Exchange	LASIK
Degree of hyperopia	High (> +4.00 D)	Low/moderate (< +4.00 D)
Age	Older (≥ 35 years of age)	Younger (18-40 years of age)
Presbyopia	More benefit	Less benefit, consider monovision
Keratometry	Abnormal, postoperative keratometry > 48.00-49.00 D	Normal
Narrow angle	Benefit	No benefit
Complications	Endophthalmitis, retinal detachment, cystoid macular edema, endothelial cell loss	Ectasia, dry eyes, flap-related complications, refractive instability, regression

LASIK, so the surgeon must not make the cornea steeper than about 48.00 to 50.00 D. Increased loss of BSCVA and decreased satisfaction with quality of vision have been associated with a preoperative K value greater than 44.00 D.[12,13] Patients with overly steep corneas can also suffer from an abnormal tear film, causing poor visual quality. Other risks of LASIK include abnormalities of the corneal flap, epithelial ingrowth, corneal ectasia, refractive surprises, irregular astigmatism, decentration, visual aberrations, a loss of BCVA, infectious keratitis, dry eye symptoms, and diffuse lamellar keratitis.[18]

PUTTING IT ALL TOGETHER

To pick the right procedure for patients, the surgeon should consider their age, K readings, ocular surface and lens status, degree of hyperopia, and expectations (Table). Typically, we first look at the patient's degree of hyperopia and age and suggest RLE for presbyopic individuals with greater than 4.00 D of hyperopia. We offer LASIK to patients with less than 4.00 D of hyperopia, normal topography, and anticipated postoperative K values of less than 50.00 D. Clearly, not all patients fit into these categories, but they are a good starting point for broad stratification.

SUMMARY

The surgical correction of high hyperopia can be challenging given the tendency for regression with and the lack of predictability of excimer laser treatments. RLE and LASIK are both safe and effective treatments for hyperopia when applied to the appropriate patient population. A thorough informed consent is necessary regardless of the procedure chosen, because each has potential advantages and disadvantages. Patients are generally happy if they know what to expect and understand what makes them a better candidate for one procedure than another. In the future, corneal inlays or phakic IOLs may permit more precise hyperopic treatment.[8] Surgeons must perform a complete evaluation and risk-benefit assessment of the individual patient to select the best procedure. ■

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