PROGRESSIVE HIGH HYPEROPIA

Can spectacle independence be achieved?

BY JONATHAN SOLOMON, MD, FACS; DAVID A. GOLDMAN, MD; SUMITRA S. KHANDELWAL, MD; KJELL U. SANDVIG, MD, PHD; AND STEFANIE SCHMICKLER, MD

CASE PRESENTATION

A 47-year-old man presents for a refractive surgery consultation. Over the past 2 years, the patient's hyperopia has progressively increased, necessitating multiple updates to his contact lens prescription. He reports asymmetric visual function, longstanding subjective blurring in the right eye, and a growing intolerance of both contact lenses and spectacles. His ocular and medical history is otherwise unremarkable.

The patient discontinued wearing contact lenses 1 week before presentation. Upon assessment, his UCVA is 20/350 OD and 20/200 OS. His BCVA is 20/50 with a manifest refraction of +12.00 -0.75 x 035° OD and 20/20 with a manifest refraction of +11.50 -1.50 x 040° OS. Pupillary response time is sluggish in the right eye and rapid in the left eye. A slit-lamp examination reveals a mild papillary conjunctival response and peripheral corneal neovascularization in both eyes, consistent with long-term contact lens wear. The central corneas are clear, and mild nuclear sclerosis is evident bilaterally. A dilated fundus examination of each eye is normal.

The patient, a former semiprofessional soccer player and current marathon coach, has a highly active lifestyle. He expresses a strong desire for independence from spectacles and contact lenses during physical activity. How would you proceed?

– Case prepared by Jonathan Solomon, MD, FACS

DAVID A. GOLDMAN, MD

First, I would seek to confirm that amblyopia accounts for the visual acuity and pupillary reaction in the patient's right eye through a thorough history and/or ancillary testing. If questions remain, a neuro-ophthalmologist would be consulted. Assuming the right eye is somewhat amblyopic and no other pathology is detected, the only option for vision correction would be refractive lens exchange (RLE). The amount of hyperopia is too great to manage with LASIK, PRK, keratorefractive lenticule extraction, or phakic IOL implantation. Additionally, the mild nuclear sclerosis would shorten the effect of any option other than RLE.

Given the conjunctival papillary response and corneal neovascularization, treatment with topical cyclosporine would be initiated to optimize the ocular surface before surgery. Corneal topography and pachymetry would be performed, both to ensure the measurements are in a normal range and to determine whether laser refractive surgery would be an option should RLE result in a refractive surprise.

The only options for minimizing the patient's postoperative dependence on spectacles and contact lenses would be an extended depth of focus or multifocal IOL. Several studies have demonstrated success with multifocal lenses in patients with amblyopia.[1,2] Because he does not have visually significant cataracts at this time, a contact lens trial with a low-add multifocal and a small-offset monovision trial, with the amblyopic eye set for near vision, would be conducted. His level of satisfaction with each trial would help guide IOL selection.

The choice of lens, however, might also be influenced by the power required. If it is too high for a currently available multifocal IOL to correct and space in the patient's eyes allows, I would consider implanting both a multifocal IOL and a piggyback lens. In this scenario, if pupillary dilation is adequate, I would also consider the option of implanting a multifocal lens in the bag and a Light Adjustable Lens (LAL; RxSight) in the sulcus because optical biometry can be less accurate in short eyes. The LAL features a silicone-based optic, so the risk of intralenticular opacification would be minimal.

SUMITRA S. KHANDELWAL, MD

Before addressing the patient's refractive goals, I would seek to understand why his vision is changing

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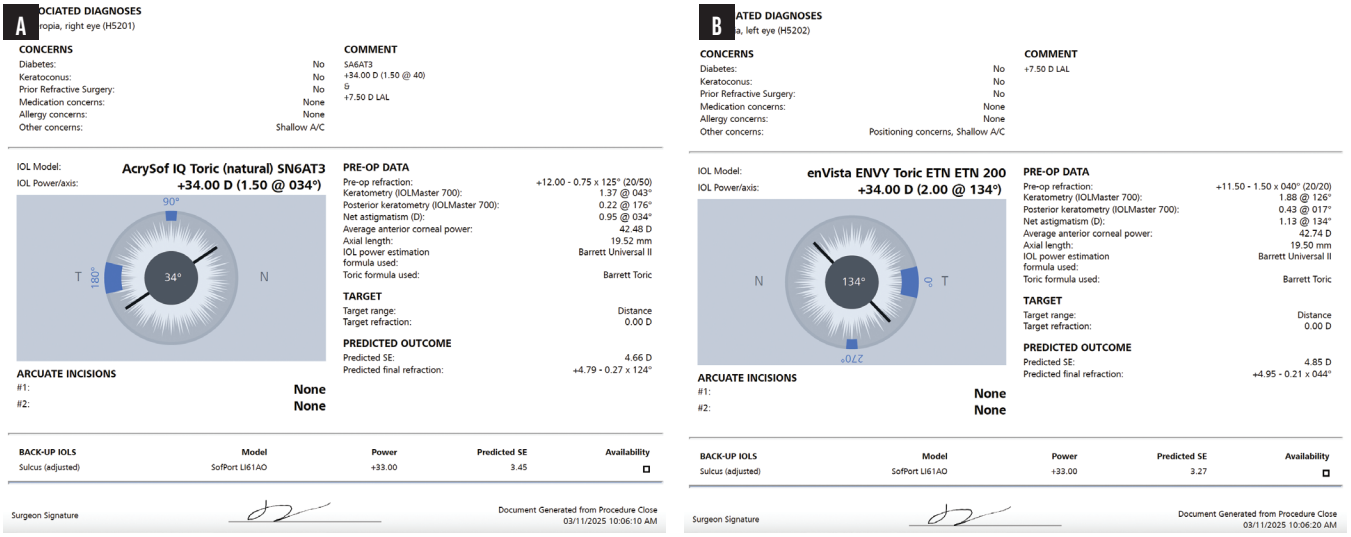

Figure 1. IOL calculations using the Veracity Surgery Planner (Carl Zeiss Meditec) for the primary lens implants in the right (A) and left (B) eyes.

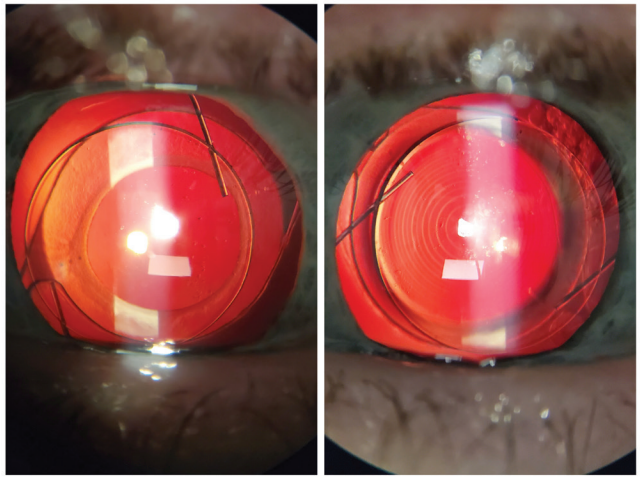

Figure 2. Slit-lamp photographs of the piggyback IOL in each eye.

and lack of 20/20 visual potential in the patient's right eye prompted further questioning. He stated that the right eye had always been weaker. Mild amblyopia was therefore suspected.

Given the patient's strong desire for visual independence during physical activity and his increasing intolerance of contact lenses, after a discussion of his options, he decided to proceed with bilateral RLE followed by staged, secondary IOL implantation to address the expected residual hyperopia due to biometry limitations. Preoperative A-scans revealed an axial length of approximately 19.5 mm in both eyes, necessitating the maximum dioptric power (+34.00 D) for the primary lens in each eye (Figure 1).

A monofocal toric IOL was selected for the right eye, and a trifocal toric IOL was chosen for the dominant left eye. One day after RLE, the patient's manifest refraction was +4.79 -0.27 x 124° OD and +4.95 -0.21 x 044° OS. One month after surgery, his UCVA was 20/100-2 OD and

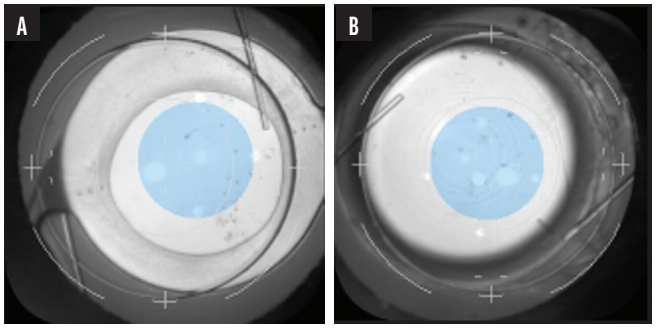

Figure 3. The right (A) and left (B) eyes during light adjustment.

20/50 OS. His BCVA was 20/50 with a manifest refraction of +5.00 -0.75 x 140° OD and 20/25 with a manifest refraction of +4.75 -1.00 x 045° OS.

Two months after RLE, immediately sequential bilateral sulcus fixation of an LAL was performed (Figure 2). IOL calculations used the following formula: manifest refraction spherical equivalent x 1.5 = piggyback IOL power. The result was +7.50 D. Because the LAL is available in 1.00 D increments, a +7.00 D LAL was selected for each eye. The plan was to target mild hyperopia and refine the result with postoperative light adjustments (Figure 3).

One week after the first light adjustment (4 weeks after LAL implantation), the patient's uncorrected distance visual acuity (UDVA) was 20/60 OD and 20/30 OS. His uncorrected near visual acuity (UNVA) was J5 OD and J2 OS. His BCVA was +1.00 -1.00 x 145° = 20/50 OD and +0.75 -0.75 x 030° = 20/25 OS. At the lock-in visit (8 weeks after LAL implantation), the patient's UDVA was 20/60 OD and 20/25+2 OS. His UNVA was J5 OD and J2 OS. His BCVA was +0.50 -0.50 x 165° = 20/50-1 OD and +0.25 -0.25 x 035° = 20/20-2 OS.

REFRACTIVE SURGERY **CASE FILES**

The final outcome balanced the patient's optical limitations with his functional demands and highlights collaboration between the patient and surgeon. Although the initial refractive correction was constrained by available IOL power, postoperative fine-tuning ultimately achieved functional spectacle-free UDVA and UNVA for the patient. He is satisfied with his vision during athletic activities and daily tasks, and he is being monitored for posterior capsular opacification and potential intralenticular opacities. ■

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