

Presbyopia, Anisometropia, and Unilateral Amblyopia

BY MITCHELL A. JACKSON, MD; LOUIS E. PROBST, MD; AND JONATHAN H. TALAMO, MD

CASE PRESENTATION

A 45-year-old female nurse is interested in LASIK. She does not wear glasses. She says there has always been a large difference in prescription between her eyes and that she rarely wore glasses in the past. Her UCVA is 20/200 OD, correcting to 20/30 with +1.75 -4.25 X 180. Her UCVA is 20/40 OS, correcting to 20/15 with -0.75 -0.25 X 30. The patient is right-handed, and her left eye is dominant. Central ultrasound pachymetry measures 488 μm OD and 480 μm OS.

Figure 1 shows TMS4 (Tomey Corp.) topography of the patient's right and left eyes, respectively. Both the Klyce/Maeda and Smolek/Klyce Keratoconus Screening Systems are highlighted. Wavefront data, as derived from

the AMO WaveScan WaveFront System (Abbott Medical Optics Inc.) for the patient's right eye calculated a prescription at 4 mm of +2.20 -4.22 X 9 across a 5.75-mm pupillary diameter. This had a corresponding higher-order aberration root mean square error of 0.20 μm . The patient's left eye had a calculated prescription of -0.56 -0.21 X 31, also at 4 mm. The pupillary diameter of her left eye was 5.25 mm, and the higher-order aberration root mean square error was determined to be 0.17 μm (Figure 2).

How would you counsel this patient regarding her suitability
(Continued on page 49)

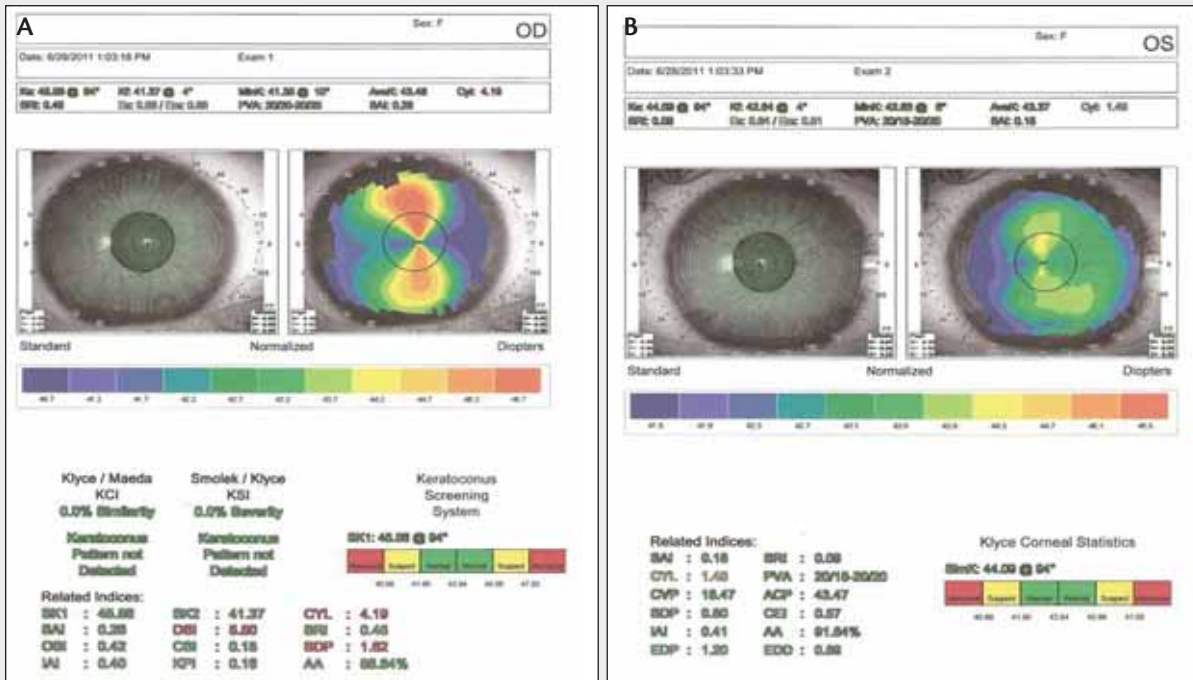


Figure 1. Topography readings of the patient's right (A) and left (B) eyes.

CASE PRESENTATION

(Continued from page 48)

for laser vision correction? Comment on your general approach to patients with amblyopia as well presbyopia in this

setting. If you deem this patient a surgical candidate, please indicate what changes, if any, you would make to the treatment profiles as well as calculations for the flap's thickness.

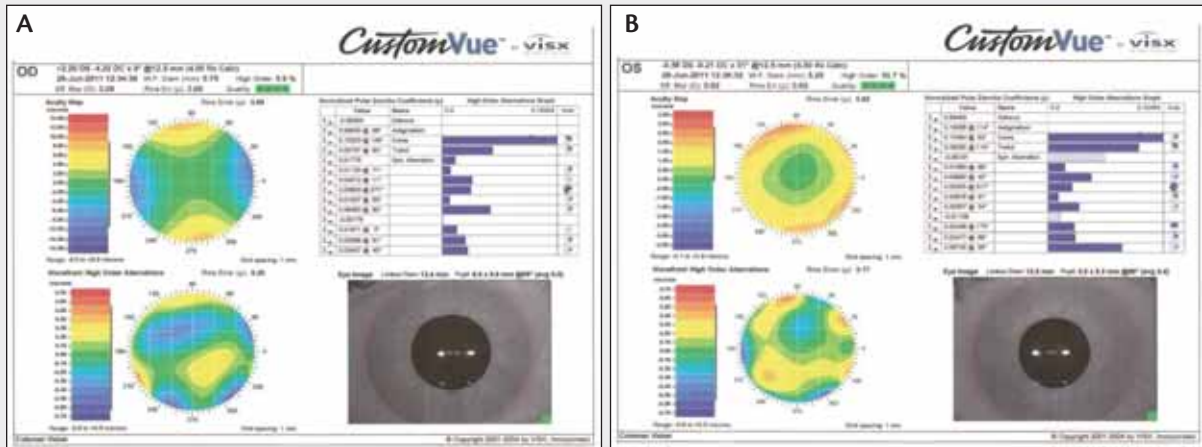


Figure 2. Wavefront aberrometry readings for the patient's right (A) and left (B) eyes.

MITCHELL A. JACKSON, MD

Various articles have supported LASIK in pediatric, hyperopic, anisometropic amblyopia¹; in the cases they described, the patient's visual acuity improved in the amblyopic eye, and the amount of anisometropia was reduced. In my experience, similar outcomes can be achieved in adults with symptomatic, hyperopic, anisometropic amblyopia.

The small amount of myopia in the dominant eye of this 45-year-old presbyope is beneficial, however, and the patient has no stated symptomatology from the anisometropia. Furthermore, although the corneal topography is normal in both of her eyes, the central pachymetry readings approach a level of two standard deviations for putting the patient at risk of corneal ectasia postoperatively. In my opinion, a borderline case for any risk of ectasia in a monocular or amblyopic setting is usually a setup for disaster.

I would not perform laser vision correction in this case because of the benefits of mild myopia in a presbyope, her asymptomatic anisometropia, and her heightened risk of ectasia. If another surgeon were brave enough to proceed, my advice would be to perform PRK with mitomycin C to guard against corneal haze.

LOUIS E. PROBST, MD

This case presents a number of challenges that individually are not insurmountable but that raise concern when they are considered together as a whole. For all refractive procedures, I require posterior corneal imaging with the Orbscan (Bausch + Lomb) or the Pentacam Comprehensive Eye Scanner (Oculus Optikgeräte GmbH). This

information would be especially relevant for this case, because there is a higher risk of corneal instability from the thin corneas and the high astigmatism in the patient's right eye.

Refractive surgery on any 45-year-old patient must be approached cautiously due to impending presbyopia. Counseling regarding the need for reading glasses and a contact lens trial with monovision, however, can successfully prepare such a patient for postoperative changes over the next few years. This would assist with the decision to treat both eyes or the right eye only in this case.

This patient also has high mixed astigmatism in her right eye that shows a normal symmetrical pattern on topography and matching WaveScan maps. I have found the Visx CustomVue LASIK laser treatment (Abbott Medical Optics Inc.) to be very effective for addressing high mixed astigmatism, because the iris registration feature allows for accurate alignment of the astigmatic axis. There would still be a small risk of residual or regressive astigmatism, however, that could require an enhancement. In addition, the patient's right eye demonstrates a low but significant degree of amblyopia. Although I have noted an improvement in BCVA after customized corrections, this patient's right eye definitely would not achieve the same level of postoperative UCVA as her left eye. She might therefore be somewhat disappointed, even if she were carefully and repeatedly counseled preoperatively about this expected outcome.

The patient's corneas are thin, so PRK would be the most appropriate option, given the associated high astigmatism and increased potential for corneal instability. She could

also benefit from corneal collagen cross-linking when the procedure becomes available in the United States.

There are altogether too many potential reasons for this patient to be disappointed in her postoperative outcome. Although refractive surgery is possible, I would not recommend it.

JONATHAN H. TALAMO, MD

This patient has been functionally monocular for most (if not all) of her adult life, owing to amblyopia and undercorrected, presumed mixed astigmatism in her right eye. Before performing refractive surgery, the ophthalmologist would need to address three important questions.

First, can the patient's right eye obtain useful vision if the refractive error is corrected? If not, I would counsel against surgery in the dominant eye, because a poor outcome would be devastating to this functionally monocular patient. Before deciding whether to proceed with surgery, I would establish whether the patient is able to read, drive, and perform other activities of daily living with the amblyopic eye. I would ask her to tell me why she desires refractive surgery. I would explain to her that a complication in her dominant eye could result in the amblyopic eye's being the better-seeing one and that surgery on her weaker eye will not fix the amblyopia.

Second, would strabismus or other visual discomfort result from the correction of refractive error in the patient's right eye? A contact lens trial should reveal if she can tolerate anything close to full correction of the non-dominant right eye. To determine the correct power, a cycloplegic refraction should be performed to exclude latent hyperopia. Motility at distance and near should be examined before and after contact lens correction using a prolonged, alternating cover test; this would be important to exclude any latent phoria. If the patient had findings consistent with accommodative esotropia when she was younger, it would be important to avoid even a slightly hyperopic spherical equivalent outcome in her left eye.

If the patient reported visual discomfort with full astigmatic correction in the right eye, I would refit the contact lens to achieve an undercorrection of cylinder with a mildly myopic spherical equivalent in that eye, which could then become the target refraction for surgery. Before proceeding with surgery, I would make sure that the patient understood the risk for strabismus and that she would accept a modest undercorrection in one or both eyes. I would also discuss the issue of impending presbyopia and explain that, because of her age, near correction might soon be necessary.

Third, do the additional low pachymetry readings on corneal topography mean that corneal pathology is present? Although software analysis of the topographic readings does not show clear-cut keratoconus or forme fruste

keratoconus, the anisometropia, asymmetric astigmatism, and slightly skewed nature of the observed pattern of bowtie astigmatism coupled with below-average central corneal thickness measurements make it difficult to exclude forme fruste keratoconus without tomography. As such, I would carefully scrutinize elevation and thickness data from the Pentacam, Orbscan, or Galilei Dual Scheimpflug Analyzer (Ziemer Ophthalmic Systems AG) before deciding to operate.

Because the corneal thickness is below 500 μm and due to the level of astigmatism present, I would recommend surface ablation rather than LASIK in both eyes of this patient. I would not operate using the WaveScans shown for her left eye due to the small physiologic pupillary size and low correction. I would use conventional ablation software with the Visx laser or a wavefront-optimized profile with the Allegretto Wave Eye-Q excimer laser system (Alcon Laboratories, Inc.). The WaveScan image for the patient's right eye may be acceptable for a customized wavefront-guided ablation if the refraction correlates well with the cycloplegic refraction. Because visual recovery after PRK for mixed astigmatism can be prolonged for an attempted correction of the magnitude observed in the patient's right eye, I would recommend sequential surgery at least several weeks apart. ■

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1. Utine CA, Cakir H, Egemenoglu A, Perente I. LASIK in children with hyperopic anisometropic amblyopia. *J Refract Surg.* 2008;24(5):464-472.