Decentered LASIK Ablation

BY ARTHUR CUMMINGS, FRCSED; LOUIS E. PROBST, MD; AND PAUL J. DOUGHERTY, MD

CASE PRESENTATION

A 27-year-old man underwent bilateral LASIK in March 2010 at another clinic. The surgeon used the IntraLase FS laser (Abbott Medical Optics Inc., Santa Ana, CA) to create flaps of the intended thickness (100 µm) and performed the ablation with the Visx CustomVue laser (Abbott Medical Optics Inc.). The ablation depths were 136 µm OD and 144 µm OS, with a calculated residual stromal bed of 384 µm and 372 µm, respectively. The patient is extremely happy with the 20/25 UCVA of his right eye. His complaint regards the 20/70 UCVA of his left eye.

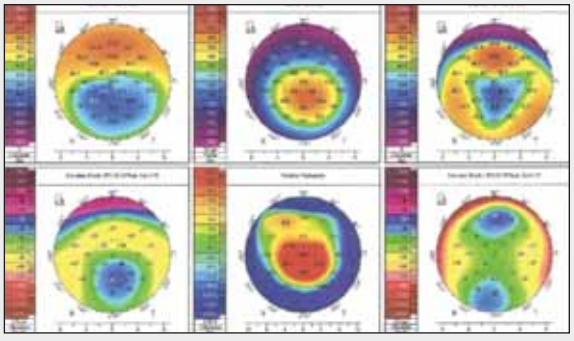

Figure 1. Topography of the patient's left eye.

The slit-lamp and fundus examinations are normal except for LASIK flaps in both eyes. The patient's preoperative manifest refractions were -10.75 +3.75 X 75 = 20/25 OD and -10.25 +2.5 X 98 = 20/25 OS. Preoperative pachymetry measurements were 620 µm OD and 618 µm OS. At present, his manifest refractions are +0.50 D = 20/25+2 OD and +0.25 +2.00 X 164 = 20/30 OS. His current pachymetry readings are 428 µm OD and 425 µm OS.

The patient wishes to discuss the options for treatment of his left eye. Figure 1 shows the results of topography

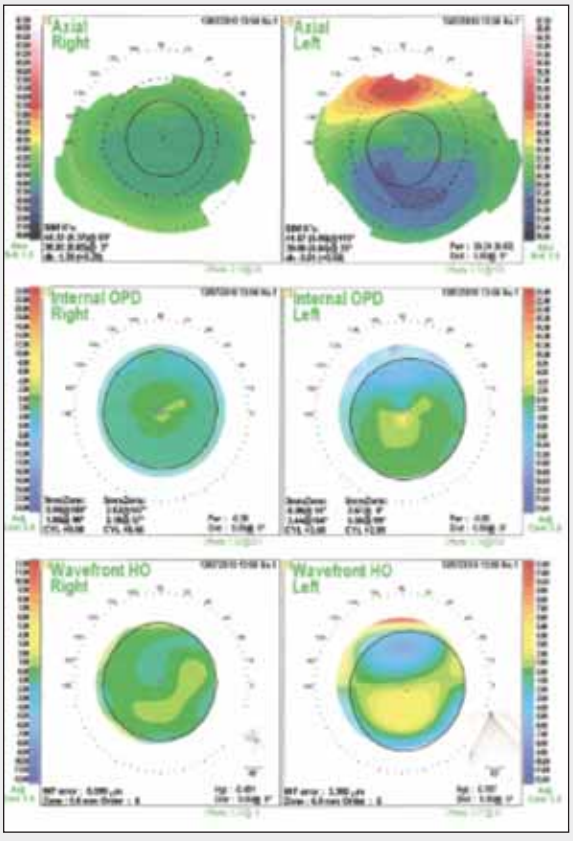

Figure 2. Aberrometry of the patient's left eye.

with the Pentacam Comprehensive Eye Scanner (Oculus, Inc., Lynnwood, WA). Aberrometry was unsuccessful except with the Nidek OPD (Nidek, Inc., Fremont, CA) (Figure 2). How would you proceed?

ARTHUR CUMMINGS, FRCSED

I would like to see the preoperative Pentacam and topographic maps, too. If they are normal, then the LASIK in the patient's left eye was decentered. If these diagnostic tests showed signs of forme fruste keratoconus or irregular astigmatism, that would affect my choices for further management.

If the patient's corneas were 100% normal before the first procedure, the best ablation profile in my hands for LASIK decentrations and small optical zones is topography guided (not available in the United States). This preference would apply even if I could get validated

wavefront maps, which I normally use in other cases. I would use data from either the Allegro Topolyzer (Placido disc) or Allegro Oculyzer (Scheimpflug) (both products from Wavelight GmbH, Erlangen, Germany). I would rely on the data set that had the best raw data and was most repeatable. There is a chance that the topography-guided procedure (LASIK enhancement) will leave a residual refractive error in this case, so I would warn the patient that a two-stepped procedure might be required. The first step would be regularization of the topography and the second a correction of his residual refractive error.

If there were signs of forme fruste keratoconus preoperatively, I would perform the enhancement as a topography-guided surface procedure (on the flap if the ablation profile were less than 30 µm centrally) 1 year after the original LASIK procedure and combine it with corneal collagen cross-linking. The LASIK flap is only 100 µm thick, as was planned, and I would not like to make it much thinner than 70 µm after surface ablation. Most of the second ablation, however, will be paracentral, where the cornea is thicker, but the flap is still 100 µm thick over the entire area of the flap with planar flaps.

LOUIS E. PROBST, MD

This is a challenging case. The original correction was large for both myopia and astigmatism, which makes centration critical for a successful outcome. The postoperative Pentacam map of the patient's left eye demonstrates a large inferior decentration of the ablation. This pattern can be caused by superior rotation of the eye due to an aggressive Bell's reflex during the ablation. It can also be produced by a hinge that superiorly encroaches on the ablation zone or an excessive accumulation of fluid around a superior hinge during the ablation. Although this pattern is characteristic, I would review the preoperative topography to confirm that no abnormalities/asymmetry was present prior to the original LASIK procedure.

It is unfortunate that wavefront maps were not possible, because I have found that customized wavefront corrections with the Visx CustomVue system are very effective for the treatment of decentrations, corneal irregularities, and higher-order aberrations. A topography-guided approach could be successful, but I have no experience with it. I would be reluctant to treat this cornea with anything less than a customized correction, because the corneal thickness is limited and the outcome will be less predictable. I would attempt wavefront measurements again with ocular lubrication. If wavefront capture continued to be impossible, I would temporarily correct the patient's vision with a contact lens and wait for the higher-resolution aberrometer that should be available soon. After obtaining wavefront measurements, I would treat the patient with customized PRK using alcohol to remove the epithelium and would pay careful attention to the ablation's depth to avoid an overcorrection.

> "[Initially] a phakic IOL might have been a better choice."
>
> *—Paul J. Dougherty, MD*

PAUL J. DOUGHERTY, MD

This unfortunate gentleman presents with a significantly decentered ablation in his left eye after LASIK for high myopic astigmatism. He has induced cylinder, coma, and a loss of BCVA.

With respect to the appropriateness of the initial LASIK procedure, the patient certainly had enough corneal tissue and calculated thickness of the residual bed for the surgeon to consider the procedure, and both fell within the FDA-approved range for the Visx CustomVue laser platform. Still, a phakic IOL might have been a better choice. The higher the prescription, the poorer the visual quality and the higher the likelihood of a poor visual outcome with corneal refractive surgery. I prefer the Visian ICL (STAAR Surgical Company, Monrovia, CA) with bilateral, sequential, same-day surgeries using surgical iridotomies[1] for patients with 5.00 D or more of myopia. For patients with 2.00 D of refractive cylinder or less, I will perform limbal relaxing incisions at the time of surgery. If they have more than 2.00 D of cylinder, I perform bilateral, sequential, same-day, mixed-cylinder LASIK 1 week prior to the scheduled ICL implantation or advise the patient to await FDA approval of the Visian TICL (STAAR Surgical Company). Multiple studies have shown better accuracy, safety, and predictability with the ICL than corneal refractive surgery in moderate and high myopes.[2,3]

A review of the topographic images reveals a decentered ablation in the patient's left eye without evidence of ectasia (which is certainly in the differential diagnosis of a high myope with irregular astigmatism after corneal refractive surgery). Given the high amount of irregularity, it is certainly not surprising that standard Hartmann-Shack whole-eye aberrometry images cannot be obtained or used as a basis for therapeutic treatment. Because there is no evidence of ectasia, additional corneal refractive surgery is an option for the treatment of this patient in addition to the alternative of a rigid

gas permeable contact lens.

Given that the patient would likely be more interested in further laser treatment, I would offer a Nidek CATz topography-guided LASIK (Nidek, Inc.) retreatment[4] after lifting the original flap. Topography-guided treatment could also be performed as a surface procedure. Considering the 425-µm pachymetry and an anticipated flap thickness of 100 µm, however, I would expect there to be a sufficiently thick residual stromal bed to avoid ectasia. I would perform the treatment as a two-stepped procedure. The first step would be a CATz topography-guided treatment of corneal irregularity outside the United States to center the ablation. Three months later, I would relift the flap and treat the residual refractive error, if necessary, with a laser approved in the United States. ■

Section editor Stephen Coleman, MD, is the director of Coleman Vision in Albuquerque, New Mexico. Parag A. Majmudar, MD, is an associate professor, Cornea Service, Rush University Medical Center, Chicago Cornea Consultants, Ltd. Karl G. Stonecipher, MD, is the director of refractive surgery at TLC in Greensboro, North Carolina. Dr. Stonecipher may be reached at (336) 288-8523; stonenc@aol.com.

Arthur Cummings, FRCSEd, is a consultant ophthalmologist at Wellington Eye Clinic in Dublin, Ireland. He is a consultant to Alcon Laboratories, Inc., and Wavelight GmbH. Mr. Cummings may be reached at +353 1 2930470; abc@wellingtoneyeclinic.com.

Louis E. Probst, MD, is the national medical director of TLC The Laser Eye Centers in Chicago; Madison, Wisconsin; and Greenville, North Carolina. He is a consultant to Abbott Medical Optics Inc. Dr. Probst may be reached at (708) 562-2020.

Paul J. Dougherty, MD, is the medical director of Dougherty Laser Vision in Camarillo, California, and a clinical instructor of ophthalmology at the Jules Stein Eye Institute of the University of California, Los Angeles. He is an investigator for Nidek, Inc., and owns stock in and receives travel support from STAAR Surgical Company. Dr. Dougherty may be reached at (805) 987-5300; info@doughertylaservision.com.

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