

Decentered Hyperopic Ablation

BY ARTHUR CUMMINGS, FRCSEd; DAVID G. KENT, FRANZCO;
AND DAVID T. C. LIN, MD, FRCS

CASE PRESENTATION

A 44-year-old female underwent bilateral PRK 1 year ago. Her past records reveal that her original refraction was +2.50 +0.5 X 180 OD and +3.00 +0.25 X 180 OS. With those refractions, she saw 20/20-2 OU. Her treatment had a target of emmetropia in her right eye and monovision (+1.75 D) in her left. The surgeon used the Visx Star S4 excimer laser (Advanced Medical Optics, Inc, Santa Ana, CA) conventionally with a 5- X 9-mm optical zone in both eyes. Her original pachymetry measured 541 μ m OD and 523 μ m OS. The surgery was uneventful.

Postoperatively, the patient described poor vision that was worse in her left eye and complained of dry eyes. Figure 1 provides a topographic analysis. Her dry eyes resolved with permanent occlusion of her right and left lower puncta, topical Restasis (Allergan, Inc, Irvine, CA) twice per day, and the use of unpreserved artificial tears as needed. The patient's current manifest refraction is plano OD and -1.50 +1.25 X 174 OS, and her BCVA is a poor-quality 20/30-2 OU. Her current pachymetry measurements are 535 μ m OD and 549 μ m OS. Figures 2 through 4 show her current topographic and wavefront analyses. The rest of her examination is normal.

How would you treat this patient?

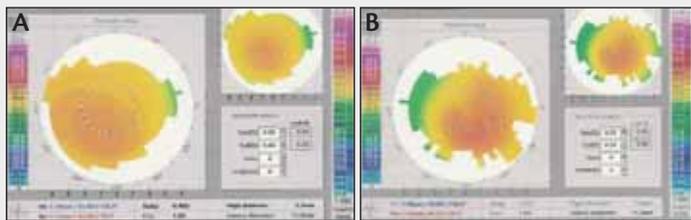


Figure 1. These postoperative views of the patient's right (A) and left (B) eyes were obtained with the Allegro Topolyzer.

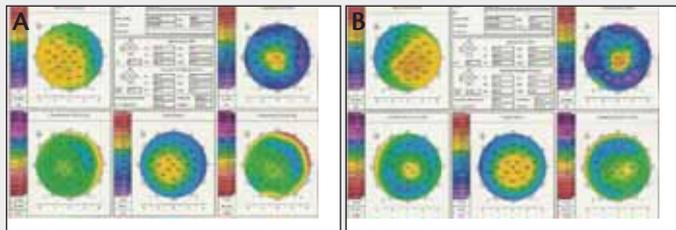


Figure 2. Topographic analyses with the Pentacam Comprehensive Eye Scanner of the patient's right (A) and left (B) eyes are shown.

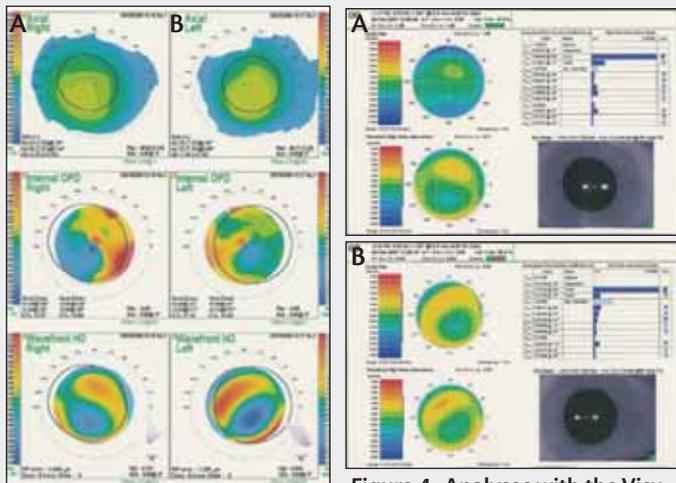


Figure 3. Analyses with the Nidek OPD Scan are shown for the patient's right (A) and left (B) eyes.

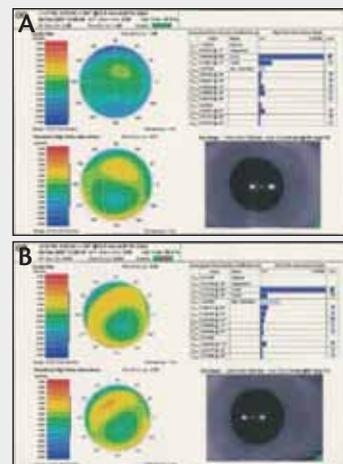


Figure 4. Analyses with the Visx CustomVue technology are shown for the patient's right (A) and left (B) eyes.

ARTHUR CUMMINGS, FRCSEd

This patient has a small optical zone and a decentered ablation. Moreover, she may be struggling to adapt to monovision. Because her left eye is the more affected, I would concentrate on it first. If treatment satisfied her, I would consider addressing her right eye as well. I would ascertain what target to aim for in her left eye. Should I keep the -1.75 D target, or would the patient do better sacrificing monovision for a plano result in that eye? I would decide based on the results of a contact lens trial demonstrating the two possible outcomes (eg, zero/zero and zero/1.75 D).

Whatever my determination, I would select a customized laser ablation, most likely topography-guided LASIK. The patient's pachymetry is adequate, her keratometry readings are not too steep after the previous surgery, and her problems with dry eye appear to have resolved. I would perform a topographic analysis with the Allegro Topolyzer (WaveLight, Inc. Sterling, VA) as well as tomography with the Oculyzer (WaveLight, Inc.; alternate version of the Pentacam Comprehensive Eye Scanner [Oculus, Inc., Lynnwood, WA]). I would then compare the ablation profiles created by the two modalities. I would aim for at least a 6.5-mm optical zone and would probably use a 7.0-mm optical zone if enough data were obtained by the Allegro Topolyzer and Oculyzer. If the two technologies generated similar ablation profiles, then either one of them could be used. If the ablation profiles differed, then the Allegro Topolyzer might be a better choice, because I find that it images the peripheral corneal data better than the Oculyzer. The coma that is present should respond very well to the recentering and expanding of the optical zone.

Because the patient's troubles are a direct result of a corneal problem from the previous ablation, the best data to correct it are going to be corneal. I do not think that a wavefront-optimized (WaveLight, Inc.) or wavefront-guided treatment would be as good as topography-guided ablation in this case.

DAVID G. KENT, FRANZCO

The patient's Placido disk corneal topography shows significant asymmetry with inferotemporal steepening in both eyes. Analysis with the Pentacam in each eye also demonstrates inferotemporal steepening of the anterior surface, the corneal thickness map shows mild inferotemporal displacement of the thinnest corneal area, and the posterior elevation map reveals mild inferotemporal displacement of the posterior surface's apex. Analysis with both the Nidek OPD Scan (Nidek, Inc., Fremont, CA) and the Visx CustomVue technology (Advanced Medical Optics, Inc.) shows a high degree of coma on the higher-order wavefront map.

The differential diagnosis includes decentration of the

hyperopic excimer laser ablation or inferotemporal corneal steepening due to forme fruste keratoconus. The relatively normal corneal thickness and posterior Pentacam scan suggest that the problem is a decentered hyperopic excimer laser treatment. Similarly, the nearly normal corneal curvature of approximately 44.00 D after hyperopic ablation suggests that, prior to surgery, the cornea was flatter than average. Given that I think this finding fits best with a decentered hyperopic treatment, I would recommend either a wavefront-guided or a corneal topography-guided retreatment.

I use the international version of the Zyoptix 100 excimer laser system (Bausch & Lomb, Rochester, NY) with no treatment restrictions. I would perform wavefront-guided, IntraLase FS laser-assisted (Advanced Medical Optics, Inc.) LASIK using the Zyoptix diagnostic workstation and would use the iris recognition technology to align the axis and compensate for pupillary shift. I would target a plano result in each eye, because I would not want to leave the patient with corneas that were significantly steeper than average.

DAVID T. C. LIN, MD, FRCSC

This case demonstrates the effect of decentered hyperopic treatments. If I were to look at the topographies without having the patient's prior clinical history, I would think that they were quite typical of someone with keratoconus and inferonasal steepening in each eye. The management of such topographic irregularities would be similar.

Although the patient's right eye shows some irregularity, her left eye shows more and is the one I would treat first. I would recommend topography-guided PRK with the Allegretto Wave excimer laser (WaveLight, Inc.). Because the topography appears similar to that typical of eyes with keratoconus, I would use a keratoconus treatment protocol that I have developed using a topographic neutralizing technique.

This patient has reasonably thick (approximately 525 μm) corneas. I cannot be sure what her preoperative topography was. If inferonasal steepening were present preoperatively, a hyperopic ablation could result in a similar postoperative topography. PRK is safer in a patient with possible forme fruste keratoconus. I would choose transepithelial phototherapeutic keratectomy for epithelial removal, because the procedure smoothes the irregularity. After previous PRK with haze, transepithelial phototherapeutic keratectomy also produces a smooth surface for the refractive ablation (Dr. Lin's article "Transepithelial Topography-Guided PRK for Keratoconus" is available at http://www.crstoday.com/PDF%20Articles/0507/CRST0507_11.php).

I routinely perform topography-guided PRK with the Allegretto Wave to treat irregular corneas. I would use the Oculyzer to capture at least four reproducible topographies and transfer the elevation data to the excimer laser plat-

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form. The planning for a topographic neutralizing technique involves four steps. First, I analyze the plano treatment for smoothing the cornea. The plano treatment is produced by the Oculyzer when no refractive input is entered; in an eye with inferior steepening, it is essentially a mini-asymmetric hyperopic treatment. Second, I identify the cylinder that will be induced by the plano treatment and the amount of astigmatic treatment needed for neutralizing it. Third, I add a myopic treatment in the center of the induced myopic shift to compensate for the initial hyperopic ablation. Finally, I add the manifest refraction to calculate the final treatment. The left eye of this patient has a relatively low refractive error primarily requiring an astigmatic treatment, and a topography-guided PRK should address it effectively.

When re-treating eyes that have undergone PRK, I apply topical mitomycin C 0.02% for 15 seconds and rinse it off with balanced salt solution. I place a bandage contact lens and have patients instill topical antibiotics and steroids until full epithelialization occurs. Generally, I prescribe a tapering dose of steroids over 4 weeks.

Before proceeding with the retreatment, I would emphasize to the patient that her expectations must be realistic and that a final refractive touch-up might be needed after the smoothing of the corneal surface. ■

The use of topography-guided ablation with the Allegretto Wave Eye-Q laser (Wavelight, Inc.) is off-label. The international version of the Zyoptix 100 does not have the same treatment limitations as the model sold in the US. Using the Zyoptix Personalized Treatment System to treat a decentered ablation is an off-label use of the Zyoptix 100 excimer laser.

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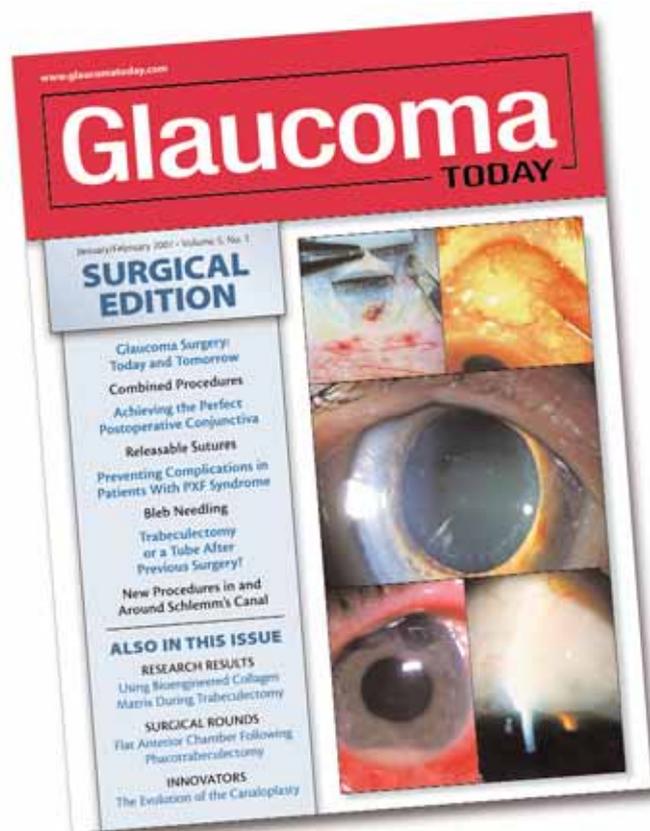
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