

Custom LASIK used to enhance older PRK

CustomVue system used on right eye of 45-year-old patient.

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HISTORY

A 45-year-old man presented with complaints of poor uncorrected vision 9 years after undergoing uneventful PRK with a Summit Apex excimer laser system employing a 6-mm optical zone. His initial surgery was done elsewhere and old records were not available, but apparently he had a preoperative refraction of approximately -3.5 D sphere in each eye. He noted that his vision had been relatively good for 6 or 7 years, but it had deteriorated gradually over the past 2 years. Although he felt his vision had been fairly good for the first 7 years, it had never been perfect. The patient presented for wavefront LASIK correction of his right eye.

Preoperative exam

On examination, the patient had uncorrected visual acuity of 20/30 -2 in the right eye and 20/25 $+2$ in the left eye. UCVA in both eyes together was 20/20. Near vision was J1 in the right eye and J1 in the left eye. The patient was right eye dominant. Maximum scotopic pupil size was 5 mm in both eyes. Post-PRK preoperative corneal pachymetry was 600 μ m in both eyes.

Manifest refraction was $-1.00 +0.75 \times 68 = 20/15$ in the right eye and $-0.30 +0.75 \times 100 = 20/15$ in the left eye. Cycloplegic refraction was unchanged.

Slit lamp examination revealed healthy cornea with no evidence of PRK-related haze or scars in either eye. Corneal topography was consistent with previous PRK surgery in both eyes. There was slight superior decentration of the ablation noted in the right eye. Surface regularity index (SRI) of 0.32 and surface asymmetry index (SAI) of 0.25 in the right eye were good for PRK of that generation (Figure 1).

Preoperative WaveScan measurements showed a higher-order aberration profile dominated by coma and trefoil with lesser degrees of spherical aberration. RMS values were relatively high at 0.25 for a 5-mm pupil (Figure 2).

Procedure

LASIK was performed on the right eye using the Bausch & Lomb Hansatome-Z microkeratome and the Vix CustomVue wavefront excimer laser system. A 180 zero-compression head was used to create the flap with a 9.5-mm diameter ring. A physician offset of -0.25 D was used to modify the CustomVue treatment. The default CustomVue settings were otherwise unchanged. The procedure was uneventful with no difficulties encountered in creating a LASIK flap underneath the previous PRK ablation.

Postoperative results

By the first postoperative day, the patient's UCVA had improved to 20/15 in the right eye, and by 1 month postoperatively the patient had UCVA of 20/10 in the right eye. The manifest refraction at 1 month was plano sphere = 20/10 in the right eye.

Corneal topography was dramatically improved. SRI improved to 0.10 and SAI improved to 0.09. Topography revealed a much more centered and larger ablation zone (Figure 3).

WaveScan testing revealed an improved RMS value of 0.10, although the patient could only achieve a 4-mm pupil as he had been placed on a morphine pump for chronic back pain. The pattern of higher-order aberrations was essentially unchanged, although there was a paradoxical increase in spherical aberration 1 month after wavefront-guided LASIK correction of PRK (Figure 4).

Discussion

This is the first case report describing the use of wavefront-guided LASIK to correct previous PRK surgery. Other surgical options would have included

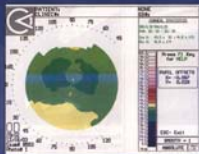


Figure 1. Preoperative corneal topography consistent with previous PRK with slight superior decentration. SRI (0.32) and SAI (0.25) are typical for well-performed, early-generation PRK.

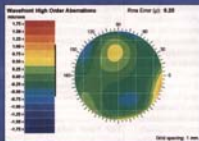


Figure 2. Preoperative WaveScan wavefront analysis. Note the high degree of coma and trefoil with lesser amounts of spherical aberration. RMS is 0.25 (5-mm pupil).

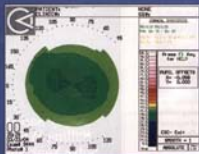


Figure 3. Postoperative corneal topography after CustomVue LASIK enhancement of PRK. Note the improvement in both SRI (0.10) and SAI (0.09). Also note the larger, more centered ablation zone.

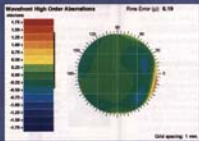


Figure 4. Postoperative WaveScan wavefront analysis. Wavefront data is essentially unchanged. There is an improvement in RMS to 0.10 (4-mm pupil), but there is a paradoxical increase in spherical aberration.

another surface ablation procedure (PRK or LASEK), which would carry a significant risk of scar and haze formation and also may not have had the accuracy of using LASIK in this setting. Furthermore, epithelial removal during repeat PRK or LASEK can technically be more difficult than in a primary case. From a contemporary standpoint, this is an unusual case in that the patient was not a poor

month. Small pupils tend to create lower RMS values. The higher-order aberration profile remained unchanged, except for a paradoxical increase in spherical aberration.

Subjectively, the patient is thrilled with the results of his CustomVue wavefront LASIK under PRK. He claims that, with or without correction, he has never seen as well as he now can see out of his right eye.

CustomVue LASIK is well-suited to the task of refining older-generation PRK procedures. There are

thousands of patients who underwent PRK in an era of poorer precision and optical quality, and this type of treatment opens up a new role for contemporary wavefront-guided LASIK.

For Your Information:

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— David R. Shapiro, MD

LASIK candidate at the time of his PRK, but rather had PRK before LASIK was widely used. In a patient in whom LASIK was initially contraindicated, a LASIK enhancement would still probably not be the procedure of choice to enhance PRK.

Technically, no problems were encountered in performing wavefront-guided LASIK underneath previous PRK using the CustomVue system. The WaveScan aberrometer had no difficulty in capturing wavefront data. The Hansatome-Z was able to effectively create a flap under the previous PRK ablation.

Having wavefront-guided LASIK under previous PRK allowed this patient to enjoy an improvement in the quality of his optics immediately after surgery. His UCVA was 20/15 on the first day. By 1 month, his UCVA and BCVA both improved to 20/10. His corneal topography showed dramatic improvement. SRI is used to measure the degree of corneal surface irregularity, and this index improved from 0.32 to 0.10. SAI measures surface asymmetry. This index improved from 0.25 to 0.09. This is consistent with the improvement in ablation centration created by the CustomVue LASIK treatment.

Despite this dramatic improvement in corneal topography, Wave Scan results did not show the same degree of improvement. RMS values decreased from 0.25 to 0.19 by 1 month, but the maximum pupil size that could be obtained was 5 mm preoperatively and 4 mm at 1



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