Customized Ablations for Better Visual Outcomes

Fast visual recovery and high predictability significantly decrease the enhancement rate compared with standard ablations.

BY BÉATRICE COCHENER, MD

More than 20 years have passed since LASIK was first performed, and the procedure continues to undergo refinement today. In the recent past, mechanical microkeratomes have been widely supplanted by femtosecond lasers, and conventional ablations have given way in many practices to customized ablations. Both advances contribute to the improved visual outcomes our patients achieve today.

Customized ablations should be the standard for all patients undergoing refractive surgery. Our goal as refractive surgeons is to reduce—or at least not to increase—ocular aberrations after the refractive procedure. Achieving visual quality better than 20/20 is not the goal; the target should be preservation of 20/20 with good visual quality under all conditions, including night driving. I believe that wavefront-guided treatment is the best option to attain these parameters. However, the differences in postoperative aspheric profiles and visual outcomes with wavefront-guided and wavefront-optimized treatments are controversial, with few reports in the literature.

Today’s wavefront-guided algorithms have been adjusted to compensate for the higher-order aberrations (HOAs) induced by photoablation and flap creation, allowing us to decrease preoperative HOAs without inducing new ones. Alternatively, wavefront-optimized treatments aim to prevent the induction of aberrations and keep the natural prolate shape of the cornea. The ability to maintain the preoperative corneal structure lies within the relationship between asphericity, spherical aberrations, and quality of vision.

REVIEW OF THE LITERATURE

Edward E. Manche, MD, at Stanford University, reported that patients achieved better results with wavefront-guided LASIK compared with wavefront-optimized LASIK.\(^1\) Dr. Manche and colleagues performed wavefront-guided LASIK in one eye and wavefront-optimized LASIK in the contralateral eye of 90 patients. At 1 week, more wavefront-guided patients had achieved visual quality of 20/20 or better (90% vs 78%), and at 3 months the results were still better in the wavefront-guided versus wavefront-optimized group.

In another study, Scott D. Barnes, MD, of the Warfighter Refractive Eye Surgery Clinic in Fort Bragg, North Carolina, compared UCVA after wavefront-optimized and wavefront-guided PRK.\(^2\) One month after surgery, 47% of wavefront-guided PRK patients achieved a UCVA of 20/15, and 92% achieved a UCVA of 20/20. In the wavefront-optimized patients, 25% achieved a UCVA of 20/15 and 72% a UCVA of 20/20 at 1 month. At 3 months, 76% of wavefront-guided and 55% of wavefront-optimized patients achieved a UCVA.
of 20/15, and 100% and 91%, respectively, achieved a UCVA of 20/20. At 6 months, 47% and 25% of wavefront-guided and wavefront-optimized PRK patients, respectively, achieved a UCVA of 20/15, whereas 92% and 72%, respectively, achieved a UCVA of 20/20. After 6 months, the results started to become similar.

From results such as these, we deduce that wavefront-guided ablations produce faster visual recovery with a higher level of predictability compared with wavefront-optimized ablations. However, in either form, customized ablations lead to a significant decrease in enhancement rates. Compared with conventional treatments, wavefront-guided ablations significantly improve patients’ contrast sensitivity, reduce glare and halos, and improve functional night vision.3

CONSIDERATIONS

Should all patients be offered the option of custom ablation, and if so, is the extra cost associated with wavefront treatments justified for only a potential improvement in visual quality? We still do not know the answers to these questions; however, we do know that wavefront customized treatments produce a more substantial effect in the following groups: patients with large pupils, as they are more sensitive to higher-order aberrations; patients with greater than 0.3 µm preoperative total HOAs; and patients with hyperopia and mixed astigmatism.

The extra cost and the extra surgical time needed for customized treatments can be potential limitations. I suggest defining one price for the procedure, whether conventional or wavefront-guided, and using aberrometry to assess all patients before surgery. Therefore, any patient who is a good candidate can elect custom treatment based on medical, not financial, arguments. After all, is it not our ethical mission to choose the best solution for each patient in terms of safety and efficacy?

PREFERENCE

Each surgeon must believe in his or her preferred method and concept of treatment. This belief is acquired through personal experience and the use of evidence-based medicine. Unfortunately, custom ablation is poorly documented in the peer-reviewed literature. This partly explains why the distribution of this technique is so heterogeneous. Another reason is that refractive surgeons who adopt these technologies must learn the new language of aberrations and how to manipulate more
Wavefront-Optimized Treatments for Advanced Surface Ablation

BY LAURA STRAUB, EDITOR-IN-CHIEF

The use of a wavefront-optimized profile produced good efficacy, safety, and predictability in patients undergoing surface ablation, according to a study published online ahead of print in the Journal of Refractive Surgery.

In the study, advanced surface ablation using the wavefront-optimized profile of the Allegretto Wave Eye-Q (Alcon Laboratories, Inc., Fort Worth, Texas) was performed in 300 eyes (303 patients). At 12 months postoperative, mean distance UCVA was 20/20.5, and in 94.7% of eyes distance UCVA was equal to or better than the preoperative distance BCVA (efficacy index, 1.05).

Additionally, 5.9% of eyes showed improvement in distance BCVA, and 93.7% maintained distance BCVA. No patient lost 2 or more lines of visual acuity (safety index, 1.05). The mean postoperative manifest refraction spherical equivalent was -0.03 ±0.15 D, and 99% of eyes were within ±0.50 D of intended correction. Over- and undercorrection were seen in 0.66% and 0.33% of patients, respectively.

In patients whose ablation depth was 80 μm or more, the authors opted for the prophylactic use of topical mitomycin C intraoperatively to reduce corneal haze. At 12 months, 98% of eyes, regardless of mitomycin C application, had no more than 0.5 grade haze, and no eye had haze greater than grade 1.

CONCLUSION

There is currently considerable contrast between centers dedicating 90% of their ablations to wavefront-customized treatment and others that are still performing only conventional treatments. We can expect a decrease in this discrepancy as prospective studies comparing the two profiles of ablation enter the literature, but also due to educational programs dedicated to teaching aberrometry from a practical point of view.

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