Wavefront Platforms Are the Way to Go!

Wavefront-optimized and wavefront-guided platforms are both desirable in a refractive surgery suite.

BY SONIA H. YOO, MD

We at the Bascom Palmer Eye Institute in Miami are lucky enough to have access to cutting-edge technology, and the institute is often one of the sites for FDA clinical investigations. I generally spend about 2 days a week in the clinic, 2 days in surgery, and the rest of my time on research projects. I have been involved in several studies of various lasers for LASIK and other applications. Technical improvements in laser systems for refractive surgery prompt patients to expect outcomes they deem "perfect" from the get-go. Although today's refractive laser procedures can provide most patients with spectacle-free vision, some will need retreatments.

In addition to the Visx Star S4 laser and the IntraLase FS laser (both from Abbott Medical Optics Inc., Santa Ana, CA), we at Bascom Palmer also use the Zeiss VisuMax, the Zeiss MEL 80 (both from Carl Zeiss Meditec, Inc., Dublin, CA), and the WaveLight Allegretto (Alcon Laboratories, Inc., Fort Worth, TX) lasers. The last two are flying-spot excimer lasers, which have fast ablation speeds that provide accurate treatments. The Visx platform gives us the ability to perform wavefront-guided ablations, and the Allegretto allows us to perform both wavefront-optimized and wavefront-guided ablations.The following are some of the differences between wavefront-optimized and wavefront-guided treatments and how they affect visual outcomes.

OPTIMIZED VERSUS GUIDED

Wavefront-optimized ablations apply a precalculated spherical aberration treatment to produce an aspheric ablation profile. The change in corneal asphericity that occurs after laser vision correction increases postoperative spherical aberration. Spherical aberration is thought to have a large effect on modulation transfer function. It also strongly correlates with disturbing visual symptoms such as starburst and glare. Studies comparing aspheric ablation profiles to conventional ablations confirm that the former induce less spherical aberration and are associated with better low-contrast UCVA and better contrast sensitivity.[1,2]

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Wavefront-guided technology, on the other hand, builds an ablation pattern based on the higher-order aberration profile of the individual eye. Numerous studies of wavefront aberrations and visual performance have revealed that conventional laser surgery increases all higher-order aberrations, which in turn degrades retinal image quality.[3-5] The ability to correct higher-order aberrations may in turn increase the modulation transfer function.[6-10]

In my opinion, the advantages of wavefront-optimized treatments are that they do not require preoperative wavefront imaging and virtually all patients are eligible. The advantages of wavefront-guided treatments are that they can be customized to the patient's eye and have been shown in some studies to induce fewer higher-order aberrations postoperatively than conventional treatments.[8,9] The disadvantage of wavefront-guided treatments is that they cannot be performed without proper preoperative imaging. The ophthalmologist must capture the pupil and perform an iris registration in order to properly use wavefront-guided technology.

In my hands, eyes with significant higher-order aberrations benefit the most from wavefront-guided ablations. I have had the opportunity to use wavefront-

guided treatments with the Allegretto only on a few individuals, as most of my patients do not have higher-order aberrations that are significant enough to warrant its use. I treat about 70% of my patients with either the Allegretto or MEL 80 platforms and the remaining 30% with the Visx. Furthermore, I create the LASIK flap with the IntraLase for about 30% of my patients and use the VisuMax for the rest.

> "There is no difference in my preoperative regimen for topical drops, regardless of the laser platform."

PLANNING THE SURGERY

I rarely plan to have a patient undergo bilateral surgery with two different laser platforms. A more likely scenario on the day of surgery is my moving a patient from the Visx to the Allegretto if I cannot properly capture iris registration. By moving the patient to the Allegretto, I can perform an aspheric ablation and still provide the highest standard of care. I rarely plan surgery with the Allegretto and am unable to use that platform. I might, however, need to move a patient to the Visx if he or she has a thin cornea. Situations can arise in which pupillary tracking is not wanted, and that feature on the Allegretto cannot be switched off. In such cases, I would move the patient to the Visx where pupillary tracking is controlled manually.

There is no difference in my preoperative regimen for topical drops, regardless of the laser platform. I prepare the lids and lashes with povidone-iodine and administer a topical nonsteroidal anti-inflammatory agent, a fluoroquinolone, gentamycin, and prednisolone at the end of the case. Assuming there are no intraoperative surprises, I will prescribe a fluoroquinolone, prednisolone, four times daily for a week, and a topical NSAID postoperatively twice daily for a week.

PATIENTS' REACTIONS

My patients are generally pleased with their visual outcomes. I have not observed much difference in the "wow" factor between wavefront-guided and wavefront-optimized ablations; Snellen acuity outcomes are good with conventional, wavefront-guided, and wavefront-optimized treatments. The differences among the platforms are considerably more subtle in terms of quality of vision, contrast sensitivity, glare, halos, and other higher-order aberrations.

My retreatment rates appear to be lower with the Allegretto. I have a slight preference for the Allegretto and MEL 80 for treating myopia and a slight preference for the Visx for treating astigmatism. I will use either the Visx or Allegretto for hyperopia. I favor the Allegretto for hyperopic treatments if the flap is large enough in diameter but prefer to perform conventional hyperopic treatments on the Visx.

To provide the best-quality refractive surgery, I believe surgical suites should have lasers with both wavefront-guided and wavefront-optimized capabilities. A femtosecond laser to cut the flap is also becoming popular as more and more patients ask for it. Today's refractive surgery patient expects "perfect" vision immediately postoperatively, and part of surgeons' commitment to the patient is to have every tool available to provide him or her with that result. ■

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