

REFRACTIVE DECISIONS

WaveScan WaveFront® System Key to Individualized LASIK Treatment

Kenneth Greenberg, MD

Today's LASIK outcomes are extraordinarily satisfying to both patients and surgeons. In large measure this is due to the WaveScan WaveFront® technology that is at the heart of the iLASIK™ suite.

Prior to the introduction of wavefront aberrometry, treatments had to be based on the patient's manifest refraction, a highly subjective measurement with a significant amount of variability. This is in part due to the imprecision of the astigmatism component in the manifest refraction. The WaveScan WaveFront system, by contrast, creates an accurate, objective measurement of the patient's entire optical system, including astigmatism and higher order aberrations.

WaveScan WaveFront® Technology

In concept, wavefront aberrometry is relatively simple. A beam of monochromatic light is projected into the eye and reflected off the retina. The WaveScan WaveFront system uses a Hartmann-Shack wavefront sensor to capture the light exiting the eye. The aberrations induced by passage of this light through the various optical media are measured. For diagnosis and review, the wavefront is reconstructed using Zernike polynomials; for the generation of wavefront-guided refractive treatments, the wavefront is reconstructed using Fourier algorithms, which are better able to accurately reconstruct complicated shapes.

In practice, this WaveScan examination can be used as the basis for the manifest refraction. The WaveScan system is extremely accurate in identifying the axis and magnitude of astigmatism. Performing manifest refraction guided by data from the WaveScan WaveFront system saves a tremendous amount of time during the preoperative evaluation.

Ablations Without Aberrometry

Unlike the methodology described above, "wavefront optimized" ablations do not make use of wavefront data from the patient. Instead, the ablation uses an average modification to spherical aberration. This may be a problem because patients with the same refractive error can have different degrees of spherical aberration prior to surgery. Moreover, patients often have significant levels of other higher order aberrations, which "wavefront optimized" systems do not address at all.

In contrast, the WaveScan WaveFront system takes *all* aberrations into account, based on each patient's individual *measured* wavefront. It enables a far more detailed correction than can be provided by an ablation based on average levels of just one higher order aberration.

Surgical Results

The WaveScan WaveFront system in the iLASIK platform directly impacts our surgical results. We achieve a high percentage of patients with 20/16 visual acuity because we are able to treat the patient's entire

aberrated wavefront, including both higher and lower order aberrations. As a result, our patients experience less glare and halos and better overall satisfaction with their outcomes.

A substantial number of patients are referred to our practice with sub-optimal results—including residual refractive error, visual symptoms, and irregular corneas—after having had LASIK elsewhere. The Advanced CustomVue platform is, I believe, the only platform in the US that enables treatment of these problems. A key element in this is the WaveScan WaveFront system that provides extremely accurate information regarding each patient's optical system.

Data from the WaveScan WaveFront system is used to design and calculate the patient's treatment. Before treatment we use the WaveScan WaveFront system data to create a PreVue™ lens that allows the patient to evaluate the potential benefit of a wavefront-guided retreatment. (The PreVue lens is a plastic lens that is ablated with the patient's planned CustomVue treatment.) Furthermore, the iris registration feature on the Advanced CustomVue platform allows us to apply these customized treatments with extreme precision.

Practice Success

In a practice that relies on word-of-mouth referrals, patient satisfaction is paramount; the more happy patients we have, the more referrals we get. By allowing us to base each patient's treatment on the patient's unique wavefront, the WaveScan WaveFront system enables me to create more happy patients than ever before. ●



Kenneth Greenberg, MD, practices at the Riverdale Laser Center in New York, NY. Dr. Greenberg is the Medical Monitor for AMO/ VISX™. Support for this column is provided by an educational grant from Abbott Medical Optics, Inc.