

Reshaping the cornea: Which laser profiles should we use?

Laser vision correction (LVC) has grown with tremendous speed over the past decade. In addition to the choice of surface (photorefractive keratectomy, laser-assisted epithelial keratectomy, epi-laser in situ keratomileusis [LASIK]) or lamellar (LASIK, femto-LASIK) treatments, the surgeon now has to select a laser profile for myopic, hyperopic, or astigmatic treatment. Wavefront-guided, wavefront-optimized (aspheric) and topography-guided ablation are the most advanced and frequently used profiles in current practice.¹ Technical developments, clinical studies, and surgeon experience should help in selecting the best profile. In this issue, examples of some profiles are presented.

Although wavefront-guided treatments have evolved since their introduction, results in the literature suggest that improvements (eg, predictability of the wavefront measurements and wavefront-guided algorithm, calculation of variables that induce higher-order aberrations (HOAs) by overriding the reduction of HOAs, closed-loop ablation systems, individual biomechanical responses of the cornea) are necessary to optimize the outcome of wavefront-guided treatments. Current studies² report promising outcomes of primary treatment, but more information about secondary treatments are needed. Steinert and Fynn-Thompson (pages 1267–1272) used wavefront-guided profiles to enhance LASIK eyes. A reduction in HOAs was found, but a nomogram adjustment was suggested. Bababeygy et al. (pages 1260–1266) report effective and predictable results using wavefront-guided LASIK retreatments for consecutive hyperopia and compound hyperopic astigmatism. These 2 studies are important because they improve our knowledge about secondary wavefront-guided profiles.

Customized topography-guided corneal ablation was introduced to improve the optical quality in eyes with irregular corneal conditions such as irregular astigmatism or decentered ablation zones. Alpíns and Stamatelatos (pages 1250–1259) looked at combining topography and refractive wavefront for the problem of differences between the astigmatic parameters measured on the cornea and the refraction. The ocular residual astigmatism, ie, the differences between corneal and refractive astigmatism, quantifies this optical situation. In the Alpíns and Stamatelatos' study, the combination of topography and wavefront treatments resulted in less corneal astigmatism and a better visual outcome under mesopic conditions than wavefront alone, although the HOAs were equivalent.

These 3 studies are good examples of how advanced profiles can be studied and developed. In the future, we expect that a combination of advanced nomograms will be tested; eg, wavefront guided with aspheric or topography with refractive wavefront guided. Ray-tracing treatments as suggested by Mrochen et al.³ may solve the problem even more effectively. The search for the best profiles to use in LVC is ongoing.

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