Reporting Acuity Outcomes and Refractive Accuracy After LASIK

To the Editor:

In their article, “Longitudinal Postoperative LASIK Epithelial Thickness Profile Changes in Correlation With Degree of Myopia Correction,”1 Kanellopoulos and Asimellis describe the importance of epithelial thickness mapping after LASIK and confirm that epithelial thickness profile changes can be lenticular in shape after myopic LASIK, as measured by spectral-domain ocular coherence tomography. This confirms the results of previous reports using high-frequency ultrasound2 and other methods.

These findings are helpful in understanding epithelial change and the contribution of the epithelium to overall refractive change after myopic and myopic–astigmatic LASIK. Almost as an incidental finding, Kanellopoulos and Asimellis cited statistics for refractive accuracy in their patients, reporting that “1 year postoperatively, all patients had a corrected distance visual acuity of 20/20, and 57 of 61 cases were within ±0.25 D of the intended correction.”1 This suggests that they obtained a visual acuity of 20/20 in 100% of patients and that the outcome accuracy of 93.4% (57 of 61) can be within ±0.25 diopters (D) at 1 year postoperatively. This seems like an unprecedented predictability outcome for LASIK up to -8.50 D with any excimer laser, including the Wavelight platform (Alcon Laboratories, Inc., Fort Worth, TX) with which I have extensive experience.

The dynamics of curvature-corrected (ie, “wave-front-optimized”), spherocylindrical shape subtraction as performed by modern excimer lasers, including the Wavelight, dictate that accuracy of correction is proportional to the magnitude of the targeted correction and is influenced by other factors, including temperature, humidity, stromal hydration, ablation speed, plume effects, fluence consistency, beam stability, laser optics, and more. Refractive stability is generally achieved by 12 weeks postoperatively. After that, there can be small amounts of refractive drift related to lens growth (layer formation) and possibly epithelial change for a period of time. In my experience, 20/20 visual acuities are obtained at 90 to 120 days postoperatively in approximately 89% of patients and at 240 to 430 days postoperatively in approximately 87% of patients.

The authors’ claim of outcome accuracy within ±0.25 D at 1 year postoperatively also seems extraordinary and suspect, given that this is better than the repeatability for manifest refraction in a controlled environment. For example, Raasch et al.3 reported the 95% confidence interval for intra-observer repeatability of manifest refraction to be 0.62 D,1 and Shah et al.4 reported it to be ±0.25 D in 81% of eyes. Zadnick et al.5 reported the best comparison measure of the refraction measurement of 95% limits of agreement to be ±0.32 D. Did Kanellopoulos and Asimellis intend to report outcome accuracy as spherical equivalent or actual myopic sphere? Did they intend for this to be 93% within ±0.50 D spherical equivalent?

REFERENCES

David A. Wallace, MD
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Reply:

We welcome the letter by Dr. Wallace commenting on our recent study.1 In response to the points made, we did note in our results that all patients had corrected distance visual acuity of 20/20 as a means of assessing the safety of the procedure studied and not uncorrected distance visual acuity. Perhaps the term “corrected” was inadvertently misread by Dr. Wallace as “uncorrected.” We have correctly stated that 57 of 61 cases studied in our report were within ±0.25 of spherical equivalent error at 1 year, comprising 93.4% of the study population. When considering all cases, the average drops to less than 85% and it is the patients with higher myopia who “skew” these numbers.

We would welcome peer-reviewed publication of reports documenting the “wavefront-optimized” data that Dr. Wallace notes that he has experience with. Although we generally agree with the data mentioned anecdotally in his letter, topography-guided treatments with the WaveLight platform (Alcon Surgical, Fort Worth, TX) appear to offer superior visual acuity LASIK results, also documented in the recent multi-center U.S. Food and Drug Administration trial on to-
procedure. Our early experience of evaluating patients in high fluence corneal cross-linking with the LASIK pro-

it to change this response when employing adjunct corrections and have since documented a significant abil-

phy pattern more pronounced in higher myopic cor-

observed a specific mid-periphery epithelial hypertro-

using high-frequency ultrasound imaging. We actually

lenticular in shape, in contrast with previous reports

LASIK central and paracentral epithelium that are not

actually reported topographic changes of the myopic

which is well illustrated in the epithelial remodeling

and confirm that epithelial thickness profile changes

and confirm that epithelial thickness mapping after LASIK

may significantly bias the refractive and visual function results.

Nevertheless, we believe that the novelty and main

message of our findings lies in the epithelial remodel-

ing assessment in the cohort reported. We beg to differ

with the statement made: “In their article, ‘Longitudi-

nal Postoperative LASIK Epithelial Thickness Profile

Changes in Correlation With Degree of Myopia Correc-

tion,’ Kanellopoulos and Asimellis describe the impor-

tance of epithelial thickness mapping after LASIK and

confirm that epithelial thickness profile changes can be lenticular in shape after myopic LASIK, as mea-

sured by spectral-domain ocular coherence tomogra-

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LASIK central and paracentral epithelium that are not

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using high-frequency ultrasound imaging. We actually

observed a specific mid-periphery epithelial hypertro-

phyr pattern more pronounced in higher myopic cor-

rections and have since documented a significant abil-

ity to change this response when employing adjunct high fluence corneal cross-linking with the LASIK pro-

procedure. Our early experience of evaluating patients in

an anterior segment practice with epithelial mapping

over the past 3 years has made its capture and clinical evaluation an integral part of our clinical assessment

of every patient we observe and we strongly recom-

 mend its use when assessing refraction and visual per-

formance in any patient, by clinicians who have access

to similar technology.

We hope that we have been able to address the ques-

tions noted and clear possible elements of “suspicion”

for Dr. Wallace.

REFERENCES

1. Kanellopoulos AJ, Asimellis G. Longitudinal postoperative

LASIK epithelial thickness profile changes in correlation with

2. WaveLight Allegretto Wave Eye-Q Excimer Laser - P020050/

S012, Summary of Safety and Effectiveness Data (SSED).


following cataract surgery: three-dimensional investigation

with anterior-segment optical coherence tomography. J Refract


4. Kanellopoulos AJ, Asimellis G. Anterior-segment optical coher-

tomography investigation of corneal deturgescence and

epithelial remodeling after DSAEK. Cornea. 2014;33:40-400.


high-frequency digital ultrasound for 3D pachymetric

mapping of the corneal epithelium and stroma in laser in situ


of stand-alone with LASIK combined with prophylactic high-


7. Kanellopoulos AJ, Asimellis G. In vivo three-dimensional cor-

eonal epithelium imaging in normal eyes by anterior-segment

optical coherence tomography: a clinical reference study. Cor-


8. Kanellopoulos AJ, Asimellis G. Anterior segment optical coher-

tomography assisted topographic corneal epithelial thickness

distribution imaging of a keratoconus patient. Case Rep Ophthal-


9. Kanellopoulos AJ, Asimellis G. In vivo 3-dimensional cor-

eonal epithelial thickness mapping as an indicator of dry eye: prelimi-


10. Kanellopoulos AJ, Dupps WJ, Seven I, Asimellis G. Toric to-

gographically customized transepithelial, pulsed, very high-

fluence, high energy and high riboflavin concentration


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