# The Literature

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## EARLY CLINICAL OUTCOMES OF WAVEFRONT-GUIDED MYOPIC LASIK TREATMENTS USING A NEW-GENERATION HARTMANN-SHACK ABERROMETER

*Schallhorn S, Brown M, Venter J, et al*[1]

### ABSTRACT SUMMARY

Schallhorn et al retrospectively reviewed the postoperative outcomes of 243 eyes of 126 patients with myopia that underwent wavefront-guided LASIK using a new-generation Hartmann-Shack wavefront sensor (iDesign Advanced WaveScan Aberrometer; Abbott Medical Optics). The investigators evaluated patients' visual acuity, refraction, and satisfaction 1 month after surgery.

The manifest spherical equivalent changed from -3.28 ±1.79 D (range, -9.88 to -0.38 D) before surgery to -0.03 ±0.29 D (range, -1.00 to 1.25 D) 1 month postoperatively and was within 0.50 and 1.00 D of the intended target in 93% and 99.6% of eyes, respectively. Manifest astigmatism was reduced from (-0.72 ±0.67 [range, 0.00 to -5.00 D]) preoperatively to -0.14 ±0.20 (range, 0.00 to -1.00 D) 1 month after surgery. An uncorrected distance visual acuity (UDVA) of 20/16, 20/20, and 20/25 or better was achieved in 79%, 93.4%, and 96.7% of eyes, respectively. No eye lost 2 or more lines of BCVA, whereas a gain of 1 or more lines was observed in 14% of eyes. Most patients (98.5%) reported that they were satisfied with the outcome of their procedure.

The investigators concluded that wavefront-guided LASIK with the new aberrometer is effective, safe, and predictable for the correction of myopia in the early postoperative period with high satisfaction among patients.

### DISCUSSION

Wavefront-guided LASIK has been shown to be safe and effective for reducing myopia.[2] The study by Schallhorn and colleagues found that wavefront-guided LASIK with the iDesign was safe and effective, with excellent refractive predictability and postoperative UDVA. Despite a broad range of treatments, most eyes (75.5%) achieved a monocular UDVA of 20/16 or better 1 month after surgery, and the binocular UCVA was similarly excellent.

Vector analysis was used to analyze the accuracy of astigmatic correction achieved with LASIK treatments.[3,4] Astigmatism is a vector parameter, and a thorough analysis requires that the change in both magnitude and axis be computed. The vector analysis confirmed the high predictability of the astigmatic correction achieved with the excimer laser used in the study. A total of 90.12% (219) of eyes showed an error of angle of 5° or less, which was also an excellent outcome.

According to Schallhorn et al, the improvement in astigmatism was related to the quality of the measurement and alignment of the ablation profile with the aberrometer. With four times as many lenslets and purportedly improved internal software, the iDesign may measure aberrations, including astigmatism, more precisely than other units. This improved measurement may be either cylinder magnitude or a more precise determination of axis. Although the literature is mixed on the value of previous iris registration technology, the new device used an enhanced iris registration system, which may improve rotational and directional alignment of the ablation profile.[5,6] Even small rotational misalignments can significantly reduce the effectiveness of astigmatic treatment.[7]

In the study, most patients who answered the subjective questionnaire were satisfied with their outcome (98.5%), and all patients said they would recommend the procedure to others. Patients also confirmed that their expectations were met or exceeded, similar to previous reports by patients after LASIK.[8,9]

The most important limitations of this study were its retrospective design and short follow-up period. Additionally, only 50% of patients filled out the questionnaire. Longer-term follow-up would be helpful to further assess these results.

## COMPARISON OF VISUAL AND REFRACTIVE OUTCOMES FOLLOWING FEMTOSECOND LASER-ASSISTED LASIK WITH SMILE IN PATIENTS WITH MYOPIA OR MYOPIC ASTIGMATISM

*Ganesh S, Gupta R*[10]

### ABSTRACT SUMMARY

Ganesh and Gupta compared the visual and refractive outcomes of femtosecond laser-assisted LASIK with those of small-incision lenticule extraction (SMILE [Carl Zeiss Meditec]; not approved in the United States) in patients with myopia or myopic astigmatism. Specifically, they evaluated refractive accuracy, predictability, safety, visual acuity, contrast sensitivity, aberrations, and dry eye up to 3 months postoperatively. Two postoperative subjective questionnaires were used to assess patients' pain, pricking sensation, redness, glare, and overall satisfaction.

On the first postoperative day, 48 (96%) of 50 eyes in the SMILE group achieved a UCVA of 20/20 compared with 46 (92%) of 50 eyes in the LASIK group. Fifteen days postoperatively, contrast sensitivity was similar in the two groups ($P$ = .15). By 3 months postoperatively, however, contrast sensitivity was better in the SMILE group than the LASIK group at

all spatial frequencies ($P < .0001$). Also at 3 months postoperatively, 42 (84%) eyes in each group had achieved a UCVA of 20/20, with six eyes (12%) in the SMILE group and two eyes (4%) in the LASIK group achieving 20/15. Higher-order aberrations (HOAs) 3 months postoperatively were significantly higher in the LASIK group (0.437 ±0.103 µm) than in the SMILE group (0.267 ±0.07 µm; $P < .001$). Postoperative dry eye disease (DED) and glare were significantly more common after LASIK ($P < .001$).

The investigators concluded that refractive accuracy was improved, DED (examination findings and patients' symptoms) was less, contrast sensitivity was better, and induced HOAs were less frequent after SMILE when compared to LASIK.

## DISCUSSION

In this study, SMILE was superior to LASIK, but both procedures were safe and effective, with a high predictability for the correction of myopia and myopic astigmatism.

In another study that compared the two refractive procedures, BCVA was better than 20/20 in 85% of eyes in the SMILE group and in 83% of eyes in the LASIK group.[11] Lin et al found no significant difference between eyes that achieved a UCVA of 20/20 in the two groups.[12]

Ganesh and Gupta reported a significant difference in the refractive efficacy of SMILE versus LASIK. It is difficult to compare the refractive efficacy of the two procedures in this patient population, however, because the preoperative astigmatism was lower in the SMILE group (-0.53 ±0.93) compared to the LASIK group (-0.85 ±0.97). The SMILE group also had lower total HOAs compared to the LASIK group (0.206 ±0.075 vs 0.263 ±0.114). Because the LASIK patients had significantly more astigmatism and HOAs preoperatively, it is also difficult to compare the contrast sensitivity results.

The investigators reported that a variation in hydration of the corneal stroma is the most likely cause of the under- or overablation of stromal tissue.[13-15] In LASIK, the flap needs to be lifted before the excimer laser ablation can be performed. This exposes the stroma to hydration changes before the refractive correction occurs. On the other hand, in SMILE, a femtosecond laser cuts the refractive lenticule before the stroma is disturbed. Ganesh and Gupta claimed that this difference contributed to greater predictability.

Shoja and Besharati reported a significant reduction in Schirmer 1 and 2 tests and tear breakup time after LASIK 3 and 6 months postoperatively.[16] Li et al found that eyes that underwent SMILE had less corneal staining and greater central corneal sensitivity scores than eyes in the LASIK group.[17] In the current study, there was a significantly lower incidence of DED in the SMILE group than the LASIK group. In LASIK, subbasal and superficial stromal nerve bundles are cut during the flap's creation. Subsequent excimer laser ablation severs more stromal nerve fiber bundles, decreasing corneal sensation and increasing DED symptoms.[10] Many studies have reported various percentages of less DED after laser flaps compared to blade flaps, but DED is still a concern for LASIK patients.[18] In the flapless SMILE procedure, the anterior stromal nerve plexus is disrupted significantly less than in LASIK, resulting in fewer DED symptoms postoperatively.[19]

A comparison of root mean square HOAs showed a significant difference between the groups, with HOAs lower in the SMILE group than in the LASIK group. Shoja and Besharati found a 0.02- and 0.06-µm and a 0.10- and 0.14-µm increase in coma and spherical aberrations, respectively, after SMILE and LASIK.[16]

This study is limited by its small sample size and short follow-up period. ■

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