

# Epithelium On or Off?

In a study, surface ablations produced similar results regardless of epithelial retention.

**BY SUPHI TANERI, MD; SASKIA OEHLER, DIPL ING; JÖRG M. KOCH, MD;  
AND DIMITRI T. AZAR, MD**

To date, no surface ablation procedure has been shown to produce superior results over another surface ablation procedure. Therefore, it is mostly the surgeon's preference for PRK, LASEK, or epi-LASIK that determines which procedure is chosen. The common characteristic of any surface ablation is that the epithelium is removed and the ablation takes place on the surface of the stroma instead of intrastromally as in LASIK. LASEK combines certain elements of PRK and LASIK, with alcohol applied to loosen the epithelium and avoid the creation of a stromal flap. In epi-LASIK, a blunt oscillating blade is used to create an epithelial sheet that is repositioned after the ablation.

But what is the benefit of preserving the epithelium after surface ablation? Results are just as good with PRK, in which the epithelium is discarded.

Because the potential benefit of replacing the epithelium has not been established in the literature, we recently compared LASEK and epi-LASIK to examine the role of the epithelium. This prospective, randomized, masked study comprised 20 patients treated with bilateral epi-LASIK and 20 patients with bilateral LASEK (Table 1). There were no statistically significant differences between groups in optical zone size, maximum ablation depth, and use of mitomycin-C. Additionally, there was no statistically significant difference in preoperative pachymetry between groups. In each patient, one eye was ran-

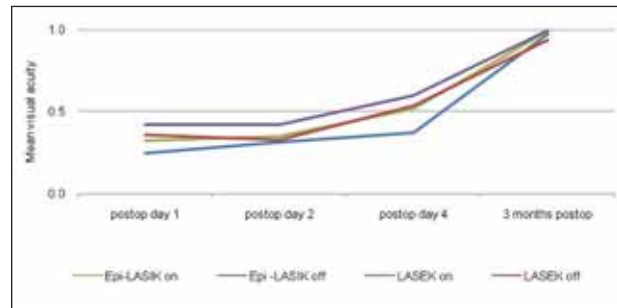


Figure 1. Development of distance UCVA over time.

domly selected for repositioning of the epithelial sheet (the *on* group). In the contralateral eye, the epithelial sheet was discarded (the *off* group).

The trial was single-masked until postoperative day 2, in that the surgeon could easily tell at the slit-lamp examination whether the epithelial sheet had been replaced or discarded. After postoperative day 2, this determination was no longer possible, so the trial can be considered double-masked.

## DIFFERENCES BETWEEN GROUPS

**Visual acuity.** The mean distance UCVA on postoperative days 1, 2, and 4 and at month 3 developed similarly in all groups. Differences in distance UCVA (Figure 1) between the LASEK on and off groups were statistically

TABLE 1. TREATMENT DATA

Group	SE $\pm$ SD (range)	Sph $\pm$ SD (range)	Cyl $\pm$ SD (range)
Epi-LASIK on (n = 20)	-3.65 $\pm$ 2.06 D (-7.50 to 0.31)	-3.30 $\pm$ 2.11 D (-7.00 to 1.10)	-0.71 $\pm$ 0.53 D (-1.95 to 0.00)
Epi-LASIK off (n = 20)	-3.69 $\pm$ 2.08 D (-7.38 to 0.99)	-3.39 $\pm$ 2.24 D (-6.75 to 2.21)	-0.71 $\pm$ 0.72 D (-2.69 to 0.00)
LASEK on (n = 20)	-3.11 $\pm$ 1.75 D (-7.25 to -0.13)	-2.67 $\pm$ 1.92 D (-6.75 to 0.75)	-0.89 $\pm$ 0.74 D (-2.45 to 0.00)
LASEK off (n = 20)	-3.10 $\pm$ 1.51 D (-5.90 to -0.63)	-2.55 $\pm$ 1.73 D (-5.34 to 0.75)	-1.10 $\pm$ 0.83 D (-2.75 to 0.00)

SE = spherical equivalent, SD = standard deviation, sph = sphere, cyl = cylinder

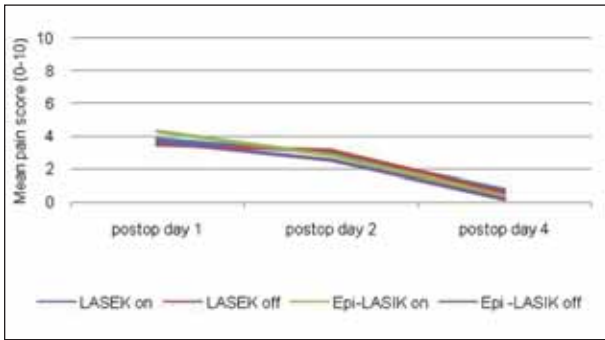


Figure 2. Development of postoperative pain perception over time.

significant on postoperative days 1 and 4 and between the epi-LASIK on and LASEK on groups on postoperative day 4. These early postoperative results indicated that distance UCVA was slightly better if the epithelium was removed in LASEK or epi-LASIK. At the day 4 examination, mean distance UCVA was significantly worse in eyes that had the epithelium repositioned after LASEK, compared with those in which it was removed after epi-LASIK (0.37 vs 0.61). Differences between the epi-LASIK off group and the LASEK on group on postoperative days 1 and 4 were highly statistically significant. There were no other statistically significant differences among the four groups, and at 3 months distance UCVA was similar in all four groups.

**Pain perception.** Ocular pain level was evaluated on postoperative days 1, 2, and 4 using a visual analogue scale (0 = absence of pain, 10 = unbearable pain). At no time was there a statistically significant difference in mean pain levels between groups (Figure 2).

In some patients, pain levels were debilitating until epithelial closure was achieved, even when combined topical and oral medications were prescribed and cold compresses were applied. Other patients had almost no pain perception from the first day, seemingly independently of whether the epithelium covered or exposed corneal nerve endings. We have no conclusive explanation for this huge variation in pain scores, which occurred not only between patients but sometimes between the two eyes of the same patient. However, the average pain score was almost identical in all four groups. We therefore concluded that the method of epithelial separation and the decision to return or discard the epithelium are minor factors for pain perception compared with other influences that we did not monitor.

**Epithelial closure.** The diameter of the epithelial defect decreased nearly equally in both groups with discarded epithelium (Figure 3). Differences on postoperative days 1 and 4 were statistically insignificant. Additionally, we observed statistically significantly more

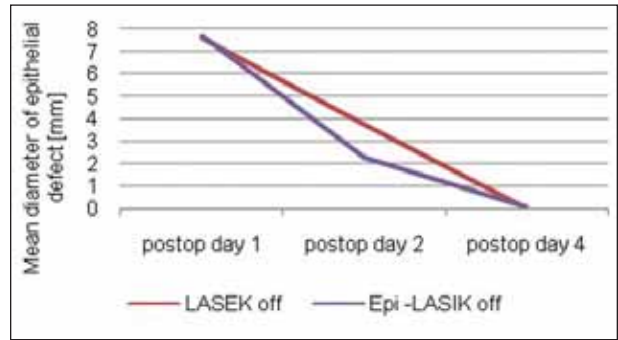


Figure 3. Closing of the epithelium in the LASEK off and epi-LASIK off groups over time.

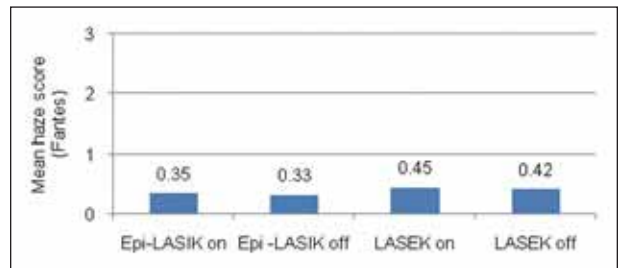


Figure 4. Haze levels 3 months postoperatively.

progressive epithelial closure on average 2 days after epi-LASIK compared with LASEK, but this was not reflected in pain scores.

**Haze.** After 3 months (Figure 4), mean haze levels according to the Fantes classification were 0.45 (range, 0.0–1.0) in the epi-LASIK on group, 0.42 (range, 0.0–2.5) in the epi-LASIK off group, 0.35 (range, 0.0–1.0) in the LASEK on group, and 0.33 (range, 0.0–1.0) in the LASEK off group. Differences between these groups were not statistically significant. However, a lower haze level was observed in the epi-LASIK groups compared with the LASEK groups.

One interesting note is that, of all the eyes, only one had outlying haze formation, and this eye was in the group with the lowest mean haze level. The appearance of epithelial and subepithelial opacification in this eye was star-shaped and centrally located, reducing distance UCVA and BCVA to 0.7. Despite continued therapy with fluorometholone eye

**TAKE-HOME MESSAGE**

- In the early postoperative period, distance UCVA results were better if the epithelium was removed during LASEK or epi-LASIK.
- In eyes with the epithelium repositioned after LASIK, distance UCVA was worse than in eyes with the epithelium removed after epi-LASIK.
- At 3 months, distance UCVA was similar in all four groups.
- Epithelial closure is a minor factor for pain perception.

drops, this manifestation improved only marginally until the 6-month visit. The contralateral cornea was perfectly clear at the 3- and 6-month visits. Both eyes had similar refractions and ablation depths, which were in the midrange of treatments in this study. This example may illustrate that, even with a standardized technique, a surprising clinical course may still be encountered after surface ablation.

## DISCUSSION

At first glance, the decision to reposition or to remove the epithelium after surface ablation seems crucial. However, as evident in our study of 40 patients, postoperative outcomes are similar irrespective of epithelial retention. No clinically significant differences between LASEK and epi-LASIK were detected, regardless of epithelial retention, in terms of visual recovery, epithelial closure time, pain perception, and haze formation.

After surface ablation, ocular pain normally abates once the stromal defect is closed, but full visual recovery may be delayed by slower reorganization of the epithelium. However, both epi-LASIK and LASEK are proven techniques for refractive correction. Although PRK, LASEK, and epi-LASIK have established efficacy, predictability, and safety, the search continues for new techniques with even better results. ■

*Dimitri T. Azar, MD, is the Field Chair of Ophthalmologic Research and the Professor and Head of the Department of Ophthalmology, University of Illinois at Chicago. Dr. Azar states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +1 312 996 2020; e-mail: dazar@uic.edu.*



*Jörg M. Koch, MD, is Director of the Center for Refractive Surgery, St. Francis Hospital, Münster, Germany. Dr. Koch states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +49 251 935 2725.*



*Saskia Oehler, Dipl Ing, is a Research Assistant at the Center for Refractive Surgery, St. Francis Hospital, Münster, Germany. Ms. Oehler states that she has no financial interest in the products or companies mentioned. She may be reached at e-mail: oehler@refraktives-zentrum.de.*

*Suphi Taneri, MD, is the Director of the Center for Refractive Surgery, Eye Department, St. Francis Hospital, Münster, Germany. Dr. Taneri states that he has received travel reimbursement from Technolas Perfect Vision GmbH. He may be reached at tel: +49 251 9877890; fax: +49 251 9877898; e-mail: taneri@refraktives-zentrum.de.*



# PRE-LOADED EXPERTISE

High quality pre-loaded systems.



HYDROPHILIC PRE-LOADED

HYDROPHOBIC PRE-LOADED\*

