Lenticule Intrastromal Keratoplasty (LIKE) for hyperopia correction - feasibility

Seiler T,
Krishna PV,
Bhavatharini G,
Seiler TG

IROC, Zürich, Switzerland
and
LV Prasad Eye Institute, Hyderabad, India

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Refractive results
Hyperopia

Femtosecond laser–assisted hyperopic laser in situ keratomileusis with tissue-saving ablation: Analysis of 800 eyes

Antonio Lascaratos, MD, PhD

RESULTS: Eight hundred eyes of 413 patients were treated. The mean preoperative values were SE, +3.41 D ± 1.16 (SD); defocus equivalent, 4.20 ± 1.33; corrected distance visual acuity (CDVA), 0.07 ± 0.08 logMAR. At 9 months, the mean SE was −0.06 ± 0.26 D and the mean defocus equivalent 0.68 ± 0.62 (both $P<.05$). The defocus equivalent was 0.50 D or less in 594 eyes (74.3%) and 1.00 D or less in 707 eyes (88.4%). The mean CDVA was 0.07 ± 0.06 logMAR; 3 eyes (0.4%) lost 2 lines of CDVA and 58 eyes (7.3%) lost 1 line. The mean uncorrected distance visual acuity was 0.16 ± 0.13 logMAR. The safety index was 1.0 and the efficacy index, 0.8. The mean root-mean-square induced primary spherical aberration was 0.65 μm and the mean induced primary coma, 0.24 μm (both $P<.05$).

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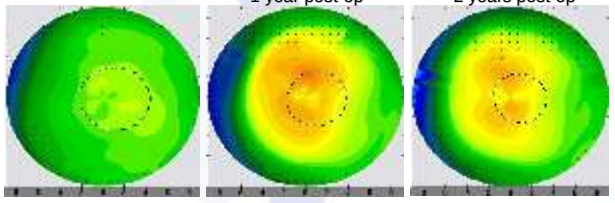
hyperopia correction

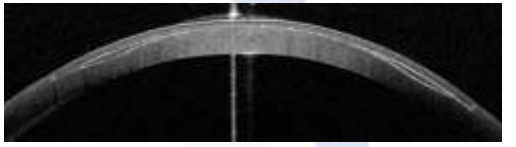
Hyperopic LASIK achieves notoriously undercorrection and only 80% and less are 1 year after surgery within ±0.5D (for example Alio et al. JRS,2015). Also, the optical zone is plagued with significant and asymmetric regression inducing the so called “healing astigmatism.



+1.25D -1.0 cyl -0.5/170 -0.5 cyl -1.0/170

hyperopia correction

Instead of removing a doughnut-shaped tissue ring from the cornea (that induces asymmetric healing) we propose an additive technique where a prepared lenticule of donor tissue is implanted under a 10mm-LASIK flap.



hyperopic LASIK

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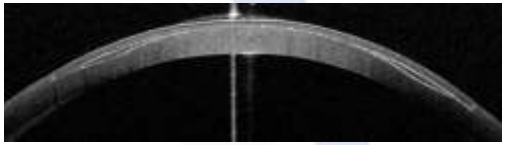
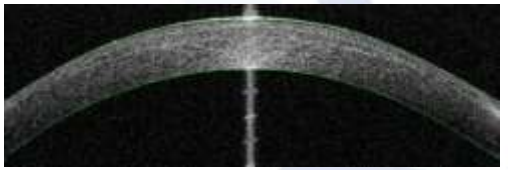


hyperopic LASIK



hyperopic LIKE

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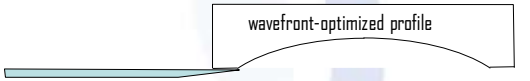
donor preparation

After epithelium removal the donor cornea is attached to a titanium foam-block with a defined profile (Gebauer, Germany) and the lenticule cut with a special blade. The lenticule`s diameter ranges from 7 to 9 mm with a range of correction up to 10D. It has to be emphasized that the lenticule includes an intact Bowman`s.



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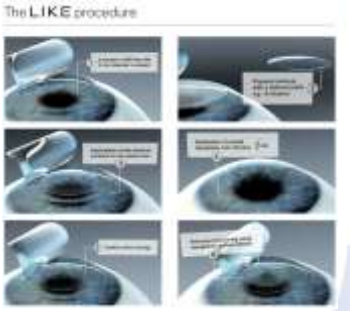
Preparation of Lenticule



- SMILE Lenticle vs. Lenticle created with microceratome and intact Bowman !
- High precision of about 5-10 um
- Re-lift for refractive fine tuning is easier

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Centration

- „Best guess“ centration
  - Using Alcon Verion

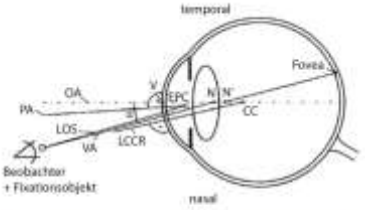

Abb. 3.26 Die Achsen des optischen Systems. OA optische Achse, LOS line of sight-, VA virtual axis-, LCCR Linie des koaxial betrachteten Hornhautreflexes, PA Pupillenachse, V Hornhautscheitel, EPC Zentrum der Eintrittspupille, N, N' Knotenpunkte, CC Zentrum der Hornhautkurvatur

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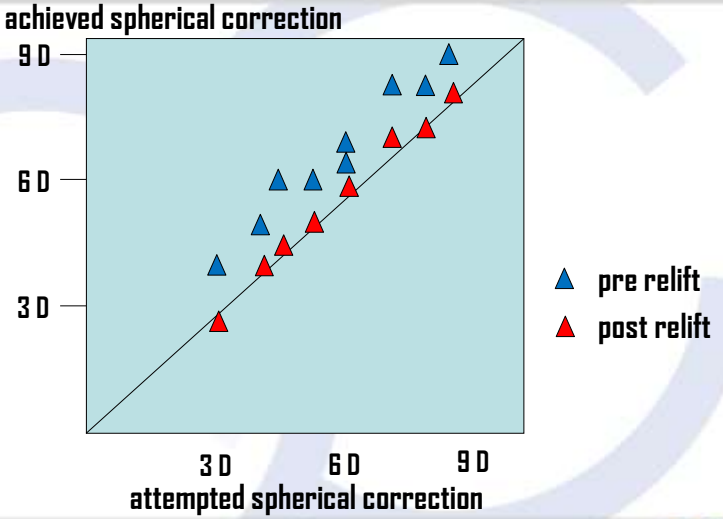
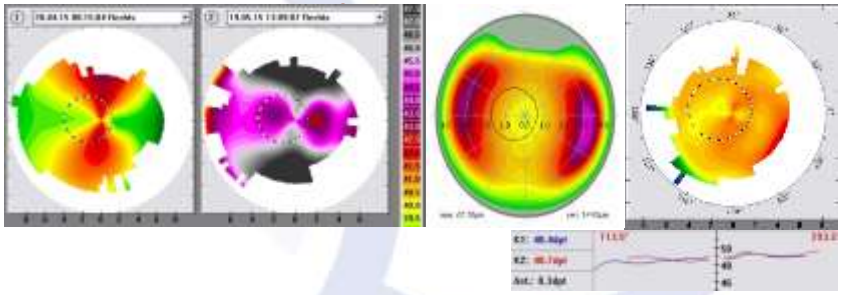
power density



patient 2

The patient was referred because of hyperopic astigmatism (+5.5 cyl -2/175),
contact lens intolerance and shallow anterior chamber. One month after a +7D-LIKE, we performed a relift and a topography-guided ablation



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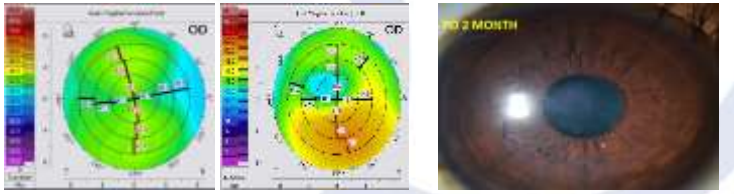
results

Twelve eyes of 9 patients were treated with LIKE for hyperopia up to +8.5D and astigmatism up to -2.5D, 5 eyes received laser ablation on the leticule at 1 to 3 months post-op. One lenticule was replaced at 1 month (undercorrection).

None of the eyes lost more than 1 line 6 months after LIKE, 3 eyes gained 2 lines and more. Four of 7 eyes showed transient haze (+1) in the lenticule.

In 3 eyes the lenticule was decentered, the lenticule was recentered in 2 eyes.



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conclusion

- The refractive results after hyperopic LASIK are significantly worse compared to myopia
- Additive hyperopia correction (LIKE) is a new approach implanting a precut donor lenticule
- This technique apears to be feasible
- Prospective studies are under way to show safety and efficacy

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