

Refractive surgery: Is the new small-incision lenticule extraction (SMILE) technique equal to or better than the standard flap-and-ablation (FS-LASIK) technique for treating high-degree myopia?

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Eye Surgery for Nearsightedness:

Small-incision lenticule extraction (SMILE) vs. Femtosecond laser *in situ* keratomileusis (FS-LASIK)

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Introduction

Corneal laser surgery for myopia (nearsightedness) is increasingly popular and among the most performed surgical procedures today. For almost two decades LASIK has been the most widely used surgical technique for treating myopia, but a shift to the new less invasive SMILE technique might be underway. SMILE is proven efficient and safe for correction of myopia and low degrees of astigmatism. However, the literature is still sparse, especially for high degrees of myopia (Spherical equivalent (SE) refraction of -6.00 diopters (D) or more).

Objective

The aim of this study was to evaluate and compare accuracy, efficacy, visual acuity, safety and refraction up to 3 months after surgery with SMILE or FS-LASIK for high degrees of myopia and low degrees of astigmatism.

Method

Retrospective study of all eyes treated with SMILE or FS-LASIK for high degrees of myopia and low degrees of astigmatism from 2011 to 2013 at the Department of Ophthalmology, Odense University Hospital, Odense, Denmark.

Inclusion criteria: Best spectacle-corrected visual acuity (BSCVA) of 20/25 or better on Snellen chart before surgery, and no other ocular conditions than high degree myopia with or without astigmatism of maximum 3 D.

Exclusion criteria: Eyes having undergone re-treatment.

Clinical examinations were performed pre-operatively and at 1 day, 1 week and 3 months post-operatively.

Results

In total, 545 SMILE eyes and 254 FS-LASIK eyes were included and analyzed.

Accuracy: After 3 months, 80% of SMILE eyes and 71% of FS-LASIK eyes ($P=0.38$) were within 0.50 D of attempted post-operative refraction, whilst 96% of SMILE eyes and 90% of FS-LASIK eyes ($P=0.54$) were within 1.00 D.

Efficacy: In 180 eyes the attempted post-operative refraction was 0 D. Of these, 69% of SMILE eyes and 83% of FS-LASIK eyes ($P=0.55$) had an uncorrected distance visual acuity (UDVA) of 20/25 or better at 1 day post-operatively. After 3 months, the results were 95% for SMILE eyes and 81% for FS-LASIK eyes ($P=0.73$). Moreover, the average UDVA was -0.03 0.09 (logMAR) in SMILE eyes and 0.04 0.15 (logMAR) in FS-LASIK eyes ($P<0.05$) after 3 months.

Visual acuity and safety: The percentage of eyes with BSCVA of 20/20 or better was unchanged after both procedures. In total, 2% ($n=13$) of SMILE eyes and 1% ($n=2$) of FS-LASIK eyes ($P=0.17$) had gained 2 or more lines of BSCVA after 3 months, whilst 0.2% ($n=1$) of SMILE eyes and no FS-LASIK eyes ($P=1.00$) had lost 2 or more lines of BSCVA. No flap or cap complications were reported.

Refraction: After 3 months, 89% of SMILE eyes and 76% of FS-LASIK eyes ($P=0.17$) had an SE refraction of -1.00 D or better. Before surgery, 76% of SMILE eyes had astigmatism of 1.0 D or less, and 96% after 3 months ($P<0.05$). For LASIK it was 68% before surgery, and 96% after 3 months ($P<0.05$).

Conclusion

Both FS-LASIK and SMILE was accurate, efficient and safe in treating high degrees of myopia and low degrees of astigmatism, and results was overall comparable up to 3 months after surgery.

BASELINE	SMILE	FS-LASIK	P
BSCVA (logMAR)	-0.04 (-0.18 to 0.10)	0.05 (-0.18 to 0.10)	<0.05*
SE (D)	-7.7 (-14.8 to -6.0)	1.4 (-16.5 to -6.0)	0.22
SE attempted (D)	-0.6 (-8.3 to 0.0)	0.6 (-7.8 to 0.0)	0.78
3 MONTHS	SMILE	FS-LASIK	P
BSCVA change (logMAR)	-0.01 (-0.23 to 0.22)	0.06 (-0.11 to 0.18)	<0.05*
SE dif. (D)	0.2 (-1.5 to 3.4)	0.5 (-3.3 to 1.5)	<0.05*

Table 1: Baseline characteristics and outcomes 3 months after surgery. All values are average standard deviation (range).
BSCVA change = Before surgery – Achieved
SE dif. = Achieved – Attempted

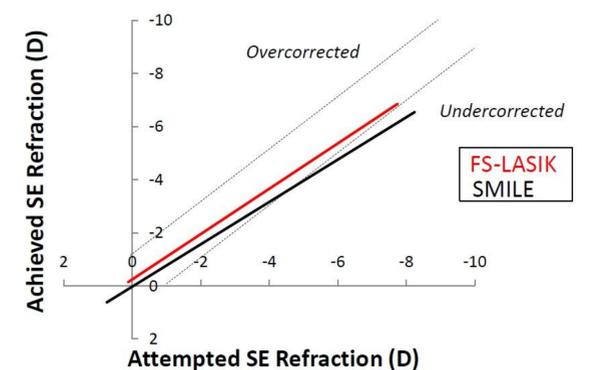


Figure 2: Refractive predictability. Attempted SE plotted against the achieved SE after 3 months.

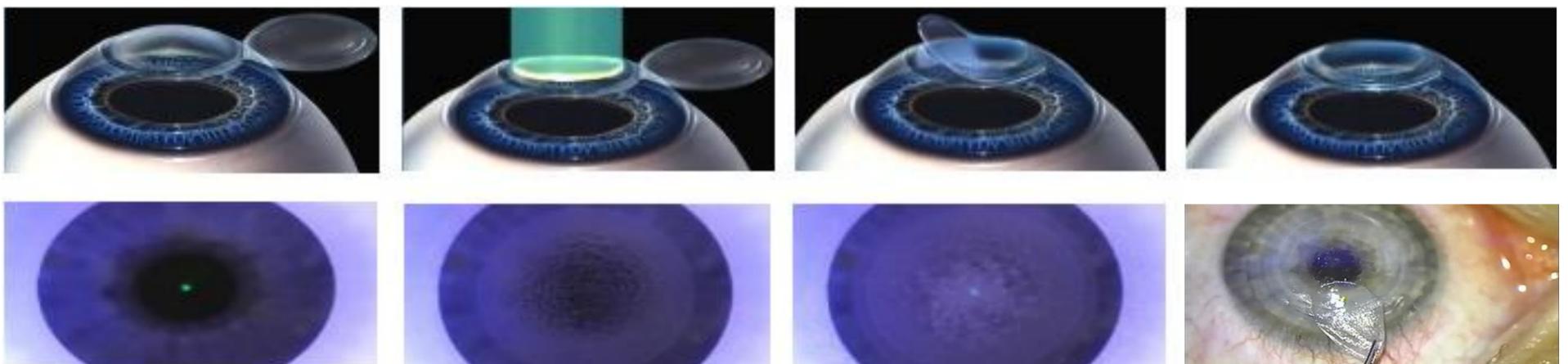


Figure 1: Top: FS-LASIK = Flap cut → Photoablation → Flap repositioning → Healing.
Bottom: SMILE = Docking → Lenticule cut → Cap cut → Lenticule extraction.

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For all authors; None.