THE PROS AND CONS OF LASIK VS SMILE

Which vision correction procedure is right for your patient?

BY NABILA GOMEZ, OD, FAAO

When advising patients on laser vision correction options, optometrists must weigh the benefits of LASIK against those of the newer small incision lenticule extraction (SMILE) procedure. Both approaches can help patients achieve freedom from glasses or contact lenses. More traditional procedures, such as advanced surface ablation (ASA), also known as photorefractive keratectomy (PRK), remain well-established and highly effective in specific cases; however, this article compares LASIK and SMILE (Figures 1 and 2). Understanding their advantages and disadvantages helps ensure patients are guided toward the option that best fits their refractive needs, ocular anatomy, and lifestyle.

LASIK

During the LASIK procedure, a surgeon creates a corneal flap 90 µm to 120 µm thick with a femtosecond laser,[1] then lifts the flap to ablate the stromal tissue and reshape the cornea using an excimer laser. Once complete, the flap is repositioned, and healing begins almost immediately.

LASIK: The Pros

Long Track Record, High Success Rates

First approved in the 1990s, LASIK has a 30-year track record, with millions of procedures performed worldwide. It consistently delivers excellent visual outcomes and patient satisfaction. Modern LASIK techniques (eg, femtosecond laser flaps, wavefront-guided ablations, and topography-guided ablations) have refined safety and efficacy, with studies reporting high patient satisfaction rates.[2,3] LASIK's long

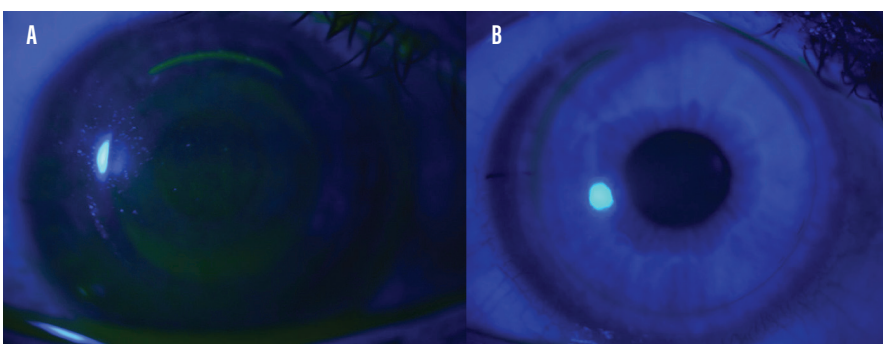

Figure 1. Postoperative Day 0 slit-lamp images comparing SMILE and LASIK. SMILE-treated eye under cobalt blue illumination, showing a small superior incision used for lenticule extraction and no visible flap margin (A). LASIK-treated eye under cobalt blue illumination, demonstrating a well-defined circumferential flap edge (B).

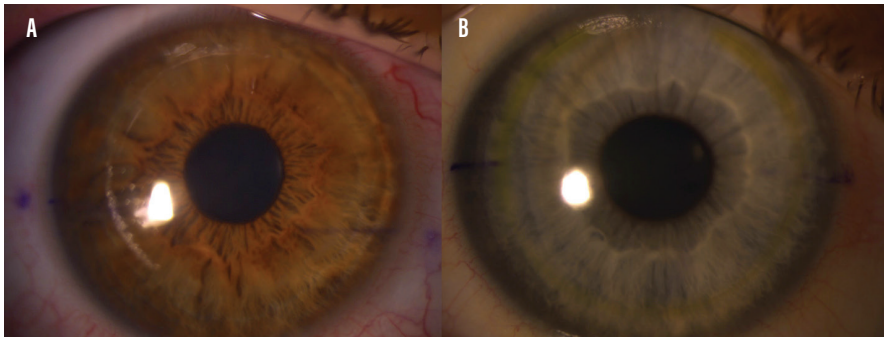

Figure 2. Postoperative Day 0 slit-lamp images comparing SMILE and LASIK. Post-SMILE eye under white light, where the superior incision is barely perceptible (A). Post-LASIK eye under white light, showing the flap interface and hinge marks (B).

history means surgeons have extensive experience and low complication rates with proper patient selection.

Rapid Visual Recovery, Minimal Discomfort

LASIK is known for its quick recovery of vision. Most patients achieve functional vision within 24 hours.[7] Because the corneal flap allows the treated area to heal in place, visual acuity often stabilizes faster than with ASA/PRK or SMILE procedures. This rapid recovery appeals to patients with limited downtime. Additionally, postoperative discomfort is typically mild and short-lived.

Broad Range of Treatable Prescriptions

LASIK can correct myopia, astigmatism, and even hyperopia within FDA-approved ranges. In fact, LASIK is approved to treat hyperopia up to approximately +6.00 D, a range that SMILE does not cover.[4] This broad applicability makes LASIK an option for a wide spectrum of refractive errors. However, while hyperopic LASIK is FDA-approved, surgeons approach hyperopic treatments with caution due to its high regression rate.[4,5]

Advanced Customization and Laser Technology

LASIK offers the ability to tailor treatment using either wavefront-guided or topography-guided ablation profiles, both of which can enhance outcomes in patients with higher-order aberrations or irregular astigmatism. Wavefront-guided LASIK helps reduce optical distortions by treating internal aberrations measured across the visual system.[2] Topography-guided LASIK (eg, Contoura Vision [Alcon]) focuses on corneal surface irregularities, improving visual quality and reducing glare or halos.[3] In addition, LASIK performed with new-generation femtosecond lasers, such as the VisuMax 800 (Zeiss), offers faster flap creation, shorter suction time, and smoother interface quality.[6]

Ease of Enhancements

If an enhancement is needed, patients who have had LASIK can be relatively easily re-treated. The surgeon simply lifts the corneal flap (Figure 3) or performs an excimer ablation (ASA/PRK) on the flap. The ability to re-access the stromal bed makes for a more straightforward refinement. This is not the case in patients who have had SMILE, in which there is no flap to lift.

LASIK: The Cons

Flap Creation and Complications

Although uncommon, flap-related complications such as incomplete or irregular flaps, striae, or displacements can occur, particularly if trauma happens before full flap adherence. While the incidence of serious complications is less than 1%,[7] the presence of a flap is a lifelong consideration. Patients who play contact sports or who are in high-impact professions may prefer a flapless option.

Postoperative Dry Eye

LASIK temporarily disrupts corneal nerves during flap creation, which can increase the risk of dry eye symptoms in the early postoperative period.[8] While symptoms are

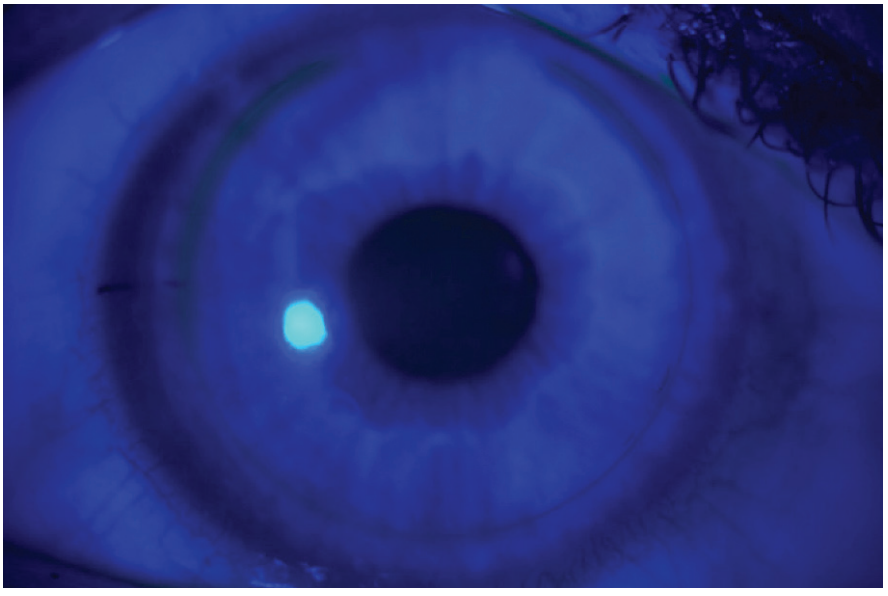

Figure 3. Postoperative Day 0 fluorescein staining under cobalt blue illumination: LASIK-treated eye showing a well-defined circumferential flap edge.

usually manageable with lubricants and tend to improve as nerve regeneration occurs, the initial dryness may be more pronounced in patients post-LASIK than in those who have had SMILE. Proper preoperative dry eye optimization and patient counseling are key to reducing postoperative discomfort. A 2016 meta-analysis found that SMILE was associated with less dry eye during the first 6 months after surgery than femtosecond LASIK.[9] However, 12 months postoperatively, most studies report no difference in dry eye incidence or severity between the two procedures.[10]

Ectasia Risk in Susceptible Corneas

Because refractive surgery involves the removal of corneal tissue, it can weaken biomechanical stability. In LASIK, creating a flap, combined with stromal ablation, reduces corneal integrity, posing a small risk of postoperative ectasia, particularly in patients with undiagnosed keratoconus or borderline corneal thickness. Fortunately, using advanced screening tools such as corneal topography, tomography, and pachymetry has made ectasia increasingly rare. That said, it remains an important consideration during preoperative evaluation.

Limited Eligibility in Some Cases

Because a certain corneal thickness is required to safely create a flap and ablate tissue for LASIK, some patients with thin corneas and high prescriptions are not ideal candidates. In such cases, ASA or phakic IOLs might be a better option.

SMILE

SMILE is a minimally invasive refractive surgery in which a surgeon uses a femtosecond laser to create a small, lens-shaped piece of tissue called a lenticule within the mid-stroma of the cornea. Instead of a flap, the surgeon creates a thin corneal cap, typically 120 µm to 130 µm thick,[11] and the lenticule is carefully extracted through a small 2-mm to 4-mm incision, reshaping the cornea to correct the patient's refractive error.[11]

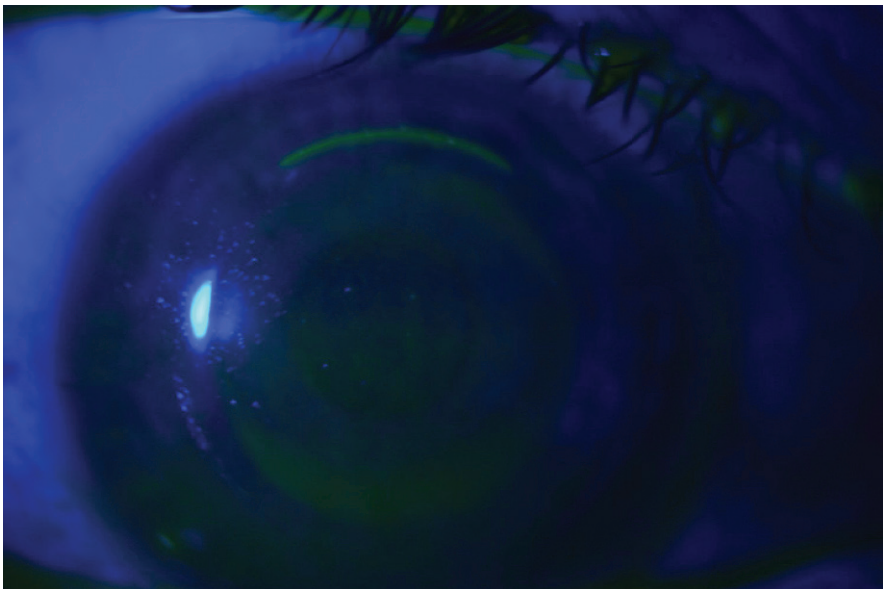

Figure 4. Postoperative Day 0 fluorescein staining under cobalt blue illumination: LASIK-treated eye showing a well-defined circumferential flap edge.

SMILE: The Pros

Flapless Surgery

SMILE corrects vision without the creation of a corneal flap (Figure 4), which means there's no risk of flap complications, and the overall disruption to corneal nerves is reduced. This flapless approach is an advantage for patients worried about flap injuries or those in physically demanding occupations.

Reduced Postoperative Dry Eye

Because SMILE leaves the anterior corneal nerves more intact, corneal sensitivity is minimally affected, and patients experience fewer immediate postoperative dry eye symptoms than those who have LASIK.[12] Additionally, SMILE may offer a gentler postoperative dry eye course for patients with borderline dry eyes or contact lens intolerance.

Comparable Visual Outcomes and Safety

Although SMILE is a newer procedure, multiple studies and meta-analyses have found that, for myopic corrections, its efficacy and accuracy are on par with modern LASIK.[6, 13,14] At approximately 1 year and beyond, uncorrected visual acuity and refraction outcomes are very similar between SMILE and LASIK, indicating that SMILE can achieve 20/20 results reliably in eligible patients. Long-term data, over 5 years, also show stability of refraction comparable with LASIK.[14]

Potential Biomechanical Advantage

With SMILE, the cornea's structural integrity may be better preserved because there is no full-thickness flap cut.[1] Some surgeons believe this could reduce the risk of postoperative ectasia or allow slightly more corneal strength in higher corrections. Although definitive evidence is still being collected, the smaller incision used in SMILE

inherently leaves more of the corneal collagen network undisturbed, which is a theoretical benefit.[1]

SMILE: The Cons

Limited Treatment Range

SMILE is approved for correcting myopia and myopic astigmatism.[11] Hyperopia cannot be treated with SMILE, and astigmatism treatment is typically limited (up to ~3.00 D in the United States). Therefore, patients with significant hyperopia or higher astigmatic errors are not candidates for SMILE. LASIK, by contrast, can treat a broader range of refractive errors.

Slightly Slower Visual Recovery

Visual acuity after SMILE tends to improve more gradually over the first few days compared with LASIK. Many patients who have undergone SMILE have good vision by the next day, but some report that it takes several days to 1 week for their vision to become as crisp as LASIK patients' next-day vision. In practice, by 1 week postoperative, SMILE and LASIK vision are typically equivalent, but patients should be counseled that the immediate clarity effect is often less pronounced with SMILE.

Transient Postoperative Dry Eye

SMILE preserves more corneal nerves than LASIK at 1 month, suggesting less ocular surface disruption. However, this hasn't consistently translated into meaningful differences in dry eye symptoms.[15] While SMILE may cause less dryness early on,[9] studies show no significant difference in dry eye severity between the two by 12 months.[10,15] Less dry eye still means dry eye—an important point in patient counseling.

Challenges with Enhancements

If a patient requires an enhancement after SMILE, the options are more limited. There is no flap to lift for re-treatment. Surgeons may perform ASA/PRK on the cap or, less commonly, convert to LASIK by creating a thin flap months after SMILE.[16] Either approach can fine-tune residual refractive error, but they add complexity compared with the relatively simple enhancement process with LASIK. Fortunately, enhancement rates after SMILE are low; however, this issue remains a consideration when discussing long-term outcomes.

Less Customization Available

SMILE does not allow wavefront-guided or topography-guided treatments. It also lacks an eye-tracker and cyclotorsion adjustment during the lenticule creation. As a result, SMILE is less ideal for eyes with high astigmatism, which could benefit from customized treatments such as LASIK.

CHOOSING THE RIGHT PROCEDURE

Both LASIK and SMILE are excellent refractive surgery options with high success rates. The decision of which procedure is right for a particular patient depends on individual factors.

Refractive Error

LASIK is the only viable laser option between the two if the patient has high astigmatism or hyperopia. For moderate myopia with low-to-moderate astigmatism, either LASIK or SMILE can be recommended.

Corneal Anatomy

Patients with thin or borderline corneas may not be ideal candidates for LASIK or SMILE. Both procedures require sufficient residual stromal beds to ensure long-term safety. However, surface ablation procedures such as ASA/PRK may offer a safer alternative in these cases. Careful evaluation using topography, tomography, and pachymetry is essential, and any signs of corneal instability or ectatic disease would contraindicate both LASIK and SMILE.

Dry Eye and Lifestyle

SMILE may be the preferred option for patients with pre-existing dry eye or concerns about ocular surface health due to its potentially milder effect on the ocular surface in the immediate postoperative period. It may also appeal to individuals with active lifestyles who are eager to resume activities such as swimming or contact sports, as SMILE has no flap-related restrictions. Conversely, patients seeking the fastest possible visual recovery may gravitate toward LASIK, which typically provides sharper vision within the first 24 hours.

(continued on page 46)

> **BOTH LASIK AND SMILE ARE EXCELLENT REFRACTIVE SURGERY OPTIONS WITH HIGH SUCCESS RATES. THE DECISION OF WHICH PROCEDURE IS RIGHT FOR A PARTICULAR PATIENT DEPENDS ON INDIVIDUAL FACTORS.**

> ULTIMATELY, OUTCOMES ARE OPTIMIZED WHEN THE PROCEDURE ALIGNS WITH THE PATIENT'S NEEDS AND THE SURGEON'S EXPERIENCE.

(continued from page 41)

Surgeon Experience and Technology

SMILE requires specialized equipment and dedicated surgical training; therefore, not all refractive surgeons offer this option. LASIK or ASA/PRK remain excellent alternatives in practices where SMILE is not available. If a patient strongly prefers SMILE, then referral to a center that offers the procedure may be appropriate. Ultimately, outcomes are optimized when the procedure aligns with both the patient's needs and the surgeon's experience.

BE AN EDUCATED MATCHMAKER

We all know there is no one-size-fits-all approach to refractive surgery. Both LASIK and SMILE are safe, effective procedures that have distinct advantages (and disadvantages). By understanding the specifics of each technique, we can help personalize recommendations based on refractive error, corneal anatomy, lifestyle, and patient priorities. With thoughtful surgical pairing, we can often exceed our patient's expectations and help them experience life with visual freedom. ■

1 Reinstein DZ, Archer TJ, Randleman JB. Mathematical model to compare the relative tensile strength of the cornea after PRK, LASIK, and small incision lenticule extraction. *J Refract Surg*. 2013;29(7):454-460. Erratum in: *J Refract Surg*. 2017;33(11):788.
2. Schallhorn SC, Farjo AA, Huang D, et al. Wavefront-guided LASIK for the correction of primary myopia and astigmatism: a report by the American Academy of Ophthalmology. *Ophthalmology*. 2008;115(7):1249-1261.
3. Stulting RD, Fant BS, T-CAT Study Group, et al. Results of topography-guided laser in situ keratomileusis custom ablation treatment for myopia. *J Cataract Refract Surg*. 2016;42(1):11-18.
4. Llovet F, Galal A, Benítez-del-Castillo JM, et al. One-year results of excimer laser in situ keratomileusis for hyperopia. *J Cataract Refract Surg*. 2009;35(7):1156-1165.
5. Jaycock P, O'Brart DPS, Rajan MS, Marshall J. Five-year follow-up of LASIK for hyperopia. *Ophthalmology*. 2005;112(2):191-199.
6. Reinstein DZ, Archer TJ, Potter JG, Gupta R, Wiltfang R. Refractive and visual outcomes of SMILE for compound myopic astigmatism with the VISUMAX 800. *J Refract Surg*. 2023;39(5):294-301.
7. Sandoval HP, Donnenfeld ED, Kohnen T, et al. Modern laser in situ keratomileusis outcomes. *J Cataract Refract Surg*.2016;42(8):1224-1234.
8. Liu YC, Jung ASJ, Chin JY, Yang LWY, Mehta JS. Cross-sectional study on corneal denervation in contralateral eyes following SMILE versus LASIK. *J Refract Surg*. 2020;36(10):653-660.
9. Shen Z, Zhu Y, Song X, Yan J, Yao K. Dry eye after small incision lenticule extraction (SMILE) versus femtosecond laser-assisted in situ keratomileusis (FS-LASIK) for myopia: a meta-analysis. *PLoS One*. 2016;11(12):e0168081.
10. Denoyer A, Landman E, Trinh L, Faure JF, Auclin F, Baudouin C. Dry eye disease after refractive surgery: comparative outcomes of small incision lenticule extraction versus LASIK. *Ophthalmology*. 2015;122(4):669-676.
11. Moshirfar M, McCaughey MV, Reinstein DZ, Shah R, Santiago-Caban L, Fenzl CR. Small-incision lenticule extraction. *J Cataract Refract Surg*. 2015;41(3):652-665.
12. Cai WT, Liu QY, Ren CD, et al. Dry eye and corneal sensitivity after small incision lenticule extraction and femtosecond laser-assisted in situ keratomileusis: a Meta-analysis. *Int J Ophthalmol*. 2017;10(4):632-638.
13. Zhang Y, Shen Q, Jia Y, Zhou D, Zhou J. Clinical outcomes of SMILE and FS-LASIK used to treat myopia: a meta-analysis. *J Refract Surg*. 2016;32(4):256-265.
14. Tülü Aygün B, Çankaya KI, Ağca A, et al. Five-year outcomes of small-incision lenticule extraction vs femtosecond laser-assisted laser in situ keratomileusis: a contralateral eye study. *J Cataract Refract Surg*. 2020;46(3):403-409.
15. Ma KK, Manche EE. Corneal sensitivity and patient-reported dry eye symptoms in a prospective randomized contralateral-eye trial comparing laser in situ keratomileusis and small incision lenticule extraction. *Am J Ophthalmol*. 2022;241:248-253.
16. Siedlecki J, Luft N, Priglinger SG, Dirisamer M. Enhancement options after myopic small-incision lenticule extraction (SMILE): a review. *Asia Pac J Ophthalmol (Phila)*. 2019;8(5):406-411.

NABILA GOMEZ, OD, FAAO
- Optometrist, Dell Laser Consultants, Austin, Texas
- Member, *Modern Optometry* Editorial Advisory Board
- nabila.gomez@gmail.com; Instagram @dra.nabila
- Financial disclosure: None