

Case Report: CIRCLE Enhancement After SMILE



EKTET CHANSUE, MD
Medical Director,
TRSC International LASIK Center
echansue@gmail.com

History

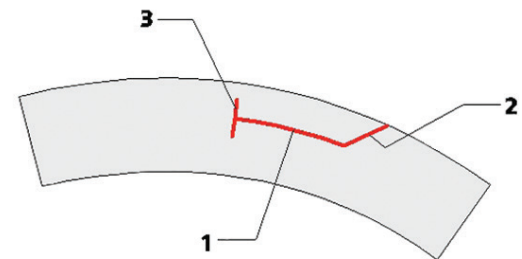
A 24-year-old woman underwent bilateral SMILE surgery at our institution in July 2011 for the correction of about -5.00 D of myopia and a small amount of cylinder. Although the right eye did well with a plano refraction and 20/16 UCVA, the left eye developed astigmatism. The distance UCVA in the astigmatic eye was 20/40, and the manifest refraction was +0.50 -1.00 X 15° yielding 20/16 distance BCVA.

Although there was no sign of ectasia, the patient experienced visual disturbances as a result of the difference in visual acuity between the eyes, and she desired an enhancement procedure. Because the only option at the time was PRK over the SMILE cap, the patient decided to hold off on the enhancement. One year later, the CIRCLE touch-up procedure became available to us. At that time, the patient decided to undergo a CIRCLE enhancement procedure. Both her manifest refraction and distance BCVA had remained stable (+0.50 -1.00 X 15° and 20/16), and serial topography showed no sign of ectatic change.

The CIRCLE Option

CIRCLE is a program used specifically with the VisuMax femtosecond laser (Carl Zeiss Meditec), whereby the laser creates cuts that convert a SMILE cap into a femtosecond LASIK (femto-LASIK) flap.^{1,2} This series of cuts serves three functions:

1. Extension of the cap in annular and planar fashions, programmable for the same depth as the original interface of the previous SMILE surgery;
2. Creation of a flap sidecut in the same fashion as in femto-LASIK; and
3. Creation of a short vertical junction cut ($\pm 10 \mu\text{m}$ high) at



- 1 Lamellar ring
- 2 Side cut with hinge
- 3 Junction cut (from inner edge of lamellar ring to junction depths)

Figure 1. Cross-sectional schematic of the laser cuts created with the CIRCLE program.

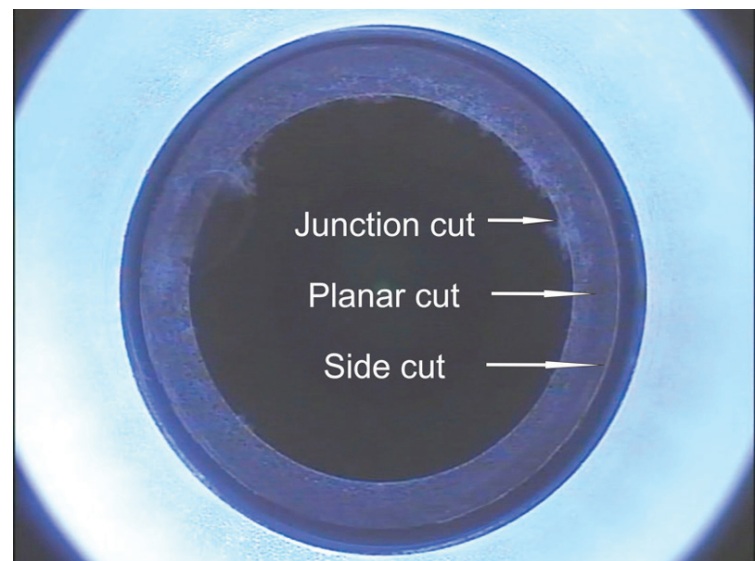


Figure 2. Microscope view of the laser cuts created with the CIRCLE program.

the inner rim of the planar cut, ensuring that the annular cut connects with the original SMILE interface (Figures 1 and 2).

Surgery

The CIRCLE enhancement procedure was performed in the patient's left eye in December 2012 with the following laser settings: annular cuts of 6.5 to 7.9 mm in diameter at a 100-

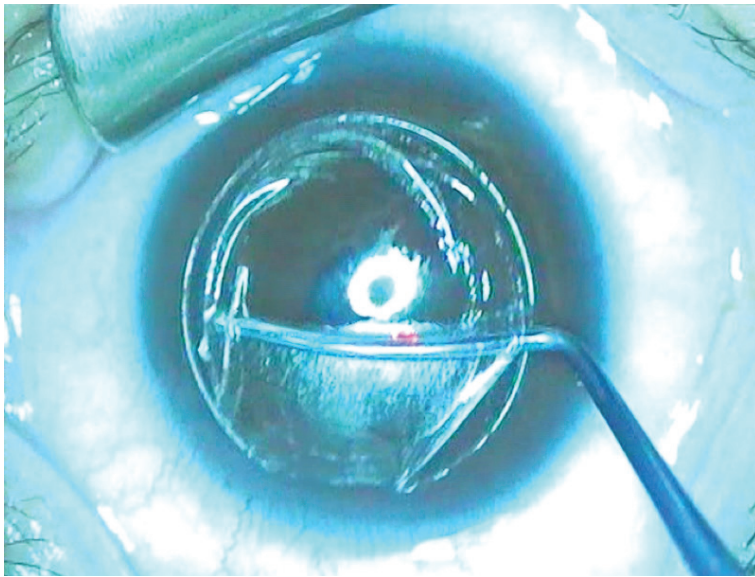


Figure 3. Lifting the flap created with the CIRCLE program.

µm depth; junction cut 20 µm tall at a 110- to 90-µm depth; and sidecut at a 90° angle leaving 3.1 mm superior hinge. The SMILE cap was essentially converted into a femto-LASIK flap, which was lifted without problems using a standard flap-lift technique (Figure 3). The excimer laser ablation and the remainder of the procedure were carried out as a routine LASIK case.

Outcome

One day postoperative, distance UCVA was 20/16 in the patient's left eye, and the flap was smooth and devoid of any inflammation. Routine postoperative medications were prescribed. Distance UCVA in the patient's left eye has been 20/20 or better at all follow-up points. At the latest examination in December 2015, 3 years after the enhancement procedure, distance UCVA was 20/16 with a plano refraction in this eye.

Conclusion

This case example demonstrates the safety and efficacy of the CIRCLE enhancement option, which converts a SMILE treatment into a regular femto-LASIK flap. Although SMILE may be one of the most accurate and efficacious refractive surgical procedures,³⁻¹¹ at

times enhancements are required. Historically, the options for enhancing a SMILE included performing PRK on the cap or femto-LASIK performed at a different depth from the pocket. More recently, the CIRCLE software by Carl Zeiss Meditec offered an alternative, allowing the surgeon to use the previous cap and extend it to create a femto-LASIK flap. The patient in the case described here was the first to receive this treatment at our institution.

Enhancement surgery is an essential and integral part of any refractive surgery practice, and it should not be viewed as a failure when it is required. In our experience, the proficiency and willingness of the surgeon to enhance results of a previous refractive surgery is key to long-term patient referrals. An ideal enhancement procedure should leave the eye in the same general state as before enhancement; that is, with a small incision in the case of SMILE.

Other approaches have been proposed in the literature, including creation of a sub-cap lenticule with the femtosecond laser, which is then extracted through the existing incision without creating a new cap or even a flap.¹² This approach seems to have potential to be the most ideal solution in the future, but thus far it is considered to be off label and needs further investigation. For now, the CIRCLE software provides a reliable solution for SMILE patients who need an enhancement procedure. ■

1. Chansue E, Tanehsakdi M, Swasditutra S, McAlinden C. Safety and efficacy of VisuMax circle patterns for flap creation and enhancement following small incision lenticule extraction.
2. Riau AK, Ang HP, Lwin NC, Chaurasia SS, Tan DT, Mehta JS. Comparison of four different VisuMax circle patterns for flap creation after small incision lenticule extraction. *J Refract Surg.* 2013;29(4):236-44.
3. Reinstein DZ, Archer TJ, Gobbe M. Small incision lenticule extraction (SMILE) history, fundamentals of a new refractive surgery technique and clinical outcomes. *Eye and Vision.* 2014;1:3.
4. Sekundo W, Kunert K, Russmann C, Gille A, Bissmann W, Stobrawa G, et al. First efficacy and safety study of femtosecond lenticule extraction for the correction of myopia: six-month results. *J Cataract Refract Surg.* 2008;34:1513-20.
5. Shah R, Shah S, Sengupta S. Results of small incision lenticule extraction: All-in-one femtosecond laser refractive surgery. *J Cataract Refract Surg.* 2011;37(11):127-37.
6. Vestergaard A, Ivarsen AR, Asp S, Hjortdal JO. Small-incision lenticule extraction for moderate to high myopia: Predictability, safety, and patient satisfaction. *J Cataract Refract Surg.* 2012;38(11):2003-10.
7. Sekundo W, Kunert KS, Blum M. Small incision corneal refractive surgery using the small incision lenticule extraction (SMILE) procedure for the correction of myopia and myopic astigmatism: results of a 6 month prospective study. *Br J Ophthalmol.* 2011;95(3):335-9.
8. Moshirfar M, McCaughey MV, Reinstein DZ, Shah R, Santiago-Caban L, Fenzl CR. Small-incision lenticule extraction. *J Cataract Refract Surg.* 2015;41(3):652-65.
9. Sekundo W, Gertner J, Bertelmann T, Solomatin I. One-year refractive results, contrast sensitivity, high-order aberrations and complications after myopic small-incision lenticule extraction (ReLEx SMILE). *Graefes Arch Clin Exp Ophthalmol.* 2014;52(5):837-43.
10. Kamiya K, Shimizu K, Igarashi A, Kobashi H. Visual and Refractive Outcomes of Femtosecond Lenticule Extraction and Small-Incision Lenticule Extraction for Myopia. *Am J Ophthalmol.* 2014;157(1):128-134.e2.
11. Chansue E, Tanehsakdi M, Swasditutra S, McAlinden C. Efficacy, predictability and safety of small incision lenticule extraction (SMILE). *Eye and Vision.* 2015 2:14
12. Donate D, Thäron, R. Preliminary Evidence of Successful Enhancement after a Primary SMILE Procedure with the Sub-Cap-Lenticule-Extraction Technique. *J Refract Surg.* 2015 Oct;31(10):708-10.