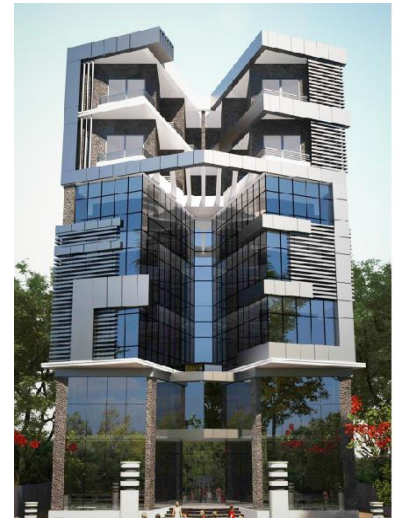


Cap Preserving Smile Enhancement

Ahmed Sedky, FRCOphth
Cairo, EGYPT
Zeiss Usermeeting
Amsterdam 2018

Financial Disclosure, Zeiss Consultant



- My speech is based on my own professional opinion or on our study results. It is not necessarily a reflection of the point of view of Carl Zeiss Meditec AG and may not be in line with the clinical evaluation or the intended use of their medical devices. ZEISS therefore recommends that you carefully assess suitability for everyday use in your practice

Retreatment, Do We Want To Keep it SMILE?

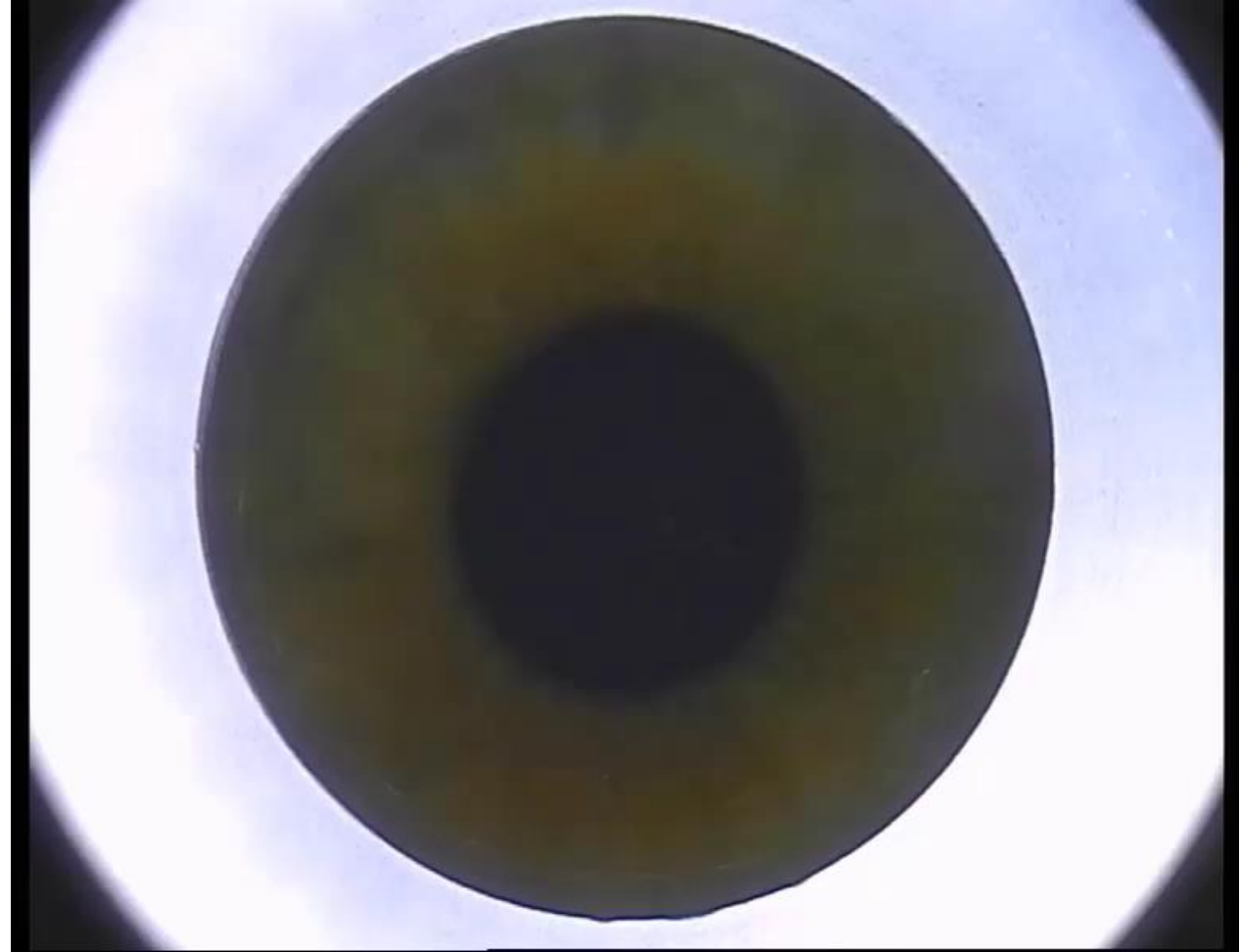
❑ Retreatment in our hospital is almost 0.5%

❑ Options for retreatment:

- Surface ablation (PRK)
- Standard femtoflap with same parameters
- Circle procedure + Excimer laser
- **Cap Preserving SMILE Enhancement (CPSE), Smile over Smile**

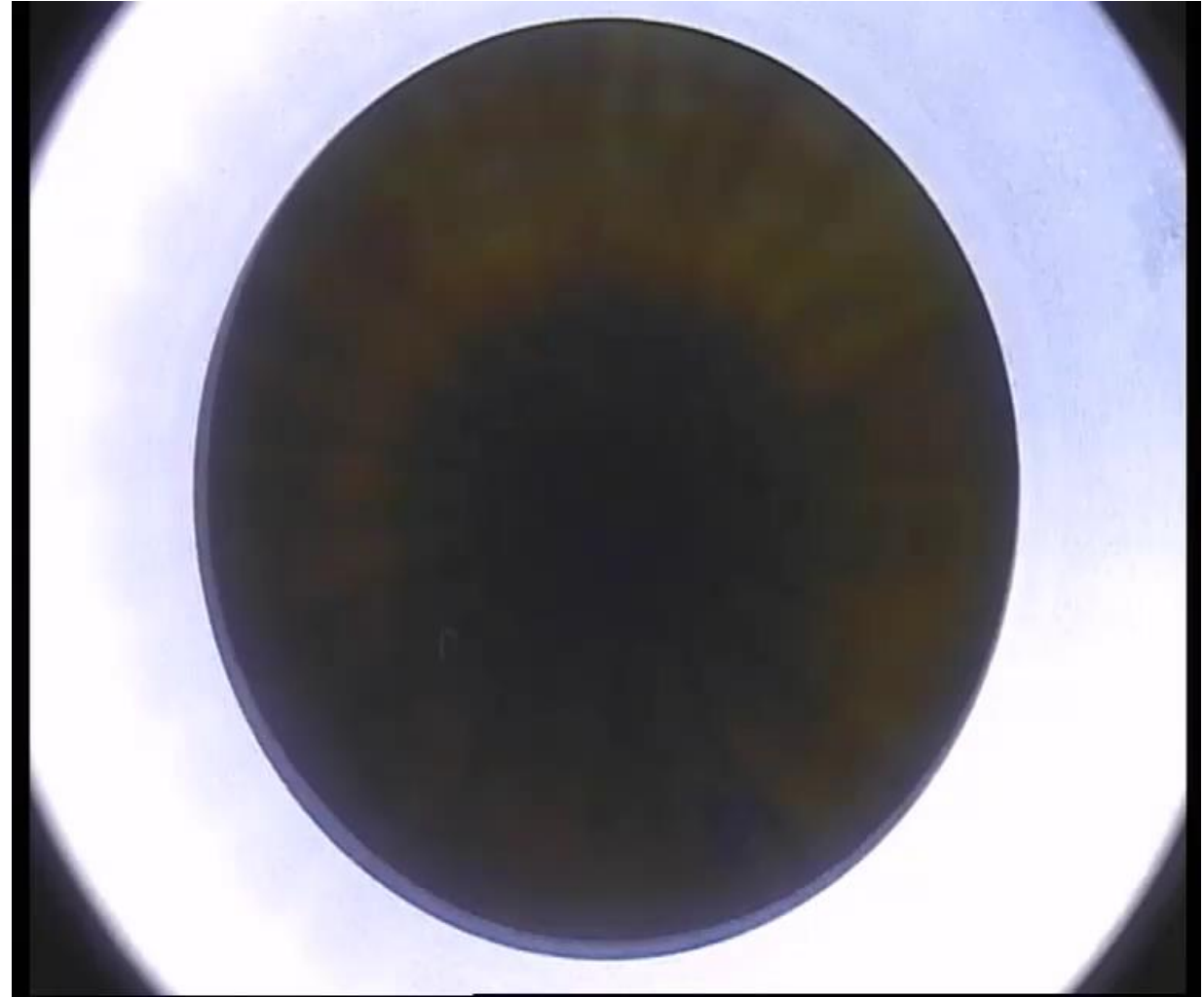
Cap Preserving SMILE Enhancement

- Preservation of Bowman's Membrane
- Cornea Never heal
- Using the primary incision
- Using the primary cap
- Creation of new inferior surface cut
- Creation of new side cut
- Within the primary lenticule cut
- Average K reading



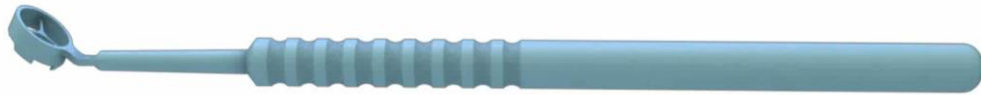
Cap Preserving SMILE Enhancement

- Primary cap thickness is 100-110 microns
- Primary ablation zone (lenticule diameter) is 6.5 – 6.7 mm
- Residual stromal bed after Re-Treatment is 250 microns
- Re-Treatment lenticule is 0.2 mm smaller than the primary one, and of minimum thickness 18 microns
- Re-treatment lenticule centration is the crucial key step (SEDKY marker)



SEDKY RelExSMILE Re-Treatment marker

Duckworth & Kent

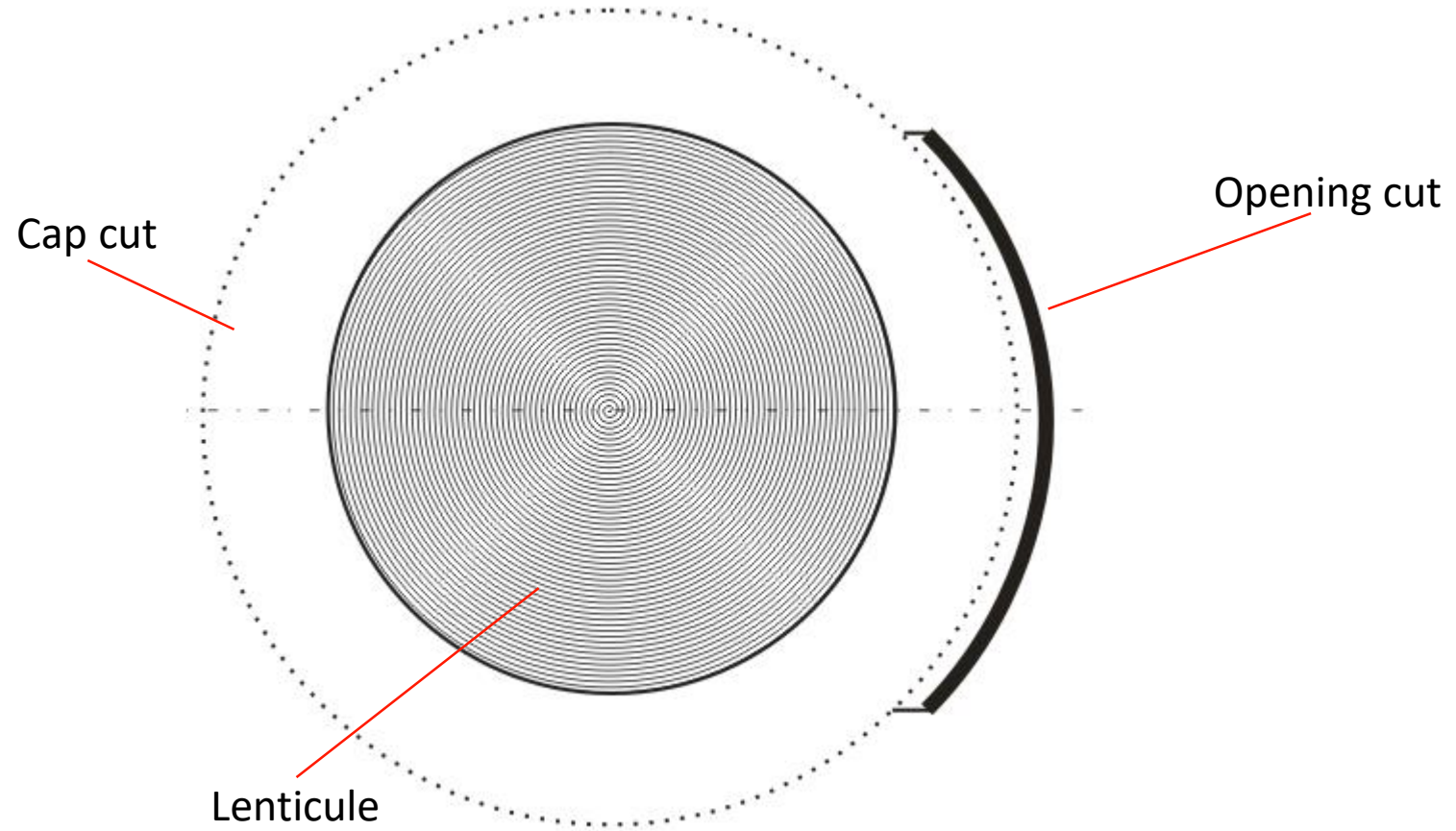


- 4 footplate to mark the primary lenticule edge.
- Central marking pin to be use as the re-treatment docking reference point
- Can be done on S/L or under the microscope
- 2 sizes , 6.50 mm & 6.3 mm
- Duckworth & kent P4599



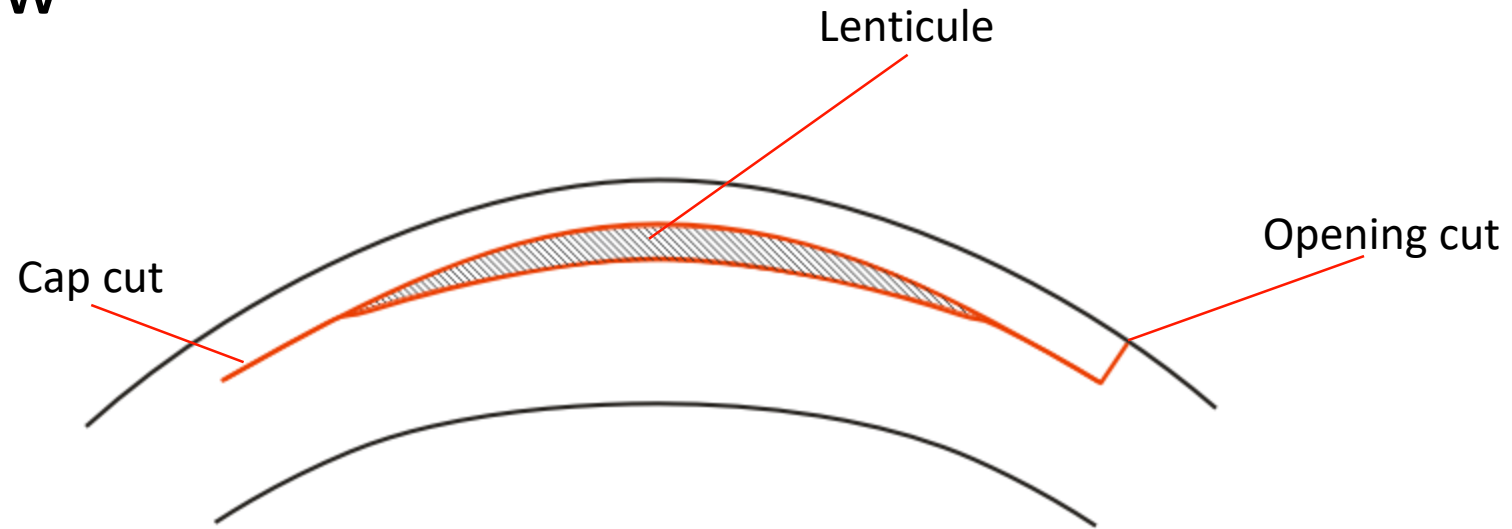
SMILE Surgery Cuts

Top View



SMILE Surgery Cuts

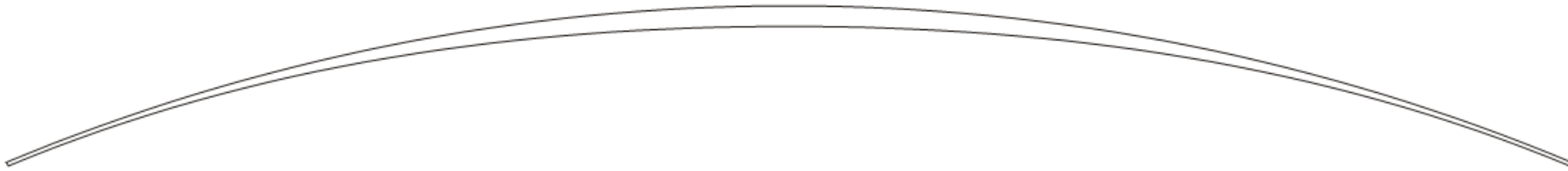
Side View



Note that the aspect ratio of the figures has been altered for illustrative purposes (vertical compression factor = 10x).

Corneal Remodeling

Aspect ratio of cross-cut figures



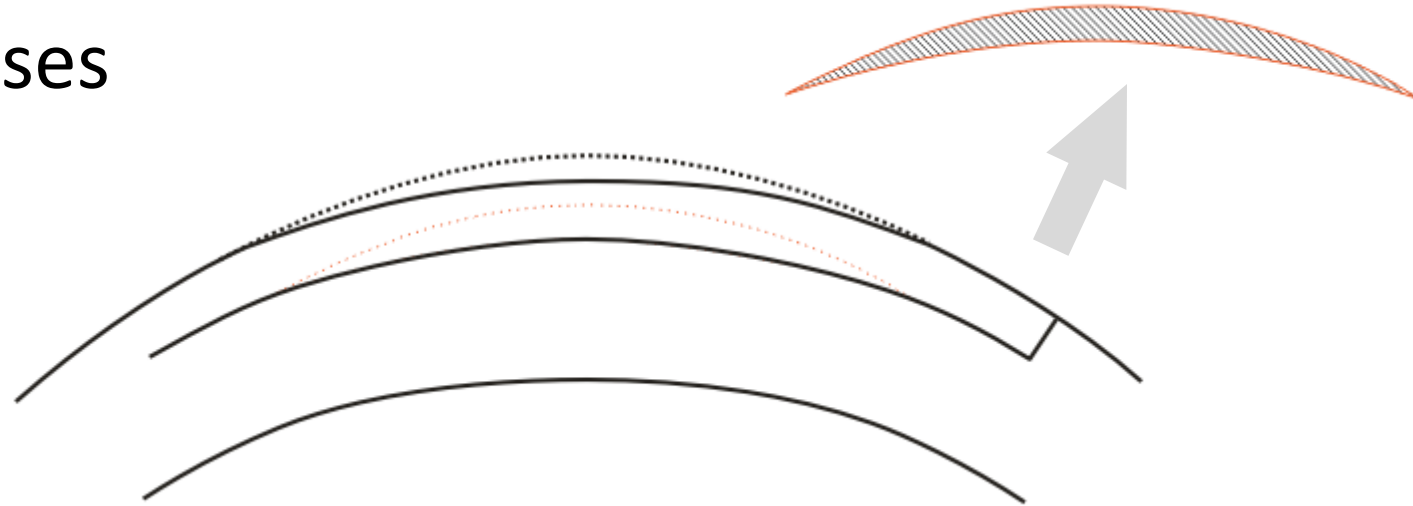
CROSS SECTION OF A TYPICAL LENTICULE FOR A SPHERICAL CORRECTION. Shown with the correct aspect ratio (sphere = -5 diopters, cylinder = 0 diopters, diameter = 6mm, minimum lenticule thickness = 15 μ m, side cut angle = 90°). Note that the curvatures are as shown and the ratio between axial and lateral dimensions (e.g. diameter and side cut length) is realistic.

Note that the aspect ratio of all other cross-section figures of this presentation has been altered for illustrative purposes (vertical compression factor = 10x).

Corneal Remodeling

Lenticule extracted

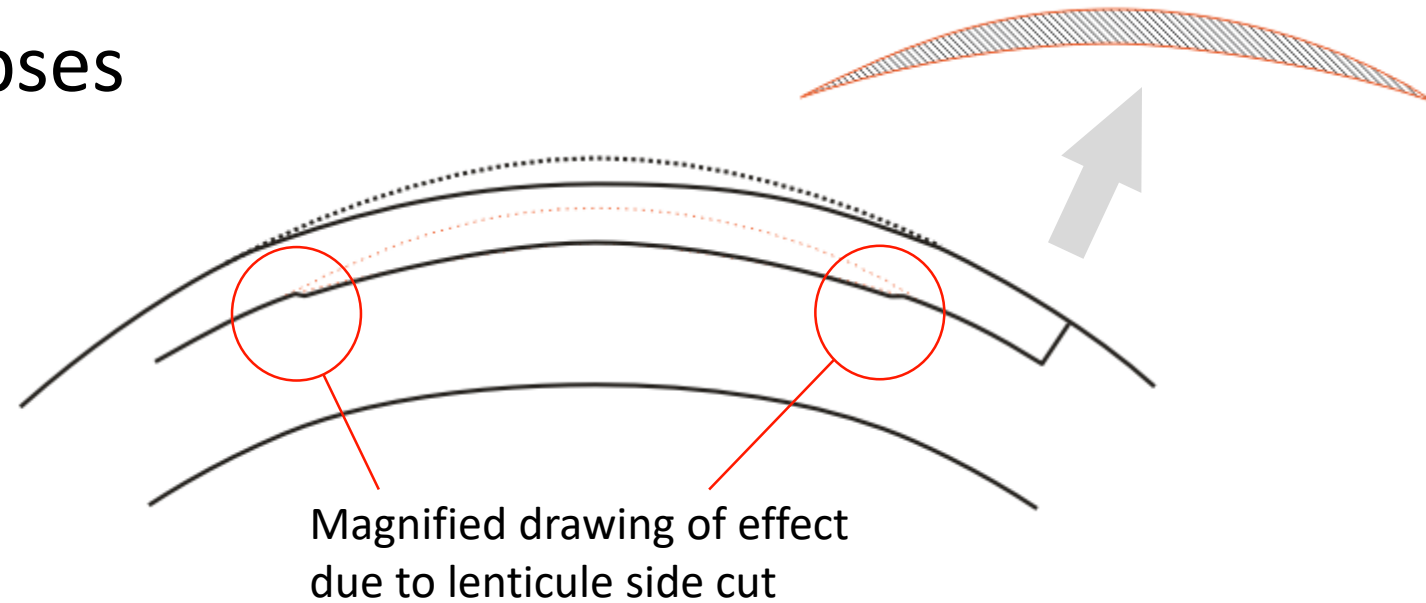
Cap collapses



Corneal Remodeling

Lenticule extracted

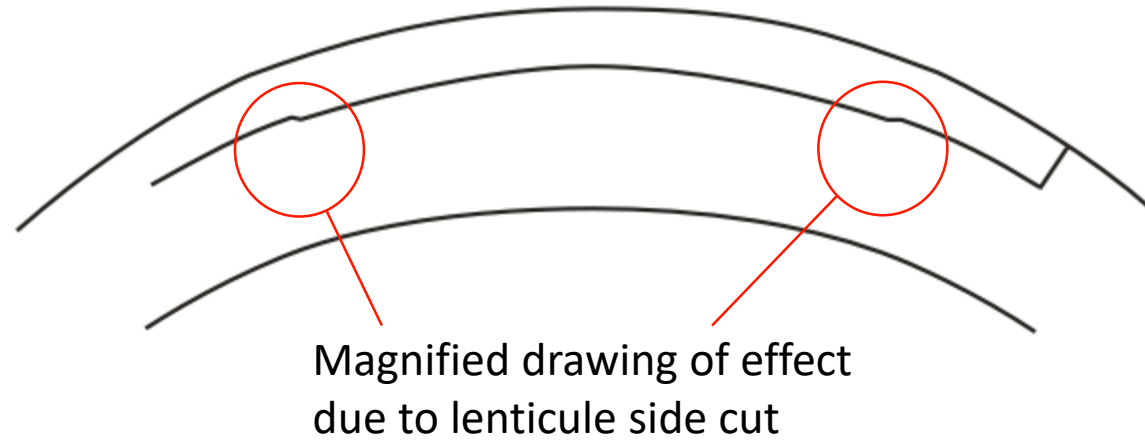
Cap collapses



Note that for illustrative purposes the “imprint” of the lenticule side cut has been magnified and that the aspect ratio of this figure has been altered (vertical compression factor = 10x).

Corneal Remodeling

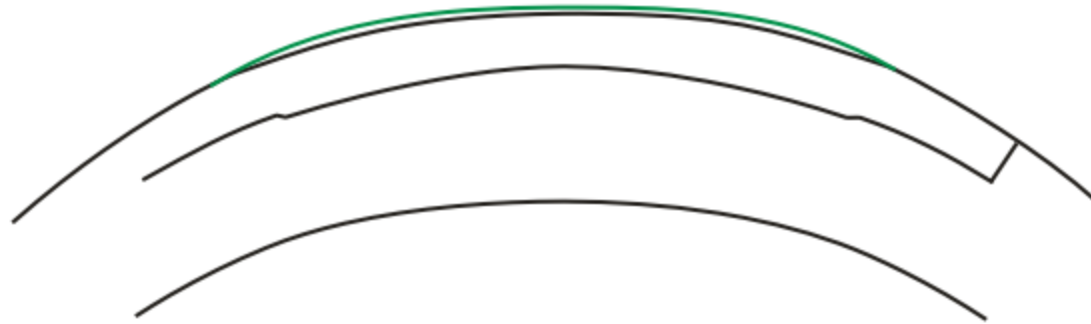
Cap collapsed



Corneal Remodeling

Epithelial Hyperplasia after SMILE Surgery

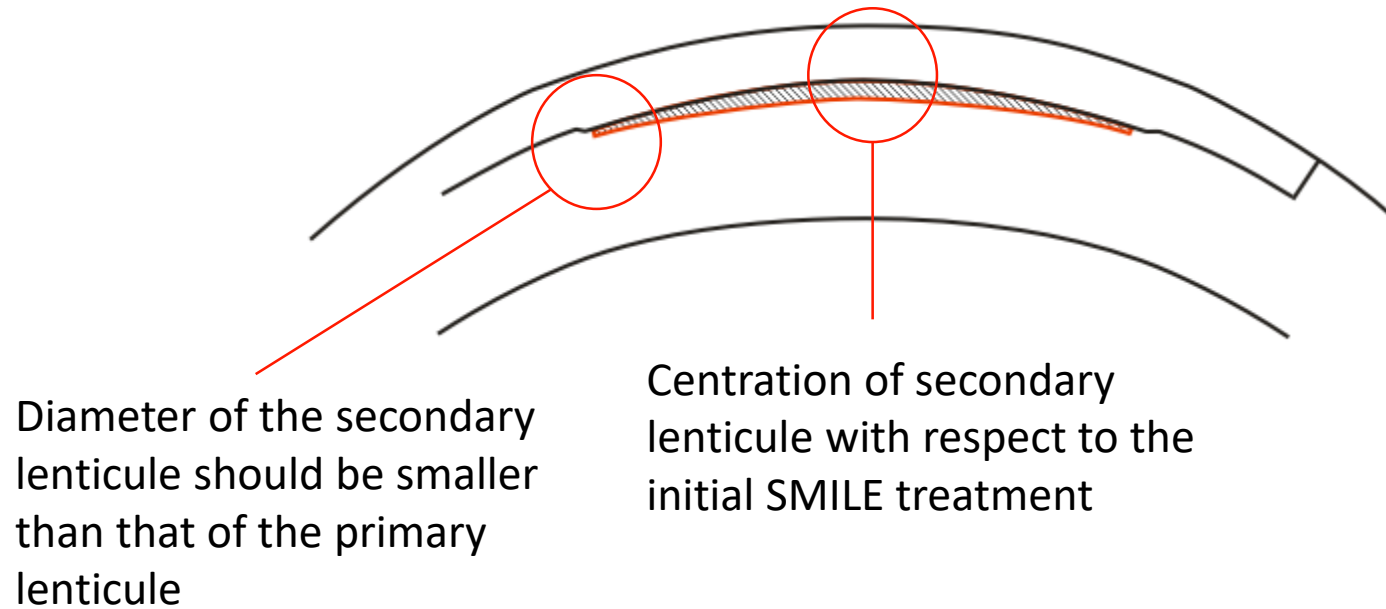
Side View



Corneal Remodeling

Secondary SMILE Surgery (w/o Hyperplasia)

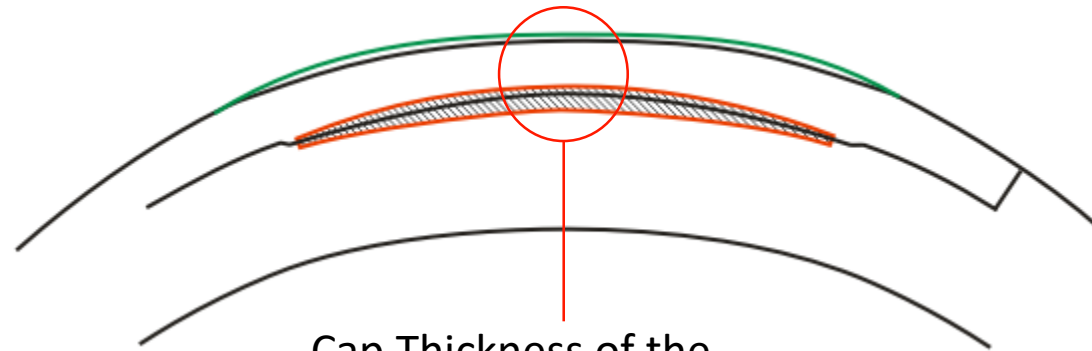
Side View



Corneal Remodeling

Secondary SMILE Surgery (with Hyperplasia)

Side View of Planned Lenticule

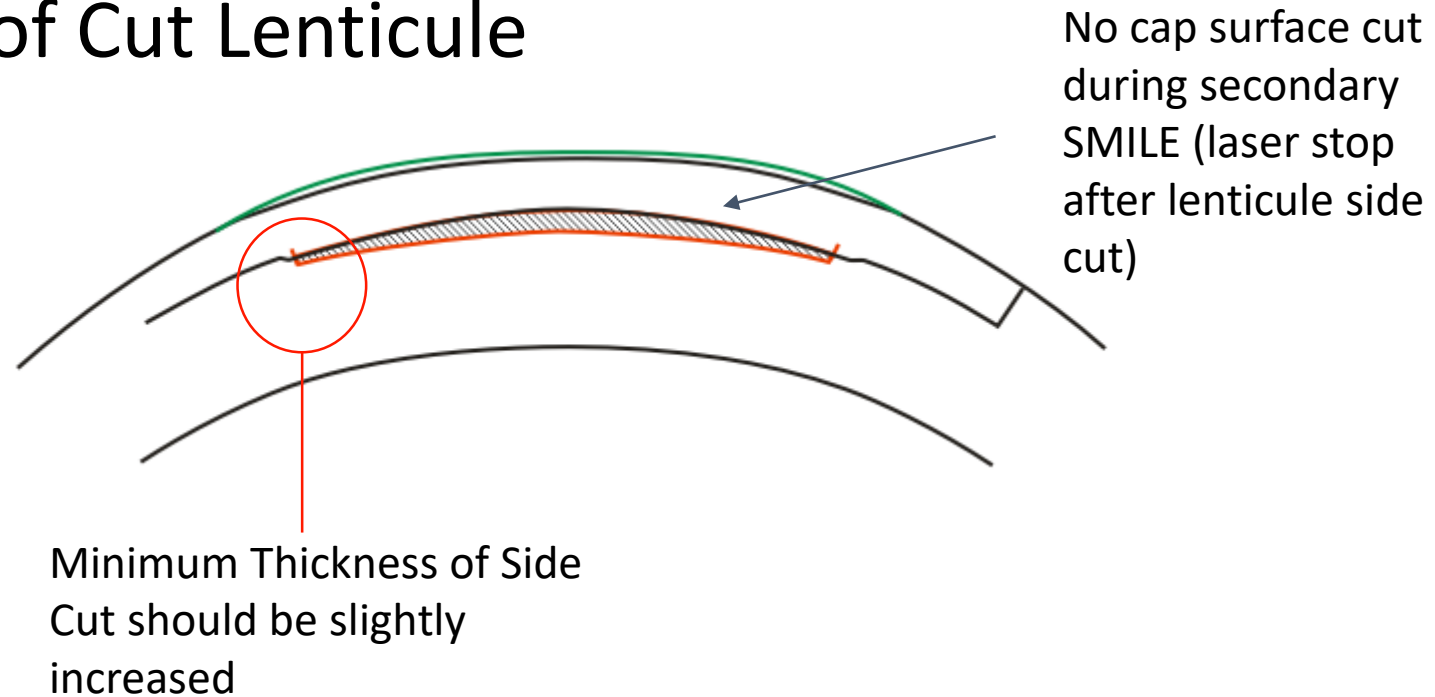


Cap Thickness of the
secondary treatment should
be the same like for the
primary treatment

Corneal Remodeling

Secondary SMILE Surgery (with Hyperplasia)

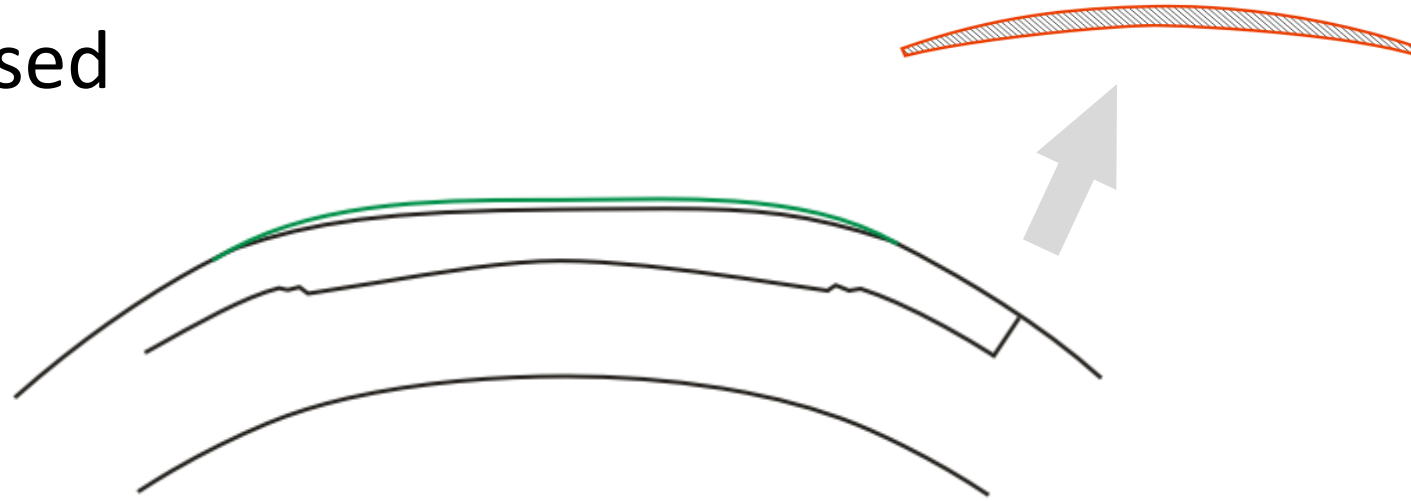
Side View of Cut Lenticule



Corneal Remodeling

Secondary Lenticule extracted

Cap collapsed



RESEARCH ARTICLE

Open Access



Cap-preserving SMILE Enhancement Surgery

Ahmed N. Sedky^{1*}, Sherine S. Wahba², Maged M. Roshdy² and Nermeen R. Ayaad³

Abstract

Background: Different enhancement procedures have been suggested for reduction of residual refractive errors after SMILE. The aim of this study is to evaluate an improved cap-preserving technique for enhancement after SMILE (Re-SMILE).

Methods: A retrospective case series was conducted at Eye subspecialty center, Cairo, Egypt on 9 eyes with myopia or myopic astigmatism (spherical equivalent -8.0 and -12.0 D), undergoing SMILE procedure and needed second interference. This was either because the more myopic meridian was more than -10.0 D and therefore planned to have two-steps procedure (six eyes) or because of under correction needing enhancement (three eyes). Assessment after the primary SMILE procedure was conducted at 1 day, 1 week, 1 month and 3 months postoperatively. Assessment after Re-SMILE was conducted at 1 day, 1 week, 1 month, 3 months, 6 months and 1 year postoperatively. The assessments included full ophthalmic examination, objective and subjective refraction, and rotating Scheimpflug camera imaging.

Results: Preoperatively, the mean refractive spherical equivalent (MRSE) values were: -9.36 ± 0.89 . After primary SMILE it was -2.18 ± 0.71 . After Re-SMILE it was -0.13 ± 0.68 . MRSE was significantly improved after both procedures ($P < 0.01$). The safety index of primary SMILE cases was 1.65 ± 0.62 and for Re-SMILE 1.13 ± 0.34 and the efficacy index was 1.14 ± 0.24 after primary SMILE and 1.11 ± 0.26 after Re-SMILE.

Conclusion: Centered cap-preserving Re-SMILE is an effective procedure in reducing residual refractive errors after primary SMILE in high myopes.

Keywords: SMILE, SMILE enhancement, Cap-preserving SMILE enhancement, Re-SMILE

Background

Laser in-situ keratomileusis (LASIK) and photorefractive keratectomy (PRK) have been the two standard keratorefractive procedures. Small incision lenticule extraction (SMILE) was developed to reduce the corneal biomechanical compromise of LASIK and PRK. In numerous studies, the SMILE procedure was shown to be safe, predictable, and effective in treating myopia and myopic astigmatism [1–3].

As in any refractive procedure, residual refractive errors might occur. For example, Hjortdal et al. published that 20% of eyes have ≥ 0.5 D and 6% have ≥ 1.0 D of residual refractive error three months after SMILE in eyes with

moderate to high myopia (mean refractive spherical equivalent (MRSE) -7.19 ± 1.30 D) [4].

Different enhancement procedures have been suggested for the reduction of residual refractive errors after SMILE.

Surface ablation, such as in PRK, causes postoperative pain and can lead to corneal haze. The Circle option, which converts the SMILE cap into a complete LASIK flap followed by excimer laser ablation similar to LASIK, has also been suggested as an enhancement procedure [5]. Another suggestion is the creation of a LASIK flap within the SMILE cap followed by ablation. However, this procedure comes with a risk of crossing the existing cap interface or creation of gas breakthrough [6].

One great benefit of SMILE is the preservation of the anterior layer of the corneal stroma and Bowman's membrane. All enhancement procedures mentioned above share the disadvantage of losing this SMILE benefit.

and therefore planned to have two-steps procedure (six eyes of four patients) or because of undercorrection needing enhancement (three eyes of three patients). To preserve the SMILE benefits, as less dryness induction, we went for the cap-preserving technique. Exclusion criteria were keratoconus, keratoconus suspects, insufficient corneal thickness to leave 250 μ m residual stromal bed, corneal scars, and previous anterior segment surgeries. These patients were not specifically enrolled to receive this surgery for the research aim but when we reached good parameters for a centered cap-preserving Re-SMILE technique we collect and analysed the available data retrospectively.

Primary SMILE

Preoperative assessment included full ophthalmic examination, objective and subjective refraction including uncorrected distant visual acuity (UDVA) and corrected distant visual acuity (CDVA) and rotating Scheimpflug camera (Pentacam, OCULUS Optikgeräte GmbH, Wetzlar, Germany) imaging.

The primary SMILE surgery was performed using the VisuMax femtosecond laser system with the following parameters used: cap thickness of 100 to 120 μ m, cap diameter of 7.5 to 7.7 mm, cap side cut angle 70°, 3 mm incision positioned at 100° and angled at 45°. The lenticule diameter (optical zone) was 6.5 mm, transition zone of 0 to 0.1, and clearance of 0.5 mm, lenticule side cut angle of 90° and edge lenticule thickness of 10 μ m. Table 1 shows the other surgical parameters used in the primary SMILE procedure that varied from case to case.

At the end of the procedure, we performed good massage to the cap, evenly from the center to the periphery, to avoid any potential complications from the mismatch between the bed and the cap like mud-crack type microfolds.

Postoperative treatment included topical steroids and antibiotics 4 times per day for 10 days and tear substitutes 4 times daily for one to two months. Follow-up visits were on the first day, one week, one month and 3 months postoperatively. Follow-up visits included full ophthalmic examination, objective and subjective refraction, and rotating Scheimpflug camera imaging. In the planned two-step procedures, Pentacam was done after one month. If the refraction was consistent with the predicted one and stable since the first postoperative week the decision was to proceed to RE-SMILE after patient counseling. Figure 1 shows the details of each visit.

Re-SMILE

The eyes eligible for enhancement were those with expected mean K readings after ablation of not less than 33 D, residual stromal bed of at least 250 μ m, and those with no suspicion of ectasia based on tomography.

All Re-SMILE procedures were performed using the same laser device as in the primary SMILE procedure. The Sedky SMILE Retreatment Centering Marker (Fig. 2) was utilized in the centration of the Re-SMILE procedure. Some refractive laser settings were modified with respect to the primary SMILE treatment.

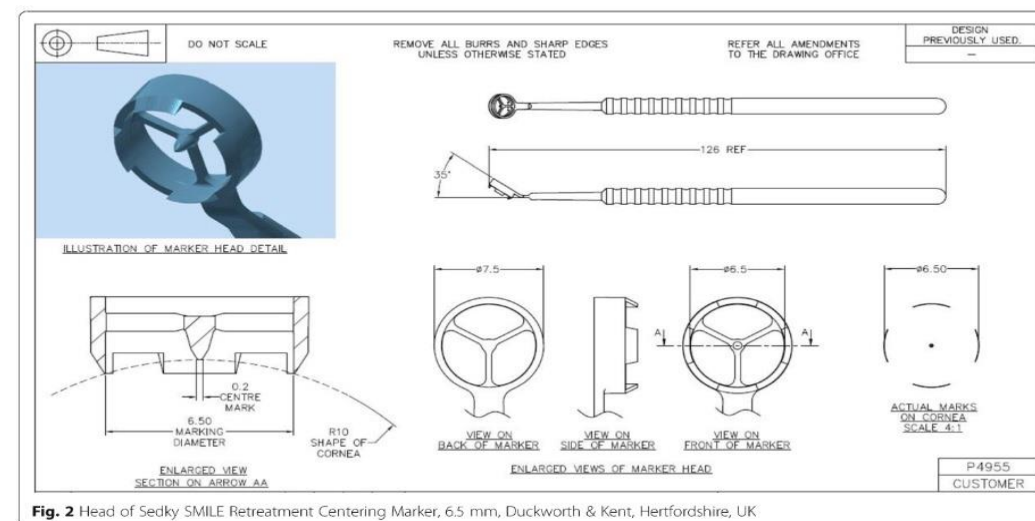


Fig. 2 Head of Sedky SMILE Retreatment Centering Marker, 6.5 mm, Duckworth & Kent, Hertfordshire, UK

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Take Home Message

- The Re-Treatment technique is simple & predictable.
- Carefully consider epithelial remodeling after the primary procedure. We use the cap thickness of the primary SMILE for the enhancement procedure.
- Preserving the strongest part of the cornea.
- Needs to modify the Visumax software.
- Not applicable for residual Hyperopia or Mixed Astigmatism
- **Centration of the second lenticule is the key step of the technique.**

Thank You

