

Comments on Femtosecond Lenticule Extraction for Spherocylindrical Hyperopia Using New Profiles

We read with interest the article by Sekundo et al.¹ about their early experience with femtosecond lenticule extraction (FLEx) for the correction of low to moderate hyperopia. One of the greatest challenges of hyperopic correction with LASIK continues to be the lower predictability and the higher incidence of refractive regression² compared to myopic corrections. In fact, up to 30% of eyes treated with hyperopic LASIK require an enhancement.^{3,4} Although Sekundo et al. provided reasonable visual and refractive outcomes, we have some concerns about their approach to correct hyperopia. First, we believe that the predictability of the procedure reported was relatively low and clearly far from ideal. In fact, considering that the mean preoperative spherical equivalent (SE) was just +1.96 diopters (D) (range: +0.63 to +4.50 D), the finding that only 69% of the 39 treated eyes were within ± 0.50 D of emmetropia seems poor. Second, the authors described a corneal haze grade 1 in 20% of eyes at the 9-month postoperative follow-up, with a loss of one line of corrected distance visual acuity in 10% of cases.

Interestingly, in the same issue of the *Journal of Refractive Surgery*, we reported our experience with hyperopic femtosecond laser-assisted LASIK (FS-LASIK) using intraoperative mitomycin C (MMC).⁵ It is well known that MMC modulates the corneal wound-healing process, so to avoid the localized haze that sometimes develops in the area of the hinge after hyperopic LASIK, we started to routinely use short-term application of MMC in hyperopic LASIK. Considering that MMC could also theoretically minimize the risk of having refractive regression after hyperopic LASIK by its effect on the stromal remodeling, we decided to compare the refractive outcomes of FS-LASIK with and without the adjuvant use of MMC for the correction of hyperopia.

We found that in the 76 eyes included in the MMC group, the mean residual SE was only $+0.18 \pm 0.40$ D and 86.8% of eyes were within ± 0.50 D of emmetropia at 6 months postoperatively. Given the fact that the mean preoperative SE in our study was +2.71 D (range: +2.00 to +6.25 D), we believe that our results were clearly better than those obtained with FLEx in the study by Sekundo et al.,¹ so, based on our promising results, we believe that the use of MMC to improve hyperopic LASIK results should be clearly preferred to FLEx for the treatment of hyperopia.

On the other hand, during the 15-month postoperative follow-up, only 6.6% of hyperopic eyes treated with FS-LASIK + MMC required an enhancement, which was

easily performed by re-lifting the original flap. Given the fact that in the study by Sekundo et al.¹ 10% of eyes had more than 1.00 D of residual refractive error, we invite the authors to explain which surgical technique they have used for re-treatment in their hyperopic FLEx cases that needed it and the visual and refractive results obtained.

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The authors have no financial or proprietary interest in the materials presented herein.

Reply

We thank Drs. Garcia-Gonzalez and Teus for their interest in our article¹ and for bringing the reader's attention to their impressive results published in the same issue of the *Journal of Refractive Surgery*.² We acknowledge that the predictability results do not meet the standard set by LASIK,³ but this must be considered in the context that this was a feasibility study of femtosecond lenticule extraction (FLEx) for the treatment of hyperopia. It should not be expected for the two procedures to be equivalent given the different stage of maturity. Prior to the start of our study, there had been 47 eyes treated with a first-generation lenticule profile⁴ and only 9 eyes treated by FLEx with the updated lenticule profile⁵ compared to many millions of hyperopic LASIK procedures. We would also like to reiterate that only a crude nomogram adjustment was used for this population, based on the previous 9-eye study,⁵ so the refractive predictability is likely to increase with a more sophisticated nomogram. It might also be noted that our study was a prospective trial, rather than a retrospective review as Garcia-Gonzalez et al. reported.

With respect to the use of mitomycin C (MMC), their results provide an intriguing argument for the adjunctive use in hyperopic LASIK and may have some value in reducing haze and regression. However, because MMC is an off-label medication in ophthalmology, informed consent may be an issue for routine use of MMC in many countries. There is also still a need for further studies to verify the long-term safety of prophylactic use of MMC at this depth within the cornea due to the flap and relatively deep hyperopic ablations.

Hyperopic FLEx and SMILE are still in the early stages of development and improvements relating to visual recovery and visual quality can be expected with the next clinical trial phases, similar to the experience with optimizing energy settings for myopic SMILE.⁶⁻⁹

To date, we have performed a re-treatment for only one eye with an undercorrection of +1.25 diopters (D). Because this study was a prospective non-commercial feasibility study and patients were treated at no charge, an enhancement was not routinely offered. Re-treatment following a FLEx procedure can be performed as a flap lift in the same manner as after LASIK. However, we decided to perform an advanced surface procedure with MMC because there was some scarring at the flap edge. This re-treatment led to a satisfactory result.

Had the primary procedure been small incision lenticule extraction (SMILE), the same re-treatment options are available as after primary myopic SMILE. If the cap thickness was relatively thin, a Circle procedure can be performed to convert the cap into a flap with a wider diameter.¹⁰ If the cap is, a thin-flap LASIK procedure can be performed with the flap thickness chosen based on epithelial thickness and cap thickness measurements to avoid crossing either of these interfaces.¹¹ Alternatively, a surface ablation procedure can be used.^{12,13}

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Supported by Carl Zeiss Meditec AG, Jena, Germany.

Drs. Blum, Reinstein, and Sekundo are consultants for Carl Zeiss Meditec AG. Dr. Reinstein has a proprietary interest in the Artemis technology (ArcScan Inc., Morrison, Colorado) through patents administered by the Center for Technology Licensing at Cornell University, Ithaca, New York. The remaining authors have no financial or proprietary interest in the materials presented herein.

doi:10.3928/1081597X-20180409-01