Is refractive enhancement a safer option for post laser *in situ* keratomileusis and small incision lenticule extraction regression – How far we have come?

Myopia is the most common refractive error encountered in pediatric as well as adult patients nowadays. There has been a global upshoot in myopia prevalence which the COVID-19 pandemic has further fueled. The hot bedrock of digitalization is provoking a myopia blast in the near future. The estimated prevalence of myopes is expected to reach beyond 8.5 million in the 7–12 years age group and 1.5 billion in 13–18 years old.[1] This indicates the future patterns of increasing surgical demand for myopia correction. The history of refractive correction dates back to the 19th century when a limbal relaxing incision was first given to a patient undergoing cataract surgery by Schiotz.[2] Various refractive procedures available today for myopia correction include incisional procedures, excimer laser refractive procedures, or intraocular surgeries. The incisional procedures have now become obsolete due to associated complications like infection, higher regression, weakening of the cornea, and night vision problems. Intraocular surgeries, popularly known as refractive lens exchange (RLE), are preferred for patients with very high degrees of myopic refractive error (>10D), in which laser *in situ* keratomileusis (LASIK) might lead to unpredictable results, apart from the risk of regression or ectasia.

The most commonly performed refractive procedures worldwide at present are excimer laser surface procedures which include photorefractive keratectomy (PRK), laser subepithelial keratectomy, or LASIK. The most recent innovation has been the small incision lenticule extraction (SMILE), a flapless procedure (advantage of PRK) with the added benefit of early visual recovery (advantage of LASIK). It is of great interest to understand the sustainability and safety of various procedures over time, with regression and iatrogenic keratectasia particularly significant. Previous studies with long-term follow-ups have shown a high level of safety with PRK and LASIK.[3] SMILE has also shown promising results and low levels of regression. The studies have concluded a higher regression for higher levels of myopic corrections. Another innovative technique of simultaneous collagen cross-linking has been described along with refractive procedures defined as LASIK Xtra, PRK Xtra, and SMILE Xtra.[4] The long-term results of these procedures are yet awaited. Moshirfar *et al.*, in their study, found older age at primary LASIK, female sex, right eye, and larger sphere, cylinder, and spherical equivalent as important risk factors for regression and, thus, need for enhancement.[5] Following the enhancement procedure, 86% of eyes had an uncorrected distance visual acuity of 20/20 or better, and 93% had a refractive error of ± 0.50 D of the target. Alla *et al.*, in their study, performed transepithelial PRK using smart pulse technology with mitomycin C enhancement following SMILE on 68 patients of 40 eyes. They reported an average 6.7 ± 0.4 months duration between SMILE and enhancement procedure. The mean spherical equivalent and astigmatism postenhancement were found to be <0.5D in 100% of patients till 12 months of follow-up.

This study[6] focuses on the comparison of enhancement procedures following LASIK and SMILE. The LASIK patients underwent enhancement by flap lift compared to SMILE procedures who underwent PRK. The mean spherical error (−4.17 ± 2.5 versus −3.17 ± 2.12) and the mean refractive spherical equivalent (MRSE) (−4.73 ± 2.49 versus −3.76 ± 1.86) were significantly higher in the SMILE group as compared to the LASIK group. Further, the authors found that a total of 32 eyes of 26 patients (0.5%) in the SMILE group (Group 1) and 36 eyes of 32 patients (0.44%) in the LASIK group (Group 2) required an enhancement procedure. This is a significant finding suggesting good long-term results and stability of refractive correction post-SMILE/LASIK procedure. The mean preenhancement spherical, cylindrical, and MRSE values in the SMILE and LASIK

groups were comparable to previous studies. Post enhancement, the two groups' uncorrected distant visual acuity ($P = 0.009$) and cylindrical values ($P = 0.004$) were significant, with the LASIK group faring better. Another important take-home message from the study is an enhancement rate of 0.5% following SMILE and 0.44% following LASIK, which is lower than the previously reported rates. This confirms the excellent and ethical patient selection by the authors, strictly adhering to the refractive surgery guidelines. Another take-home message is that the majority of enhancement procedures take place within one year after the primary refractive procedure indicating the importance of the right patient selection. The study stands out as one of the largest patient data sets of refractive enhancement from the Indian population, which is a potential addition to the existing literature.

As per previous reports, the need for refractive enhancement will be greater in patients with a higher degree of myopia or myopic astigmatism preoperatively. It should also be remembered that the higher the degree of myopia, the more the chances of refractive instability and the more the chances of regression and the need for an enhancement procedure.[7] As per American Refractive Surgery Council, refractive enhancement has the advantage of making the patient spectacle free again within a short frame of time with the risk of infection, slower healing, and added cost to the patient. By rule, a second surgical attempt should be safer. Hence, PRK is always a safer option as a secondary procedure. LASIK enhancement can also be used to improve vision after other primary surgical interventions such as phakic Intraocular lens (IOL) implantation, RLE and to reduce residual refractive error after cataract surgery.[8] In a nutshell, refractive enhancement is an additional tool in a surgeon's armamentarium for patients developing regression and, in today's era, is considered safe and effective. Still, the surgical decision is subjective, considering the multitude of factors. Thus, refractive enhancement promises improved quality of life in this small subgroup of patients.

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