Since the first reports in 2011, small incision lenticule extraction (SMILE) has dramatically entered the landscape of corneal refractive surgical procedures. With offerings of a single laser system, less disruption of the corneal surface, and relative preservation of the anterior lamellar fibers, SMILE has promised excellent refractive outcomes and possible advantages over previous iterations of laser refractive surgery.

One of the postulated advantages is biomechanical. Through maintenance of the anterior lamellae, SMILE in theory maintains a stronger cornea postoperatively. Mathematical modeling and finite element analysis lend some support to this view. Clinically, the extent of this biomechanical benefit remains to be determined.

Postoperative ectasia remains a feared complication of corneal refractive surgery and has driven the development of technology and patient screening protocols for more than a decade. Although there remains controversy in some aspects of screening, there are many identified topographic and tomographic patterns that have been shown to place patients at higher risk for postoperative ectasia and that are recognized as at least relative contraindications for excimer laser procedures, including LASIK and surface ablation.

Although a relatively new procedure, there are already a handful of reports of ectasia developing after SMILE. In this issue, the Journal is contributing an additional case to the literature. To date, all of these cases have exhibited abnormal preoperative topographic patterns, and most if not all would have been excluded from LASIK during screening by most surgeons. And that is the point of this editorial.

LESSONS FROM THE PAST

Corneal refractive surgery has provided immense benefit to our patients worldwide for more than 50 years, with greatest adoption of a few procedures: radial keratotomy, followed by photorefractive keratectomy (PRK), followed by LASIK. Each of those procedures offered unique benefits to patients, and each came with unique risks. With each technique, initial treatment parameters proved too broad and each saw a narrowing of their scope. There were several patients with 16 or more radial keratotomy incisions until surgeons realized that eight cuts or less proved significantly more stable over time. There are many early reports of outcomes for PRK or LASIK up to -20.00 diopters or more, whereas today’s excimer lasers are not approved for that range and most surgeons stop well short of treating that degree of myopia. And topographic patterns that placed patients at risk for ectasia were clarified in part through evaluating cases with these patterns that developed the complication.

We now have amassed extensive knowledge about how the cornea responds to laser surgical alteration, how preoperative corneal biomechanics, determined through screening topography and tomography, affect candidacy and long-term stability, and how the amount of tissue altered through surgery affects risk. So, let us use this information to our advantage as we perform and study the novel surgical approach that is SMILE.

STARTING CONSERVATIVELY

With SMILE we have an opportunity to do things a better way from the outset, during the phase of possible widespread use of the procedure. This better way includes using a cautious, conservative, and scientific approach relying on evidence-based medicine to drive surgical decision-making. We can use the information from screening patients for 20 years for PRK and LASIK, especially what we’ve learned in the past 10 years, and apply those standards to SMILE.

We have identified many abnormal topographic patterns as contraindications for LASIK. We know from...
LASIK that although the percent tissue altered is a robust metric for patients with normal preoperative topographies, it is much less relevant in patients with suspicious topographies because less tissue needs to be altered to affect a cornea already predisposed to ectasia. There appears to be no definite safe limit of tissue alteration in these at-risk corneas. Applying that logic to SMILE, where the potential biomechanical benefit should come directly from the decreased anterior tissue altered, it seems logical that no safe limit would exist for this procedure either in ectasia-susceptible corneas. Therefore, why not use the same preoperative topographic and tomographic screening criteria that we have developed for LASIK and PRK?

**AVOIDING AN ECTASIA UPSURGE**

Ectasia after LASIK was at one time considered a primarily academic concern until a multitude of cases presented. We saw the number of reported ectasia cases rise for years until the trend turned around in the mid-2000s. We have the opportunity to stave off this phenomenon with SMILE if we apply strict screening criteria now and only expand treatment parameters beyond those for LASIK or PRK if and when we have scientific evidence to do so. If patients are deemed to be poor candidates for LASIK due to their topographic patterns, why not also exclude them from SMILE?

Let us take this opportunity as a profession to do things a better way, using the knowledge we have gained from previous work and applying it to this new procedure. There is much still to learn about SMILE and corneal biomechanics after laser vision correction. We welcome all articles to the Journal to advance our understanding of what is and is not possible with SMILE and how it compares to today's excellent LASIK and PRK.

**REFERENCES**


