

High myopic correction

Results of corneal refractive surgery improving in the treatment of high myopia.

Roibeard Ó hÉineacháin reports

Newer technologies and knowledge gained from experience are improving the results of corneal refractive surgery in moderate to high myopia, reports Jodhbir S Mehta MD, Singapore National Eye Centre, Singapore.

The three main corneal laser refractive surgery techniques for myopia – PRK, LASIK and SMILE® – have all evolved considerably since their early days. A consequence of that may be that a higher degree of myopia can now be treated more safely and effectively than was the case in the first decade of this century, Dr Mehta told the 36th Congress of the ESCRS in Vienna, Austria.

In an 18-year prospective audit of LASIK outcomes for myopia in 53,731 eyes treated between 1998 and 2015, the proportion of high myopes achieving an uncorrected visual acuity of 20/40 rose from 50% in 1998 to more than 99% in 2015. During the same period, the proportion of high myopes achieving 20/20 rose from 8% to 50%. The predictability of the procedure in high myopes also rose, with only 40% within 1.0D of target refraction in 1998, compared to 80% in 2015.

Results with surface ablation have also improved over the past

decade. For example, in a 2009 study that compared long-term outcomes after PRK and LASIK to correct -6.0D to -10D of myopia showed that at 10 years' follow-up, 88% of LASIK-treated eyes were within one dioptre of target refraction compared to only 71% of PRK-treated eyes. By comparison, in a 2018 study involving high myopes, 88% eyes with 6.0D of myopia and 82% were within 0.5D of target refraction.

The advantages of PRK include a greater residual stromal bed and, therefore, less risk of ectasia and more tissue reserved for enhancement surgery if needed. The disadvantages include slow recovery, risk of haze, more postoperative visits and longer postoperative medication regimen.

Dr Mehta cautioned that high myopes are at an increased risk of regression because of the high degree of sphere associated with long axial length, steeper central cornea and altered corneal biomechanics. Therefore, a long follow-up is necessary to determine the stability of corneal refractive procedure in these patients, which is a limitation of current literature.

FEMTOSECOND FRONTIERS

Newer femtosecond laser-based procedures like refractive lenticule extraction (ReLEx®) appears slightly more accurate than LASIK, especially for higher degrees of myopia.

Dr Mehta noted that he and his associates have been performing ReLEx since 2012. In their first 150 cases, ReLEx, was more accurate and predictable for eyes with -5.0D to -10.0D of myopia. That is, 100% of cases were within 0.50D of the intended compared to 85.8% in the LASIK group.

SMILE may be more stable than LASIK, he continued. He noted that in a study comparing the two treatments, refraction regressed in the LASIK group by 0.89D between one month and three years postoperatively compared to a change of only 0.14D in the SMILE treated eyes over the same period.

Dr Mehta pointed out that, unlike the excimer laser used in LASIK and surface ablation, the femtosecond laser in SMILE procedures operates in a 'closed

laser system'. As a result, there is less stromal dehydration during the refractive correction. In addition, the energy with a femtosecond laser is more stable, with less variation related to environmental changes.

Moreover, since the eye's position is fixed with the femtosecond laser, it is less sensitive to eye movements so there is no need for an eye tracker. Moderate-to-high myopes are particularly prone to fixation fatigue, he noted.

Dr Mehta suggested that there is a reduced wound healing/inflammatory response after SMILE procedures when compared to LASIK. He noted that in a study using a rabbit model, he and his associates observed that in LASIK-treated eyes there was an increased intensity of wound healing and inflammation with increased refractive correction which they did not observe in eyes that underwent SMILE procedures.

Subsequent studies have borne out the Singapore Eye Research Institutes (SERI)'s results and shown that although moderate myopes have better results than those with higher degrees of myopia, the higher myopes also achieved good results with similar safety and efficacy. However, higher-order aberrations and spherical aberration tend to be more pronounced following LASIK compared to SMILE, although the postoperative mean coma RMS tends to be higher following SMILE, which is an issue with centration.

SMILE also may also have a slight advantage over surface ablations. In a recent comparative study in which 26 eyes underwent LASEK and 24 underwent SMILE to correct a mean -8D of myopia, there was no significant difference between the treatment groups in terms of safety, efficacy or contrast sensitivity.

However, there was a greater amount of higher-order aberrations and spherical aberration after LASEK than after SMILE. There were no reports of postoperative haze in eyes that underwent LASEK procedures, which involved the use of mitomycin-C. The ocular surface index and MTF were better in the SMILE group, but the difference was not significant.

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Jodhbir S Mehta

