PresbyLASIK techniques yielding encouraging results

Rolf de Riedmatten in Barcelona

SEVERAL multifocal and aspheric approaches to LASIK are showing promise in the treatment of presbyopia in hyperopes, myopes and emmetropes, according to studies presented at the 12th Winter Refractive Meeting of the ESCRS.

In a study presented by Kenneth A. Greenberg MD, all patients achieved simultaneous uncorrected binocular visual acuities of 20/25 or better for distance and J3 or better for near. 12 months after undergoing customised bilateral hyperopic/multifocal LASIK ablations.

“This is a combination of a wavefront-guided hyperopic ablation with a multifocal treatment which effectively increases the central steepness of the cornea directly over the pupil. These two ablations are combined and delivered to the cornea” Kenneth A. Greenberg MD

The multicentre study involved 28 presbyopic hyperopes with an mean age of 56 years. Their preoperative sphere ranged from +0.50 D to +3.50 D and their preoperative cylinder ranged from 0.0 D to +1.50 D, said Dr Greenberg.

All underwent bilateral multifocal hyperopic ablations on the VISX CustomVue platform with a STAR S4 IR™ excimer laser (AMO). The surgeons used Amadeus microkeratomes or an Intralase FS femtosecond laser for flap creation.

“This is a combination of a wavefront-guided hyperopic ablation with a multifocal treatment which effectively increases the central steepness of the corneal tissue over the pupil. These two ablations are combined and delivered to the cornea,” he explained.

Predictability with the procedure was high, Dr Greenberg noted. At 12 months’ follow-up, 86 per cent of eyes were within 0.5 D of emmetropia. In addition, 86 per cent of eyes had a binocular distance VA of 20/20 or better and 88 per cent had binocular near VA of J1 or better.

Monocular near visual acuity with best correction for distance was J1 or better in 38 per cent of eyes and J3 or better in 68 per cent of eyes.

Reduced spectacle dependence

Furthermore, while all patients required glasses for reading prior to surgery, only 51 per cent required them one year after surgery. In addition, while preoperatively 85 per cent required glasses for driving at night and 82 per cent needed them for driving during daytime hours, postoperatively only two per cent needed them for driving during the day or night.

Patients expressed greater satisfaction with their uncorrected vision than with their preoperative corrected vision, under a range of lighting conditions. For example, postoperatively, 78 per cent said that they were very or somewhat satisfied with their night vision without correction under glare conditions, compared to only 57 per cent preoperatively with correction under the same lighting conditions.

Similarly, the proportion somewhat, or very satisfied with their distance vision under mesopic conditions was 86 per cent postoperatively without correction, compared to 73 per cent preoperatively with correction. Satisfaction levels were lower regarding best-corrected distance vision in bright conditions and near vision in mesopic conditions.

There was some loss of BSCVA, Dr Greenberg noted. Thirty-two per cent of eyes lost one or two lines of BSCVA and four per cent lost more than two lines. However, no eyes had a distance BSCVA worse than 20/40. Mesopic contrast sensitivity was moderately decreased in the early postoperative period but returned close to preoperative levels by one year.

“Most of the loss of best-corrected vision was due to epithelial issues. We’re steepening these eyes and most of these patients are older and therefore dry eye is a significant issue in these people and you need to treat it aggressively,” he said.

Central multifocal LASIK in myopic patients

Using a similar multifocal ablation algorithm with the ESIRIS laser (Schwind) can improve the functional near vision of presbyopes who have low to moderate myopia, said Jorge Alio MD, Vissum-Instituto Oftalmologico de Alicante, Spain.

In a study involving 16 presbyopic myopes, binocular uncorrected visual acuity was 1.0 or better for distance in all patients and J3 or better for near in 85.2 per cent of patients, after they underwent central bi-aspheric multifocal presbyLASIK procedures, he said.

The patients in the study ranged in age from 40 to 55 years. The study’s inclusion criteria were a spherical error of at least -4.0 D, a cylinder of not more than -2.0 D, corneal thickness greater than 500 microns, and corneal curvature ranging from 40.0 D to 48.0 D. In addition, all eyes had to be able to achieve a near visual acuity of J3 or better with correction preoperatively.

Dr Alio used a bi-aspheric laser algorithm of his own design (Central PresbyMAX V.01 software) to create an ablation, centred on corneal vertex. The aim of the procedure is to create a bi-aspheric central area for near vision, equivalent to a +1.5 D reading addition, and an emmetropic mid-pPeripheral area for distance vision, he explained.

At three months’ follow-up, the mean spherical equivalent was -0.26 D and 90.6 per cent were within half a dioptre of emmetropia and the mean uncorrected visual acuities were 0.88 for distance and 0.92 for near. Monocular uncorrected visual acuity was 1.0 or better for distance in 80 per cent of eyes of J3 or better for near in 60 per cent of eyes. The mean best-corrected distance visual acuity was 0.99, and the mean best distance-corrected near visual acuity was 0.52.

Moreover, no eyes lost any lines of best-corrected distance visual acuity and 6.6 per cent gained two or more lines. However, while 10 per cent of eyes gained two lines of best corrected near visual acuity, 16.7 per cent lost one line. There were no statistically significant changes in corneal spherical and coma aberrations, Dr Alio added.

Hyperprolate monovision approach

A more purely aspheric ablation in the non-dominant eye can improve depth of field in presbyopic patients and those with milder forms of ametropia, without any major loss in contrast sensitivity or stereoacuity, said Theo Seiler MD, PhD, Zurich, Switzerland.

“A precondition for a corneal shape that supports near vision in presbyopia is that the central cornea has a higher refractive power compared to the peripheral cornea. This is what we call in modern optics a prolate cornea. With this corneal shape if you have a 2.5mm pupil that eye should be myopic by about 1.5 dioptres, but if the pupil enlarges to 6.0mm that eye can even become hyperopic,” he noted.

Dr Seiler presented the results of a study involving 15 presbyopic patients who underwent hyperprolate aspheric ablation in their non-dominant eye. The patients’ treated eyes had a preoperative sphere ranging from -0.5 D to +1.5 D and a preoperative cylinder less than 0.75 D, he noted.

At one year’s follow-up the mean uncorrected distance visual acuity was 0.72, and the mean uncorrected near visual acuity was J3. Visual acuity ranged from 0.5 to 1.0 for distance and J2 to J4 for near, Dr Seiler said.

The mean low contrast visual acuity was reduced postoperatively, decreasing from 0.62 preoperatively to 0.58. Mean stereo acuity also fell slightly, decreasing from 88 arc seconds to 118 arc seconds. However, the range in stereo acuities remained unchanged, he noted.

“Advanced monovision includes an aspheric treatment of the ‘near eye’. The driving force is the pupil diameter that shifts the optics, with a gain in depth of focus. Our approach has the two advantages that additional reading glasses can help and that the profile is robust regarding decentration.”

If you are an ophthalmologist, this is the podcast you should be listening to on www.escrs.org/publications/eurotimes/podcast.asp.

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