Advanced laser platform technology enhances LASIK outcomes

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in San Diego

TECHNICAL upgrades to the Technolas 100 Hz excimer laser platform (Bausch & Lomb), including online optical coherence pachymetry (OCP), static eye tracking and dynamic rotational eye tracking (DRET), enhance the efficacy and safety outcomes of refractive surgery procedures, said Barbara A M Lege, MD, at the annual ASCRS Symposium on Cataract, IO L and Refractive Surgery.

Dr Lege described the features and their performance in studies conducted at the A LZ Augenklinik Muenchen, Munich Germany.

The online OCP module available for the Technolas 100 Hz platform was developed by 4optics (Luebeck, Germany). It is integrated mechanically and electronically, and it offers an easy, non-contact method to obtain real-time, precise measurements of flap thickness and corneal thickness during the ablation.

“Accurate, intraoperative determination of flap thickness represents an important safety feature for LASIK surgery. It is well known that actual flap thickness may vary from the expected, and if the flap is thicker in that situation, it may be better to take less tissue in the ablation in order to decrease the risk of ectasia,” Dr Lege said.

She reported results from a study in which corneal thickness values obtained online with the integrated pachymeter were compared with those derived from Orbscan and ultrasound pachymetry measurements. The analyses showed very good correlation between OCP and the other techniques.

In another study online OCP was used to measure flap thickness in eyes that underwent LASIK between May 2005 and August 2006 using three different microkeratomes for flap creation. The Hansatome (Bausch & Lomb) with a 160-micron head was used in 1,253 eyes, 136 eyes were operated on with the new Zyoptix XP (Bausch & Lomb) using the 120-micron head, and in 470 eyes, flap creation was performed with the 30 kHz femtosecond laser (IntraLase) set to achieve a flap thickness of 110 microns.

Mean flap thickness values were similar for the Hansatome (121.4 microns), Zyoptix XP (126.5 microns), and IntraLase (121.7 microns) groups. However, there was greater variability in the thickness of flaps created with the Hansatome, and the standard deviation of the mean for that group (19.1 microns) was significantly greater compared to both the Zyoptix XP (15.5 microns) and IntraLase (13.7 microns) groups (P < 0.03 for both comparisons). The standard deviation values were not significantly different between the IntraLase and Zyoptix XP groups.

Although the online OCP also monitors corneal thickness during the ablation, currently only the central thickness is measured. Ideally, it would be desirable to have real-time measurements of the entire ablation zone that would be fed back to the laser, Dr Lege noted.

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The control group included 365 eyes that were treated several years earlier in an initial study of wavefront-guided LASIK. The latter eyes underwent either LASIK using the first myopic wavefront algorithm or the Planoscan algorithm. The excimer laser used in that study had a 25 Hz eye tracker and the treatment was centred on the pupil.

Treatment with the upgraded system was associated with better outcomes in analyses of BCVA loss, efficacy ratio, and re-treatment rates. With the rotational alignment systems, no eyes lost two or more lines of BCVA, the efficacy ratio (three-month post-op U CRA/preop BCVA) exceeded 1.0 (1.04), and the re-treatment rate was 5.4 per cent. Among the historical controls, three per cent of eyes lost two or more lines of BCVA, the efficacy ratio was 0.83, and nearly one in five eyes underwent re-treatment.

Results of an analysis in which the three-month postoperative results were recalculated with vector analysis to determine what the outcomes would have been without DRET and the static rotational eye tracker provide an even stronger indication of the value of the upgraded technology, Dr Lege said.

That analysis was based on 1,847 eyes that underwent myopic LASIK with the Technolas100 Hz laser using an aspheric ablation algorithm, static and dynamic rotational eye tracking and visual axis centration. The vector analysis showed the efficacy of the cylinder treatments was improved from 71 per cent to 86 per cent. Safety was 99.9 per cent, with one severely dry eye being the only case where there was loss of BCVA.

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Keeping track of eye tracking systems

The Technolas 100 Hz platform features both a static eye tracker to compensate for cyclotorsional rotation and DRET that monitors and compensates for intraoperative rotation. The value of this technology should not be underestimated, Dr Lege said.

“It is erroneous to believe that rotoric misalignment only plays a role in eyes with higher astigmatism. Any misalignment leads to loss in contrast sensitivity, and the effect increases with increasing pupil size.”

“The superiority of the outcomes can be explained by the data on the incidence of rotations in this cohort. Rotation of at least 5° between the upright position in front of the aberrometer and the supine position beneath the laser occurred in 29 per cent of eyes, and 8.3 per cent of eyes rotated 3° or more during the laser treatment. Intraoperative rotation ranged up to 19.6° in one eye,” Dr Lege said.

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