Studies report benefits of iris registration technology

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In London

AUTO MATED iris registration produces excellent outcomes, particularly in highly aberrated eyes, according to several studies utilising the latest upgrade to the CustomVue (AMO) treatment platform.

With that system, wavefront measurements are taken under mesopic conditions when the patient is sitting upright. The iris and centre of the mesopic pupil are registered and matched to the laser image at the time of treatment to compensate for both cyclorotational rotation and pupil centroid shift.

In a session of the XXIV Congress of the ESCRS, John F Doane MD reported interim findings from a multicentre prospective study evaluating the benefits of Fourier-driven CustomVue treatment using the automated iris registration system. The study is enrolling eyes with primary compound myopic, hyperopic, or mixed astigmatism and pre-operative BCVA of 20/20 or better.

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John F Doane MD

Analysis of data from 39 eyes showed they had mean cyclorotational movement of 2.2 ±1.88 degrees and mean pupil centroid shifts of -0.03 ± 0.32 mm on the X-axis and 0.09 ± 0.13 mm on the Y-axis.

“The average movements in these eyes were relatively low, but the degree of movement was quite significant in some eyes,” Dr Doane said.

Focusing on outcomes in eyes with higher levels of pre-operative cylinder (2.5 D or more), Dr Doane reported 100 per cent of those eyes achieved 20/25 or better UCVA at three months and 91 per cent were 20/20 or better. He compared those outcomes with international data from procedures performed without iris registration and with data from international and US studies using iris registration. Among eyes treated without iris registration, only 82 per cent achieved UCVA of 20/20 or better.

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Iris registration is accurate and reproducible

Louis Probst MD, Chicago, US, investigated the repeatability and accuracy of iris registration capture with the CustomVue system. Patients in the study were undergoing wavefront-guided LASIK with a femtosecond laser-created flap (IntraLase). Two measurements each were obtained before flap creation and after flap lift.

The analysis revealed a significant variability in cyclorotation and pupil centroid shift among the eyes. However, the iris registration system was reliable in performing multiple measurements. There were no statistically significant differences between the two measurements made before flap lift or between the two measurements obtained once the flap was lifted, or when comparing the pre- to the post-flap lift data.

“The absence of a significant difference comparing measurements made prior to or after flap creation and lift indicate that surgeons can do the iris registration prior to creating the IntraLase flap if that approach fits in with their surgical technique,” commented Dr Probst.

Good capture rate in daily practice

Josef Reiter MD, Eye Clinic Landshut, Germany, and colleagues investigated the clinical relevance of using the AMO/VISX iris registration feature when performing wavefront-guided treatments in daily refractive practice. Their study included 96 consecutive eyes. Dr Reiter reported iris capture was successful in more than 90 per cent of the cases.

All eyes demonstrated some cyclorotation and pupil centroid shift. The mean amount of cyclorotation was 3.05 degrees with a range between 0.1 and 9.8 degrees. The mean centroid pupil shift was 0.23 mm nasally and 0.21 mm superially, with the range for both values being about 0.01 to 0.50 mm.

“Almost 90 per cent of pupils demonstrated a nasal shift with the rest moving temporally. Superior shift occurred in about 71 per cent of eyes, while the remaining eyes shifted inferiorly,” Dr Reiter said.

Dr Reiter compared outcomes in a subset of 55 eyes that underwent customised ablation with iris registration against results for a group of 59 eyes treated with the same laser prior to availability of the iris registration upgrade. Pre-operatively, mean cylinder was higher in the iris registration vs. non-iris registration group, -2.25 D vs. -0.93 D, respectively. However, the iris registration group had less residual cylinder at one week postoperatively (-0.04 vs. -0.08 D), and showed greater cylinder stability to three months when mean values were -0.04 D in the iris registration group and -0.19 D in the non-iris registration eyes.

Similarly, superior results were achieved in the iris registration versus non-iris registration group with respect to MRSE predictability at three months, with higher proportions of eyes having achieved MRSE within 0.5 D and 1.0 D of the target.

“This system has a high capture rate, and our study outcomes demonstrate that it very effectively compensates for cyclorotation and centroid pupil shift to result in improved efficacy and safety. Clinically, those benefits translate into enhanced visual comfort for patients,” said Dr Reiter.

Iris registration helps with mixed astigmatism

Mourni A. Khalifa MD, Horus Vision Correction Center, Alexandria, Egypt, presented a study comparing three groups of 20 eyes each with mixed astigmatism that were similar with respect to age and pre-operative refraction. All ablations were performed with the Star 54 laser (AMO/VISX). One group underwent conventional LASIK with manual marking at the slit lamp for registration. A wavefront-guided procedure was performed in the other two groups with iris registration used in only one group.

A three-months’ follow-up showed significantly better efficacy using the customised technique with iris registration. In that group 90 per cent of eyes achieved UCVA of 20/20 or better and 20 per cent were able to see

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20/16 or better. In the groups treated without iris registration, only about two-thirds of eyes achieved UCVA of 20/20 or better and no more than five per cent could see 20/16 or better.

The proportion of eyes with improved BCVA was higher in the group treated with the wavefront plus iris registration technique, and none of those eyes lost BCVA. Among eyes undergoing wavefront treatment without iris registration, 10 per cent lost BCVA and BCVA decreased in 25 per cent of eyes that had conventional LASEK.

"The take home message from this study is that accurate registration, either axial with the adjustment of pupil centroid shift, or torsional, with the iris pattern torsional alignment, is a crucial factor in accurately treating mixed astigmatism with the customised bitoric ablation," Dr Khalifa said.

Researchers at the Storm Eye Institute, Medical University of South Carolina, also evaluated refractive visual outcomes of CustomVue surgery with and without iris registration.

Surgeons treated 33 eyes with CustomVue surgery alone and 42 eyes with the iris registration upgrade. The patients had low to moderate myopia with up to -3.00 D of cylinder. The range of MRSE was similar in the two groups, although the mean was slightly higher in the eyes operated on with iris registration compared with those who had surgery without that technology (-3.94 D vs. -2.95 D).

Helga P Sandoval MD, MSCR reported that predictability was better in the iris registration group as a consequence of better correction of cylinder. Mean cylinder decreased 81 per cent in the iris registration group compared with only 53 per cent in eyes undergoing the wavefront-guided procedure without iris registration.

At one month, all eyes were corrected to within 1.0 D of intended MRSE, but in the iris registration group, 61 per cent were within 0.25 D and 98 per cent were within 0.50 D of intended. Corresponding rates for those predictability endpoints in the non-iris registration group were 61 per cent and 68 per cent, respectively.

She emphasised that there were no differences in visual acuity, aberrations, or low contrast visual acuity, so this algorithm should be used just for reducing ablation depth.

She said that before she undertook the study, she had heard of some anecdotal reports from other surgeons who stated that tissue saving gave good results and quality of vision compared with Planoscan. However, her own experience had always been that Planoscan worked just as well as tissue saving — an experience that was confirmed by the results of her study.

"These results demonstrate iris registration improves treatment accuracy, especially with respect to reduction of cylinder, to provide better visual outcomes," Dr Sandoval said.

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Tissue-saving algorithm effective for reducing ablation depth

Devon Schuyler
in Las Vegas

The use of a tissue-saving algorithm for laser refractive surgery is an effective way to reduce ablation depth, according to a recent randomised study presented at the annual AAO meeting.

The study also found that the tissue-saving algorithm had no advantage over the Planoscan (Bausch and Lomb) algorithm when it came to induction of aberrations, and that the two platforms were equally effective at reducing myopia and astigmatism.

"With tissue-saving, I can treat patients whose corneas are too thin for a Planoscan treatment," said Maria Regina Chalita MD in an interview with EuroTimes. Dr Chalita is from the Brazilian Centre of Vision in Brasilia, Brazil.

The study included 79 eyes in 40 patients aged 19 to 44 years old, 16 women and 24 men. A total of 21 eyes underwent PRK and 48 eyes underwent LASIK with the goal of achieving emmetropia.

Patients were ineligible for the study if the difference in spherical equivalent between the two eyes was greater than 1.0D. Patients with collagen, vascular, or ectatic diseases were also excluded, as were those whose BSCVA was less than 20/25.

Pre-operative examination included measurements of manifest refraction, cycloplegic refraction, uncorrected visual acuity, best spectacle-corrected visual acuity. In addition, the researchers performed corneal topography using the Orbscan topographer and wavefront analysis using the Zywave aberrometer.

One eye from each patient was randomly assigned to laser refractive surgery using a conventional Planoscan algorithm (conventional treatment with 50 Hz frequency), while the other eye had the same procedure using the Zyoptix tissue-saving algorithm (tissue sparing laser with 100 Hz frequency).

After six months, 39 patients were available for follow-up. All eyes had postoperative UCVA of 20/40 or better and BSCVA of 20/20. There was a statistically significant difference in high contrast UCVA and BSCVA, low contrast visual acuity, or induction of aberrations between Planoscan and tissue-saving eyes.

Total RMS aberrations decreased from 4.17µm to 1.45µm with Planoscan and from 4.04µm to 1.11µm with tissue-saving, higher-order aberrations increased from 0.44µm to 0.52µm with Planoscan and from 0.42µm to 0.56µm with tissue-saving, and spherical aberration increased from 0.15µm to 0.28µm with Planoscan and 0.15µm to 0.30µm with tissue-saving.

This finding was different from the finding at three months, when it appeared that the tissue-saving algorithm induced fewer aberrations than the Planoscan algorithm. There was no statistically significant difference in aberration induction at the three and six months' follow-up.

However, the ablation depth was significantly less in the tissue-saving group compared with the Planoscan group, at 44.6 microns vs. 53.3 microns.

The researchers concluded that both the Planoscan and tissue-saving algorithms were effective in correcting myopia and myopic astigmatism, with good high-contrast visual acuity and low-contrast visual acuity. The tissue-saving algorithm ablated less corneal tissue than did the Planoscan algorithm.

"The main advantage of using the tissue-saving algorithm is consuming less corneal tissue, therefore leaving more room for any enhancement that might be necessary and also leaving more residual stroma might be important to avoid long-term corneal ectasia," said Dr Chalita.