Binocular depth of focus is increased similarly by micro-monovision and a small aperture corneal inlay, suggests an experimental study evaluating the visual function impact of different presbyopia-correcting techniques. However, while stereovision is preserved with the inlay, it is significantly degraded by micro-monovision, reported Pablo Artal PhD, at the XXX Congress of the ESCRs.

The testing was performed in four subjects using a binocular adaptive optics visual analyzer developed by Dr Artal and colleagues in the Optics Laboratory, University of Murcia, Spain. Micro-monovision was simulated by setting the refraction to plano in one eye and to -1.25 D in the fellow eye. Simulation of vision with the small aperture corneal inlay was done by creating a normal pupil size (4mm) in one eye and limiting the pupil size to 1.6mm in the fellow eye. As a normal control, testing was also performed with a 4.00mm pupil in both eyes.

“The small aperture corneal inlay improves visual acuity over an extended range of object distances by increasing depth of focus, and according to our testing, both the small aperture inlay and micro-monovision increase binocular depth of focus by about 2 D,” said Dr Artal, professor of physics (optics) and founder and director of the Optics Laboratory, University of Murcia.

“However, the small aperture inlay results in only a moderate inter-ocular retinal disparity, so that stereovision is not significantly modified. In contrast, stereovision is severely degraded by micro-monovision because it is associated with a large difference in image quality between the two eyes.”

Stereovision was measured using a three-needle test in which the subject decides if the central stimulus wire is in front of or behind the other two wires. Fifteen runs were completed for each disparity value, and the results were averaged across the four subjects for the normal, micro-monovision, and inlay situations.

Mean stereovision for the normal control testing was about 10 arcsecs. It was increased to about 12 arcsecs in testing simulating the small aperture corneal inlay, but the difference compared with control was not statistically significant. Mean stereovision for micro-monovision was about 35 arcsecs.

“We know from clinical experience that stereovision is not very good with monovision, and we found that it was severely degraded when there was only a 1.25 D difference between the two eyes,” said Dr Artal.

“In a standard monovision approach where the difference in refraction is even greater, the reduction in stereovision is even more significant and can’t even be measured using this instrument.”

Dr Artal explained that the adaptive optics vision analyzer allows simultaneous manipulation and measurement of the optics in the two eyes of a test subject. Thus it allows pre-testing different presbyopic corrections in each patient to select the best compromise for optimum outcomes.

“Instead of doing the testing in patients with micro-monovision and a comparator group of those who had undergone the inlay procedure, we wanted to evaluate the pros and cons of the two methods of presbyopia correction using this experimental system that affords full control of the optics while performing the visual testing. We believe that the actual clinical results for the testing we perform follow closely what we measure in the lab,” Dr Artal said.

He added, “In a previous study, we established that we can successfully replicate the results of the real inlay using the binocular adaptive optics vision analyzer, and it also appears useful as a pre-screening tool and to personalise procedures for individuals in terms of optimising centration of the small aperture and residual defocus.”

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PRESERVING STEREOPSIS
Small aperture inlay shows benefit over micro-monovision despite shared mechanism

by Cheryl Guttman Krader in Milan

**Summary of the stereovision results for the three situations tested in the study**