

Toric and toric multifocal IOLs in meridional amblyopia

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Dear Sir,

Meridional amblyopia is sometimes put forward as a reason for not implanting Toric intraocular lenses (IOLs). It has been noted that patients with high levels of childhood astigmatism (>3 DC) can develop persistent orientation-dependent visual deficits despite optical correction. Studies by Mitchell *et al*^[1] demonstrated that meridional visual deprivation during the critical period of visual development results in permanently reduced response to stimuli in those orientations. This phenomenon was termed "meridional amblyopia".

Although it was noted that such astigmatism-related amblyopia can be successfully treated with optical correction in children up to school age, the amblyopia may not be completely eliminated with optical treatment alone^[2]. Children with astigmatism were shown to have significantly poorer best spectacle-corrected visual acuity (BCVA) compared to similarly treated amblyopes without astigmatism^[3]. It has been hypothesized that part of the limitations on corrected visual acuity are the inherent limitations of spectacle correction of high astigmatism; substantial distortion and suboptimal image quality is induced with spectacle correction of high astigmatism. The instability of the spectacle frame itself contributes further to poor retinal image quality. Therefore, patients diagnosed with meridional amblyopia are in fact partly affected by the suboptimal structural mechanism of measuring BCVA.

Data generated following laser *in situ* keratomileusis (LASIK) treatment of amblyopic patients has demonstrated that these patients have shown an improvement in visual acuity better than spectacle correction^[4]. In a study of 205 eyes with high myopic astigmatism (>3 DC) and reduced BCVA, Arruabarrena *et al*^[5] demonstrated statistically significant improvement in post-LASIK BCVA in meridional amblyopes. It has been hypothesized that the elimination of meridional magnification secondary to remote location of the spectacle lens from the pupil aperture and the decreased distortion of image quality secondary to limited stability of spectacle frame are the main reasons for the

improvement in acuity. Intuitively, by overcoming the same limitations, toric and toric-multifocal IOLs would impart similar improvements in post-operative visual acuity. In cases of high myopic astigmatism, toric IOL implantation will also reduce the retinal image minification created by spectacle correction. Extrapolation of data from LASIK should however be considered in a guarded manner when predicting the benefits of toric IOL implantation in this patient population. Toric IOL implantation does in itself pose certain intrinsic challenges including rotational instability, IOL displacement and compounding effects corneal incisions on pre-existing astigmatism. A study by Hoffmann *et al*^[6] demonstrated significant improvement in visual acuity following toric IOL implantation in 40 eyes with a range of astigmatism from 2.64 to 5.39 D. A similar study by Visser *et al*^[7] of 67 eyes with more than 2.25 D of astigmatism produced similarly encouraging results in terms of post operative unaided and best corrected visual acuity.

Ophthalmologists using toric IOLs for congenital astigmatism should therefore be aware of the phenomenon of meridional amblyopia. The stable refractive correction and reduction in image distortion with toric IOLs should improve the BCVA of patients with high astigmatic refractive errors. We would like your readers to know that amblyopic patients should therefore still achieve a meaningful improvement in vision following cataract surgery or refractive lens exchange and toric or toric-multifocal IOL implantation.

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