Contrast Modulation Spectacle Lenses Effect on Astigmatism after Two Years

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PURPOSE

Research published in 2025 showed a potential link between some peripheral defocus lenses and the development of increased refractive astigmatism. This study explored whether wearing contrast modulation spectacle lenses with Diffusion Optics Technology™ (DOT™) over a two-year period had any effect on cylindrical refractive error (CYL) in myopic children compared to standard single vision spectacle lenses (control).

METHODS

This analysis included 172 myopic Chinese children, aged 6-13 from Cathay (NCT05562622) study in China who completed the 24-months (m) study visit (123 DOT and 49 control) with astigmatism no greater than 1.50DC at baseline as inclusion criteria.

Right and left eye refractive CYL from manifest refraction, non-dilated autorefraction, and cycloplegic autorefraction were highly correlated, and as such, only right eye data were evaluated. The number of children with astigmatism (>0.25 DC) at baseline and at 24m using McNemar's test was determined, as was the magnitude of change in astigmatic children after 24m of wear of DOT lenses and control using their cycloplegic autorefraction data (average of 10 measurements). Corneal curvature measurements were also analyzed.

RESULTS

The proportion of children with astigmatism at baseline and 24m was not significantly different based on mean or median values. For the mean values, the control group was 92.7% ($p=0.5$) and DOT was 95.6% ($p>0.99$). For the median values, the control group was 92.1% ($p=0.15$) and DOT was 93.3% ($p=0.36$). Using logistic regression, DOT lenses did not have any impact on astigmatism, either overall ($p=0.49$), or from interactions between test and time (all $p>0.16$).

For those with astigmatism, there was no significant difference in the refractive CYL change from baseline at 24m. Baseline mean CYL (SD) for control was -0.68DC (0.28) and DOT -0.69DC (0.30). At 24m, mean CYL (SD) for control was -0.99DC (0.52) and DOT -0.99DC (0.51). The mean (SD) CYL change from baseline for control was slight, 0.34DC (0.50) and DOT was 0.28DC (0.49).

There was no significant difference between control and DOT for baseline corneal curvatures (steep or flat, $p>0.05$). At 24m, change in corneal curvatures were similar for both control and DOT

lenses and the change was mostly within 0.50D, 97.1% for control (p=0.22) and 95.3% for DOT (p>0.99), indicating no changes in corneal astigmatism.

Conclusions:

The use of DOT lenses after 2 years of wear did not result in an increase in refractive or corneal astigmatism in myopic children in this study versus children wearing single vision control. Practitioners concerned with increasing astigmatism with myopia control interventions may wish to consider contrast modulation as a treatment strategy to slow myopia progression.