

Do Age and Myopia Level influence Short-Term Choroidal Thickening Induced by Contrast and Defocus-Modulating Myopia Control Spectacle Lenses?

Purpose

Short-term changes in subfoveal choroidal thickness (SFCT) may serve as early indicators of myopia control efficacy. SFCT can vary across age and refractive error, and its short-term response to treatment remains under investigation. This study assessed SFCT responses in myopic children after short-term wear of contrast and defocus-modulating myopia control lenses, analysed by age and myopia level.

Methods

In this prospective, randomised, crossover study, SFCT response was defined as the change from baseline after one week of full-time (>12 hrs/day) wear of Diffusion Optics Technology™ (DOT), Defocus Incorporated Multiple Segments (DIMS), and standard single vision (SV) spectacle lenses. Eligible participants [aged 6–12 years; −8.00D to −0.50D spherical equivalent refraction (SER); astigmatism < 2.00DC; anisometropia ≤ 2.00D; best-corrected VA ≤ 0.10 logMAR] underwent Optical Coherence Tomography imaging (SPECTRALIS®; 6 meridians, 30° apart) following a 30-minute distance viewing task for stabilisation. SFCT was determined using a semi-automated segmentation protocol. A repeated-measures general linear model was used to compute estimated marginal means (EMMs), including lens type as a within-subjects factor, and age group and myopia level as between-subjects factors, along with randomisation order and sex. Participants were dichotomised into subgroups based on age (younger: <10 years; older: ≥10 years) and SER (moderate myopia: ≤−2.25D; low myopia: −0.50D to −2.25D), with subgroup thresholds identified to harmonise distributions.

Results

Thirty-eight participants (13 female, mean age 9.7 ± 1.6 years, mean SER -2.25 ± 1.21 D) completed the study. Main effects analysis indicated a significant effect on SFCT for lens type ($p < 0.05$), but not for age group or myopia level - when analysed as independent between-subjects factors. Choroidal thickening was observed for both myopia control lenses (EMM $\pm$ SE: 13.18 ± 2.82 μ m for DOT; 8.72 ± 2.74 μ m for DIMS), while SV produced a negligible thinning (-1.21 ± 1.78 μ m). The 2-way interaction between age and myopia level was not significant ($p = 0.195$); however, post-hoc comparisons from the 3-way interaction (with lens type) showed significant (DOT vs SV, $p = 0.029$) and borderline (DIMS vs SV, $p = 0.105$) differences in younger moderate myopes, suggesting a prompt response in this subgroup. Additionally, SFCT responses for each lens were otherwise consistent across age and myopia groups.

Conclusions

Both contrast and defocus-modulating myopia control lenses induced subfoveal choroidal thickening after short-term wear, whereas SV did not. Lens design was the primary determinant, with no significant influence from age or myopia level. Nonetheless, the variability in timing and extent of thickening - particularly among younger, moderate myopes - requires further investigation.