NCC 'Future generation 2024'
Organization Section: NCC/ BCLA
PAPER Abstracts
Monday, March 11, 2024
Netherlands, Veldhoven,
NH De Koningshof, Baroniezaal

Can optical modelling predict clinical vision outcomes of myopia control contact lenses?

Jill Woods, Josh Richards, Sarah Guthrie, Pete S Kolbaum

Purpose: To understand if optical metrology and computational modelling can predict the clinical visual performance of two myopia control contact lenses which employ different optical designs: non-coaxial senofilcon A (NC) (Acuvue Abiliti 1-Day, Johnson & Johnson Vision) and dual-focus omafilcon A (DF) (MiSight 1 day, CooperVision).
Method: For clinical assessments, children aged 8-15 years with no history of contact lens wear or recent myopia control intervention completed a randomised, non-dispensing, contralateral double-masked trial. After 1-hour of wear, participants rated their lens preference (Likert) and subjective vision (0-100 scale, 100=best), then distance visual acuity (VA) was measured.
For optical metrology and modeling, wavefront errors were measured with an aberrometer (Optocraft GmbH). Custom software was used to compute point spread functions, image quality and simulated retinal images for 3-6mm pupils by combining the lens optics with the optics of a model young eye, assuming centred and decentred lens positions.
Results: Twenty-six participants completed the clinical study: 17M; mean age 11.6yrs [8-15yrs]; mean OD refraction: -1.96DS [-0.25 to -3.50DS], -0.34DC [0.00 to -1.00DC]. Ratings of distance vision at 1-hour were better with DF (88±14) versus NC (79±18), $p<0.01$. Distance logMAR VA was better with DF (0.02±0.04) versus NC (0.09±0.08), $p<0.01$. A higher number of participants indicated overall preference for DF, with vision the most common reason (DF:14 vs NC:6, p=0.17).
Optical modelling of well-centred lenses showed reduction in image quality for both lenses as the pupil increased. Lens decentration degraded image quality for both designs, but more for the NC design. Differences in add power zone geometry and NC optics may account for these differences.
Conclusions: Both optical modelling and clinical subjective results support better image quality with the dual-focus design. These results suggest that optical modelling techniques may be valuable in evaluating and comparing myopia control lens designs prior to on-eye testing.
Research funding received: Both Institutions received research funding from CooperVision for these projects.