Myopia Progression Control (MPC) Lens Design Reverses Previously Induced Myopia in Chicks

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Abstract

Purpose: In chicks, minus lenses induce myopia approximately equal to the inducing lens power. Previously, we showed that lens induced myopia can be inhibited in chicks when the minus power is combined with a specific hyperopic peripheral lens design. The aim of this experiment was to determine whether lens induced myopia could be reversed with these designs.

Methods: 25 newly hatched chicks unilaterally wore conventional design -10.00D lenses for 7 days. On Day 7, 18 chicks were fitted with MPC lenses with central power of -10.00D; 9 with Type I (TI) and 9 with Type II (TII). The specifics of the lens designs have been previously described (Woods et al. IOVS 2013). Control and Test lens parameters were identical except for the peripheral design. 7 chicks continued to wear control lenses. Refractive error and axial length were measured by retinoscopy and ultrasonography on Days 0, 7 and 14. Lenses were only removed for measurement and cleaning. Mean differences between treated and untreated eyes (MDiff ± SE) are reported, controlling for the small eye artefact.

Results: The differences in refractive error and axial length between treated and untreated eyes were insignificant on Day 0 for all groups. On Day 7 the treated eye was longer and more myopic (~10D) vs the untreated eye for all groups; there were no significant differences between the groups. At Day 14, treated eyes of control chicks were still longer (MDiff=0.48mm±0.08) and more myopic (MDiff=-10.71D±0.75) vs untreated eyes. MPC TI treated eyes became slightly hyperopic (MDiff=3.57D±1.50) and shorter (MDiff=-0.09mm±0.13) than the untreated eye. MPC TII treated eyes were slightly myopic (MDiff=-2.92D±1.14) and longer (MDiff=0.10mm±0.12) vs untreated eyes. The refractive MDiffs were all significantly different from each other (p<0.005). TI and TII length MDiffs were significantly different from controls (TI p=0.003, TII p=0.014) but not from each other (p=0.32).

Conclusions: These novel lens designs can reverse lens-induced myopia in chicks. The unique peripheral design affects eye growth as opposed to preventing the operation of normal emmetropization.