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Changes in Ocular Parameters and Intraocular Lens Powers in Aging Cycloplegic Eyes

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Abstract

Purpose: Since age-related changes in lens elasticity and ciliary muscle contractility can affect how ocular parameters respond to cycloplegia, intraocular lens (IOL) power measurements calculated by formulas using anterior chamber depth (ACD), lens thickness (LT) or white-to-white (WtW) for effective lens position prediction can vary. In response, using swept-source optical biometry in pre-presbyopic and presbyopic eyes, we investigated changes in ocular parameters and IOL power calculations due to cycloplegia.

Design: Cross-sectional study.

Methods: In 38 pre-presbyopic and 42 presbyopic eyes, we measured pupil diameter (PD), radius of corneal curvature values (R1, R2, and Rm), central corneal thickness (CCT), WtW, ACD, LT, and axial length (AL) before and after cycloplegia. We determined IOL power calculations with the SRK/T, Holladay 2, and Haigis formulas. To pinpoint the effect of cycloplegia, we recorded refractive predictions in pre- and post-dilation conditions according to the same IOL power calculations, even if post-dilation IOL power calculations had changed.

Results: With cycloplegia, PD changed significantly more in presbyopic eyes ($p < 0.001$). CCT decreased in pre-presbyopic eyes ($p = 0.048$), whereas WtW increased in presbyopic ones ($p = 0.02$). In both groups, ACD and LT changed significantly ($p < 0.001$). IOL power calculations according to the Holladay 2 formula differed in pre-presbyopic eyes ($p = 0.042$), and refractive predictions with the Holladay 2 and Haigis formulas differed significantly in pre-presbyopic eyes ($p = 0.043$ and $p = 0.022$, respectively).

Conclusion: Surgeons should consider the effect of cycloplegia on refractive prediction errors and IOL power calculations determined with Haigis and Holladay 2 formulas especially in pre-presbyopic ages.