

Session 3-K: Refractive: Phakic IOLs

Title: Inaccuracy of Conventional External Measurements in Calculating Optimal Phakic IOL Size

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Purpose: To determine the validity of White-To-White (WTW) and other external ocular measurements to estimate the internal Angle-to-Angle (ATA) and Sulcus-to-Sulcus (STS) dimensions for phakic-IOL sizing.

Method: In twenty myopic/hyperopic subjects, refraction, K-values, axial length (AL) and anterior chamber depth (ACD) were determined. Digital photography with ruler scale provided objective WTW measurement. Five 50-MHz VHF digital ultrasound horizontal meridian B-scans were obtained using the Cornell prototype of the Artemis (Ultralink, LLC). ATA and STS were measured from B-scans. Correlation testing and stepwise multiple linear regression analysis was done to test if conventional parameters could be used to predict the internal ATA and STS dimensions.

Results: Neither myopes nor hyperopes demonstrated a significant correlation between either WTW and ATA, or WTW and STS ($p > 0.05$). For ATA: In hyperopes, WTW together with age and ACD contributed to a significant model for predicting ATA ($R^2 = 0.959$, $P < 0.001$), but no model emerged for myopes. For STS: WTW with ACD and sphere produced a significant model for predicting STS in hyperopes ($R^2 = 0.813$, $P < 0.001$), but no model emerged for myopes. For hyperopic models, ATA and STS would be predicted to within 0.9-mm and 0.8-mm respectively (95% confidence limits), and hence would be of limited use in practice.

Conclusions: No method adequately predicts ATA or STS from conventional external measurements, including WTW, ACD and AL. To maximize the safety of phakic IOL's direct measurement of ATA and STS, rather than externally based predictive models, will be necessary to optimize lens sizing.