ACCURATE INTRAOCULAR LENS POSITION DETERMINATION IN PSEUDOPHAKIC EYES
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Introduction: A critical parameter for intraocular lens (IOL) power calculation is an estimate of the postoperative anterior chamber depth (ACDpost). Moreover, when both eyes have to be operated, ACDpost measurements of the first operated eye can be used to improve the refractive outcome of the second eye. For these reasons it is crucial to be able to accurately measure this parameter. Currently there is a need to assess the accuracy of ACDpost measurement techniques. This work seeks to validate ACDpost measurement techniques with optical low-coherence reflectometry device (Lenstar LS 900, Haag-Streit AG, Köniz, Switzerland) and optical coherence tomography (Visante OCT, Carl Zeiss Meditec Inc., Dublin, California, USA).

Material and Methods: A human eye phantom with an IOL placed in micrometrically adjustable holder was built to check the calibration of both devices. A clinical study involving 45 pseudophakic eyes implanted with a 22D SA60AT Alcon Acrysoft single-piece IOL was conducted and 3 months after surgery ACDpost was measured with both devices and compared.

Results: Zeiss Visante calibrations had a R.M.S error smaller than the device’s 18 μm resolution in all the measurement sets. No span shift nor zero shift errors were found. Lenstar calibrations had a larger R.M.S error in the order of the device’s 20 μm resolution and there were instances where displacement was not detected between two consecutive measurements. In the clinical study, Lenstar failed to measure ACDpost 11% of the times. Additionally Lenstar measured an average IOL thickness of 0.74μm with σ = 0.08mm and a 16% failure rate.

All ACDpost measurements made by the Visante were larger than those of the Lenstar. BA analysis was performed and a mean difference of 74μm between the measurements was found. The dioptic shift induced by the difference was calculated in a worst case scenario and a 0.18D difference between measurements was found. This is clinically insignificant and the measurements can be considered to be interchangeable.

Conclusions: Through results obtained with the eye phantom it was possible to conclude that the optical biometry devices studied performed accurate measurements of ACDpost. Moreover, results from the clinical trial proved the interchangeability of the measurements in vivo. These results will certainly contribute to the improvement of ACDpost estimation methodologies, continue to push forward ray tracing based methodologies, which make a direct use of ACDpost, and ultimately contribute to the improvement of IOL power calculation methodologies.