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Optimized IOL Power Predicted by Customized Modelling

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Abstract

Purpose: Current IOL power calculations based in simple optics and empirical information provide in same cases relatively large errors. We present here a new procedure based in customized optical modeling to predict an optimized power for a specific lens and individual patient.

Methods: We have developed a computational method to perform an exact ray-tracing procedure through individualized pseudophakic eyes (Tabernero et al., IOVS, 47, 4651, 2006). To build up the model, different eye's parameters were measured: corneal aberrations, axial length and anterior chamber depth data, and IOL parameters (geometry and optical properties). The optimum power of the IOL for each eye was that maximizing the area under the computed MTF. This power prediction was compared with that obtained using conventional empirical regression analysis. We applied the procedure to a population of 60 eyes covering a large range of refractive errors. The impact of experimental errors and corneal aberrations in the power predictions was evaluated.

Results: We found systematic differences between the IOL power obtained by empirical formulas and those calculated with our customized method (1D on average for all the subjects of our study). The largest differences occurred in patients with large preoperative refractive error, especially in hyperopes, and in patients with larger values of corneal aberrations, as those that undertook LASIK refractive surgery.

Conclusions: The prediction of IOL power in cataract surgery can be improved by using customized modeling based on individual data. This approach is especially adequate with aberration-correction IOLs, since errors in defocus larger than 0.25 D would remove completely the potential visual benefit of correcting high order aberrations.

Keywords: intraocular lens • cataract