

# IMPROVING THE REFRACTIVE ACCURACY OF CATARACT AND REFRACTIVE LENS EXCHANGE SURGERY



Studies assessed results with the ESCRS IOL Calculator.

BY NUNO MOURA-COELHO, MD, PHD, FEBO, AND JOSÉ GÜELL, MD, PHD

## PROSPECTIVE EVALUATION OF THE ESCRS ONLINE CALCULATOR FOR CALCULATION OF A MULTIFOCAL INTRAOCULAR LENS

Lwowski C, Kohnen T<sup>1</sup>

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### ABSTRACT SUMMARY

This prospective consecutive case series of 88 eyes (88 patients) evaluated the accuracy of the ESCRS online IOL Calculator for a full-range of field (FRoF)<sup>2,3</sup> acrylic lens (PanOptix, Alcon) in femtosecond laser-assisted refractive lens exchange (RLE) and cataract surgery. The SRK/T formula was included for comparison.

The prediction errors (PEs) were calculated with each of the seven formulas available in the ESCRS IOL Calculator and the SRK/T. The main outcomes measured 3 months after surgery were the percentage of eyes with PEs within  $\pm 0.50$  D,  $\pm 1.00$  D, and  $\pm 2.00$  D; mean PE; mean absolute error

(MAE); and median absolute error (MedAE). The mean PE was slightly hyperopic for all ESCRS formulas ( $+0.01$  to  $+0.08$  D) but slightly myopic for the SRK/T ( $-0.08$  D). The MedAE was similar with all formulas; there were no statistically significant differences between ESCRS IOL calculator formulas and the SRK/T, but the SRK/T showed the highest MedAE (0.31 D) compared with the ESCRS formulas (range, 0.26–0.30 D).

Although there were no statistically significant differences between the formulas regarding the percentage of eyes that had a PE within  $\pm 0.50$  D, the accuracy of the ESCRS IOL Calculator formulas ranged from 78% to 84% (highest for the Hill-RBF), whereas the SRK/T showed 74% accuracy.

The SRK/T had one outlier of  $-2.08$  D, whereas other formulas had a PE of less than 0.28 D for that eye.

### DISCUSSION

At the time of this writing, this was the only study to analyze the performance of the ESCRS IOL Calculator for an FRoF IOL power determination.

The use of multiple modern formulas helps to optimize IOL power selection and will likely supersede traditional formulas in the future.<sup>4-9</sup> Since October 2023, the ESCRS IOL Calculator has processed nearly 3 million calculations worldwide and has been used by approximately 100,000 surgeons globally.<sup>10</sup> By extrapolation, each of these surgeons

## STUDY IN BRIEF

- ▶ A prospective consecutive case series assessed the accuracy of the ESCRS IOL Calculator for a multifocal lens in femtosecond laser-assisted refractive lens exchange and cataract surgery. ESCRS-included formulas showed excellent predictability and a trend toward higher predictability than the SRK/T formula, which was included for comparison.

### WHY IT MATTERS

This study serves as a proof of concept for the ESCRS IOL Calculator and supports the use of multiple modern IOL formulas to improve refractive outcomes with full-range of field IOLs.



## STUDY IN BRIEF

- ▶ A retrospective case series analyzed the accuracy of the ESCRS IOL Calculator for toric monofocal IOL determination. The Hoffer QST formula and EVO Toric Formula v2.0 performed statistically significantly better than the other formulas analyzed, but the clinical significance of those differences was minimal.

### WHY IT MATTERS

The results of this study support the routine use of the ESCRS multifocal toric IOL calculator to improve the accuracy of astigmatism correction, which is a crucial component of successful refractive lens exchange and cataract surgery.

however, the EVO Toric Formula v2.0 performed the best.

Despite the statistically significant differences observed across many comparisons, the clinical significance of those differences was minimal.

### DISCUSSION

We believe that the formulas incorporated in the ESCRS Toric IOL Calculator represent the highest scientific standard according to the most relevant available evidence published in the peer-reviewed literature. This study is the first to analyze the accuracy of the ESCRS Toric IOL Calculator. In the study, all the formulas showed similar clinical accuracy, although the predictability of the EVO Toric Formula v2.0 and the Hoffer QST formula tended to be favored. Using directly MPCA was not found to be superior to estimating it—in line with other research showing that EPCA was generally comparable to MPCA in regular clinical practice.<sup>14,15</sup>

Importantly, even with a multifocal approach using modern IOL formulas, refractive predictability within  $\pm 0.50$  D was achieved in only approximately 60% of eyes. This and similar studies show that there is a long way to go to improve postoperative astigmatic outcomes with toric IOLs.<sup>16,17</sup>

One area for further research is an analysis of low cylinder—a major concern particularly in the setting of simultaneous vision toric IOLs (eg, enhanced monofocal, extended

depth of focus, and multifocal IOLs) where greater than or equal to 0.75 D of residual astigmatism degrades quality of vision.<sup>18-20</sup> Another issue warranting further study is oblique astigmatism, where ESCRS formulas may suggest highly variable axes for IOL implantation, as shown in the Figure. ■

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### SECTION EDITOR EDWARD MANCHE, MD

- Director of Cornea and Refractive Surgery, Stanford Laser Eye Center, Stanford, California
- Professor of Ophthalmology, Stanford University School of Medicine, Stanford, California
- edward.manche@stanford.edu
- Financial disclosure: None

### JOSÉ GÜELL, MD, PHD

- Head of the Cornea, Cataract and Refractive Surgery Unit, Instituto de Microcirugía Ocular Barcelona Grupo Miranza and
- Universidad Autónoma de Barcelona, Barcelona, Spain
- Codirector, European School for Advanced Studies in Ophthalmology cornea, cataract and refractive surgery course
- Board Member, EuCornea
- Trustee, ESCRS
- guell@imo.es
- Financial disclosure: None

### NUNO MOURA-COELHO, MD, PHD, FEBO

- Cornea, Cataract and Refractive Surgery Unit, Instituto Português de Retina, Associação Médica do Olhar, ALM Primum, Lisbon, Portugal
- NOVA Medical School, Universidade Nova de Lisboa, Lisbon, Portugal
- Board Member, EuCornea
- Faculty Member, European School for Advanced Studies in Ophthalmology cornea, cataract and refractive surgery course
- nunomouracoelhooft@gmail.com;
- Instagram @theyeyfluencer;
- LinkedIn profdoutornunomouracoelho
- Financial disclosure: None