constant for scalar spheroequivalent errors, the same result can be accomplished for astigmatism by adding the centroid as a surgically induced astigmatism (SIA) to the preoperative measured value. For the Holladay calculator in Graph C, the SIA vector to be added to the preoperative astigmatism would be the centroid (offset) of 0.54 @ 1 degree. The regression equations for x and y essentially use 93% of the error offset (0.54 D @ 1 degree $\times$ 0.93 = 0.508 @ 1 degree) and 93% of the measured corneal astigmatism. The reduction of 7% (100% to 93%) is clinically significant only for values of preoperative astigmatism greater than 2.0 diopters (D). Adding an SIA of 0.54 @ 1 degree to the preoperative astigmatism is much easier to perform, and the SIA is an input parameter for toric calculators.

It is also interesting that the Baylor Toric IOL nomogram is similar for with-the-rule (WTR) astigmatism (steep meridian @ 90 degrees) with an SIA of 0.55 D @ 0 degrees. However, for against-the-rule (ATR) astigmatism (steep meridian @ 0 degrees or 180 degrees), the Baylor SIA is 0.25 @ 0 degree.[4] It is important that in the current study, the main data set of 68 eyes used for the development of the regression had 63% WTR astigmatism and only 32% ATR astigmatism, so the regression will reflect predominantly WTR astigmatism. I suggest the authors separate the data sets into WTR astigmatism and ATR astigmatism and they would find the SIA for ATR astigmatism would be slightly smaller (~0.25 @ 0), in agreement with the Baylor nomogram. I also agree with Koch et al.[4] that the SIA is not totally a result of posterior corneal astigmatism but also the result of other factors such as an ongoing ATR shift after sutureless cataract surgery, even after temporal clear corneal cataract surgery.[5]

I therefore recommend for optimum results and minimal residual astigmatism with toric IOLs that when using the Holladay toric calculator in patients with preoperative WTR astigmatism, an SIA of 0.60 D of flattening at 90 degrees be used and with preoperative ATR astigmatism and an SIA of 0.20 D of flattening at 90 degrees be used and expect residual astigmatism results near 80% within $\pm$0.50 D. For patients not at 90 degrees (WTR) or 180 degrees (ATR), the SIA flattening is still at 90 degrees, but the magnitude should be calculated using the following formula: Magnitude = $0.20 + 0.40 \times (\sin \theta)^2$, where θ is the steep meridian of the measured keratometric astigmatism. For example, a steep meridian at 30 degrees yields 0.30 D, 45 degrees yields 0.40 D, and 60 degrees yields 0.50 D, all with flattening at 90 degrees. At angles other than 90 degrees and 180 degrees, there will be slight rotation in the ideal alignment meridian of the toric IOL because the SIA is oblique to the original steep meridian. There is open public access to the Holladay Toric Calculator and Holladay 2 Formula[A] under the Calculators tab. I am grateful to the authors[1,2,4] for emphasizing the importance of using the correct SIA when using the Holladay Toric Calculator.

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Financial Disclosure: *Dr. Holladay is the developer of the Holladay IOL Consultant software with the toric calculator and is the president of Holladay IOL Consulting Inc., which is the distributor.*

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Reply: We thank Dr. Holladay for his interesting observations regarding our paper. We agree with Dr. Holladay's observation that in our current study the main dataset of 68 eyes used for the development of the regression had 63.2% of eyes with with-the-rule (WTR) astigmatism and only 32.4% with against-the-rule (ATR) astigmatism. However, it is important to note that in the validation group, 28.2% of eyes had WTR astigmatism and 57.7% had ATR astigmatism. Using the suggested correction by Dr. Holladay on the validation group yielded an ATR centroid prediction error of 0.19 $\pm$ 31 @ 179 and 70.5% within $\pm$0.5 diopter, compared to 0.04 $\pm$ 31 @ 176 and 78.2%, respectively, when the original

Table 1. Absolute errors and centroid errors in predicted residual astigmatism by method of calculation (all 78 eyes).

Parameter	Holladay Adjustment	Abulafia-Koch Formula
Centroid ± SD (D)	0.19 ± 0.31 @ 179	0.04 ± 0.31 @ 176
Median (D)	0.37	0.34
Mean ± SD (D)	0.42 ± 0.23	0.38 ± 0.22
±0.50	70.5%	78.2%
±0.75	89.7%	93.6%
±1.00	97.4%	97.4%

Abulafia-Koch regression formula adjustments were applied (Table 1).

That said, we appreciate his thoughtful method of incorporating the Baylor nomogram into his formula and look forward to analysis of larger data sets to increase our understanding of how to best incorporate posterior corneal astigmatism into astigmatic correction during cataract surgery.—*Adi Abulafia, MD, Li Wang, MD, PhD, Douglas D. Koch, MD*

Corneal asphericity and intraocular lens power in eyes with previous laser in situ keratomileusis

We read with interest the paper by Mori et al.[1] The authors studied an interesting and important topic regarding the relationship of corneal asphericity and intraocular lens (IOL) power calculations in eyes with previous myopic laser in situ keratomileusis (LASIK). We would like to comment on their methodology and results.

1. It seems as though the standard single-K version of the SRK/T formula was used to calculate the prediction of refractive error. It is well known that in eyes with previous LASIK, the double-K version of the IOL calculation formula provides far superior results.[2] In a previous study comparing the IOL prediction errors using the single-K and double-K versions of IOL calculation formulas,[3] we found that the IOL prediction errors increased with increasing amount of refractive correction induced by LASIK, with the SRK/T formula. Figure 4 in this study[1] showed that the preoperative manifest refraction was significantly association with the Q value. Therefore, the finding of significant correlation of corneal asphericity after myopic LASIK and the IOL power underestimation with use of the SRK/T formula might be caused by the use of the single-K SRK/T formula. It would be interesting to study the relationship of corneal asphericity to IOL power calculation in myopic LASIK eyes using the double-K SRT/T formula or formulas listed on the postrefractive IOL calculator at the American Society of Cataract and Refractive Surgery website.[A]
2. The multiple regression equation was developed on 22 eyes of 22 patients. Then, the regression equation was validated in all of the 54 eyes of 37 patients, including the 22 eyes used for developing the regression equation. The validation should be performed in a fresh data set that excludes these 22 eyes.
3. Using the regression equation, the authors found that 64.8% and 87.0% of eyes were within ±0.50 diopter (D) and 1.00 D of refractive error and concluded that the refractive error could be predicted well with the use of asphericity. Unfortunately, these results are not better than results reported in the literature using other formulas. With an optical coherence tomography (OCT)–based formula—the Barrett True-K formula—and the average of all formulas using no prior data, 68.3%, 58.7%, and 67.3% of eyes were within ±0.50 D of refractive prediction error and 92.3%, 90.4%, and 94.2% of eyes were within ±1.00 D of refractive prediction error, respectively.[4]
4. Another, and we suspect better, method of incorporating spherical aberration is ray tracing. Canovas et al.[5] reported that for 25 post-LASIK corneas, an effective refractive index derived from ray tracing over the central 4.0 mm zone (which incorporates all this region's aberrations) predicted for this same data set 84% of eyes within ±0.50 D of target. However, testing on additional data sets is obviously indicated to validate this type of approach (so we as coauthors recognize this shortcoming of our own article!).
5. Finally, we consider refractive prediction accuracy of less than 80% within ±0.50 D as to be disappointing because it is well below both what we find for normal eyes and what our postrefractive patients desire.

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