An Ineffective Astigmatism Analysis

In the article "Preoperative Prediction of the Optimal Toric Intraocular Lens Alignment Meridian" published in the August issue,[1] there was no significant difference found in the ability of three devices to predict the ideal alignment meridian for the purpose of toric intraocular lens alignment. The measure used to compare the "ideal alignment meridian" was the angle of rotation as calculated by the Berdahl & Hardten Toric Results Analyzer. This parameter, which is calculated to reduce refractive cylinder postoperatively to a minimum by performing a toric implant rotation, includes in its calculation the intraocular astigmatism present where corneal and refractive parameters differ in the absence of a crystalline or implant lens, known as "non-lens ocular residual astigmatism" (ORA).[2]

This parameter is a variable that explains the phenomenon prevailing in many toric refractive surprises that the optimal alignment of the implant may not coincide with the steepest corneal meridian to minimize refractive cylinder. Even when the toric implant is in the correct position aligned with the steepest meridian, excess refractive cylinder might still remain that can be further reduced by a rotation away from that steep meridian. It also explains the effectiveness of the intraoperative Optiwave Refractive Analysis System (Alcon Laboratories, Inc., Fort Worth, TX), which adjusts for this phenomenon at the time of toric implant surgery, thus averting in many cases refractive surprises that may otherwise have occurred. The fact that this device was used on some but not all eyes in this study would have created a bias favoring these eyes.

It would be useful for the authors to go back to their data to perform an effective vectorial analysis[3] to calculate the respective angles of error, both arithmetic and absolute, for each of the three groups and provide this information in their response to this letter. This analysis together with the difference vector might in fact provide the answer to the hypothesis question they are raising in their study to determine the device that identifies the ideal alignment meridian. The angle of error and the angle of rotation are not the same. The angle of rotation as presented contains additional variables that renders their findings of equivalence questionable, giving no certainty to this study's conclusions.

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REFERENCES

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Dr. Alpins has a proprietary interest in Assort Surgical Management Systems.

Reply

We appreciate the comments presented by Dr. Alpins and would like to address the points presented. As noted in the letter, the angle of rotation is calculated to counter the effects of all sources of residual astigmatism following intraocular lens (IOL) placement. Such astigmatism may result from the phacoemulsification incision, effective toricity of the toric IOL that may be different from the expected power at the corneal plane, final IOL orientation that differs from the intended alignment, IOL tilt, and "non-lens ocular residual astigmatism" (ORA). In addition, as Dr. Alpins notes, the position resulting in the least amount of residual astigmatism may not coincide with the steepest anterior corneal meridian. We believe it is, in fact, a strength of our study that the standard to which the devices are compared (the angle of rotation) does take into account all of these variables and does not focus solely on ORA. Thus, even though the study does not account specifically for non-lens ORA astigmatism and each device has expected potential error as a result, this should not affect the reported results. We believe this simulates real world, clinically relevant situations.

In addition, we disagree with the statement that the use of the intraoperative Optiwave Refractive Analysis System (Alcon Laboratories, Inc., Fort Worth, TX) in some but not all of the eyes would create bias for the eyes treated with this technology. Our reasoning is thus. Each of the devices was used to predict the best axis for toric alignment preoperatively for every eye. Even if the intraoperative Optiwave Refractive Analysis System resulted in significant changes in final toric placement for every eye in which it was used, the final comparison in the study was the difference between the ideal axis predicted by the Berdahl & Hardten Toric Results Analyzer (BHTRA) and those preoperative measurements. The fact that the Optiwave Refractive Analysis System may have helped place the toric lens

in a better position because it helps adjust for non-lens ORA may affect the angle between actual lens meridian and the ideal meridian predicted by the BHTRA, but likely not the difference between the BHTRA ideal meridian and those predicted preoperatively by the different devices. Although we recognize that the angle of rotation includes additional variables not present in the angle of error, as mentioned above we believe that this is a strength of the study.

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