Correspondence

Comment on: Refractive and keratometric outcomes of supervised novice surgeon performed limbal relaxing incisions

Authors

Timoteo González-Cruces OD MSc [1,2], Antonio Cano-Ortiz MD [1], María Carmen Sánchez-González OD PhD [2] and José-María Sánchez-González OD PhD [2]

[1] Department of Anterior Segment, Cornea and Refractive Surgery, Hospital La Arruzafa, Cordoba, Spain.

[2] Department of Physics of Condensed Matter, Optics Area, University of Seville, Seville, Spain.

Corresponding Author

José-María Sánchez-González / Reina Mercedes Street. University of Seville, Seville, Spain

+34 618 20 41 10 / jsanchez80@us.es

55
56
57

58
59
60
61
62
63
64
65

We read with great interest the original published by Riaz et al.[1] The authors evaluated the efficacy and safety of astigmatism management using limbal relaxing incisions performed by refractive surgeons in training. This study provides a reference for the performance of systematic astigmatism incisions in cataract surgery patients by ophthalmology residents. We would like to address some considerations regarding the vector analysis of astigmatism.

The Alpins method[2] has been established as the gold standard for reporting astigmatism outcomes following refractive surgery.[3] Both the Journal of Refractive Surgery[3] and the Journal of Cataract and Refractive Surgery[4] suggest using the Alpins method together with the recommendations of Abulafia et al.[5] In the Riaz et al.[1] study, although Alpins' terminology is used to discuss astigmatism outcomes, the term surgically induced astigmatism (SIA) does not accurately reflect Alpins' original term. Alpins defines the SIA as *"the amount and direction of corneal steepening that occurred in achieving the operative result from the preoperative astigmatic state"*.[6] Consequently, the SIA vector could take any orientation as it does not depend directly on the target induced astigmatism (TIA) meridian. Likewise, the term SIA_{cornea} suggested by Abulafia et al.[5] describes *"the change in total corneal astigmatism"* and does not consider the surgical meridian. However, Riaz et al.[1] use the term SIA as a with-the-wound (WTW) and against-the-wound (ATW) change, using the steep corneal meridian as the reference. The WTW-ATW change represents the difference between the flattening that occurs in the surgical meridian and the steepening induced in the orthogonal meridian. This terminology could be confusing as it does not represent the original term SIA. First, this is because the WTW-ATW change is a magnitude closely related to the surgical meridian and it cannot be called SIA. Second, WTW-ATW is outdated terminology, used for the first time in 1992,[7] which does not characterize the actual visual and refractive outcomes as does the standard terminology. The keratometric change that occurs in the steep corneal meridian could be expressed by the flattening effect (FE) according to the terminology used by Alpins instead

of the WTW-ATW change proposed by Holladay et al.[7] or the term "surgically induced astigmatic polar value" (s-AKP) proposed by Naeser et al.[8]

In addition, the authors suggest undercorrection of astigmatism. However, we found no measures that suggest overcorrection or undercorrection of astigmatism regarding the TIA. To make this assertion, the SIA should be evaluated in relation to the TIA. This information has traditionally been reported through standard graphs to illustrate astigmatic treatment[3]. Several studies have reported the correction index (CI) to represent treatment success. The CI is defined as the magnitude of the SIA divided by TIA. When the magnitude of the SIA is less than that of the TIA, this indicates that the intended astigmatic correction has not been achieved and the CI is less than 1.0. Conversely, if the SIA value is greater than that of the TIA, this suggests a CI greater than 1.0. A CI equal to 1 is ideal. Although this ratio has been widely used to report the outcomes of astigmatism correction, we do not believe this is entirely correct because it only represents the magnitude of the association between SIA and TIA but does not consider the orientation of both vectors. We suggest using the flattening index (FI) as the true relation between the SIA and TIA vectors. The FI is the ratio of the FE to the TIA. The FE is the projection of the SIA vector onto the TIA meridian. This concept is more accurate since the FE and the TIA are two vectors with the same orientation, and their magnitude can be directly compared. Research on the visual and refractive outcomes of astigmatism treatment would improve with the use of the FI due the vectorial nature of astigmatism.

References

1.   Riaz KM, Wang L, Williams B, Dvorak JD, Kloek CE, Farooq A V., Koch DD.
      Refractive and keratometric outcomes of supervised novice surgeon performed limbal
      relaxing incisions. *J Cataract Refract Surg*. 2021; Publish Ah.
      doi:10.1097/j.jcrs.0000000000000614

2.   Alpins NA. Vector analysis of astigmatism changes by flattening, steepening, and

torque. *J Cataract Refract Surg*. 1997;23(10):1503-1514. doi:10.1016/S0886-3350(97)80021-1

3. Reinstein DZ, Archer TJ, Randleman JB. JRS Standard for Reporting Astigmatism Outcomes of Refractive Surgery. *J Refract Surg*. 2014;30(10):654-659. doi:10.3928/1081597X-20140903-01

4. Reinstein DZ, Archer TJ, Srinivasan S, Mamalis N, Kohnen T, Dupps WJ, Randleman JB. Standard for reporting refractive outcomes of intraocular lens–based refractive surgery. *J Cataract Refract Surg*. 2017;43(4):435-439. doi:10.1016/j.jcrs.2017.04.005

5. Abulafia A, Koch DD, Holladay JT, Wang L, Hill W. Pursuing perfection in intraocular lens calculations: IV. Rethinking astigmatism analysis for intraocular lens-based surgery: Suggested terminology, analysis, and standards for outcome reports. *J Cataract Refract Surg*. 2018;44(10):1169-1174. doi:10.1016/j.jcrs.2018.07.027

6. Alpins N. *Practical Astigmatism: Planning and Analysis*. Thorofare, NY 08086 USA: SLACK Incorporated; 2018.

7. Holladay JT, Cravy T V., Koch DD. Calculating the surgically induced refractive change following ocular surgery. *J Cataract Refract Surg*. 1992;18(5):429-443. doi:10.1016/S0886-3350(13)80095-8

8. Naeser K, Behrens JK, Naeser EV. Quantitative assessment of corneal astigmatic surgery: Expanding the polar values concept. *J Cataract Refract Surg*. 1994;20(2):162-168. doi:10.1016/S0886-3350(13)80158-7