Title: Clinical efficacy of implantation of toric intraocular lenses with different incision positions: a comparative study of steep-axis incision and non-steep-axis incision

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Author’s response to reviews:

Ceyhun Arici (Reviewer 1): As mentioned by authors, toric intraocular lenses have been used extensively in cataract surgery. The toric power of lenses are calculated according to the keratometric values and the angle of main corneal incision.

The study is useful especially to show step axis incision to decrease high-order spherical aberrations which is one of main optical disorder to affect visual acuity apart from diffraction, scattering and accommodation.

Response: Thank you very much for your high value of our manuscript.

Cecilia Devoto, M.D. (Reviewer 2): This is a useful paper given variable opinions and practices of incision selection with toric IOLs. The fact that this was prospective study was very helpful along with the good inclusion and exclusion criteria.

1. It’s unclear to me why non steep axis placement varied from 15-75° deviating from steep axis. That is a large range and one may think that only 15 degrees variability might affect/correct the steep axis to some degree.

Response: We really appreciate your question. In theory, postoperative steep axis may be changed by every degree that the incision deviates from preoperative steep axis. However, within 30 degrees, this change may not have clinical effect and could be considered as steep axis area and incision made out of this area was considered as non steep axis incision.
2. Lastly if you could explain why if in steep-axis incision group, the corneal astigmatism reduced significantly vs the non steep-axis incision group then why yet the residual astigmatism was not statistically significant.

Response: Many thanks for your question. Actually, in both groups, toric IOLs played the leading role in correcting astigmatism. In steep-axis incision group, the corneal astigmatism reduced significantly because of the incision, which may help to correct some of the preoperative astigmatism, but still need toric IOL to correct the major astigmatism. In both groups, the target residual astigmatisms were calculated by the online formula to reach the least and should not be different. The differences should be shown on optic functions, because that non steep-axis incision could induce irregular corneal surface and may do worse on optic functions.


Authors propose an analysis of clinical outcomes obtained after cataract surgery with toric IOLs, using two type of incisions, in steep axis and in non-steep axis.

Although there are similar publications in this role, this is a promising and interesting work but there are several points that must be clarified.

1. In 102 (page 6), authors indicate that "Online toric calculator (…) was utilized to calculate the IOL cylinder power, taking into account keratometry data, SAI and the position of the incision". Well, due to the importance in toric IOL calculation, is essential to clarify with keratometry was used (IOLMaster, SimK from topography, TCRP from Pentacam?) and how the SIA was previously calculated. SIA is dependent from surgeon, operated eye, patient's age and incision radii from central cornea and diameter of incision. Also is important to note that nowadays Alcon IOL Toric calculator includes the Barret Toric Calculator; Authors should indicate what IOL power calculation formula was used (SKR/T, Holladay II, Haigis..?), and if they use any posterior corneal adjustment as Barret or Abulafia adjustment formulas.

Response: We appreciate your suggestion very much. Pentacam was used to measure the corneal curvature and the total corneal curvature data was used in toric IOL calculation. Thus, posterior corneal adjustment was not needed in our study and SRK/T formula was used. We have made it clear in the revised manuscript (Revised manuscript Page 66 Line 99 and Line 103). We have only one surgeon in this study and his SIA was calculated from previous experiences by online calculator at http://sia-calculator.com. Prof. Lu was an experienced surgeon in cataract surgery and could make sure that the incision size and type are almost the same for each patient. We used
the average SIA calculated from his previous surgeries as theoretical SIA in toric IOL calculation.

2. In line 108 (page 6) authors indicate "The location of incision and axial position of OIL were marked on the cornea close to the limbus using a sterile marker pen". Is this the most accurate form to mark axis in a patient? What is the error range using this marking method? How was confirmed that the axis position of the lens was correct?

Response: Thanks a lot for your question. At the time we performed this study, this method was the most used method to mark axis in a patient.1.2.3 The axis position of the lens was confirmed to be correct when the markings of the toric IOL were aligned to the corneal markings. The error range using this marking method was from 1 to 5 degrees. Nowadays, many intraoperative navigation systems could be used in guidance of the axis position of the lens and may be more accurate.

Reference:


3. In line 128 (page 7), authors said that they assess the SIA measured after surgery. Does it vary from the previous SIA used in IOL toric power? If so, which was the mean and standard deviation? Is it clinically and statistically significant? In line 184 (page 10) the authors indicate that post-surgical SIA was 0.50 ± 0.21 D in steep axis, and 0.54 ± 0.25 D in non-steep axis, and indicate that there was a gap between axis orientation. This effect could be explained by a miscalculation of the toric IOL, due to a wrong SIA used?

Response: Thank you very much for your question. The mean difference between the actual SIA and theoretical SIA was -0.004 ± 0.21 D in steep-axis incision group and 0.04 ± 0.25 D in non-steep-axis incision group. In both groups, the actual SIA and theoretical SIA were not statistically significant (Paired t test, steep-axis incision group: P = 0.920; non steep-axis incision
group: P = 0.380). The difference between the two groups was also not significant (Student t test, P = 0.543). Thus, the SIA used in toric IOL power calculation should be suitable.

4. In line 176 (page 10), authors indicate that 43.3% of patients had some kind of corneal surface irregularity. How was this irregularity classified? There was used any topographic index?

Response: We appreciate your question very much. We use index of surface variance (ISV) from Pentacam to evaluate the irregularity of corneal astigmatism. ISV over 37 (showing in yellow color or red color) was defined as irregular corneal surface.

5. In results authors omit numeric data; Figures 1 could be eliminated and numerical data should be included in text.

Response: We are very grateful for your suggestion. We have revised it according to your suggestion (Revised manuscript: Page 10 Line 174 and Line 176).