Pupillometry After Implantation of Phakic Intraocular Lens

We have read with great interest the article by Totsuka et al.,[1] which assessed the pupil dynamics induced by light reflex after implantable collamer lens (ICL) implantation and concluded that ICL implantation had little influence on the postoperative function of the iris. We believe this prospective observational study was well designed, but we have the following concerns that we would like to discuss here.

First, pupil diameter and pupil motility are reported to have circadian variations. Because the measurements were taken between 10:00 AM and 2:00 PM in their study, we are concerned about the existence of variations among measurements taken in the morning (10:00 to 12:00 AM) and in the afternoon (12:00 to 2:00 PM).

Second, it is a relatively small sample size of 28 eyes (28 patients). Because an appropriate sample size is critical for statistical results, we are curious about whether a sample size calculation was performed before this prospective study.

Third, the authors assumed explanations of the different results from previous studies as a longer dark adaption time and different follow-up time-points. We suggest that the different methods of pupillometry measurement may also account for the different results. Red light (single-wavelength of 635 nm) stimulus applied in this study may result in different pupil reactions from white light (combined multi-wavelength light) stimulus; in addition, monocular vision pupillometry measurement was reported to lead to different results from binocular vision measurement.

Fourth, age has a great influence on pupil dynamics[2,3] and the patients' ages in this study ranged from 25 to 42 years; refractive error was also reported to influence pupil diameters[3,4] and preoperative refraction ranged from moderate myopia to very high myopia (-3.25 to -11.80 diopters). Detailed information of how the authors dealt with the influence of age and refractive error could not be determined from the article. The associations of the maximum constriction velocity and maximum dilation velocity with the amount of the ICL vault were investigated in this study. As mentioned above, maximum constriction velocity and maximum dilation velocity may be affected by age and refractive error; therefore, we wondered whether a multiple liner regression analysis accounting for age and refractive error was performed before choosing the Spearman's linear correlation analysis.

Finally, the constriction ratio ([baseline pupil diameter – minimum pupil diameter / baseline pupil diameter] × 100) and time required to recover 63% of the pupil diameter (T5) were measured in this study, whereas their correlations with ICL vault were not examined. It can be inferred from the definitions that these two parameters adjusted the baseline difference of pupil diameters, which means they may be affected much less by age or refractive errors. Therefore, we suggest that analyzing associations of constriction ratio and T5 with ICL vault are of certain clinical value.

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Reply

We thank Zhu et al. for their interest in our article.[1] First, as a result of examining the pupil diameter for 24 hours, we found that 10:00 AM and 2:00 PM showed the most stable circadian variations. It was measured at approximately the same time in accordance with the patient every time. Second, we considered that the sample size was statistically meaningful enough. Third, the pupillary dynamics were automatically recorded under red light (635 nm) stimulus of 1 second. Although we chose to use red light, we are also interested in the effects of white and blue light on pupillary dynamics. Fourth, we also consider that age has a great influence on pupillary dynamics. However, we evaluated the same person before and after surgery and we think that the influence of age does not have to be considered. The same applies to the refractive error.

REFERENCE

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