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Presbyopia after Keratectomy

Dear Editor:

It is with great interest that we read the recent article by Artola et al.¹ The authors found that the subjective accommodation of post-photorefractive keratectomy (PRK) patients was statistically significantly higher than that of the controls; both matched for age and gender. The average age of subjects in the study group was a year less than the controls (46.3 and 47.6), though not statistically different. In addition, the better uncorrected near vision was associated with reduced distance vision in the study group, suggesting residual myopia. The authors concluded that the delayed onset of presbyopia and improved uncorrected near acuity in post-PRK patients is because of the pseudoaccommodative effect resulting from an increase in the corneal spherical aberration and depth of field after PRK.

There have been suggestions in the literature that corneal aberrations after radial keratotomies could delay presbyopic symptoms by increasing the depth of field.²

Although it may be possible that corneal aberration could delay presbyopic symptoms, a more likely explanation for the delay in onset of presbyopic symptoms in myopes is the inherent larger amplitude of accommodation (AA) in myopes compared with hypermetropes or emmetropes. In a study on the AA and refractive errors in young subjects, McBrien and Millodot³ found that the AA in myopes is greater than that in emmetropes or hypermetropes. They found that in the 80 subjects studied the AA was highest in late-onset myopes, followed by early-onset myopes, emmetropes, and hypermetropes.

In our study⁴ of 316 patients in the peri-presbyopic age group (35–50 years) including 50 myopes, we found that the AA in myopes was statistically significantly higher than those in emmetropes and hypermetropes up to age 45. After that age, the AA seemed to converge to similar values in the 3 refractive groups. These studies show an inherent increase in AA in myopes compared with other refractive groups.

The post-PRK patients in the present study possibly had moderate to high myopia and a correspondingly high AA. This preserved accommodation could be the reason for delayed presbyopia. The residual myopia and slightly younger age of the study group would have further affected the findings.

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Author reply

Dear Editor:

We are grateful to Drs Abraham and Kuriakose for their interest, attention to detail, and time spent on commenting on our article, in which we reported that subjective accommodation was 1.1 diopters (D) greater after photorefractive keratectomy (PRK) compared with normals. However, we do not think McBrien and Millodot's report¹ is completely relevant with respect to our study because their work was based on a population with an average age less than half that of our subjects. The amplitude of accommodation may be greater in myopes younger than 20 years than in emmetropes. However, to suggest the same is true in much older subjects is not likely correct in the absence of sound evidence. In the article cited by the authors,² amplitude of accommodation measured using the push-up test was, on average, 0.18 D greater in myopes than in emmetropes (age range, 45–49). The 0.18-D difference may be statistically significant, but the clinical relevance of this difference is questionable when we consider that the standard deviation of the push-up test is some 4 times greater than this difference value.³ It is interesting to note that Fong⁴ reported on 1148 eyes and concluded that, after correcting for factors such as age and ethnicity, myopic eyes have lower, not greater, amplitude of accommodation values than those of emmetropes. Hence, the greater levels of accommodation detected in our myopes previously treated with PRK compared with matched normals must be due to other determinants, such as corneal multifocality, as opposed to factors associated with myopia development. Clearly, further studies are required to evaluate the key reasons for post-PRK subjects having greater levels of accommodation than normals. This is indeed a most exciting area for clinical research, as it might have an influence on the understanding of the method to correct presbyopia based on corneal excimer laser surgery.

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Toric IOL and Postkeratoplasty Astigmatism

Dear Editor:

I read with great interest the article by Tahzib et al regarding efficacy and safety of the Artisan toric intraocular lens

(IOL) for management of postkeratoplasty ametropia.¹ I believe there are some pitfalls in their article that should be addressed.

First, the authors should explain why they did not perform corneal relaxing incisions in the steep meridian with or without compressive sutures in the flat meridian as the first approach for management of postkeratoplasty astigmatism. In my practice, this is a very safe and fairly effective measure that can be done with topical anesthesia for decreasing postkeratoplasty astigmatism, especially in old patients or contact lens-intolerant cases. It can correct high amounts of astigmatism without any kind of injury to the endothelial cells. The residual ametropia could be corrected with glasses.

Second, they excluded patients with an endothelial cell count < 500 cells/mm². I think the corneal graft is almost already decompensated with this low endothelial cell density. The minimum acceptable number of endothelial cells for implantation of the Artisan IOL (Ophtec BV, Groningen, The Netherlands) in specular microscopy should be much higher than 500 cells/mm². I usually implant the Artisan IOL when this number is >2000 cells/mm².

Third, the mean preoperative and postoperative endothelial cell count and mean anterior chamber (AC) depth of the patients are not mentioned.

Fourth, the selected cases were in an old-age group (mean, 63.8 ± 17.0 years), and some of them had even metastatic carcinomas. The authors did not mention the type of anesthesia (general vs. local); general anesthesia is a high risk for older patients, and local anesthesia makes implantation of Artisan IOLs more difficult, with greater endothelial cell loss due to repeated shallowing of the AC during the operation for enclavation of the iris in IOL haptics, all making Artisan implantation an unsuitable choice for old patients with corneal grafts, especially with a borderline endothelial cell count.

Fifth, in the title, abstract's "Purpose," and introduction the authors claimed that the follow-up period was 3 years. However, the abstract's "Design" says the minimum follow-up is 1 year, and in "Main Outcome Measures," it is mentioned that a 4-year follow-up was performed. The range of follow-up should also be mentioned.

Last but not least, regarding ongoing endothelial cell loss from 6 months to 3 years postoperatively, as mentioned by the authors in the abstract's "Conclusion," and the other complications mentioned in the manuscript, they should explicitly conclude that, though the Artisan toric IOL is an effective intervention for decreasing postkeratoplasty astigmatism, it is not safe, and graft survival may be worse after Artisan IOL implantation. We need to think about safer procedures for this problem.

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Reference

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Author reply

Dear Editor:

We thank Dr Mohammadpour for addressing the safety of the Artisan toric intraocular lens (IOL) for management of postkeratoplasty ametropia.

Concerning corneal relaxing incisions as an option for treating postkeratoplasty astigmatism, mainly older studies described this technique as being simple, safe, and efficient. However, a few studies also mentioned poor predictability and risks of overcorrection and undercorrection.^{1,2}

Regarding the minimal acceptable endothelial cell density (ECD) for the implantation of the Artisan toric IOL for postkeratoplasty astigmatism, we considered 500 cells/mm² reasonable, because our patients were contact lens intolerant and treatment options such as LASIK and photorefractive keratectomy were not performed based on the magnitude of the refractive error, risk of flap-related complications, and poor predictability.^{3,4} We should bear in mind that for many patients no other treatment modalities existed except corneal re-grafting. Future re-grafting procedures can still be performed, because the Artisan lens is perfectly removable. Besides, if we limit ourselves to a preoperative ECD of 2000 cells/mm² for inclusion, postkeratoplasty astigmatism will not be amenable for Artisan lens corrections because the mean ECD at 1 year after penetrating keratoplasty is 1958 ± 718 cells/mm².⁵ Artisan phakic IOL implantation in normal virgin eyes, on the other hand, requires a higher ECD, of ≥ 2000 cells/mm².^{6,7}

Mean preoperative ECDs were 1212 ± 710 and 992 ± 581 cells/mm², 765 ± 432 cells/mm², and 747 ± 465 cells/mm² after 12, 24, and 36 months, respectively. The mean preoperative anterior chamber depth (ACD) was 4.39 ± 0.64 mm.

With regard to the diagnosis of metastatic disease, this naturally revealed itself only after the implantations. With respect to the choice of anesthesia, this differed on the preference of the patient. In the majority of cases, general anesthesia was chosen. No side effects were noted. We have not encountered problems with shallowing of the ACD while using good viscoelastics.

Because we believe that the cause of the ECD loss after Artisan IOL implantations is of great importance, we chose to include the initial 4-year data in "Results." However, because this group was so small, we considered it inappropriate to include this in the article's title.

In summary, we believe that a cautious use of Artisan toric IOL implantation is needed, and more patients with a longer follow-up (up to 5 years) are needed to identify risk factors for progressive endothelial cell loss.

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