Intracorneal Inlays

Yoo et al. published an interesting report on the outcomes of hydrogel inlays for presbyopia, including objective aberrometry data. In this study, the authors investigated the optical quality of the eye following the implantation of these devices using the OPD-Scan aberrometer (NIDEK Co. Ltd., Gamagori, Japan). They reported its changes following implantation of the Raindrop Near Vision Inlay (ReVision Optics, Lake Forest, CA), which is a 2-mm hydrogel inlay.

The first time in which aberrometry data were reported as an investigation on the optical quality outcomes of intracorneal inlays was by our group. On that occasion, we used a 6-mm inlay for the correction of hyperopia. According to our results, the centration of these optical devices creates a significant increase in the coma aberration of the eye in most cases, with changes in the spherical aberration as well. Part of the aim of intracorneal inlays for presbyopia is based on a calculated change in the spherical aberration of the cornea together with an increase in the central corneal power, to use such changes associated with the accommodative myosis to increase the depth of field when trying to read. In our study, the levels of induced coma and spherical aberrations were highly significant and indeed in many cases led to a significant degradation in the visual quality.

We were relatively surprised about the lower induction of coma aberration and indeed of spherical aberration caused by the implants that the authors use. Because there is a lack of knowledge and understanding from their study about the optical characteristics of the inlay device implanted, I would like to invite the authors to explain further about how this device was used, how its centration was calculated, and how they could induce such a small change in coma aberration because the main problem with these devices is centration.

Another issue is the resolution capability of the aberrometry technology the authors used to measure precisely the aberrometry changes at the 2-mm area and its repeatability.

REFERENCES


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The author has no financial or proprietary interest in the materials presented herein.

Reply

We thank Dr. Alió for his careful review of our article and for his interesting response. We also read with great interest his article entitled “Intracorneal Hydrogel Lenses and Corneal Aberrations” before beginning our study.

We had expected that coma and spherical aberration would be increased after implantation of a corneal inlay. However, the results presented in our article indicate that only the spherical aberration had been increased after a 2-mm corneal hydrogel inlay implantation.

If a 2-mm corneal inlay is well positioned in the center, it is intended to reshape the anterior curvature and to change the corneal aberration and corneal power. Based on these reshaping effects and using round, 2-mm hydrogel material, the induction of negative spherical aberration could be understood. We think that a small change in coma aberration might be due to the successful centration of the hydrogel inlay. However, if it is off center, a small inlay could affect the paracentral area (ie, the upside, downside, and lateral side). In this situation, an off-center corneal inlay could arouse a vertical or horizontal coma by reshaping the paracentral cornea.

The PermaVision Intracorneal Lens (Anamed, Lake Forest, CA) that Alió et al. investigated was 5 to 5.5 mm in diameter with a central thickness of 30 to 60 µm. A 5.5-mm diameter has a much greater impact on the reshaping paracentral cornea and could arouse a vertical and horizontal coma.

The OPD-Scan III (NIDEK Co. Ltd., Gamagori, Japan) has also been compared to other aberrometers and is repeatable for corneal aberrations. The resolution capability of the OPD scan aberrometer has been investigated in other studies. Measurements provided by the OPD scan have a successful repeatability and accuracy, based on the results of previous studies.

A relatively small, 2-mm corneal inlay that is well centered has minimal effects on the entire optical system. Moreover, central reshaping of the corneal curvature had minimal effects on coma aberrations.
REFERENCES


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doi:10.3928/1081597X-20151207-01