CASE REPORT

Use of a capsular tension ring to prevent early postoperative rotation of a toric intraocular lens in high axial myopia

Steven G. Safran, MD, PA

Two patients with high axial myopia, bilateral cataracts, and astigmatism had cataract surgery with implantation of a toric intraocular lens (IOL) without a capsular tension ring (CTR) in the first eye. Rotation of the IOL occurred shortly after surgery. In the second eye of both patients, a toric IOL of the same type and power and with a similar axial orientation as in the first eye was used; however, a CTR was placed at the time of surgery. In both cases, there was no IOL rotation in the second eye. Placement of a CTR at the time of cataract surgery in highly myopic eyes may help prevent postoperative rotation of a toric IOL.

Financial Disclosure: The author has no financial or proprietary interest in any material or method mentioned.

JCRS Online Case Reports 2015; ■:■–■

Placing a toric intraocular lens (IOL) on the steep corneal axis at the time of cataract surgery has become a popular and effective method for correcting coexisting visually significant astigmatism.[1] For the toric IOL to work effectively, it must resist rotation and maintain its position after placement on the correct axis during surgery. For every degree that a toric IOL is moved from its intended axis, it loses 3.3% of its astigmatism-correcting effect, with complete loss of effect occurring at 30 degrees off axis.[1] If the IOL rotates more than 30 degrees, it may cause an increase rather than a decrease in astigmatism. Previous studies note that rotation of toric IOLs in the early postoperative period may be more prone to occur in highly myopic eyes,[2,3] particularly when the IOL is placed on a vertical axis to correct with-the-rule (WTR) astigmatism.[3] In the following 2 cases, there was significant rotation of a toric IOL in the first eye early in the postoperative period and a decision was made to insert a CTR at the time of surgery in the second eye to reduce the risk for IOL rotation.

Submitted: January 6, 2015.
Final revision submitted: January 28, 2015.
Accepted: January 29, 2015.

From Capital Health System, Pennington, New Jersey, USA.

Corresponding author: Steven G. Safran, MD, PA, 132 Franklin Corner Road, Lawrenceville, New Jersey 08648, USA. E-mail: safran12@comcast.net.

CASE REPORTS

Case 1

A 48-year-old man with an axial length (AL) of 27.10 mm in the right eye and 2.37 diopters (D) of WTR corneal astigmatism had phacoemulsification with placement of an 11.0 D Acrysof SN60T5 IOL (Alcon Laboratories, Inc.) on the 95-degree steep meridian. The IOL showed greater than 20 degrees of rotation in the first week and was repositioned on day 14. It rotated again and was repositioned 23 days after the first repositioning. The IOL remained stable after the second repositioning (performed 37 days after the initial cataract surgery).

Three years later, the patient presented for cataract surgery in the left eye. The measurements in this eye were very similar to those in the first eye: AL of 26.93 mm and 2.37 D of corneal astigmatism. An 11.0 D Acrysof SN6AT6 IOL was placed on the 80-degree axis to treat WTR corneal astigmatism, and a CTR (Type 14C, Morcher GmbH) was placed in the capsular bag. The IOL did not rotate during 2 years of follow-up. The postoperative course was uneventful, and no further surgical interventions were required.

Case 2

A 75-year-old woman with an AL of 26.84 mm in the right eye and 26.92 mm in the left eye had phacoemulsification in the right eye first with placement of an 11.0 D IOL (ZCT400, Abbott Medical Optics, Inc.) on the 86-degree axis to correct 3.4 D of WTR corneal astigmatism. Correct placement of the IOL at the time of surgery was ascertained by reviewing a video of the surgery. All the ophthalmic viscosurgical device (OVD) was aggressively removed from behind the IOL prior to final positioning. On the first postoperative day, the IOL had rotated counterclockwise to the 160-degree axis; the uncorrected distance visual acuity (UDVA)

2214-1677/$ - see front matter
http://dx.doi.org/10.1016/j.jcro.2015.02.001

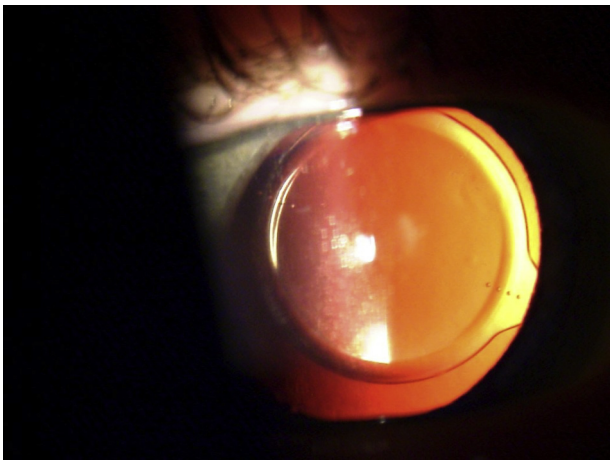

Figure 1. Case 2, right eye. On postoperative day 1, the IOL placed on the 86-degree axis has rotated counterclockwise to the 160-degree axis.

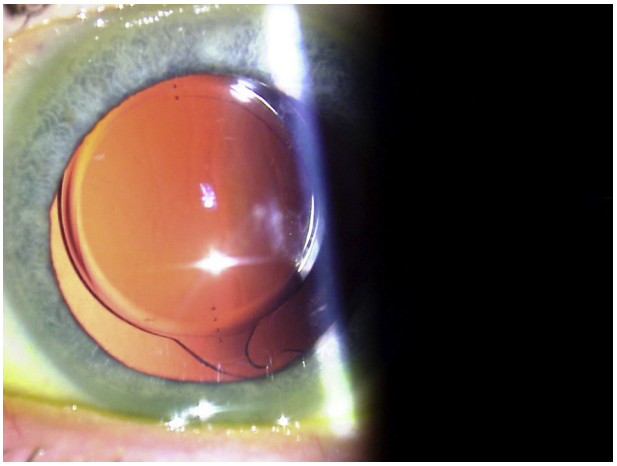

Figure 2. Case 2, left eye. On postoperative day 1, the IOL placed on the 92-degree axis along with a CTR remains where it was placed at the time of surgery.

was 20/200 (Figure 1). A decision was made to perform cataract surgery in the left eye before repositioning the IOL in the right eye as the patient was bothered by the severe anisometropia. There was a concern that repositioning the IOL in the right eye too soon could lead to a repeat rotation.

After uneventful phacoemulsification in the left eye, the CTR was injected into the capsular bag and an 11.0 D IOL (ZCT400) was placed on the 92-degree axis to address 3.9 D of WTR corneal astigmatism. An attempt was made to remove all OVD from behind the IOL before final positioning. On postoperative day 1, the UDVA was 20/25 and the IOL was on the correct 92-degree axis per the surgical plan (Figure 2). The surgical video was reviewed to compare the axis at the conclusion of surgery and the axis on postoperative day 1 at the slitlamp; no movement was apparent. The IOL did not rotate during the postoperative period and remains in position after 4 months of follow-up. The rotated IOL in the right eye has been repositioned with CTR placement and has been stable, with no recurrence of rotation after 2 months.

DISCUSSION

Rotation of toric IOLs may be more common in myopic eyes because these eyes tend to have larger capsular bag diameters.[4] Lower power IOLs used in myopic eyes also have a thinner optic profile and may occupy less volume in the capsular bag. The tendency for rotation to occur more frequently when the optic is placed at 90 degrees may be associated with a slightly oval rather than perfectly round capsular bag. Khng and Osher[5] report that the horizontal diameter of the human lens is slightly smaller than the vertical diameter (9.28 mm versus 9.30 mm) on average in cadaver eyes, but there is limited additional data on capsular bag shape and variability. It is clear that the ciliary sulcus is oval and larger in the vertical meridian than in the horizontal meridian,[6,7] and it seems logical to conclude that in a large eye in which rotation in the capsular bag may be more likely with eye movement, the IOL would tend to rotate away from the longest capsular bag diameter and stop moving at a narrower point. The rationale for using a CTR in such eyes is that the CTR might occupy space within the capsular bag equator and shorten the effective capsular bag diameter, providing a contact point for the haptics that is less wide than the actual capsular bag equator. There may be a frictional component at the contact point between the IOL haptic and the CTR. The CTR may also put the anterior and posterior capsule under greater tension, which could increase the contact area between the IOL and the lens capsule. Finally, the CTR could minimize the capsular bag "shape factor" by rounding out its oval shape and thus reducing the tendency for the IOL to rotate toward the narrowest diameter.

In both cases presented, a highly myopic patient had cataract surgery with placement of a toric IOL in both eyes. The patients experienced IOL rotation in the first eye in which no CTR was used. They subsequently had cataract surgery with simultaneous CTR placement in the second eye and experienced no IOL rotation. In both cases, the anatomy, IOL model and power, and astigmatic axis were virtually identical in the 2 eyes; the only clear difference was the use of the CTR. It appears likely that placement of the CTR at the time of cataract surgery inhibited the tendency toward rotation in the second eye in both patients. Larger studies are required to determine the validity of this approach and whether adding a CTR to primary cataract surgery in eyes with high axial myopia reduces the tendency toward rotation.

REFERENCES

1. Bauer NJC, de Vries NE, Webers CAB, Hendrikse F, Nuijts RMMA. Astigmatism management in cataract surgery with the AcrySof toric intraocular lens. J Cataract Refract Surg 2008; 34:1483–1488
2. Shah GD, Praveen MR, Vasavada AR, Vasavada VA, Rampal G, Shastry LR. Rotational stability of a toric intraocular lens: influence of axial length and alignment in the capsular bag. J Cataract Refract Surg 2012; 38:54–59
3. Miyake T, Kamiya K, Amano R, Iida Y, Tsunehiro S, Shimizu K. Long-term clinical outcomes of toric intraocular lens implantation in cataract cases with preexisting astigmatism. J Cataract Refract Surg 2014; 40:1654–1660
4. Vass C, Menapace R, Schmetterer K, Findl O, Rainer G, Steineck I. Prediction of pseudophakic capsular bag diameter based on biometric variables. J Cataract Refract Surg 1999; 25:1376–1381
5. Khng C, Osher RH. Evaluation of the relationship between corneal diameter and lens diameter. J Cataract Refract Surg 2008; 34:475–479
6. Oh J, Shin H-H, Kim J-H, Kim H-M, Song J-S. Direct measurement of the ciliary sulcus diameter by 35-megahertz ultrasound biomicroscopy. Ophthalmology 2007; 114:1685–1688
7. Blum M, Tetz MR, Faller U, Völcker HE. Age-related changes of the ciliary sulcus: implications for implanting sulcus-fixated lenses. J Cataract Refract Surg 1997; 23:91–96

First author:
Steven G. Safran, MD, PA

Capital Health System, Pennington, New Jersey, USA