CASE REPORT

Postoperative rotation of supplementary sulcus-supported toric intraocular lenses

Jay J. Meyer, MD, MPH, Bia Z. Kim, MB ChB, Mohammed Ziaei, MB ChB (Hons), FRCOphth, Charles N.J. McGhee, PhD, DSc, FRCOphth

We describe 7 cases in which supplementary sulcus-based toric intraocular lenses (IOLs) rotated postoperatively, requiring surgical realignment. The initial rotation was identified clinically between 3 months and 36 months postoperatively. All eyes had keratoconus, with and without prior keratoplasty, and 6 had longer than average axial lengths. No preceding trauma could be identified for 5 of the eyes. One eye had 3 episodes of postoperative IOL rotation, eventually requiring suture fixation to stabilize the IOL. This series indicates that postoperative rotation of a supplementary sulcus-based toric IOL may occur in eyes with or without preceding trauma. Eyes with keratoconus are at risk for postoperative rotation of the IOL, and suture fixation may be required to obtain stability.

J Cataract Refract Surg 2017; 43:285–288 © 2017 ASCRS and ESCRS

Sulcus-supported intraocular lenses (IOLs) have been used to treat a residual refractive error following implantation of an in-the-bag IOL.[1–4] We previously described using a supplementary sulcus-supported IOL to treat refractive error following keratoplasty.[5] In that series of 10 eyes, 8 received a supplementary toric IOL; the only case of IOL rotation within the sulcus occurred in an eye with keratoconus and prior keratoplasty.

In the current study, we describe in greater detail the case identified in our earlier study[5] and 6 additional cases of postoperative rotation of a supplementary sulcus-supported toric IOL in eyes with keratoconus with and without prior keratoplasty. The same IOL (Sulcoflex, model 653T, Rayner Intraocular Lenses, Ltd.) was implanted in the 7 cases.

CASE REPORTS

Case 1

A 73-year-old woman wished to improve the uncorrected distance visual acuity (UDVA) in her left eye, which had high myopia, keratoconus, mild open-angle glaucoma that was controlled on 1 agent, and pseudophakia with a 3-piece IOL. The UDVA was 20/80; improving to 20/40 with +1.50 +2.50 × 170. Preoperative scanning-slit corneal topography (Orbscan II, Bausch & Lomb, Inc.) confirmed orthogonal corneal astigmatism with other biometry measurements (Table 1).

A 1-piece acrylic supplementary sulcus-supported toric IOL (+2.0 diopter [D] sphere, +4.5 D cylinder) was implanted at 170 degrees. Eight months postoperatively, the UCDA in this eye, which had been 20/40, was 20/70 and the IOL had rotated to 40 degrees. The patient denied any history of trauma. The sulcus IOL was surgically realigned to 170 degrees, and the UDVA improved to 20/50. Six months after realignment, the patient had a severe fall with fractures to the face and the sulcus IOL axis rotated to 10 degrees. The IOL was realigned for a second time 19 months after the initial implantation. At the latest review (6 months after the second realignment and 25 months after implantation), the IOL was well aligned and the UDVA was 20/30.

Case 2

A 60-year-old man presented with residual astigmatism in his left eye following bilateral penetrating keratoplasty (PKP) for keratoconus and prior phacoemulsification and implantation of a 1-piece IOL. The left keratoplasty (sutures removed) improved the UDVA to 20/40 (blurry) and to 20/20 with −2.00 +3.00 × 80. This level of UDVA was inadequate to meet the patient's occupational needs as a physician, and he elected to have surgery after the risks had been extensively reviewed.

A supplementary sulcus-supported toric IOL (−2.5 D sphere, +4.5 D cylinder) was implanted at 80 degrees. One month postoperatively, the IOL was well aligned and the UDVA was 20/20. At 8 months, the patient had bilateral dacryocystorhinostomy and subsequently developed bilateral orbital cellulitis. At 11 months, following resolution of the cellulitis, the CDVA in the left eye had decreased to 20/200 and the sulcus IOL had rotated to 124 degrees. The IOL was realigned to 80 degrees; 1 month after the realignment, the CDVA was 20/20.

Three months after the realignment, the patient woke up with "blurred vision" and the IOL was seen to have rotated to 110 degrees. It was realigned for the second time, but 2 months later, the IOL had rotated to 105 degrees. There was no history of trauma or eye rubbing. After realignment to 80 degrees, the inferior leg of the sulcus IOL was sutured to the sclera with a 9-0 polypropylene (Prolene) suture. At the latest review (1 month after the third realignment and 20 months after implantation), the UDVA was 20/25.

Submitted: August 31, 2016 | Final revision submitted: November 27, 2016 | Accepted: December 1, 2016

From the Department of Ophthalmology, New Zealand National Eye Centre, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand.
Corresponding author: Jay J. Meyer, MD, MPH, Department of Ophthalmology, Private Bag 92019, University of Auckland, Auckland, New Zealand. E-mail: jay.meyer@auckland.ac.nz.

0886-3350/$ - see frontmatter
http://dx.doi.org/10.1016/j.jcrs.2016.12.014

Table 1. Characteristics of eyes that had postoperative rotation of a sulcus-based supplementary toric IOL.

Pt	Age (Y)	KCN	PKP	Primary IOL	AL (mm)	ACD* (mm)	WTW* (mm)	Misalignment (°)
1	73	Yes	No	Alcon MA60MA 0.0 D	24.26	4.13	11.7	50
2	60	Yes	Yes	Alcon SN60WF 14.5 D	25.77	4.04	12.1	44
3	59	Yes	No	Alcon MA60MA 0.0 D	28.33	4.20	11.9	25
4	55	Yes	No	Unknown	25.50	5.07	11.8	52
5	50	Yes	Yes	Rayner 623T 11.0 D	24.50	5.04	11.6	45
6	80	Yes	No	Alcon SA60AT 21.5	24.70	4.36	12.2	40
7	89	Yes	No	Unknown	23.32	4.31	11.6	45

ACD = anterior chamber depth (pseudophakic); AL = axial length; IOL = intraocular lens; KCN = keratoconus; PKP = penetrating keratoplasty; Pt = patient; WTW = white-to-white corneal diameter
*Measured by scanning-slit tomography

Case 3

A 59-year-old woman presented with contact lens intolerance in her right eye, which had astigmatism and a small apical scar as well as high myopia, keratoconus, and pseudophakia with a 3-piece IOL. The UDVA was 20/200, improving to 20/40 with −1.00 +6.00 × 122. Topography showed orthogonal corneal astigmatism of 6.8 @ 119.

A supplementary sulcus-supported toric IOL (+0.0 D sphere, +6.0 D cylinder) was implanted at 120 degrees. One month postoperatively, the IOL was well aligned and the UDVA was 20/60. The patient reported a slow decline in acuity between 3 months and 4 months postoperatively, and the IOL had rotated to 145 degrees with no obvious causal event. The IOL was realigned, and the UDVA was 20/25 at 17 months after realignment.

Case 4

A 55-year-old man presented with keratoconus, bilateral monofocal IOLs (unknown model and power), severe ocular allergies, and contact lens intolerance.

A supplementary sulcus-supported toric IOL (−7.0 D sphere, +6.0 D cylinder) was implanted in the right eye at 166 degrees. Eighteen months postoperatively, the IOL was aligned and the UDVA was 20/25. A similar IOL model (−8.5 D sphere, +6.0 D cylinder) was implanted in the sulcus of the left eye at 18 degrees, and the UDVA improved from 20/400 to 20/70. Four months postoperatively, the left IOL had rotated to 70 degrees and the UDVA was 20/160. The patient denied trauma to his eyes. He is awaiting realignment of the IOL.

Case 5

A 50-year-old man presented with keratoconus, prior PKP and compression sutures (since removed because of breakage), anisometropia, and pseudophakia in his left eye. With +2.50 −9.00 × 15, the CDVA was 20/25.

A supplementary sulcus-supported toric IOL (−5.0 D sphere, +6.0 D cylinder) was implanted at 105 degrees. During surgery, a small dehiscence of the graft–host junction developed, which required placement of 2 interrupted sutures for closure. Three months postoperatively, following removal of the 2 sutures, the IOL had rotated to 150 degrees. The IOL was surgically rotated to 105 degrees; with plano −3.00 × 8, the CDVA was 20/25 and stable 1 year later.

Case 6

An 80-year-old man presented with a history of keratoconus, trachoma, and pseudophakia in the right eye. The UDVA was 20/80, improving to 20/30 with −0.50 −3.50 × 175.

A supplementary sulcus-supported toric IOL (−4.5 D sphere, +4.0 D cylinder) was implanted at 85 degrees, which improved the UDVA to 20/40. A manifest refraction of plano −1.25 × 10 improved it to 20/30.

Three years postoperatively, the patient returned complaining of fluctuating visual acuity. The UDVA was 20/80, improving to 20/50 with +1.00 −3.25 × 180. Examination revealed a poor ocular surface secondary to meibomian gland dysfunction, and the sulcus-supported IOL had rotated to 45 degrees. The patient denied any ocular trauma and is awaiting realignment of the IOL following optimization of the ocular surface.

Case 7

An 89-year-old man presented with keratoconus/pellucid marginal degeneration, allergic conjunctivitis, and bilateral monofocal IOLs. In the right eye, the UDVA was 20/160, improving to 20/40 with +3.00 −8.50 × 60.

A supplementary sulcus-supported toric IOL (−4.5D sphere, +6.0 D cylinder) was implanted at 155 degrees with intentional undercorrection of the astigmatism. One month postoperatively, the UDVA was 20/60. At 3 months, the IOL had rotated to 20 degrees and the UDVA was 20/400. The patient denied any trauma but reported the change in visual acuity had occurred during a recent chest infection with significant coughing. The IOL was subsequently realigned with scleral suture fixation.

DISCUSSION

We report a series of 7 patients with significant postoperative rotation of a secondary ciliary-sulcus-supported toric IOL. It is well established that alignment of a toric IOL is a key factor in the correction of ocular aberrations[6] and that rotational stability is critical in maintaining long-term postoperative refractive correction.[7] The Sulcoflex 653T supplementary toric IOL was designed for sulcus placement to reduce pseudophakic refractive error. The spherical and cylindrical power of each IOL and recommended placement axis were calculated using the IOL manufacturer's web-based software (Raytrace[A]). The IOL has a 6.5 mm optic and an overall length of 14.0 mm, with an undulating configuration of the outer haptic edges to reduce the risk for rotation (Figures 1 and 2). A previous study reported excellent rotational stability of this IOL, with a mean axis rotation of 3.0 degrees ± 2.45 (SD) after 6 months of follow-up.[2] However, significant postoperative rotation of the toric IOL is a