Toric IOLs

BY MALAIKA DAVID, ASSOCIATE EDITOR

Welcome to the final part of our series on premium IOL technologies. Once again, I caution you that, because these lenses are entering the market at a rapid pace, the peer-reviewed literature lags behind current trends.

This edition of "Peer Review" focuses on toric IOL technologies. These lenses first entered the US market in 1998, when STAAR Surgical Company (Monrovia, CA) introduced its plate-haptic toric IOL. The IOL's debut preceded the industry-wide paradigm shift toward physicians being allowed to charge for uncovered benefits at the time of cataract surgery, and thus it was slow to gain acceptance. The first AcrySof Toric IOLs from Alcon Laboratories, Inc. (Fort Worth, TX), were introduced to the US market in 2005. The early Alcon technology did not yield the same quality of vision as its replacement, the AcrySof IQ Toric IOL, and was also slow to gain acceptance in the US market. Currently, the AcrySof IQ Toric IOL is available in three toric powers (T3, T4, and T5), which can correct up to 2.50 D of corneal astigmatism. Additional powers (T6, T7, T8) are available internationally, which expand astigmatic correction to 4.00 D. Not mentioned in this review, but also available internationally, are the Acri.Lisa Toric and Acri.Lisa Multifocal Toric IOLs (Carl Zeiss Meditec, Inc., Dublin, CA) as well as the Rayner T-flex IOL (Rayner Intraocular Lenses Ltd., Hove, East Sussex, United Kingdom).

Having implanted many toric IOLs over the past 10 years, I must note that accurate identification preoperatively and marking of the axis of astigmatism at the time of surgery are critical to success. As with multifocal IOLs, the corneal surface must be free of dry eye symptoms, and patients should discontinue wearing contact lenses prior to the measurement of astigmatism, power, and axis. Implanting a toric IOL greater than 10º away from its intended axis will result in a loss of more than 50% of its intended astigmatic power. Care must be taken preoperatively to mark the cardinal 3- to 9-o'clock positions while the patient is seated upright, followed by marking of the steep axis. Intraoperatively, the surgeon removes all viscoelastic from behind the IOL to prevent its postoperative rotation, which could require a return to the OR for repositioning.

I hope you enjoy this installment of "Peer Review," and I encourage you to seek out and review the articles in their entirety at your convenience.

—Mitchell C. Shultz, MD, Section Editor

TORIC IOLs VERSUS SPHERICAL IOLs

Lane et al analyzed 62 patients with cataract and corneal astigmatism who previously underwent implantation of either the AcrySof Toric IOL or the spherical AcrySof IOL and opted to receive the same IOL in their fellow eye at a later date. Eighty eyes (40 patients) received the toric IOL, and 44 eyes (22 patients) received the spherical IOL. A 6-month postoperative follow-up of the second implantation revealed that the toric IOL group achieved a significantly greater degree of spectacle independence for distance vision and did not require prescription glasses for near or distance vision ($P = .0190$). Additionally, the toric IOL group had significantly less refractive cylinder ($P < .0001$) and better binocular distance UCVA ($P = .0014$) than the spherical IOL group.[1]

In a comparative, retrospective study of patients with low amounts of corneal astigmatism, subjects received the AcrySof SA60 spherical IOL or the AcrySof Toric SN60T3 IOL. Twenty-four eyes (12 patients) were implanted with the toric IOL, and 20 eyes (10 patients) received the SA60 spherical IOL. By 1 month postoperatively, the mean magnitude of the postoperative astigmatic power vector was not significantly smaller in the toric group, with a difference of 0.271 D ($P = 0.00$). The mean UCVA was significantly better in the toric group (approximately 20/20) compared with the spherical group (approximately 20/40) ($P = 0.01$).[2]

Investigators concluded that, in patients with low degrees of astigmatism, the AcrySof Toric IOL provides significant improvement in postoperative astigmatism and UCVA when compared to its spherical counterpart.[2]

REDUCING ASTIGMATISM

Reducing preexisting astigmatism in patients with cataract may further improve their visual acuity after cataract surgery.[3]

Investigators at the Donostia Hospital in San

Sebastián, Spain, performed a comparative, prospective study of the effect of opposite clear corneal incisions (OCCI) versus toric IOL implantation for the correction of preoperative astigmatism greater than 1.00 D after small-incision clear corneal phacoemulsification. Twenty eyes (20 patients) in the toric IOL group received the AcrySof Toric IOL (SN60T3, SN60T4, or SN60T5 model, depending on their level of astigmatism). In the OCCI group, 20 eyes (20 patients) underwent the implantation of a foldable, spherical AcrySof SN60AT IOL paired with 2.75-mm/3.20-mm OCCIs in the steep axis. By 3 months postoperatively, 95% of eyes in the toric IOL group achieved a mean UCVA of 20/40 or better, and 70% achieved a mean UCVA of 20/25 or better. In the OCCI group, 80% of eyes achieved a mean UCVA of 20/40 or better, and 50% of eyes achieved a mean UCVA of 20/25 or better. All eyes in both groups achieved a mean BCVA of 20/25.[3]

In an observational clinical study, Dardzhikova et al shared their early experience with the AcrySof Toric IOL for the correction of astigmatism in cataract surgery. Between April and September 2007, investigators implanted the IOL in 111 eyes, including those of 41 patients who received the lens bilaterally. Preoperatively, the mean refractive cylinder was -1.25 D. By 6 months postoperatively, the mean refractive cylinder was -0.32 D, and 93.7% of eyes had less than 1.00 D of cylinder. By 6 months postoperatively, the IOL remained within 10º of the planned axis in 95.5% of eyes. Two eyes (one patient) required repositioning of the lens 2 weeks after surgery due to its significant rotation off axis.[4]

Park et al evaluated postoperative astigmatism and rotational and footplate stability of the STAAR Toric IOL. Thirty eyes of 20 patients received the STAAR Toric IOL to correct myopic astigmatism. Preoperatively, the patients' mean refractive astigmatism was 2.43 ±1.24 D. By 7.6 months postoperatively, the mean refractive astigmatism decreased to 0.73 ±0.47 D. The follow-up visit also revealed that 73.3% of the IOLs were 5º or less from the intended axis, 90% were 10º or less, and 100% were 11º or less. Furthermore, "the footplates of all toric implantable collamer lenses were in situ in the ciliary sulcus except for one case in which one of the four footplates was located below the ciliary sulcus." No statistically significant rotation of the IOL or displacement of the footplate was detected postoperatively.[5]

Two patients (four eyes) with keratoconus underwent in-the-bag toric IOL implantation to correct myopia and irregular astigmatism. In the first case, a 55-year-old male with forme fruste keratoconus, a preoperative uncorrected distance visual acuity of 20/800, and a refraction of -6.50 -3.00 X 135 received the AcrySof Toric SN60TT IOL. In the second case, a 46-year-old male with a claw-shaped topographic pattern, a family history of keratoconus, an uncorrected distance visual acuity of 20/800, and a refraction of -5.00 -3.00 X 85 also received the AcrySof Toric SN60TT IOL. By 1 year postoperatively, the mean uncorrected distance visual acuity in both cases was 20/25. The first patient had a refraction of -0.25 X 140, and the second patient had a refraction of -0.25 -0.50 X 60. The investigators concluded that toric IOLs can provide excellent outcomes in carefully selected cases of nonprogressive keratoconus.[6]

ROTATIONAL STABILITY

In a prospective, single-surgeon study, Chang analyzed the early rotational stability of the AcrySof SN60T Toric IOL in 100 eyes (50 patients) and compared the results against a previous retrospective consecutive study of 90 eyes (45 patients) who received the STAAR AA4203TF Toric IOL. Both IOLs were implanted by the same surgeon using identical surgical techniques and study methods. Patients were examined on the first postoperative day and at an additional visit that occurred between 3 and 6 weeks postoperatively.

Ninety percent of the AcrySof Toric IOLs were within 5º of the target axis compared to 73% of the STAAR Toric IOLs. Ninety-nine percent of the AcrySof Toric IOLs were within 10º of the target axis compared to 91% of the STAAR Toric IOLs. The mean rotational misalignment was 3.35 ±3.41 in the AcrySof Toric IOL group compared to 5.56 ±8.49 in the STAAR Toric IOL group ($P = .01$). One AcrySof Toric IOL was 15º or more off axis compared with eight STAAR Toric IOLs. None of the AcrySof SN60T Toric IOLs were repositioned, whereas three of the STAAR Toric IOLs required repositioning. The investigator noted that the AcrySof Toric IOL has better rotational stability than the STAAR Toric IOL.[7]

In a follow-up report to the previously mentioned prospective, single-surgeon study of the AcrySof Toric IOL, Chang reported that, by the end of 2008, he had implanted 263 AcrySof Toric IOLs and that three of them (1.1%) had rotated more than 15º off axis, requiring surgical repositioning. The investigator noted that the expanded study represented a more accurate repositioning rate for the AcrySof Toric IOL. Minor blunt trauma was a factor in one out of the three eyes. The study concluded that postoperative rotation is more likely to occur in large myopic eyes with large-diameter capsular bags, and partial shrinkage of the capsular bag following the original surgery may have been a factor in the stability of the three IOLs. One day and 1 month after surgical repositioning, each of the three IOLs remained properly oriented.[8]

In a retrospective, interventional case series, Jampaulo et al evaluated whether STAAR Toric IOLs rotate more than 2 weeks after implantation, including after Nd:YAG laser posterior capsulotomy. One hundred and fifteen eyes (72 patients) were implanted with STAAR Toric IOL models AA4203TF and AA4203TL. The IOL axis was documented with slit-lamp retroillumination photographs for 25 eyes (19 patients). "Before" photographs were taken at a 2-week postoperative visit. Patients underwent Nd:YAG laser capsulotomy between 5 and 52 months after the IOL's implantation, and "after" photographs were taken 2 weeks after Nd:YAG laser capsulotomy was performed. The "after" photographs revealed a mean absolute difference of 1.36º, and none of the axes changed by more than 5º. Investigators concluded that neither a significant amount of postoperative time nor Nd:YAG laser posterior capsulotomy changed the axis orientation of either of the STAAR Toric IOL models.[9]

A prospective, nonrandomized, observational study assessed visual and refractive outcomes and rotational stability in patients who underwent the implantation of the AcrySof Toric IOL during refractive lens exchange surgery. Thirty-two eyes (19 patients) with more than 1.00 D of preexisting corneal astigmatism were implanted with the AcrySof Toric IOL. By 6 months postoperatively, all eyes had a mean UCVA of 20/32 or better, 84.3% of eyes had a mean UCVA of 20/25 or better, and 100% of eyes had a mean BCVA of 20/25 or better. Mean axial rotation was 0.90 ±1.76º, and mean refractive cylinder was significantly reduced from -2.46 ±0.99 D to -0.53 ±0.30 D ($P < .001$). Investigators concluded that the AcrySof Toric IOL does not rotate significantly. Patients' satisfaction averaged nine on a scale of one to 10, and 5% of patients wore glasses part time to view distant objects.[10]

In a prospective study, Hashem et al assessed axial alignment and stability of the Visian TICL (STAAR Surgical Company) in 35 eyes (19 patients) for the treatment of myopic astigmatism. By 3 months postoperatively, the mean refractive cylinder improved from 2.80 ±1.45 D preoperatively to 0.63 ±0.75 D, and the mean manifest refraction spherical equivalent improved from -7.61 ±4.02 D to -0.14 ±0.38 D. The mean absolute value of the measured axial alignment from 1 day to 1 month was 2.90 ±2.11º. By 3 months postoperatively, 96.8% of eyes had 8º or less of axial misalignment, and 90.3% exhibited 5º or less of axial misalignment. Investigators concluded that the Visian TICL showed minimal axial misalignment after implantation and remained stable through 3 months postoperatively.[11] ■

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