

Correcting Residual Astigmatism After the Implantation of a Toric IOL

Tips for determining whether to rotate the IOL or perform laser vision correction.

BY JOHN BERDAHL, MD

Toric IOLs improve visual outcomes after cataract surgery by reducing patients' dependence on spectacles as well as decreasing high levels of astigmatism. These lenses have been used with great success in patients with regular astigmatism, and they have been reported to improve visual quality in patients with mild to moderate amounts of irregular astigmatism as well.¹ The two toric IOLs that are currently available in the United States are the AcrySof IQ Toric IOL (Alcon Laboratories, Inc.) and the STAAR Toric IOL (STAAR Surgical Company).

Although toric lenses are highly reliable, unanticipated residual astigmatism is occasionally present after their implantation. Residual astigmatism can be caused by incorrect placement of the IOL, incorrect marking of the cornea, inaccurate preoperative measurements, unanticipated surgically induced astigmatism, posterior corneal curvature, or rotation of the IOL itself. There are four primary options for correcting residual astigmatism: spectacles or contact lenses, laser vision correction, corneal relaxing incisions, and rotation of the IOL.

DETERMINING A COURSE OF ACTION

To determine which option is best after implantation of a toric IOL, the surgeon begins by calculating the patient's spherical equivalent. If the spherical equivalent is not near plano or the targeted refraction, then either an IOL exchange or laser vision correction must be performed. Rotating a toric IOL may reduce the residual astigmatism, but it will not change the spherical equivalent. Corneal relaxing incisions also will not change the spherical equivalent.

If the spherical equivalent is near the targeted refraction, the next step is to determine the cause of the residual astigmatism. If the toric lens is properly aligned with

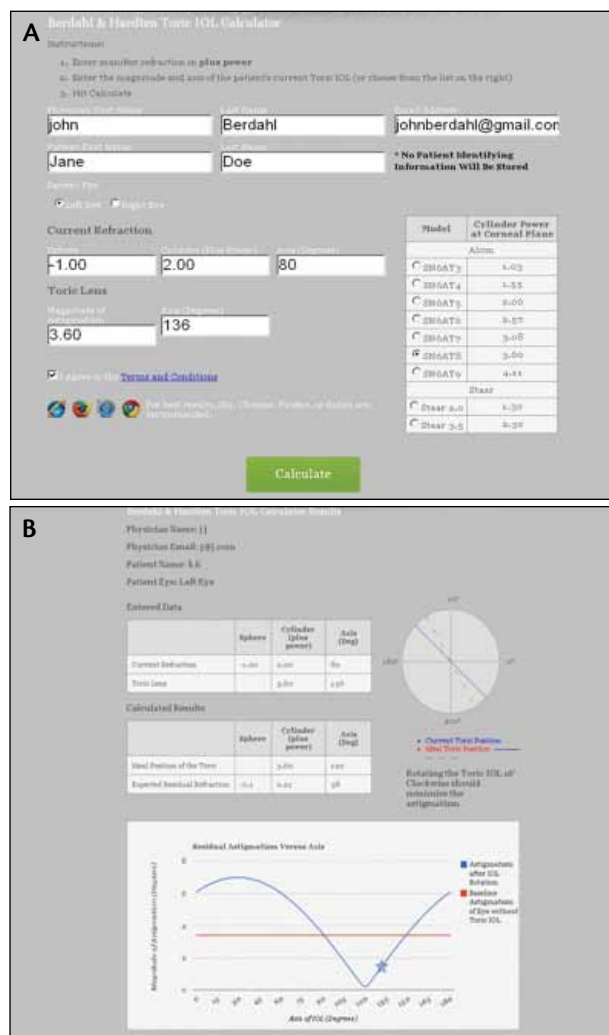


Figure 1. A screenshot of the calculation information page (A) and the result page (B) on www.astigmatismfix.com.

the axis of astigmatism present in the manifest refraction, then rotating the IOL will not reduce the residual astigmatism. It is important to note that the axis of the toric IOL is being compared with the patient's manifest refraction, not with the patient's corneal topography, because posterior corneal curvature may affect the residual astigmatism. If the manifest refraction is on a different axis than the toric IOL, the surgeon can perform a calculation to determine if rotating the IOL will reduce the astigmatism. David Hardten, MD, and I created the Toric Results Analyzer, a free online tool to help surgeons determine if a previously placed toric IOL is ideally aligned. This tool is available at www.astigmatismfix.com (Figure 1).

ROTATION OF THE IOL

In the early postoperative period (up to 3 months), I prefer to rotate a toric IOL if doing so can reduce the residual astigmatism to less than 0.50 D per the recommendations of the Toric Results Analyzer. I determine the axis of the IOL with two methods. First, I use the OPD-Scan III (Nidek Inc.) to determine the axis of the lenticular astigmatism (Figure 2). Second, I adjust the angulation of the slit beam at the slit lamp to estimate the position of the three dots present on the toric IOL inside the eye. Next, I compare this to the manifest refraction and then determine the expected refraction after the toric IOL is rotated. If rotation is warranted, I return to the operating theater and, under topical anesthesia, reopen the paracentesis and try to avoid the main corneal incision to avoid surgically inducing astigmatism.

Preoperatively, I mark the current position of the toric IOL and remeasure the amount of angulation I would like to change. For example, if the toric IOL is currently aligned at 150° and I want to rotate the lens to 140°, I mark where the IOL currently is and then mark 10° counterclockwise for the new ideal position. It is much easier to mark the position relative to where the toric IOL currently is placed as opposed to rotating it exactly to 140° and have to take into account effects such as cyclotorsion. If the anterior capsule is fused to the IOL, a viscoelastic cannula can typically be placed adjacent to a haptic, and viscoelastic can be instilled to free the anterior capsule. Then, viscoelastic can be placed underneath the IOL to free it from the posterior capsule, and it can be rotated fairly easily. The STAAR Toric IOL can usually be rotated in either direction, whereas the AcrySof IQ Toric IOL usually needs to be rotated clockwise. After the lens is properly positioned, I remove the remaining viscoelastic and tap the lens with the I/A port to

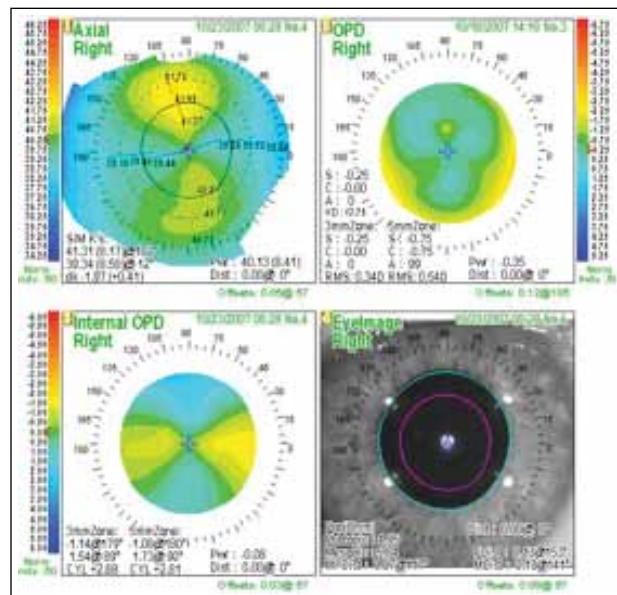


Figure 2. An OPD-Scan III shows corneal astigmatism (upper left) balanced by lenticular astigmatism in the toric IOL (bottom left).

create contact between the posterior capsule and the posterior surface of the IOL.

In patients with demonstrable late rotation of the IOL or in high myopes, I consider placing a capsular tension ring to minimize the chance of repeated rotation.

LASER VISION CORRECTION

If the patient has astigmatism that cannot be corrected by rotating the IOL, I perform either LASIK or PRK to eliminate the residual astigmatism. Laser vision correction is also my preferred choice if the spherical equivalent is not near the intended target. I favor PRK for patients who have anterior clear corneal incisions that could interfere with the LASIK flap or patients who have a significant anterior basement membrane dystrophy.

Before performing any surgery, it is imperative that the tear film be optimized. Blepharitis should be mitigated, and aqueous tear deficiency should be improved pharmacologically, with punctal plugs, or with a combination of both. My colleagues and I have seen numerous cases of residual astigmatism that improved dramatically with artificial tear therapy.

CORNEAL RELAXING INCISIONS

Corneal relaxing incisions are not my preferred method for eliminating residual astigmatism after the implantation of a toric IOL, although they can be performed if the spherical equivalent is near the targeted

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refraction and if the residual astigmatism is minimal. I typically do not manually create corneal relaxing incisions because of their variability and the lack of an effective nomogram to treat a combination of lenticular and corneal astigmatism, which would be present in the setting of a toric IOL.

FINAL THOUGHTS

If a toric lens is misaligned by just 10°, 30% of its effective power is lost. If a toric lens is misaligned by 30°, 100% of its effective power is lost. Loss of astigmatic correction is especially important for high-powered toric IOLs such as the AcrySof Toric IOLs models T7 through T9, which correct up to 4.00 D at the corneal plane. An AcrySof Toric T9 IOL that is off by just 10° will leave 1.30 D of residual astigmatism. Small rotational misalignments can cause large amounts of residual astigmatism. ■

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1. Sauder G, Jonas B. Treatment of keratoconus by toric foldable intraocular lenses. *Eur J Ophthalmol*. 2003;13(60):577-579.

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What is your preferred method for correcting astigmatism after the implantation of a toric IOL?

- ☐ Spectacles or contact lenses
- ☐ Laser vision correction
- ☐ Corneal relaxing incisions
- ☐ Rotation of the IOL