# Calculating the Acrysof Toric IOL's Power

Online software facilitates precise surgical planning for each patient.

BY WARREN E. HILL, MD

Limbal relaxing incisions are easy to create, but they generally are not a precise method for correcting astigmatism. Additionally, it is well known that first-generation, plate-haptic toric IOLs are challenged by poor rotational stability and a limited power range. The recently approved Acrysof Toric IOL (Alcon Laboratories, Inc., Fort Worth, TX) is designed to address these concerns.

Based on the familiar SN60AT single-piece acrylic platform (Alcon Laboratories, Inc.), the Acrysof Toric lens offers excellent rotational stability and a precise power range. Currently, the IOL is available in powers of +1.25D (SN60T3), +2.25D (SN60T4), and +3.00D (SN60T5). A small power step of +0.75D (+0.50D at the corneal plane) between each model improves the accuracy of correction. Moreover, the Acrysof Toric IOL Calculator, available online at http://www.acrysoftoriccalculator.com, improves surgeons' ability to predict the required cylindrical power and the true axis of postoperative corneal astigmatism. Success with this toric lens can be broken into a few areas.

## CALCULATIONS

The main criteria for an Acrysof Toric IOL are the patient's desire for spectacle independence at distance and the presence of less than +2.50D of corneal astigmatism by keratometry. Surgeons should begin by calculating the spherical equivalent IOL power normally with the same optimized lens constant as for the SN60AT model. The spherical equivalent powers currently available range from +16.00 to +25.00D. After determining the desired IOL power, surgeons can use the Acrysof Toric IOL Calculator.

Unlike the other programs available, the Acrysof Toric IOL Calculator compensates for surgically induced astigmatism. Surgeons can also customize important variables to accommodate their preferences and their patients' needs for optimized outcomes. The Acrysof Toric IOL Calculator requires only a few easy data-input variables (Figure 1). First, surgeons enter basic information such as their name, the patient's name, and the operative eye. Second, they input data from manual keratometry (the flat and steep K reading in diopters and the meridian) and biometric results (IOL spherical power as determined by the surgeons' preferred formula). Finally, surgeons enter the estimated surgically induced cylinder and the location of the cataract surgery incision.

Next, the calculator uses the input information to identify the model of Acrysof Toric IOL and spherical equivalent power that is best for each patient. In addition, it determines the optimal axis placement of the lens within the capsular bag. Vector analysis compensates for surgically induced astigmatism in the calculation of IOL power and optimal axis location (Figure 2).

A vector is any measurement that has both magnitude and direction. For example, +2.00D of corneal astigmatism at an axis of 135° is a vector quantity. Many surgeons do not consider the potential of clear corneal cataract incisions to induce astigmatism. The vector of the corneal

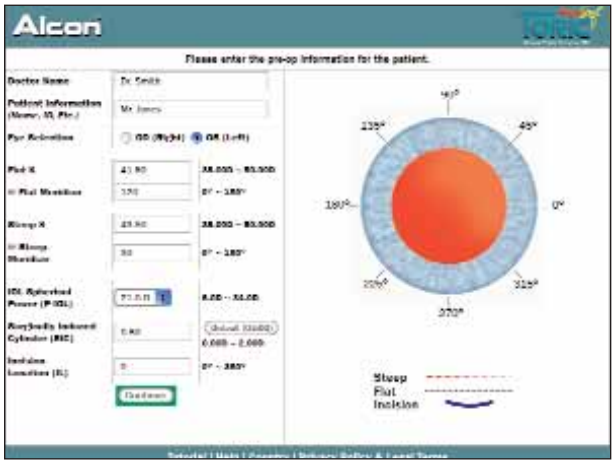


**Figure 1. The Acrysof Toric IOL Calculator's input screen lets surgeons enter customized variables.**

wound (depending on the incision's location, size, and architecture) invariably changes the vector of the preoperative corneal astigmatism.

If a surgeon selects the amount of toric IOL power and axis placement based on preoperative keratometry, the postoperative result may be an astigmatic angular error, even in the absence of IOL rotation. Ophthalmologists who have implanted first-generation toric IOLs are all too familiar with the differences that can occur between the predicted and postoperative magnitude of astigmatism and its corresponding axis.

Because corneal astigmatism and astigmatism induced by corneal wounds can be considered vectors, they may be added together. Just as pilots may need to change power and direction to compensate for the wind, surgeons may also need to calculate a new toric IOL power and axis to compensate for wound-induced astigmatic changes.

For example, an eye with a low degree of astigmatism (approximately +1.25D) can be corrected by a toric IOL with the steep axis at 135°. Making a single- or multi-planed temporal clear corneal incision at 180° induces about 0.50D of steepening at 90°. Although this change may not appear significant, ignoring the subsequent shift in axis will produce an angular error of approximately 0.50D at the corneal plane and 0.75D at the plane of the capsular bag. These differences mean the toric power of the IOL will be off by 0.75D.

Similarly, one might consider the results of making a scleral tunnel incision at 90° to correct +2.00D of corneal astigmatism with a toric IOL and placing the steep axis at 135°. Such an incision typically induces 0.75D of steepening at 180°. Ignoring the shift in axis induced by the incision would produce a residual angular error of approximately 0.75D at the corneal plane and approximately 1.00D at the plane of the capsular bag. This type of outcome may no longer be sufficiently precise to meet cataract patients' expectations.

## CLINICAL DATA

In the phase 3 FDA study of 500 eyes, patients who received Acrysof Toric IOLs of powers determined by the Acrysof Toric IOL Calculator were three times more likely to achieve less than 0.50D of residual postoperative astigmatism than patients in the control group. The mean absolute residual refractive cylinder for all Acrysof Toric IOL patients was 0.55D compared with 1.22D for control patients. These results confirmed the value of adding vector analysis as a further refinement to toric IOL power.

## FINAL THOUGHTS

Surgeons may now use the Acrysof Toric IOL with companion vector-analysis software to further optimize refractive accuracy. This approach requires careful preoperative manual keratometry and an awareness of the amount of astigmatism induced by typical corneal incisions. The new Alcon Acrysof Toric IOL will be the first lens for which such a strategy is employed.

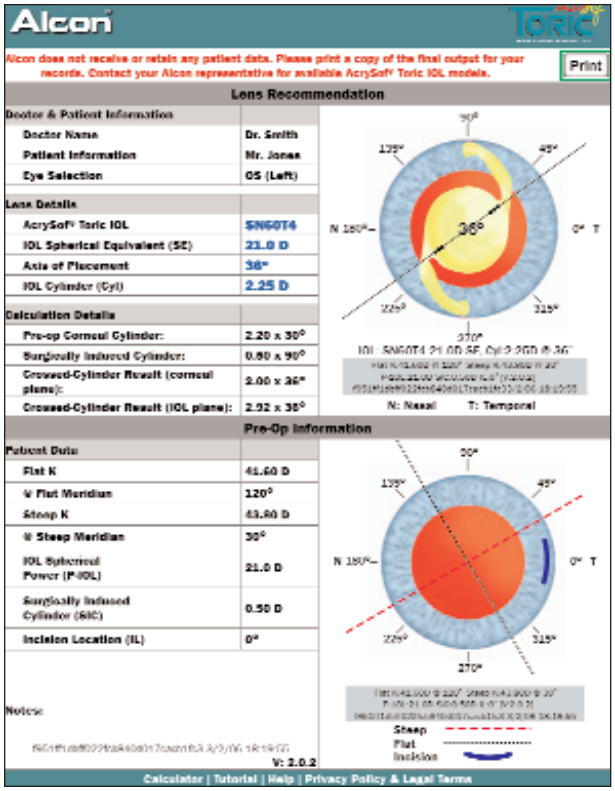


**Figure 2. The output screen of the Acrysof Toric IOL Calculator displays all relevant information and is easily printed for reference in the OR.**

Now that patients are beginning to expect spectacle independence after cataract surgery, ophthalmologists' ability to eliminate rather than simply reduce astigmatism is more attractive than ever. Depending on the location of the corneal incision in relation to the steep axis of corneal astigmatism, the Acrysof Toric IOL does an excellent job for patients with moderate levels of astigmatism. It may also be useful for patients with severe astigmatism when combined with other procedures, including limbal relaxing incisions. Alcon Laboratories, Inc., plans to produce the lens in greater cylindrical powers in the future. ■

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