

i-ASSORT Provides Astigmatic Analyses Using Topography

Surgeons can compare vector magnitudes and axes separately when planning astigmatic changes.

BY NOEL ALPINS, FRCOPTH

I developed the Alpins method of astigmatic analysis to assist surgeons with providing more effective astigmatic treatments. Because these techniques involve complex mathematics, a computer system is required. The Alpins Statistical System for Ophthalmic Refractive Surgery Techniques (ASSORT) is a total ophthalmic surgical analysis system that integrates and analyzes all measurable ophthalmic parameters, including visual acuities and personalized A-constants. A major feature of the ASSORT system is its use in astigmatic surgery planning and analysis. By using the software's reporting capabilities, surgical techniques can be compared in different groups of patients, and pre- and post-operative events can be documented and the changes quantified.

ASSORT provides an innovative way of analyzing vectors for changes in astigmatism. The Alpins method of astigmatic analysis is displayed numerically and graphically in a clear format.

i-ASSORT FOR TOPOGRAPHY

The newly introduced i-ASSORT program performs astigmatic analyses using the measured corneal topography provided by the diagnostic instrument into which the software has been installed. On combined topography/wavefront aberrometry systems, refractive analysis is also available. The i-ASSORT will import the required parameters—ie, simulated keratometry (sim K) readings from topography and second-order astigmatic values from aberrometry—and display analyses comparing pre- and postoperative maps. Using these data, the surgeon can determine success and refine his or her surgical nomograms.

Differences between refractive and corneal values are quantified by the program. Significant differences can be a red flag for a possibly adverse visual outcome. The program also calculates topographic disparity—a dioptric measure of corneal irregularity—as well as visual indication of the success of the astigmatic treatment using familiar symbols of ticks and crosses (Figure 1). Additionally, graphic analyses display the calculated parameters using double-angle and polar-vector diagrams (Figure 2).

The i-ASSORT software is available for use as third-party software with topographers such as the Pentacam Comprehensive Eye Scanner (Oculus, Inc., Lynnwood, WA) the Keratron Scout (Optikon 2000 Industrie, Rome, Italy), the CSO corneal topographer (Costruzione Strumenti Oftalmici, Florence, Italy), the Magellan (Nidek, Gamagori, Japan), and the Medmont Studio (Medmont International Pty Ltd, Vermont, Australia). Currently, the software is interfaced with these six topography systems, and it should work with several more as we complete the interfaces.



Figure 1. The i-ASSORT entry screen displaying the ocular residual astigmatism, sim K imported from topography, and basic analyses of corneal astigmatism.

ADVANTAGES AND USES

Surgeons who use a topographer should find the i-ASSORT useful. Comparing pre- and postoperative magnitudes (sim K) of astigmatism is not enough information for an effective surgical self-evaluation. With the i-ASSORT software, topographers can quantify the change after any corneal surgical procedure.

Surgeons can obtain a display and printout of information before surgery that provides indicators regarding the patient's risk for having a less-than-satisfactory astigmatic outcome. Astigmatism emanates from the cornea, and spectacles are used to correct for it. In the real world, however, astigmatic correction in the spectacles does not always match the magnitude or orientation of the astigmatic error in the cornea. When a patient's examination reveals a difference between refraction and corneal

topographic values, that patient's eye cannot be treated according to the spectacle refraction alone and also have a spherical cornea after treatment. In this case, there will be remaining astigmatism, which will increase as the difference between the spectacles and the corneal astigmatism increases—in magnitude, axis, or both.

Ocular residual astigmatism is a vectorial value calculated by the i-ASSORT to quantify the differences in magnitude and axis together for corneal and refractive astigmatism. If this value is greater than 1.00 D, as happens in approximately 25% of eyes, it raises a red flag. The surgeon can advise these patients that, because of limitations or imperfections in the optical systems of their eyes, they cannot be corrected completely for astigmatism and there will be some left over, as quantified by the ocular residual astigmatism.

Surgeons can now know the ocular residual astigmatism and the irregularity quantified by topographic disparity before a refractive procedure. He or she also has a consistent gauge of irregularity that can be used universally among devices to give the benefit of standardized topographic irregularity assessments.

The software system is installed onto the topographer and appears in the user interface. The surgeon chooses what information to export. The technician enters the amount of astigmatism the procedure is attempting to reduce and what meridian is being flattened; the analysis is performed using the treatment data. The technician

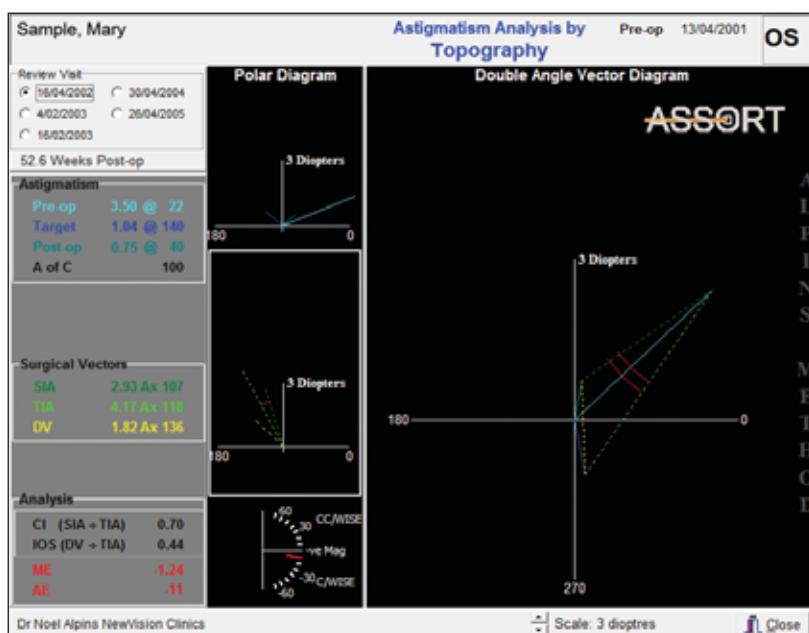


Figure 2. The i-ASSORT graphical analysis screen displays the derivation of the surgical vector's target-induced astigmatism, surgical induced astigmatism, and difference vector.

can enter the spectacle refraction and record the treatment while the sim K readings are imported.

Surgeons have asked for simple software systems to interface with topographers, and I believe the i-ASSORT offers this. Surgeons also have the ability to perform sophisticated analyses with the technology if they desire by using the more advanced functions available with the program.

CONCLUSION

The i-ASSORT program provides a useful way for surgeons to use corneal topographic data to assess eyes for surgery preoperatively. Additionally, astigmatic outcomes can be appraised and nomograms can be optimized by comparing values from postoperative and preoperative maps. For surgeons requiring a total outcomes analysis program, the i-ASSORT software offers numerical and graphical displays for all parameters measurable on the eye. ■

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