

## Software Program Refines Astigmatism Outcomes

A vector-analysis software program developed by Australian ophthalmologist Dr. Noel Alpíns to determine outcomes for laser-based astigmatism surgery is attracting the attention of vendors and physicians alike who are interested in a refractive-surgery planning and analysis tool that can be tailored to each patient and procedure. Originally developed in 1993, the Alpíns Statistical System for Ophthalmic Refractive Techniques (ASSORT) is in its fourth version and is being marketed through Alpíns' company, Assort Pty. Ltd. (Melbourne, Australia).

As more and more people undergo refractive surgery to correct nearsightedness of farsightedness, astigmatism—an asymmetry in the shape of the cornea—is moving steadily to the forefront of eyecare. About 70% of people who wear glasses require astigmatism correction, and increasing numbers are opting to throw away their glasses in favor of laser refractive surgery and other visioncorrection procedures. More than 300,000 Americans underwent laser eye surgery last year, at an average cost of \$2000 per eye, and industry sources predict a growing worldwide market.

When Alpíns first introduced his vector-analysis program, most ophthalmologists planning a refractive procedure considered only a patient's refraction—the amount of correction needed to view the standard eye chart—without regard for corneal shape. More recently, the pendulum has swung too far in the other direction, according to Alpíns; with the increasing sophistication of corneal topography, some eye surgeons now rely completely on corneal shape to guide them, disregarding the refractive astigmatism correction altogether.

Alpíns—who holds a number of US and international patents relating to astigmatism analysis—feels neither approach is entirely correct. His methodology thus considers the entire region between refraction and topography by optimizing the two pre-operative values. This enables optimization of astigmatic results in order to make improvements.

"Vector analysis uses trigonometry to develop a road map for the surgical plan," he explains. "It is the gold standard navigation system for laser surgery in astigmatism."

Alpíns claims that ASSORT is the only software program that addresses planning for regular and irregular astigmatism. The program offers an interactive approach Alpíns calls "designer cornea"; prior to surgery the surgeon proposes a desired shape, and the software then calculates the necessary treatment parameters. Alpíns uses

ASSORT on a laptop computer installed on top of an excimer laser in his operating suite. In this way he and his staff can calculate the optimal laser setting for each eye and then manually enter the settings into the laser. The laser is set at 193 nm with a frequency of 6–10 or 36–46 Hz, depending on whether a broad-beam or scanning approach is used during surgery.

Following a procedure, ASSORT numerically and graphically displays comprehensive analysis vectors for changes in astigmatism to enable meaningful comparison of multiple surgeries. The software evaluates the errors and success of surgery and suggests the necessary adjustments to improve results. After entering postoperative data, the surgeon can immediately see the effect of a procedure on the correction and change in astigmatism, based on refraction, topography, and keratometry analysis.

### Outcomes Analysis Tool

But ASSORT is more than just an astigmatic analysis program, Alpíns adds. It is also an outcomes analysis and management program that can determine visual results, glaucoma cataracts, and virtually any parameter that is measurable on the eye. It can analyze the refraction and corneal shape, define objectives for surgery, and determine the best balance between the topographical and refractive analysis. It also adjusts for spherical error, over- or undercorrection (based on the previous 60 patients), and astigmatic undercorrection.

In addition, ASSORT's querying features provide an vehicle for measuring and demonstrating surgical performance, comparing techniques, and identifying trends. Surgeons can query calculated values on ASSORT, along with the surgery and exam information. Multiple selection screens allow a variety of options for defining the patient population in a query, allowing a more balanced and comparable presentation of the data. ASSORT also displays the visual acuity groups as a colored bar graph, and a patient group-analysis function compiles a list of patients whose surgeries match the selection criteria.

ASSORT is in discussions with several manufacturers of refractive lasers and corneal topography systems to include the ASSORT program in their equipment. Ultimately Alpíns believes his software could be programmed into a variety of ophthalmic devices for surgical planning and management and outcomes analysis following astigmatic and other refractive surgeries

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