

Adjusting astigmatism magnitude to improve PRK results

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MELBOURNE—Correcting astigmatism with myopia using the excimer laser may require modifications in the procedure to get the best results, according to Noel A. Alpíns, MD.

Alpíns and coworkers Hugh Taylor, MD, and the members of the Excimer Laser Group at Melbourne University, conducted a study on how adjusting astigmatism magnitude can improve excimer laser surgery. They found that the VisX Excimer Laser System they were using was undercorrecting astigmatism by 17%.



Noel A. Alpíns

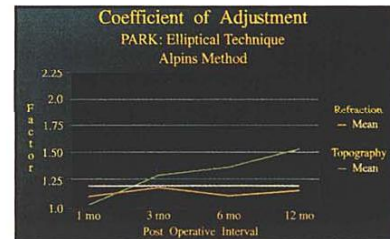
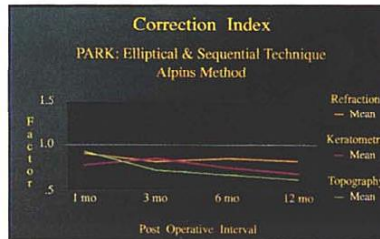
After using the machine for more than a year, Alpíns determined that results with more than 200 eyes were not what they should be. By evaluating the data, separating the astigmatism results from the spherical change of myopia and then by doing a vector analysis of the astigmatism, he was able to determine that not as much correction was being achieved as had been targeted.

The surgically induced astigmatism (SIA) fell short of the targeted induced astigmatism (TIA), he said. Alpíns has developed a technique for targeting induced astigmatism, which evolved into the outcomes analysis system called Alpíns Statistical System for Ophthalmic Refractive-surgery Techniques (ASSORT).

To compensate for the undercorrection, in April 1993 Alpíns and the Melbourne Group made an adjustment, using the VisX laser, by a factor of 1.2 to the magnitude of the targeted change in astigmatism and began providing new patients with an additional 20% of treatment. The elliptical shape for the astigmatism treatment was achieved by concurrently opening the parallel blades that mask the UV laser beam and progressively closing the round diaphragm, Alpíns said.

As the parallel blades are drawn apart, extending to a maximum of 6 mm, the diaphragm closes to a diameter of 4.5 mm. This allows the maximum astigmatic correction for the treatment to be equal to the existing spherical myopic correction, according to Alpíns. The cycle is completed by the progressive closure of the round diaphragm.

Results for the new group of 380 eyes, treated with the 20% adjustment, were promising. Alpíns broke the analysis into three groups—those with spherical myopia ranging from 0 to 5 D, those with 5 to 10 D and those with 10 to 15 D of myopia at the corneal plane.



The first two groups performed equally with patients achieving a 50% improvement in astigmatism, according to Alpíns. This was a 10% improvement over results achieved prior to making the adjustment for the undercorrection.

In patients with more than 10 D of myopia, the patient's astigmatism results were disappointing, because examined as a group, they were not significantly better off after surgery than before, Alpíns said. There had been large reductions in spherical myopia.

"Our success rate is not as good as we would wish it to be because there are so many changes happening on the cornea when you treat that amount of spherical myopia that the astigmatism changes become a lot less controllable," he said.

While the 50% success rate achieved with lower myopes also leaves room for improvement, this is not the result of a problem in correcting the astigmatism magnitude. "The TIA is much closer to being achieved," said Alpíns. "We are only getting a 50% success rate in our patients who are between 0 and 10 D because the orientation of the treatment (the placement) may not be accurately applied. There are difficulties in identifying the steepest axis of the cornea at the time of surgery," he said.

The angle of error, which is the angle between the TIA and the SIA, is quite erratic, according to Alpíns. "This can be due to either the application of the treatment, eye rotation or most importantly, healing factors within the patient," he said.

"The next step in the improvement of our astigmatism surgery is being able to align our treatment more accurately and paying attention to healing factors in the patient that make these results look less successful in the orientation of the treatment," Alpíns said.

In correcting the magnitude of the astigmatism, surgeons must remember every machine is unique—even two machines of the same type, Alpíns said.

Surgeons should perform their own analysis before making any changes. "Surgeons have to start treating the patients according to the manufacturer's specification. After they do a certain number of patients, they can do a vector analysis and determine how the machine is behaving and make the necessary adjustment," Alpíns said. ■