# PRK more accurate when astigmatism isn't also a factor

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MELBOURNE, AUSTRALIA—A new method of astigmatism analysis that uses both corneal and refractive data has shown that PRK to treat myopic astigmatism with the VISX 20/20 excimer laser is not as successful as PRK to treat spherical myopia.

Using the method designed by Noel Alpins, FRACO, FRCOphth, FACS, authors of a study reported one of the early causes for this shortfall in treatment was that the programmed astigmatism treatment in the laser undercorrected astigmatism by 20%.

"This trend, when first detected in February 1993, initiated the adjustment in the VISX algorithm to 1.20 of astigmatism magnitude shortly after," said Dr. Alpins, medical director of NewVision Clinics and a member of the Melbourne Excimer Laser Group at the University of Melbourne Department of Ophthalmology in Melbourne, Australia.

In this study, 79 patients (97 eyes) with an average age of 44.4 years underwent PRK to treat myopia and astigmatism and were followed for 1 year. Patients were included in the study if they had a preoperative refractive error of –1 to –18.5 D.

The results were reported in 1998 in the *Journal of Refractive Surgery.*

All patients also underwent preoperative and postoperative examinations that included refraction, keratometry, and topography measurements.

The version 2.7 software was used in the study and either the sequential or elliptical method was used to treat the myopic astigmatism. Using the former method, myopia and astigmatism were treated in two phases. In the latter, they were treated in one smooth elliptical ablation.

The method of analysis devised by Dr. Alpins was used to evaluate the changes in astigmatism after treatment.

Dr. Alpins' method was published in the July 1993 issue of the *Journal of Cataract and Refractive Surgery* and has been recently recommended as an advanced method of astigmatism analysis. The ASSORT outcomes analysis software was used for vector analysis of the astigmatism data.

The preoperative refractive errors of the patients ranged from –1 to –15 D at the corneal plane. The mean preoperative refractive astigmatism at the spectacle plane was –2.17 ± 1.05 D (range, –1.25 to –6 D).

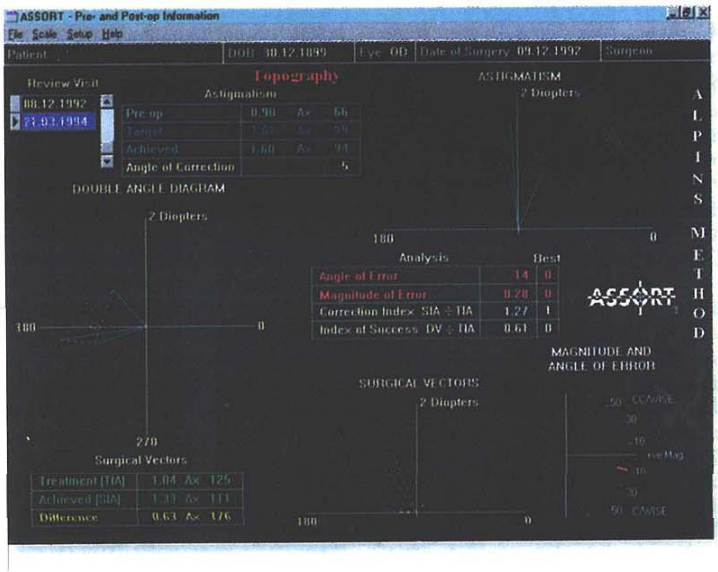
The authors reported that "the success in treatment of astigmatism appeared measurably less than the treatment of sphere when analogous indices were used for assessment."

The outcomes of the astigmatism surgery improved, they explained, when an additional 20% of correction was applied to the astigmatism treatment magnitude indicated by the VISX computer algorithm.

When the sequential and elliptical methods of treatment were compared, the sequential method undercorrected astigmatism more often and provided more accurate corrective spherical corrections.

However, "equivalent success rates were present in view of the greater astigmatic changes attempted using the sequential mode," the authors reported.

When the authors compared the geometric means of patients at 12 months, they found that a 74% correction was achieved by the elliptical method, while a 89% spherical correction occurred in those treated by the sequential mode. The elliptical mode tended to produce a greater undercorrection of associated sphere ($p = 0.313$) when examining the spherical success index.




**ASSORT outcome analysis software is used for vector analysis of the astigmatism data. This is used to plan surgery and evaluate the results afterward.**

The method devised by Dr. Alpins also showed that astigmatic changes measured by refraction showed a larger change than those measured by topography and keratometry. He suggested that the presence of "noise" in the topography and keratometry measurements may affect the measurements, "but at least these tools reduce the human element in the measurement process and will no doubt be improved over time."

There is significant potential for inaccuracy in the measurement of postoperative refractive astigmatism values when large spherical changes have occurred. There may have been little attention paid to the measurement of any remaining refractive astigmatism.

The results of astigmatism treatment when measured by the objective corneal values of keratometry and topography are less flattering than those examined by the subjective values of refractive astigmatism.

The authors concluded, "Astigmatism analysis using objective corneal astigmatism values as well as subjective examination enables refractive surgeons to assess results and determine the most appropriate means to improve the outcome of treatment. Just as there are differences in preoperative values of corneal shape and refraction, one would expect there to be differing values after the surgery. These valuable data available before and after the surgery should not be disregarded, neither in the planning nor the analysis of the astigmatism surgery.

"The performance of this task using both simple and vector analysis provides additional information on trends that are not otherwise readily apparent. The inclusion of objective astigmatism measures of corneal shape—such as topography or keratometry values—provides additional information both in surgical planning and the examination of the results of astigmatism surgery.

"The inclusion of these parameters with that of refractive astigmatism enables a comprehensive analysis of astigmatism treatments. We will be able to reduce the scatter of results and narrow the bell curves and further refine nomograms and achieve better results when astigmatism correction is addressed in refractive surgery," they concluded.

Dr. Alpins has a proprietary interest in the method of astigmatism analysis and the ASSORT outcomes analysis software.