Improving surgery by analysis

by Noel Alpins, FRACO
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(This article is based on a presentation by Dr. Alpins at the Aspen Advanced Anterior Segment Symposium, Aspen, Colo.)

A program that allows surgeons to compare results retrospectively after changing an element of technique brings a measure of objectivity to surgical improvement.

How can ophthalmic surgeons be sure that their surgical results are improving based solely on patient feedback and single samples of readings obtained on postoperative visits—so-called "seat-of-the-pants" ophthalmology?

Many times I have heard colleagues say, "My patients are happy, but degrees of happiness are hard to gauge. We have all experienced widely differing degrees of satisfaction in patients with the same visual result.

To be serious about improving our surgery, we require more objective methods of analyzing results. As we have all found on occasion, changing an element of technique doesn't always achieve an improvement in results. Sometimes we may be disappointed by an undesired outcome.

Ophthalmic surgery is a specialty in which almost every parameter of success can be measured numerically—astigmatism, ocular tensions and visual acuity, to name just a few. For example, the elimination or minimization of astigmatism provides us with happy patients, if our biometry achieves close to emmetropia. To satisfy this objective, our cataract surgery incisions should either be astigmatically neutral, or preferably reduce or eliminate preexisting astigmatism, which in some circumstances may require additional tangential keratotomy incisions.

But how does the practising ophthalmologist keep a handle on the incision and suturing technique currently in use and compare it to previous techniques, when one has to contend with so many variables, including magnitudes of preoperative and postoperative astigmatism, each with its own axis? There is limited time available in any busy practitioner's daily schedule.

Vector analysis is required to achieve a meaningful interpretation of any astigmatism data. The Jaffe formula is the standard for precisely analyzing induced astigmatism of *individual* incisions for magnitude and direction. Averaging these magnitudes for a series of incisions is the measure of mean *total* induced astigmatism.

The Jaffe method of vector analysis does not address the relative with the-rule or against-the-rule change induced by an incision, nor how closely the incision achieves a nearspherical corneal shape. These are two vital surgical questions that need to be asked when analyzing any incision closure technique. To answer them, all astigmatism results require conversion to their polar values.

Utilizing the concept of the moving vector, the Naeser vector-analysis formula for polar values is the closest to the Jaffe formula. This can be shown graphically by comparing the curves generated by the formulae currently available. We need more than a pen, paper and calculator to determine surgical trends and calculate complex formulae. The appropriate software performs an instant calculation of each data entry. On completion of all data entries, a comparative and statistical analysis together with generation of reports can be achieved within minutes.

The reporting abilities of the Alpins Statistical System for Ophthalmic Refractive-surgery Techniques (ASSORT) extends to all surgical parameters, such as refraction, visual acuity and personalized A-constant. The facility is also provided for recording and reporting on preop and postop conditions, as well as intraoperative and postop complications. Operation of the program is relatively simple and can be performed by a staff member familiar with ophthalmic terminology.

This information enables the surgeon to objectively assess his or her technique, and determine the success of any changes made to it. This knowledge can be confidently shared with colleagues informally or as a scientific presentation with the vector and statistical analysis demanded for peer-reviewed publication.

Applications of this software will be explored in future articles. For more information on this system contact the author.

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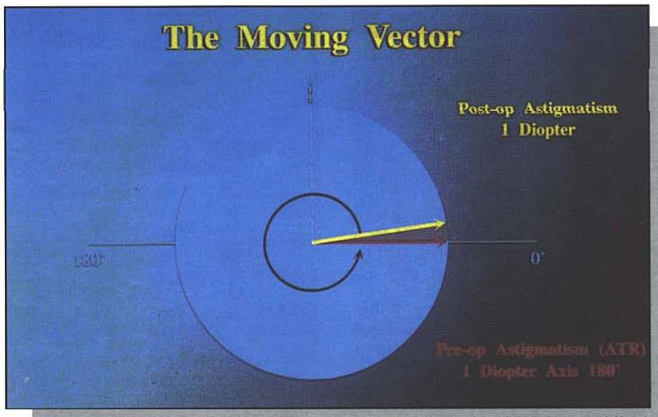
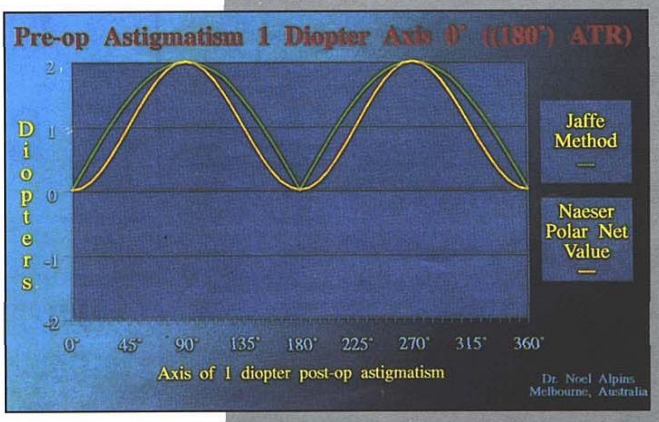
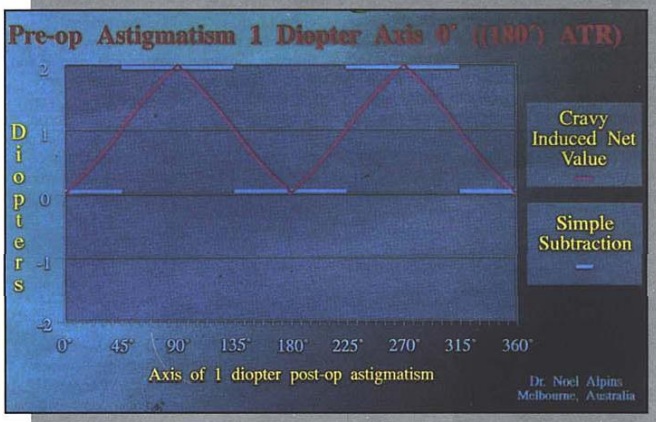
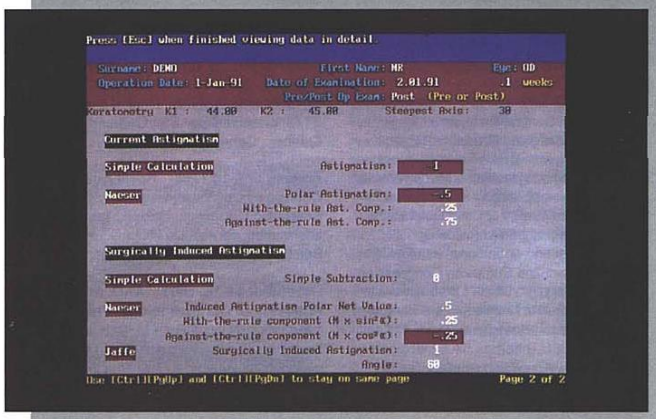


Postop astigmatism *is same degree as preop, but the axis has shifted.*



Left, below- *Induced astigmatism calculated by various methods.*





Screen display *of ASSORT program shows calculation of postop astigmatism.*