

# Mixing vector, wavefront values improves outcomes

Combining vector planning with refractive values reduces astigmatism, high-order aberrations.

by Ryan DuBosar

CORRESPONDENT

Incorporating corneal shape into a refractive surgery treatment plan, rather than treating via wavefront values alone, provides improved postoperative outcomes, according to a surgeon in Melbourne, Australia.



Noel A. Alpines

"A refractive treatment alone doesn't address the underlying topography that's actually going to change. And it leaves an excess amount of astigmatism actually remaining on the cornea," said Noel A. Alpines, MD.

To achieve the best potential vision and leave a minimum of astigmatism on the cornea, Dr. Alpines applies vector planning in his preoperative regimen. Vector planning improves the corneal astigmatism outcome by reducing astigmatism of the second-order aberrations, as well as reducing coma and trefoil of the third order.

"Attaining this maximum visual potential depends upon leaving the minimum amount of corneal astigmatism and fewer second-order aberrations, and also potentially reducing with advanced technology the amount of corneal irregularity that can be achieved in a more sophisticated treatment plan," he said.

## Super-vision targeted

When a surgeon applies a symmetrical ablative treatment using corneal plane refractive values alone, as derived from the wavefront analysis, then the best that can be done often is to leave significant remaining astigmatism, Dr. Alpines said.

Naturally, the preference would be to leave no astigmatism remaining on the cornea and no astigmatism remaining in the spherocylindrical postop refraction, Dr. Alpines reported at the American Society of Cataract and Refractive Surgery meeting. However, differences between the preop wavefront spherocylindrical and corneal values render this goal unattainable. This remnant is what Dr. Alpines calls the ocular residual astigmatism (ORA).

The astigmatism can be viewed as being asymmetrical and nonorthogonal, Dr. Alpines said. The same process can be used to view halves of the cornea, instead of the cornea as a whole. This allows the surgeon to calculate correction of asymmetry, or nonorthogonality.

The ASSORT (Alpines Statistical System for Ophthalmic Refractive Surgery Techniques) software program provides a calculation to derive a corneal plane refraction that can be used in the preop planning analysis. The simulated keratometry values can also be displayed to determine the corneal astigmatism preop values that have been quantified against the corneal plane refractive values.

Using the corneal and refractive data boxes of the ASSORT program, the surgeon can calculate the effect of correcting astigmatism using a simple vectorial calculation.

"The vision for the future is to be able to deal with not only the minimization of the corneal astigmatism, but to regularize that minimized irregularity that remains," Dr. Alpines said. "In this way we're going to be able to attain the maximum visual potential of the eye, or super-vision, as it is sometimes called."

## Sliding emphasis

Dr. Alpines told OCULAR SURGERY NEWS that treatment does not have to be based entirely on refractive analysis. Some emphasis can be given to topographical values in the treatment plan. The ASSORT program allows surgeons to adjust the emphasis of refractive ablations along a percentage ratio between refractive and topographic emphasis.

A treatment could use zero percent topography and 100% refractive correction, or 50% topography and 50% refraction, or 100% topography and zero percent refraction, or any other combination between these extremes, he said.

Although the emphasis changes between topography and refraction, each ratio achieves a maximum treatment that leaves a minimum possible amount of ORA.

Using an optimization program that favors with-the-rule astigmatism, the planning is not likely to cause an increase in refractive astigmatism achieved in refractive astigmatism achieved postop, as measured in the postop manifest wavefront, while at the same time reducing corneal astigmatism, thus gaining "something for nothing."

"Consequently, the second-order aberration, or spherocylindrical, and the third-order aberration, or coma and trefoil, are likely to be reduced by the lesser amount of corneal astigmatism remaining, with the additional benefit of reduced overall astigmatism," he said.

Dr. Alpines concluded that vector planning for customized treatment effectively addresses the corneal shape as it exists preoperatively, and also reduces

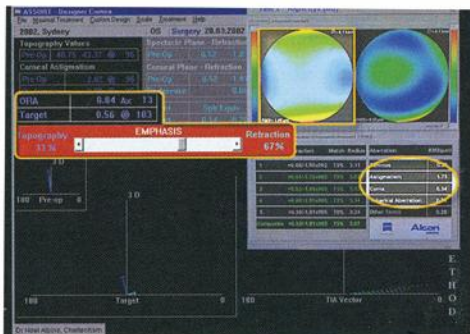
overall corneal astigmatism and coma.

"In this way, we can link wavefront and corneal shape values in a customized preoperative treatment plan to achieve what is likely to be an ideal laser treatment."



## For Your Information:

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