Software computes accurate astigmatic correction nomograms for LASIK, PRK

By performing six sequential tasks outlined by the ASSORT computer system, refractive surgeons can enhance their outcomes.

CHELTENHAM, Australia – A computer program enhances the accuracy of refractive surgery and results in less postoperative astigmatism, whether the surgeon is performing laser in situ keratomileusis (LASIK) or photorefractive keratectomy (PRK), according to **Noel Alpins, MD**. "By separately treating and analyzing our adjustable effects, we can adjust our treatment nomograms to achieve accurate results," stated Dr. Alpins, who is the medical director of New Vision Clinics and also is affiliated with the Melbourne Excimer Laser Group, of Melbourne University.

Six tasks for proper settings

The software, Alpins Statistical System for Ophthalmic Refractive Surgery Techniques (ASSORT), guides the surgeon through a series of six tasks that result in the proper laser settings. Those tasks are as follows:

1. Convert the spectacle plane to the corneal plane;
2. Determine the target spherical equivalent, usually either 0 D or a mild undercorrection for presbyopic patients, or those over 45;
3. By comparing the refraction and the eye's corneal topography, determine the cylindrical treatment axis at a location between the refraction and the topography. For example, while a refractive value may indicate a correction of –2.31 D Ax 40, the actual correction would be –1.79 D Ax 35 when the topography is considered;
4. Allow for the hyperopic shift created in the treatment of myopic astigmatism of .40 times the astigmatism treated;
5. With the new information in steps 3 and 4, determine whether the hyperopia or myopia will be undercorrected or overcorrected and adjust accordingly. For example, in a recent study by Dr. Alpins, the surgeon may have planned to reduce the correction of myopia by 10% to compensate for a potential overcorrection by the laser of this amount. "As we refined the nomograms, we realized that the overcorrection occurring was only about 5%," Dr. Alpins said. "We adjusted the treatment to 95%, which became the adjustment coefficient for spherical change. We now adjust the desired spherical value by 0.95;"
6. Use the three figures arrived at in step 5 for sphere, cylinder and axis as the setting. "The number comes purely out of ASSORT," Dr. Alpins said. "You don't have to do anything else to it."

"Once you've calculated all the nomograms, you shouldn't have to change your numbers at all when you convert from PRK to LASIK."

— Noel Alpins, MD

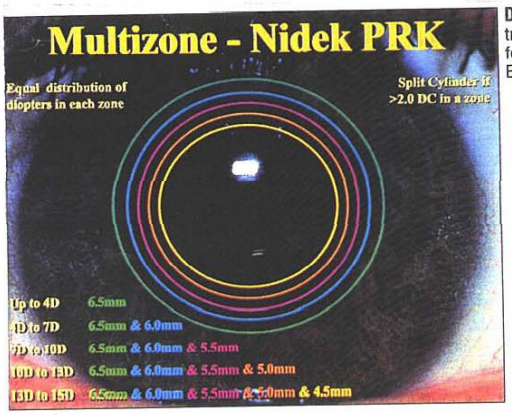
LASIK setting same as PRK

ASSORT's value has been established in PRK, Dr. Alpins noted. When a surgeon begins to use LASIK, he or she can go through the same six steps and use the value arrived at for the laser setting in LASIK. "Once you've calculated all the nomograms, you shouldn't have to change your numbers at all when you convert from PRK to LASIK," Dr. Alpins said. "If you've got your nomogram right for the surface ablation, it should also be correct for ablation within the stromal lamellae."

He particularly stressed the importance of integrating the corneal topography data into the surgical plan. "As a corneal surgeon, it always bothered me that treatment by refraction alone ignores the corneal shape," Dr. Alpins said. "If you treat by spectacles alone, and there's a difference between the spectacles' astigmatism and the topography astigmatism, you're maximizing the astigmatism that you can't eliminate from the system. You're etching it onto the cornea. However, if you bring the topography into the plan, you're going to have less astigmatism remaining on the cornea.

Astigmatic undercorrection

"Almost all lasers undercorrect astigmatism," he added. "In our initial group, we thought the laser was undercorrecting by 30%. When we went through the ASSORT outcome analysis steps, we determined that it was undercorrecting 40%. We now multiply the desired spherical value by 0.95. Similarly, the desired astigmatic correction is adjusted for undercorrection by multiplying it by 1.4."



Dr. Alpins' multizone treatment distribution for PRK with the Nidek EC5000 excimer laser.

In the study mentioned above, Dr. Alpins used the ASSORT steps when they performed PRK and photorefractive astigmatic keratectomy (PARK) on 204 eyes using the Nidek (Tokyo, Japan) EC5000 excimer laser. The correction ranged from –1.75 D to –15.25 D, with approximately 75% of the corrections in the less than –5 D range. The remaining 25% were in the –5 D to –10 D and –10 D to –15 D ranges.

Refractive outcome was within ± 1 D for 96% of PRK and 98% of PARK. Both groups had 100% refractive outcomes ± 2 D. The mean spherical equivalent was –0.23 for the PRK group, and virtually zero for the PARK group. The PRK group had achieved a 95% correction, whereas the PARK group had 99%.

Multizone corrections address haloes

"We also vary from the manufacturer's specifications when we use a multi-zone technique, rather than shrinking the single treatment zone down as the diopters increase," Dr. Alpins said. The usual recommendation is that the surgeon use an ablation zone inversely proportional in size to the correction, in order to avoid cutting too deeply.

However, this technique can be associated with problems, he warned. "The smaller you make the ablation zone diameter, the more problems the patient's going to have at night," he said. "As the pupil dilates, the patient will suffer from haloes and similar adverse symptoms.

"With spherical corrections of less than –4 D, we used a 6.5-mm zone. From –4 D to –7 D, we used a 6.5-mm and a 6-mm zone, with an equal distribution of diopters in each zone." From –7 D to –10 D, –10 D to –13 D and –13 D to –15 D, he used three, four and five zones, respectively, with equal distribution of diopters in each zone. The cylindrical correction was split among the zones if it exceeded 2 D.

"With this multizone technique, you're getting the best of both worlds," he said. "You've got a much more shallow ablation for the amount of correction, and you're employing the largest possible diameter." ■

by Paula Moyer
Correspondent

For Your Information:
Noel Alpins, MD, the medical director of New Vision Clinics, in Melbourne, also is affiliated with the Melbourne Excimer Laser Group, of Melbourne University, can be reached at 7 Chesterville Road, Cheltenham, 3192, Melbourne, Australia; ++(3) 9583-0422; fax: ++(3) 9585-0995; e-mail: alpinsn@world.net. Dr. Alpins developed the ASSORT software, and he has a direct financial interest in it. Dr. Alpins is not a paid consultant for any companies mentioned in this article.