



Omid Kermani

MD

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Alignment in customised LASIK using the NAVEX platform

The importance of correct alignment should not be underestimated if clinicians want to consistently deliver the best possible results from customised LASIK procedures using the NIDEK Advanced Excimer Laser System (NAVEX), according to Omid Kermani, MD.

“While correct beam alignment is difficult to achieve, it is of fundamental importance in customised LASIK. We have to consider the fundamentals of good and proper alignment, which includes factors such as lateral alignment, Z-plane focusing, tilt control, torsion error detection and eye movement tracking during the ablation procedure. If any or all of these are not rigorously controlled, they can have a serious impact on the final visual outcome,” he said.

Turning to each of these criteria in turn, Dr Kermani, illustrated the importance of lateral centration with reference to an eye with an eccentric pupil.

“It is important to consider lateral centration when you start operating on such an eye because you need to make sure that an equidistant area of refracted light hits the fovea. Therefore you have to make a flap centred on the pupil and not on the cornea,” he said.

Line of sight or visual axis?

Once the flap is well centred on the pupil, the next point of decision for the surgeon is either to centre the treatment on the line of sight or on the visual axis, noted Dr Kermani. He defined the line of sight as the line between the centre of the entrance pupil and a fixation object, and the visual axis as the line between the fovea and the fixation object.

Dr Kermani noted that the default option for the FinalFit programme is to align the laser beam with reference to the line of sight (LOS) when customised segmental laser ablation is applied. However, in cases with significant offset between the LOS and the visual axis (hyperopic eyes) it is possible not to use segmental ablation and to manually align the beam toward the visual axis, said Dr Kermani. A surgeon can, for example, treat sphere and cylinder on the visual axis and return to the line of sight for the correction of higher order aberrations.

Focusing of the laser is also critical, emphasised Dr Kermani. “The Z-plane is usually defined by cross-centering the two slit lamp projections on the cornea with the first Purkinje image of the fixation light, which is red,” he said.

For hyperopic laser ablation, Dr Kermani said that some surgeons recommend focusing a little bit further downwards because the main interaction area is in the periphery of the cornea, just below the Z-plane apex of the cornea.

“In terms of the ablation rate we have calculated that there is no difference whether you calculate the Z plane on the apex of the cornea, or a little bit below as for hyperopic cases,” he said. He advised, however, to maintain the focus on the apex of the cornea even for hyperopic eyes, since manually changing the focus has the potential to interfere with the proper functioning of the eye-tracker, resulting in a decentration.

Turning to the issue of tilt control, Dr Kermani said that many highly myopic eyes were affected by ‘tilt’ – a repeating, upward movement of the eye. The result is that even though the eye-tracker remains on the centre of the pupil, the ablation is decentred because of the tilt effect.

“In these cases, the eye-tracker cannot help you because it remains tracking on the centre of the pupil. The only way to ensure you are receiving a tilt is by using the slit lamp projections,” he said.

Getting to grips with cyclotorsion

Surgeons should also try to reduce the impact of cyclotorsion error, said Dr Kermani, as it may affect the refractive outcome. “This is mainly due to the change from the binocular view of the sitting position to the monocular viewing conditions under the surgical microscope. And the effect on the astigmatism is significant and is even greater for the higher order aberrations especially higher terms. A misalignment of even 5 degrees can lead to 15% under-correction in the astigmatic error,” he said.

Dr Kermani noted that the NAVEX platform makes it relatively easy to minimise the impact of cyclotorsion.

“The OPD-Scan gives you an image of the biometry of the iris structure and it can be compared under the operating microscope so that you can make sure it is on the same axis. Once the flap is lifted, there is not very much rotation any more and you can continue with your ablation as normal,” he said.

Summing up, Dr Kermani said that correct alignment requires identification of the important axes of the eye: the line of sight, the visual axis and torsion-corrected astigmatic axis. Furthermore, tracking and stabilising the ablation procedure has to be accomplished by both the surgeon and the machine and can be disturbed by a variety of influencing factors.

“Correct alignment is vital not only for customised ablation of higher order aberrations but also for standard treatments of corneal laser ablation,” he said.

