**SOLID RESULTS**

Solid-state platform studies indicate good outcomes with wavefront-guided treatments

by Dermot McGrath in Vienna

Using a solid-state laser platform seems to offer surgeons a safe, efficacious and predictable method of minimising the induction of ocular aberrations in both LASIK and surface ablation procedures, according to a number of studies.

“The results from our preliminary study evaluating the results of wavefront-guided LASIK with a solid-state platform were very promising although the trends need to be confirmed in future series with larger sample sizes. This laser technology should be considered as an additional option for the correction of higher order aberrations,” David P Pinero PhD, told delegates attending the XXIX Congress of the ESCRs.

Dr Pinero noted that the Pulzar Z1 solid-state laser (CustomViz) enables photoablation of corneal tissue using a wavelength of 213 nm, which produces a similar clinical and histopathology course to the excimer 193 nm laser. The 213nm wavelength is close to the absorption peak of collagen and has low absorption in fluid, which contributes to its high corneal ablation efficiency. The laser utilises a 0.6mm Gaussian shaped flying spot, a pulse rate of 300 Hz, and optimised, ocular wavefront-guided and topography-guided ablation profiles.

“This approach delivers a high degree of accuracy and minimal damage to the adjacent areas as with LASIK, but the outcomes are less dependent on the hydration of the corneal surface,” he said.

Surveying the scientific literature, Dr Pinero said that there were very few substantial studies assessing the performance of solid-state lasers in refractive surgery. One study from Tsiklis et al in 2007 reported excellent safety and efficacy for the treatment of low to moderate myopia using a solid state laser for PRK and LASIK treatments. However, there were no previous reported experiences with solid-state lasers using wavefront-guided ablation profiles.

Dr Pinero’s retrospective case series included 13 eyes of seven patients ranging in age from 21 to 32 years who underwent ocular wavefront-guided LASIK for the correction of myopia or myopic astigmatism using the Pulzar solid-state laser and the M2 mechanical microkeratome.

The mean postoperative follow-up period was almost nine months and the visual and refractive outcomes, as well as the aberrometric changes were evaluated during the follow-up by means of the iTrace system (Tracey Technologies).

Dr Pinero reported that a significant improvement was observed in uncorrected distance visual acuity, changing from a mean preoperative LogMAR score of 0.99 (about 20/25) to 0.0 or better in 12 eyes (92 per cent). This visual improvement was consistent with a significant reduction in sphere and cylinder, with 92 per cent of eyes within 0.50 D of emmetropia and all eyes within 1.0 D.

Furthermore, the mean postoperative higher order aberration RMS was 0.50 (± 0.41 microns), a difference that was statistically significant in spite of being of small magnitude, said Dr Pinero.

In a separate presentation, Sunil Shah MD also highlighted the excellent refractive outcomes obtained in surface ablation procedures carried out using a solid-state laser platform.

“The Pulzar Z1 solid state laser is a safe, reliable and effective tool for laser refractive surgery. Interestingly, because these were surface treatments these patients did not seem to feel the same levels of pain as they would have experienced had we been using a standard excimer laser for LASEK. Our patients are leaving the clinic with a smile on their face, which I think may be down to the unique properties of this type of laser,” said Prof Shah.

Discussing those properties in greater detail, Prof Shah noted that because there is no gas within the solid-state system, apart from the sealed laser chamber itself, hence there is theoretically less risk of toxicity with this device. He also echoed Dr Pinero’s suggestion that the wavelength of the laser should give it a theoretical edge over its excimer counterpart.

“This was one of the key reasons to look at this particular wavelength where your results would never be changed even if you had excess water on the cornea,” he said.

Prof Shah’s study included 244 eyes, 180 myopic and 64 hyperopic, that underwent surface LASEK performed by the same surgeon using the Pulzar Z1 laser at Jersey Vision Correction, St Helier, Jersey, with three months’ follow-up.

The mean preoperative spherical equivalent was -3.59 (range -0.75 to –10.50 D) in the myopic group and +2.78 (range +0.75 to +6.00 D) in the hyperopic group. The mean preoperative cylindrical refraction was 1.05 D (range 0 to 5.00 D) in the myopic group and 1.11 D (range 0 to 5.50 D) in the hyperopic group.

Prof Shah said that 96 per cent of preoperative myopes achieved within 0.50 D of the target refraction and 100 per cent were within 1.00 D, while the results for hyperopia were 78 per cent of patients within 0.50 D and 93 per cent within 1.00 D of target refraction.

The safety data was also very impressive, said Prof Shah, with corrected distance visual acuity remaining unchanged in 89 per cent of patients, with six per cent gaining one line of BCVA and four per cent losing one line of Snellen visual acuity (no patients lost more than one line).

“If you consider the extremely wide treatment range of this patient population, this is a very acceptable result indeed. In our study we have 24 eyes with more than 2.5 D of astigmatism and despite that we are still getting 50 per cent of these patients within 0.13 D and 89 per cent within 0.50 per cent of target refraction,” said Prof Shah.