New solid-state lasers show potential advantages over excimer lasers

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in Rome

THIS year’s ESCRS Winter Refractive Surgery Meeting will include reports of results of LASIK and PRK using two new non-excimer solid-state lasers, the Pulzar™ Z1 (CustomVis) (Friday, February 4, Corneal Remodelling for Refractive Surgery I 17:00-19:00).

Solid state lasers have several potential advantages over currently available excimer laser systems said Matteo Piovella MD, Monza, Italy, who will be presenting one-year results with the Lasersoft laser at the meeting.

For example, they do not require the use of toxic excimer gases and also provide better pulse-to-pulse stability of the energy due to the cw-diode pumping of the primary laser. They can also use beams with a wavelength of 0.6 nm, and even if the stromal bed reflects on confocal microscopy, after one and a half months, UCVA improved in nine eyes, by up to five lines, and keratometric cylinder decreased by as much as 90.0.

At one-and-a-half month’s follow-up 95.64% of eyes had a UCVA of 0.5 or better and that increased to 98.08% after six months. Furthermore, while the percentage with a preoperative BCVA of 1.0 or better was only 59.42%, the percentage rose to 73.33% after one-and-a-half months, and to 94.23% after six months. In addition, 16.09% of eyes gained one line of BCVA after three months.

“In this winter ESCRS meeting we will present the one- and-a-half year follow-up of the same group, and the overall results of a greater cohort of more than 350 eyes,” Dr Rossi’s associate, Paolo Garimoldi MD. His findings indicate not only the Lasersoft laser applies less heat to the cornea than excimer lasers, but also that it induces less inflammation and haze when used for surface ablations.

At one and a half years follow-up 91.84% of eyes had a UCVA of 0.5 or better and that increased to 98.08% after six months. Furthermore, while the percentage with a preoperative BCVA of 1.0 or better was only 59.42%, the percentage rose to 73.33% after one-and-a-half months, and to 94.23% after six months. In addition, 16.09% of eyes gained one line of BCVA after three months.

“Its ablation pattern overlaps the true Gaussian spot, ensuring an extremely homogenous corneal surface. Thanks to its very small spot size, Lasersoft spots, ensuring an extremely homogenous corneal surface, have a small spot diameter with a true Gaussian beam shape, which permits us to obtain a smooth surface and opens the way to the correction of higher order aberrations by customisation ablation. Clinical data of patient treatments showed the efficacy and safety of the refractive procedure.”

Less haze and inflammation

Further evidence of the safety benefits of the solid state laser will be presented by Dr Rossi’s associate, Paolo Garimoldi MD. His findings indicate not only that the Lasersoft laser applies less heat to the cornea than excimer lasers, but also that it induces less inflammation and haze when used for surface ablations.

A study which compared the results involved 64 eyes of 34 patients who underwent PRK with the LaserSoft or Zeiss Meditec Mel 70. Thermocamera measurements showed that the temperature increase during treatment was only 0.8°C in eye treated with diode pumped solid state laser, compared with 5.3°C in eyes treated with excimer laser.

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The Pulzar™ Z1 refractive solid state laser system has been designed to perform custom ablations, as well as standard treatments. It utilises a 213 nm laser beam of 0.6 mm scanning spot size, with the fast pulse rate of 300-400 Hz allowing quick ablations. The solid state technology also allows superior laser beam scanning; significantly faster than the Galvanometer based systems. The Pulzar Z1 combines refractive and topographic data to create the customised treatment plan for each patient, Dr Anderson said.

In a multicenter study, 62 eyes with a manifest refraction spherical equivalent less than -5.0 D and astigmatism up to -4.0 D underwent customised ablations with the Pulzar™ Z1 laser. The postoperative MRSE was ± 0.5 D from target in 70% of cases, and 92% were within ± 1.0D.

Furthermore, 90% achieved unaided vision of 6/7.5 or better and 100% were 6/12 or better. In addition, at one site six LASIK cases were performed; all achieved unaided vision equal to their pre-operative aided vision.

Dr Anderson has also used the solid state Pulzar Z1 to custom treat eyes with severe visual anomalies. He told EuroTimes that he has achieved dramatic initial results with patients who had highly irregular corneas and severe irregular astigmatism following either penetrating keratoplasty or photorefractive keratectomy. Corrections were between +5.25 D to -3.0 D sphere and up to -9.0 D of astigmatism. Of the 12 cases, UCVA improved in nine eyes, by up to five lines, and keratometric cylinder decreased by as much as 90.0.

“The solid state Pulzar™ Z1 laser with its 213 nm wavelength represents a very suitable option for customised refractive surgery.”

In addition, extensive scientific experiments performed in collaboration with the University of Western Australia, histological observations show that the solid state 213 nm wavelength produces smooth, clean corneal ablations with no evidence of thermal damage. Absorption studies demonstrate that 213 nm is significantly less absorbed in 0.9% NaCl and water in comparison to the excimer 193 nm, thus fluctuations in hydration or humidity are unlikely to have a significant effect on 213 nm ablation performance.

“The Pulzar™ Z1 has combined the advantages of solid state technology with an effective custom-ablation platform; this system could possibly be the next generation in refractive surgery.”