Surgical treatment of hyperopia presents a variety of challenges

A N E W upgrade to the Zyoptix wavefront-guided refractive surgery system (Bausch & Lomb) greatly simplifies pre-operative examination and calculation of the ablation profile by removing the need for pupil dilation during aberrometry and automatically incorporating wavefront data in the treatment algorithm, said Erik Mertens MD, Antwerp Eye Center, Antwerp, Belgium.

The upgrades include a better computer for measurements with the Orbscan topographer and the Zywave aberrometer and new software. A wireless link allows direct data transfer of diagnostic measurements to the new updated laser treatment calculator, without the need for floppy discs.

In addition, the system's software eliminates the need for pupil dilation by extrapolating wavefront measurements from eyes with undilated pupils, he noted.

"When we do higher-order corrections we need to dilate the pupil in a lot of cases because otherwise we won't have enough information. But the problem with dilation is you can get dry eye and de-centred pupils and it gets much more difficult to do a good job. Now with the new software from Bausch & Lomb you can have a 10 per cent larger treatment zone than the pupil diameter during wavefront measurement," Dr Mertens told the 11th ESCRW Inter Refractive Meeting.

As a result, the new software makes it possible to perform wavefront-guided treatments with optical zones up to 7.1 mm when the pupil size at the time of examination was only 6.5 mm, he added.

In addition, the system eliminates the need for pharmacological pupil dilation and removes the extreme pupil shift issues and other sources of variation caused by dilation process. It also creates the possibility for one-day procedures. Moreover, it enables speedier examinations, which provides increased comfort to the patient and improved patient throughput for the surgeon, Dr Mertens said.

The system's new personalised nomogram automatically incorporates the influence of pre-operative factors, including lower- and higher-order aberrations into the laser ablation algorithm, he noted.

"The problem is that when you are going to treat higher-order aberrations and the patient has a lot of positive spherical aberration and you do not take that into account in your refraction you will get an overcorrection. This program does that for you, you just do a very good subjective refraction and your higher-order aberration measurements with Zywave, click the advanced nomogram button, and it will give you the treatment algorithm and you don't have to do anything to correct it yourself," he added.

Good early results

Dr Mertens noted that in 22 eyes treated with epi-LASIK with the upgraded Zyoptix platform using the new personalised nomogram to treat myopia ranging from -0.50 to -5.00 D, 100 per cent were within 0.5 D of attempted correction. Regaining safety BCVA was unchanged in 86 per cent, while nine per cent lost one line and five per cent gained one line.

Similarly, among 31 eyes that underwent LASK with the new personalised nomogram, only one eye was overcorrected (1.07 per cent) and all the rest were within 0.5 D of intended correction. In addition, although 16 per cent lost one line of BCVA, 16 per cent gained one line, while 68 per cent remained unchanged.

"I'm very pleased with the results achieved with the advanced nomogram. I made no adjustments to the nomogram and just used it as the company delivered it to me, so I did not use any fudge factors. This is a big advantage because before using it we ended up with some refractive surprises when doing higher-order corrections and now we can filter that out using this programme," he added.

Dr Mertens noted that he and his associates have three-month follow-up data on 264 eyes that they treated with Zyoptix personalised nomograms. He said that in those eyes uncorrected visual acuity (UCVA) was 20/20 or better in 94 per cent of eyes, and the same proportion were within 0.5 D of attempted refraction.

He added that his impression of the system is that it enabled faster patient examination with pre-operative examinations taking a maximum of one-and-a-half hours. Since no dilation is required patients are also more comfortable and also get a more "high-tech" impression of the examination process. As a result, more patients immediately decide to undergo surgery.

"My prediction is that the new advanced personalised treatment will increase both patients' and surgeons' awareness of superior Zyoptix personalised treatment outcomes," he added. e.mertens@itet.be
Dermot McGrath in Athens.

MO RE precise flap creation, faster performance and an ability to deliver even smoother stromal beds are among the defining characteristics of the current generation of femtosecond lasers, according to researchers.

Speaking at a special session on femtosecond lasers held during the ESCR S W inter Retractive Meeting Perry S Binder MD said that the increased speed and decreased energy of the latest 60 kHz femtosecond laser (IntraLase FS, IntraLase Corp.) produces a smoother surface compared to LASIK flaps generated by 4th generation mechanical keratomes, added Dr Binder. “There is agreement that creating smoother stromal beds is the way forward, so we wanted to see how we could achieve this without compromising on the speed of the procedure. When the Femtosecond laser ablations are placed closer together it takes longer to create a given flap diameter. So we needed to develop a faster engine to achieve similar flap creation times because closer spot sizes translates into smoother surfaces,” he said.

With its latest upgrade, which comes less than one year after the introduction of the FS30 30kHz system, IntraLase has sought to address one of the key concerns of eye surgeons relating to the longer time required to create a flap using the femtosecond laser. The new system can create 9.0mm diameter LASIK flaps in 15-20 seconds, compared to 45 seconds or more with the 15 kHz model, bringing it more in line with mechanical keratomes.

Dr Binder, who serves as co-medical director for IntraLase, and colleagues performed a scanning electron microscopic study comparing the stromal bed after IntraLase flap creation versus the stromal bed after Zyoptix XP microkeratome (Bausch & Lomb) flap creation. Intended flap thickness in the femtosecond eyes was 110 µm, and 120 µm in the microkeratome eyes using the 9.5mm ring. New blades were used for each microkeratome cut. The femtosecond spot/line size was 6x6 µm and the raster energy was 0.7 or 0.8 µJ.

Three masked observers and a computerised quantitative surface analysis determined that the IntraLase stromal bed was significantly smoother than that produced by the microkeratome, he said. Dr Binder noted that a comparison of results for the 60 kHz laser versus those for the earlier 15 kHz and 30 kHz iterations showed a slight improvement in smoothness for the latest model due to the closer Femtosecond laser spots and raster lines used in this study. Also of interest, he said, was the fact that there was no opaque bubble layer observed in this series. “Some surgeons prefer to wait for the opaque bubble layer to dissipate before proceeding with the ablation, but with the increased speed and reduced energy of the 60 kHz laser this is far less likely to create a significant opaque bubble layer,” he said.

Dr Binder said that the IntraLase FS60 was clearly a significant improvement on earlier versions of the technology. “What this study demonstrates is that by having an engine that can place spots and lines closer together and not increase the procedure time that you can have a much smoother surface, which translates into easier flap lifts and more rapid recovery of visual acuity,” he said.

Easier for treating irregular corneas

A slightly different perspective on the pros and cons of using the IntraLase FS60 was offered by Andromachi Frangouli MSc, MCOptom, who cited an ability to treat more irregular and thinner corneas as among the more notable advantages of the femtosecond laser.

“One of the best aspects of this technology is that we could treat flatter, steeper and thinner corneas. The main disadvantages from the surgeon’s point of view were that the suction is manual and it is a slightly slower procedure than with a mechanical keratome. However, from the patients’ perspective they seemed more comfortable with the technique of the femtosecond flap formation than with a mechanical blade. It is possible that this was due to the fact that it was the first week of our experience with the Femtosecond laser,” she said.

In a retrospective study carried out by Andromachi Frangouli and her co-worker Dr O urania Frangouli, MD MRCOphth at 0 ptmax Laser Eye Clinics in Manchester, the refractive and complication results of 153 myopic (72 Femto & 81 Moria) and 39 hyperopic (11 Femto & 28 Moria) eyes treated with the Femtosecond laser for LASIK were compared to routine LASIK using a Moria microkeratome.

The study showed no statistically significant difference in uncorrected and best-corrected visual acuity outcomes between the IntraLase and Moria groups three months’ follow-up. There was also no statistically significant difference in the postoperative Mean Sphereal Equivalent between the two groups both for myopic and hyperopic eyes.

In terms of complications, Dr Frangouli said there seemed to be a slightly increased incidence of dry eye in the femtosecond laser group, 24 per cent for the femto group compared to 12 per cent for the Moria group. There were also seven cases of losses of suction with the IntraLase, which were subsequently converted to uncomplicated Moria procedures. She also reported two cases of significant interface haze in the femtosecond group. There were seven retreatments in the IntraLase group and five in the Moria group, although Dr Frangouli noted that six of the IntraLase retreatments were attributed to central islands rather than problems with the laser per se. Interface debris, of no clinical significance was also reported in the femtosecond laser group (16.7 per cent).

Other points of interest, she said, included the incidence of small bubbles on the limbus, conjunctiva and the hinge that resolved one day postoperatively, plus the fact that the flap edge seemed more pronounced in the femtosecond group. “We also have a thinner flap with the IntraLase and therefore more likelihood of it dislocating and we would recommend securing it with a bandage contact lens,” she added.

Dealing with opaque bubbles

The issue of bubbles in the stromal bed was also raised in a separate presentation by Sukumaran Ramanathan MD.

“In the first few cases, I found that iris recognition was a bit difficult because of the bubbles in the stroma. For that reason I decided to switch over to doing iris recognition before the flap cut,” he said.

Dr Ramanathan presented a retrospective evaluation of the first 50 consecutive procedures of 27 patients carried out at the Ultralase Eye Clinic, Reading, U.K. The IntraLase FS60 was used to create the flap for LASIK and the Technolas 217/100Hz was used for wavefront-guided ablation with iris recognition in all cases.

In terms of visual outcomes, 43 eyes were within 0.50 D of their target correction (86 per cent) and 48 eyes (96 per cent) were within 1.0 D. A total of 35 eyes (70 per cent) had an uncorrected visual acuity of 6/6 or better, and 47 scored 6/12 or better (94 per cent). All eyes recorded best-corrected visual acuity of 6/12 or better.

Adverse events included epithelial abrasions in two eyes and severe photophobia in one patient. “This happened about seven days after the treatment and she had to take time off work for three days until that settled. We gave her topical corticosteroid drops which quickly resolved the situation but it was quite disabling for her,” he said.

Dr Ramanathan also cited problems with interface debris in six eyes, one of which required a flap lift and wash out. He emphasised, however, that such complications occur in only a small number of cases and his overall clinical experience with the femtosecond laser indicates that it is a safe and reliable tool for creating LASIK flaps.

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the procedure is continuing to evolve.

The procedure is safest and most effective for patients who require corrections of no more than 5 D, he said. For corrections within 5 D, 76 per cent to 98 per cent of patients have results within 1 D of the goal. By contrast, for corrections of more than 5 D, only 50 per cent to 90 per cent have comparable results. In addition, the loss of two or more lines of BSCVA occurs in just zero to two per cent of patients undergoing corrections within 5 D, compared with seven per cent to 10 per cent of patients undergoing corrections of more than 5 D.

Dr O’Brart emphasised that ophthalmologists who perform hyperopic LASIK should use a large optical zone – at least 7.0mm. This has been associated with improved outcomes, including better safety and efficacy, and fewer high-order aberrations. Surgeons should also factor in considerations such as age when deciding what technique to use.

Other options for patients with hyperopia include PRK and LASIK, which appear to have good long-term stability when performed for hyperopia.

“Excellent corrections may be achieved with hyperopic LASIK, although recovery is slow,” he said.

Peter S Hersh, MD, who moderated the session, told EuroTimes that he thought both surgeons had made “proper and fair conclusions”, and that he agreed with their conclusions.

“I think that the emphasis on patient understanding of hyperopia and presbyopia is important, and that contact lens trials can be helpful,” said Dr Hersh, who is the chief of cornea and refractive surgery at UMDNJ- New Jersey Medical School.

He added that he thought that CK was appropriate for plano presbyopes or very low hyperopes – less than 0.75 D – and could be preferable in those circumstances.

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