

The Best of 2012: Trends and Breakthroughs in Cataract and Refractive Surgery

With the help of industry representatives and fellow ophthalmologists, Associate Chief Medical Editor of *CRST Europe* uncovers this year's hottest topics and looks ahead at what is in store for European cataract and refractive surgeons in 2013.

BY ARTHUR B. CUMMINGS, MB ChB, FCS(SA), MMed (OPHTH), FRCS(EDIN)

The last cover focus of 2012 highlights some of the major topics and breakthroughs of the past year in ophthalmology. This article focuses on those developments specifically pertaining to cataract and refractive surgery around Europe; subsequent articles in this section concentrate on other areas in ophthalmology, including glaucoma, retina, and ocular pathologies.

In the past few years, European ophthalmologists have witnessed the birth of so many new technologies that it is nearly impossible to stay abreast of every development. Therefore, I have chosen to focus on two areas, femtosecond laser systems for cataract surgery and excimer and femtosecond laser systems for refractive surgery, in order to provide the most in-depth and current overview of where we are today in Europe with these ophthalmic hot topics. I asked representatives of 11 companies to provide our readers with their industry views on these topics and paired their responses with those from physician users, key opinion leaders who use these technologies. The following article is a result of excellent collaboration from industry and colleagues to provide you with updates on these exciting areas of ophthalmology. Below, the contributions appear in alphabetical order for laser cataract surgery followed by

laser refractive surgery. Looking at the developments during 2012 and the exciting prospects for next year, it truly is a wonderful time to be an ophthalmologist.

Arthur B. Cummings, MB ChB, FCS(SA), MMed (Ophth), FRCS(Edin), practices at the Wellington Eye Clinic & UPMC Beacon Hospital, Dublin, Ireland. Dr. Cummings is an Associate Chief Medical Editor of CRST Europe. He states that he is a consultant to Alcon Laboratories, Inc./WaveLight. Dr. Cummings may be reached at tel: +353 1 2930470; fax: +353 1 2935978; e-mail: abc@wellingtoneyeclinic.com.



FEMTOSECOND LASER SYSTEMS FOR CATARACT SURGERY

Catalys Precision Laser System (OptiMedica Corp.)

Industry perspective: Mark J. Forchette

This has been a tremendous year for OptiMedica and for the field of laser cataract surgery. We launched our Catalys Precision Laser System (Figure 1) internationally in November 2011 and in the United States in February 2012. As of publication date, Catalys has been purchased and installed in 10 countries, and more than 5,000 laser cataract procedures have been performed.



Figure 1. The Catalys Precision Laser System.

The adoption of Catalys is a result of the system's unparalleled performance. Catalys is Conformité Européenne (CE)-Mark approved and cleared by the US Food and Drug Administration (FDA) for every step of the laser cataract procedure, including capsulotomy, lens fragmentation, and corneal incisions. Our surgeons report excellent results across these steps, including a 99% free-floating capsulotomy rate, elimination of phaco power during lens disassembly and removal, and precise corneal incisions (personal communication). They have also reported little to no learning curve with the system. This performance represents a dramatic advance over first-generation laser cataract surgery technologies.

Looking ahead to 2013, we expect to see continued dramatic growth of our business worldwide. Once surgeons are able to observe or use Catalys, they become firm believers in the technology. We are convinced that the laser will ultimately become the centerpiece of the cataract procedure.

Mark J. Forchette is President and Chief Executive Officer of OptiMedica Corp. He may be reached at e-mail: mforchette@optimedica.com.



Physician perspective: H. Burkhard Dick, MD, PhD

Catalys has exceeded my expectations, and patients are delighted immediately after surgery by faster visual recovery as a result of a 19% reduction in the incidence of inflammation over a manual procedure.¹

In addition to creating perfectly circular, centered capsulotomies, I have been able to virtually eliminate ultrasound, using no phaco energy in more than 40% of cases with Catalys (Figure 2). I have also observed that the placement and geometry of corneal incisions is perfect, as arcuate incisions are placed within 0.22° of the intended location.



Figure 2. Phacofragmentation with Catalys.

Courtesy of H. Burkhard Dick, MD, PhD

Specific features unique to Catalys give me the capability to treat patients with comorbidities and to address the most challenging cases. These same features provide a platform for exploring exciting frontiers, such as posterior capsulotomy in pediatric cases, posterior optic buttonholing, and bag-in-the-lens procedures. Lastly, adoption has been fast, and our 2-year projected break-even procedural volume number was achieved early in this first year.

I am looking forward to discovering more exciting applications for laser cataract surgery. We have under way many innovative, prospective, controlled, intraindividual trials that assess potential technological benefits over the manual procedure. We are also planning a larger study on visual outcomes and visual recovery. There are still many areas to explore for corneal indications, including intrastromal incisions and the development of new nomograms. This upcoming year will be exciting.

H. Burkhard Dick, MD, PhD, is the Chairman of Ruhr University Eye Hospital, Bochum, Germany. Professor Dick is a member of the CRST Europe Editorial Board. He states that he is a member of the medical advisory board for OptiMedica. Professor Dick may be reached at tel: +49 234 299 3101; e-mail: burkhard.dick@kk-bochum.de.



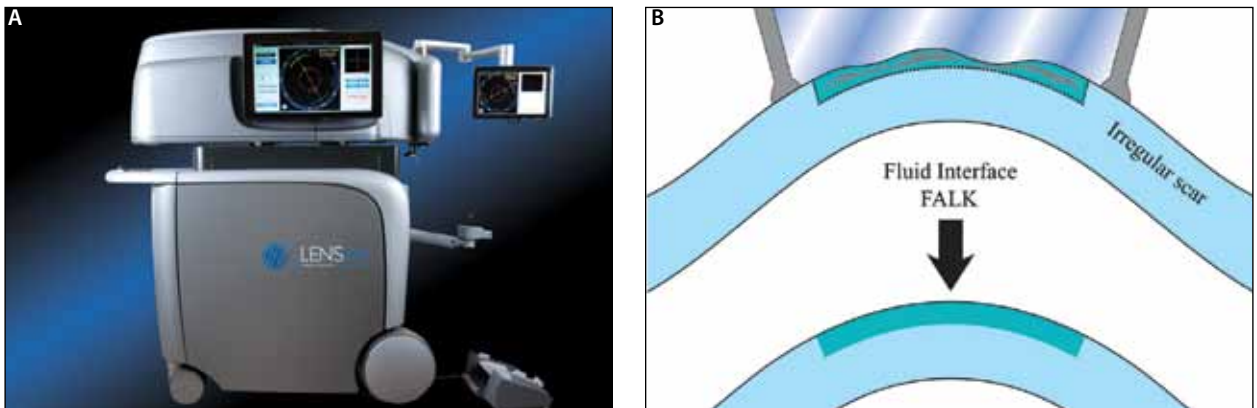
1. Dick B. Clinical results of a prospective randomized intraindividual comparative trial. Paper presented at: the European Society of Cataract and Refractive Surgeons annual meeting; September 8-12, 2012; Milan, Italy.

LensAR Laser System (LensAR, Inc.)

Industry perspective: Nick Curtis

This was a breakout year for LensAR. The company received FDA clearance and CE-Mark approval for capsulotomy and phacofragmentation with the LensAR Laser System (Figure 3A), and it made regulatory submissions for corneal incisions. This summer, the company began the first shipments and installations of the next-generation LensAR Laser System using its automated 3-D imaging and biometric measurement software that accounts for lens tilt and centration in every axis.

LensAR has the only laser cataract surgery system that provides the surgeon with fully automated treatment



Courtesy of Ronald R. Krueger, MD

Figure 3. (A) The LensAR Laser System. (B) LensAR's 3-D augmented reality imaging, fluid interface, and closed-loop feedback corneal incision localization will likely facilitate future advancements in lens refractive surgery and even keratoplasty techniques.

options generated from augmented-reality imaging and the choice to make changes to the treatment in a touchscreen format, based on the unique measurement of the patient's anatomy. Because of the fluid interface, the device does not make corneal contact, which when it occurs can create corneal folds that affect accuracy of the treatment. The ergonomics of the LensAR system allows placement in the operating or treatment rooms according to preference and existing facility restrictions. The platform increases patient flow and efficiency in treatment. For these reasons, LensAR has been enthusiastically received, and, in the first months of release, 20 systems have been shipped to nine countries.

In 2013, we look to continue pursuit of our unique approach to accommodation restoration treatments in the crystalline lens and to see growing acceptance of our laser system worldwide as the benefits of the platform become evident.

Nick Curtis is the Chief Commercial Officer of LensAR, Inc. Mr. Curtis may be reached at e-mail: nick.curtis@lensar.com.



Physician perspective: Ronald R. Krueger, MD

Three unique features of the LensAR Laser System put it into a strategic position within the market, making it attractive for clinical use. The first is the augmented reality imaging provided by the 3-D confocal structured illumination (3D-CSI) system. This has advantages over optical coherence tomography (OCT) imaging, which has limitations with depth of focus and precision focusing of fine posterior structures, especially in dense nuclear cataracts. LensAR will be best suited to image and treat these dense nuclear cases, where the technology of laser fragmentation is most needed.

Second, the LensAR is one of two systems to offer a fluid interface for enhanced imaging and laser delivery within both corneal and lens structures. Where contact interfacing

distorts the cornea and creates an interface for light scattering, the fluid interface will not only enhance the image of lens structures but also the delivery of laser pulses without skip regions in the capsulotomy. This will also be important for precision pulse placement in the lens when accommodation restoration procedures are eventually implemented.

Finally, the precision 3-D imaging capability of the augmented reality of LensAR can not only compensate for lens tilt and centration but adjust for microsaccadic movements of the cornea beneath the fluid-filled interface to provide closed-loop feedback of the location of laser corneal incisions for accurate placement of subsequent laser pulses. These three unique features, in addition to the ergonomically friendly touchscreen control, make the LensAR Laser System attractive not only for laser cataract surgery, but also for possible accommodation restoration and advanced keratoplasty procedures in the future (Figure 3B).

Ronald R. Krueger, MD, is Medical Director of the Department of Refractive Surgery, Cole Eye Institute, Cleveland Clinic Foundation. Dr. Krueger is a member of the CRST Europe Global Advisory Board. He states that he is a consultant to LensAR, Inc. He may be reached at tel: +1 216 444 8158; e-mail: krueger@ccf.org.



LenSx Laser System (Alcon Laboratories, Inc.)

Industry perspective: Brian O'Neal

Alcon recently released the LenSx SoftFit Patient Interface for the LenSx Laser System (Figure 4). This new design delivers easier docking, free-floating capsulotomies, and patient comfort with lower intraocular pressure (IOP). The company introduced another software upgrade earlier in 2012 to provide LenSx users with high-density OCT, offering twice the resolution of the previous version. That upgrade also included new features such as independent

arcuate and bimanual incisions and new automation and procedure overlays that allow faster overall procedure times without sacrificing surgeon control. The company also announced FDA clearance of flap creation for corneal refractive procedures, adding a new modality to the LenSx laser platform that will be commercially available in 2013.



Figure 4. The LenSx Laser System.

Brian O'Neal is Head, Surgical Franchise, Europe, Middle-East and Africa, Alcon Laboratories, Inc. For more information on the LenSx Laser System contact Alcon Laboratories at e-mail: alcon.publicrelations@alconlabs.com.

Physician perspective: Michael C. Knorz, MD

More than 4 years ago, at the Semmelweis University in Budapest, Hungary, Zoltan Z. Nagy, MD, performed the first laser refractive lens surgeries with the LenSx femtosecond laser. As of today, in excess of 200 LenSx lasers have been placed in more than 42 countries, and more than 50,000 procedures have been performed.

I am convinced that the femtosecond laser has opened the door to a new era of lens and cataract surgery for several reasons. First, the laser creates a perfectly shaped and reproducible capsulorrhexis. Second, it chops and liquefies the nucleus, reducing phaco time significantly. Third, it creates corneal incisions and allows us to predictably correct corneal astigmatism with arcuate laser incisions. Because the laser can create a perfect capsulorrhexis and arcuate incisions, the refractive outcome is significantly better than after standard phacoemulsification surgery.

A lower incidence of complications is another advantage of laser cataract surgery. Compared with a manual capsulorrhexis, the laser-created capsulorrhexis is much less likely to cause anterior tears that can extend onto the posterior capsule and possibly cause vitreous loss. Use of the femtosecond laser also reduces the amount of phaco energy required, which correlates to less endothelial cell damage and less corneal swelling in the early postoperative period. The introduction of laser refractive lens surgery will, therefore, significantly improve outcomes of cataract and refractive lens surgery.

Michael C. Knorz, MD, is a Professor of Ophthalmology, Medical Faculty Mannheim of Heidelberg University, Mannheim, Germany. He is also a member of the CRST Europe Editorial Board. Dr. Knorz states that he is a paid consultant to Alcon Laboratories, Inc. He may be reached at e-mail: knorz@eyes.de.



Victus Anterior Segment Workstation (Technolas Perfect Vision GmbH and Bausch + Lomb) Industry perspective: Calvin W. Roberts, MD

Victus (Figure 5) is the first laser platform to enter the market that supports both cataract and corneal refractive surgery on a single device. This femtosecond laser system can be described as an accurate scalpel that can create

precise corneal flaps for refractive surgery and pockets for intrastromal corneal ring segments (ICRSs), perform penetrating keratoplasty and presbyopia-correcting Intracor procedures, and accomplish several steps of cataract

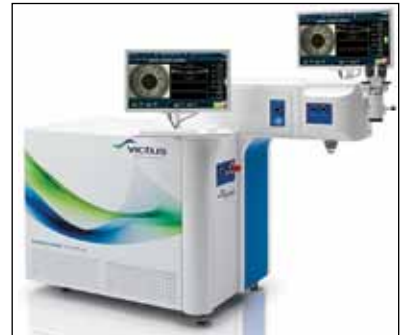


Figure 5. The Victus Anterior Segment Workstation.

surgery including corneal incisions, limbal relaxing incisions (LRIs), capsulorrhexis, and lens softening. This is the greatest single advancement in cataract surgery since the phacoemulsification system made its debut 40 years ago.

The Victus works particularly well with the Stellaris Vision Enhancement System phaco machine and the enVista IOL (both by Bausch + Lomb). These three technologies form a comprehensive portfolio of products to fulfill all surgical needs of the cataract and refractive surgeon.

By the end of 2012, there will be more than 30 Victus lasers placed in practices across Europe, and several thousand procedures will have been performed. The goals for 2013 are to continue to adapt the software of the Victus for greater precision, to grow the market in terms of greater market penetration and more users, and to gain approval for more functionality in the United States, adding lens fragmentation and LRIs to the already approved capsulorrhexis and corneal incision functions.

Calvin W. Roberts, MD, is the Executive Vice President and Chief Medical Officer of Bausch + Lomb. Dr. Roberts may be reached at e-mail: calvin.w.roberts@bausch.com.



Physician perspective: Erik L. Mertens, MD, FEBOphth

Laser-assisted lens surgery was the most exciting thing to happen to ophthalmology this past year. For the first time, several crucial steps in lens surgery can now be performed with a machine instead of the human hand. But where does this change have the most impact? In short, the size, centration, and circularity of laser capsu-

Courtesy of Erik L. Mertens, MD, FEBOphth



Figure 6. Dr. Mertens performs cataract surgery with the Victus.

lotomies are superior to what even the most experienced surgeon can do. However, predictability and patient satisfaction are also enhanced, especially when this technology is used in conjunction with premium IOLs.

I deliver a variety of procedures with the Victus (Figure 6), including key steps in cataract surgery (capsulotomy, corneal incisions, and lens emulsification), the instromal presbyopia-correcting procedure Intracor, LASIK flaps, corneal procedures such as penetrating keratoplasty, tunnels for ICRS implantation, and arcuate cuts for astigmatic keratotomy.

The ability to perform multiple procedures with a single femtosecond laser platform is a benefit in terms of economics but also in optimizing space in the operating room.

In 2013, I am looking forward to further therapeutic indications and an increased capability to perform corneal incisions with the Victus and the ability to study their effects on surgically induced astigmatism.

Erik L. Mertens, MD, FEBOphth, is Medical Director of Medipolis, Antwerp, Belgium. Dr. Mertens is a Chief Medical Editor of CRST Europe. He states that he is a consultant to Bausch + Lomb, Topcon, Technolas Perfect Vision GmbH, and STAAR Surgical. Dr. Mertens may be reached at tel: +32 3 828 29 49; e-mail: e.mertens@medipolis.be.



EXCIMER AND FEMTOSECOND LASER SYSTEMS FOR REFRACTIVE SURGERY

AL-Scan (Nidek Co. Ltd.)*

Industry perspective: Stefan Pieger, Dipl.Ing

Launch of the AL-Scan optical biometer (Figure 7) was good news for Nidek in 2012. This instrument makes optical biometry fast and easy, as it uses a 3-D eye tracker and starts capturing data automatically once the pupil is detected. In one scan, this device measures axial length, keratometry (K), anterior chamber depth, central corneal thickness, white-to-white distance, and pupil size using partial coherence interferometry and Scheimpflug imaging techniques. Its double-mire keratometry (diam-



Figure 7. The AL-Scan.

eters, 2.4 and 3.3 mm) provides stable K values, even in asymmetric and irregular corneas. The instrument can also be ordered with a built-in ultrasound unit for measuring dense cataracts.

In 2013, diagnostic instruments will be further integrated into the company's comprehensive platform for the high-end cataract surgeon.

Nidek has linked the AL-Scan

with its aberrometer/topographer combination OPD Scan III and the new specular microscope CEM 530 using IOL Station software, which automatically reads the data of all linked instruments and allows IOL calculation and comparison of the simulated visual quality for different types of IOLs. This will be a milestone for the successful marketing of premium IOLs.

Stefan Pieger, Dipl.Ing, is an Application Manager at Nidek Co. Ltd. He may be reached at e-mail: Stefan@Pieger.net.

Physician perspective: Omid Kermani, MD

In my perspective as a cataract and refractive surgeon, Nidek's largest contribution in 2012 was in the category of diagnostics for premium IOLs. Launch of the AL-Scan was an important milestone, closing the loop for complete diagnostics of the premium IOL patient. Not only does the AL-Scan make optical biometry fast and easy, but the optional built-in ultrasound unit for measuring dense cataracts is helpful.

Because the AL-Scan can be linked with the OPD Scan III and the CEM 530 using IOL Station software, I can compare simulated representations of the visual quality achieved with different IOLs, thus allowing me to provide each patient with a lens choice to fit his or her visual requirements. Having this information immediately in my hands is crucial, and I believe that Nidek's IOL Station software is the perfect diagnostic tool to fully capture the potential of new premium IOL developments. Patients want to achieve perfect UCVA after cataract surgery—at all distances and in daylight, dim light, and at night—and this technology is another tool to ensure this goal is met.

Omid Kermani, MD, practices at the Augenklinik am Neumarkt, in Cologne, Germany. Dr. Kermani did not provide financial disclosure information. He may be reached at e-mail: o.kermani@augenportal.de.



**Editor's Note: Although this category is laser refractive surgery, Nidek chose to highlight its cataract diagnostic equipment in this section.*



Figure 8. The Schwind Amaris.



Figure 9. The Sirama nanosecond laser.

Amaris and Sirama Laser Systems (Schwind eye-tech-solutions) Industry perspective: Samuel Arba Mosquera, PhD

In the spring of 2012, Schwind announced the installation of its 1,000th excimer laser system worldwide. The first

Schwind laser was installed in South Korea in 1992, and over the past 20 years the company has made much progress in its sales and innovations, deciding in 1999 to focus its expertise and resources on laser eye surgery. In the 2011-2012 business year, more than 100 lasers were sold.

The Amaris excimer laser was introduced in 2007, and the latest model is the flagship Amaris 750S (Figure 8). Using this technology, more than 5,000 PresbyMAX treatments have been performed. The latest technique, PresbyMAX μ -Monovision, uses bispispheric multifocal ablation profiles to enhance depth of focus. The treatment aims for approximately -0.12 D on the distance eye and approximately -0.88 D on the near eye. The PresbyMAX μ -Monovision concept significantly shortens recovery time for distance visual acuity and ensures excellent intermediate and near visual quality. It also offers high patient satisfaction, a low retreatment rate (comparable to conventional LASIK), and higher visual acuity including significantly better intermediate visual acuity than multifocal IOLs. This treatment is suitable for pseudophakic eyes.

Samuel Arba-Mosquera, PhD, is an optical/visual researcher for Schwind. He may be reached at tel: +49 6027 508 274; fax: +49 6027 508 520; e-mail: samuel.arba.mosquera@eye-tech.net.

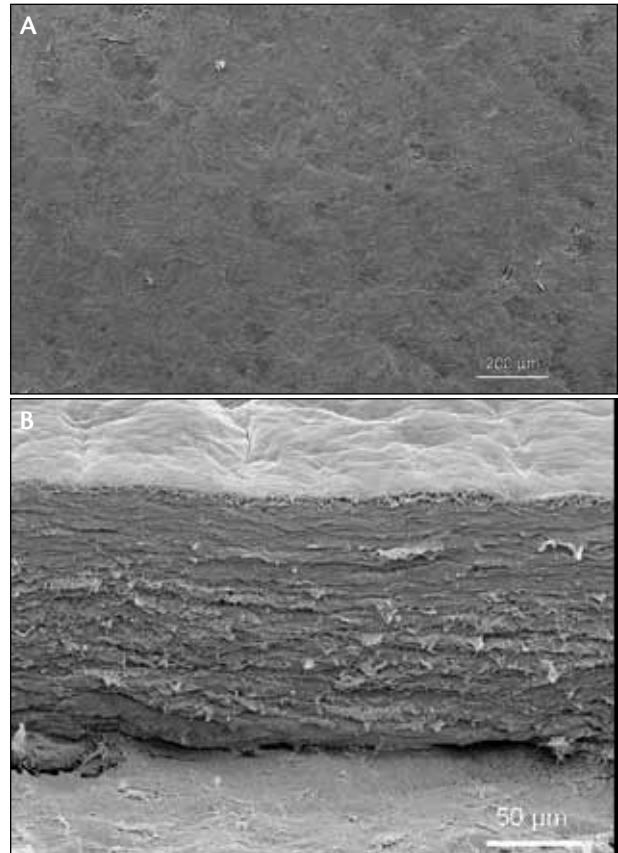


Figure 10. Microscopic view of a (A) stromal bed and (B) flap sidecut, both created with the Sirama nanosecond laser.

Physician perspective: Oliver K. Klaproth, Dipl Ing(FH); and Thomas Kohnen, MD, PhD, FEBO

Academic medicine is more than patient care. As faculty members at a university facility, we are committed to training young ophthalmologists and performing clinical and basic science studies. This research allows us to cooperate with scientists and engineers of other faculties.

In 2012, one of these innovative projects made its way from physics to medicine: the Sirama nanosecond laser (Figure 9). The initial idea was to develop a microchip laser with short wavelengths in the ultraviolet range (355 nm) to ensure enhanced precision for LASIK flap creation. The focal spot size of the nanosecond laser is one-third that of femtosecond lasers; combined with the low-density plasma, this ensures significantly finer structures, leading to more precise and smoother cuts.

To ensure proper fixation of the eye under the laser, an integrated interface low-suction system is used to appurate the cornea. The laser system has a swiveling laser arm and can be used with any excimer laser.

The first patients have been treated with the Sirama in multiple settings. Flap creation takes approximately 15

Courtesy of Oliver K. Klaproth, Dipl-Ing(FH)

seconds, including formation of the stromal bed (Figure 10A) and sidecuts (Figure 10B). Using an optimized docking process, suction time is minimal, starting after the cornea is correctly positioned and automatically releasing after the flap is created. The flap cut can be performed with variability of position, diameter, hinge position, thickness, and sidecut angles. In the future, the Sirama nanosecond laser will also offer therapeutic treatment modes for lamellar keratoplasty, ICRS channels, corneal inlays, and astigmatic keratotomy.

The Sirama will be available in 2013.

Oliver K. Klapproth, Dipl Ing(FH), is the Trial Center Manager at the Department of Ophthalmology, Goethe-University Frankfurt, Germany. Mr. Klapproth states that he has received travel reimbursement from Schwind eye-tech-solutions. He may be reached at e-mail: o.klapproth@med.uni-frankfurt.de.

Thomas Kohnen, MD, PhD, FEBO, is Professor and Chairman of the Department of Ophthalmology at Goethe-University, Frankfurt, Germany. Professor Kohnen is a member of the CRST Europe Editorial Board. He states that he is a consultant to Schwind eye-tech-solutions and he has received research grants, lecture honoraria, and travel reimbursement from the company. He may be reached at tel: +49 69 6301 3945; e-mail: kohnen@em.uni-frankfurt.de.



Femto LDV Z Models (Ziemer Group)

Industry perspective: Sandro Palumbo

In 2012, Ziemer launched the Femto LDV Z Models Z2, Z4, and Z6 for a variety of applications in ocular surgery (Figure 11). The concept of the laser platform embraces a strategy that grows with the surgeon's practice, offering the latest technology available today on a platform that is ready for tomorrow. Every model is designed



Figure 11. The Femto LDV Z Models (Z2, Z4, and Z6).

for an onsite upgrade; modularity makes it happen, and a seamless and stepwise upgrade between systems can be performed at any time.

Our slogan is simple: *Various cornea and presbyopia treatments today, cataract options tomorrow.* A wide range of corneal (Z-LASIK, Z-LASIK Z, channels for ICRS implantation, and various keratoplasty options) and presbyopia (pockets

for corneal inlays) treatments are already available with the current product range, and cataract modules including LRIs and capsulotomy will follow in 2013. A further highlight in 2013 will be release of the OCT module for refractive treatments with the Femto LDV Z Models, creating a femtosecond laser device with a broad variety of treatment options.

Our diagnostic product family will also be completed in 2013 with introduction of the Galilei G6. This device will incorporate the technology of the Galilei G4 (dual-Scheimpflug and Placido-disc) for precise imaging of the anterior segment with a biometer to measure eye length. The features and benefits of the Galilei G6 are tailored to support the needs of laser cataract surgery.

The Ziemer Femto LDV Z Models and Galilei G4 have the CE Mark and FDA clearance. Galilei G6 and the laser cataract surgery and OCT modules are pending CE-Mark approval and are not FDA cleared.

Sandro Palumbo is the Vice President of Marketing, Ziemer Group. Mr. Palumbo may be reached at e-mail: Sandro.Palumbo@ziemergroup.com.

Physician perspective: Scott M. MacRae, MD

The Femto LDV Z2, Z4, and Z6 femtosecond laser models represent an exciting improvement in laser technology. Refractive surgeons now have the ability to advance the same system from flap-making to creating lamellar corneal pockets and tunnels and cuts for penetrating keratoplasty. The Z capability allows the surgeon to customize the flap diameter, depth, hinge, and shape with unprecedented accuracy. This system allows the surgeon to subsequently upgrade to laser cataract surgery with the same platform.

The great advantage of the Femto LDV Z platform is the small (micro)-bubble technology, which is extremely reliable and precise and dramatically reduces inflammation.

Scott M. MacRae, MD, is a Professor of Ophthalmology and a Professor of Visual Science at the University of Rochester Medical Center in New York. Dr. MacRae states that he is a consultant to Ziemer Group. He may be reached at tel: +1 585 273 2020; e-mail: scott_macrae@urmc.rochester.edu.



iDesign and iFS Advanced Femtosecond Laser System (Abbott Medical Optics Inc.)

Industry perspective: Andreas Reichert, PhD

Prior to the introduction of wavefront-guided laser vision correction, the variables used for correcting refractive errors were limited to sphere and cylinder.



Figure 12. The iDesign Advanced WaveScan Studio.



Figure 13. The iFS Advanced Femtosecond Laser System.

Since the incorporation of wavefront-sensing technology, however, wavefront eye exams can detect more complex refractive errors such as higher-order aberrations. Abbott Medical Optics Inc. (AMO) recently introduced the iDesign Advanced WaveScan Studio (Figure 12), a high-definition wavefront sensor with five times greater resolution than its predecessor, the WaveScan System.

Besides

wavefront aberrometry, the iDesign System enables four additional measurements within a single capture sequence (autorefractometry, topography, pupillometry, and keratometry). The first European experience with the iDesign System in more than 500 eyes resulted in excellent visual outcomes and high patient satisfaction. These findings included very high accuracy of cylinder compensation.¹

Another innovation in the refractive laser business of AMO is the introduction of Inlay Pocket Software for the iFS Advanced Femtosecond Laser System (Figure 13). Taking into account the increasing interest in implanting corneal inlays for presbyopia correction, the iFS system now enables surgeons to perform customized pockets for each individual cornea and inlay.

Andreas Reichert, PhD, is the Director Medical Strategy & Education Europe, Middle East, Africa, Abbott Medical Optics Inc. Mr. Reichert may be reached at e-mail: Andreas.Reichert@amo.abbott.com.

1. Schallhorn S. Development of an optimal wavefront-guided LASIK nomogram for myopia using a large dataset. Paper presented at the European Society of Cataract and Refractive Surgeons annual meeting; September 12, 2012; Milan, Italy.

Physician perspective: Steven C. Schallhorn, MD

AMO released two new products during the European Society of Cataract and Refractive Surgeons (ESCRS) meeting in Milan, Italy this year, the iDesign aberrometer for custom LASIK with the Star S4 excimer laser and an upgrade to the iFS femtosecond laser to enable the creation of corneal pockets for inlays.

The iDesign System represents the latest-generation aberrometer, with considerable capability and enhanced dynamic range to drive wavefront-guided treatments with the Star S4 excimer laser. Besides performing high-definition aberrometry with more than 1,200 Hartmann-Shack lenslets, each capture measures pupil size (pupillometer), refraction (autorefractor), corneal shape (topographer), and corneal power (keratometer). By taking into account the corneal shape, the iDesign software automatically compensates for the cosine effect of the laser ablation.

Although the software has been available for only a short time, we have treated more than 300 patients with iDesign-driven wavefront ablations with the iLASIK treatment or procedure. It is easy to use for both technicians and surgeons and has significantly improved patient throughput. Most important, we have observed excellent clinical outcomes, in terms of both postoperative refractive predictability and UCVA. In particular, the astigmatism correction with the iDesign System has been the best I have ever observed.

Captain (Ret.) Steven C. Schallhorn, MD, is in private practice in San Diego and is Chief Medical Director of Optical Express. Dr. Schallhorn states that he is a consultant to Abbott Medical Optics Inc. He may be reached at e-mail: scschallhorn@yahoo.com.



iVis Suite (iVis Technologies)

Industry perspective: Giuseppe D'Ippolito

We at iVis Technologies have been unconventional thinkers in corneal therapeutics and refractive surgery since 1996, when we launched our CIPTA software for customized corneal surgery. This platform integrates corneal morphology, pupil dynamics, and refractive disorders to minimize the invasiveness of treatments and to optimize quality of vision for the patient.

C-TEN, our proprietary no-touch customized trans-epithelial surgical strategy, is a safe and automated procedure that avoids corneal manipulation by eliminating the need for appplanation, suction, and flap creation. As a one-step procedure, it dramatically reduces surgical time. Additionally, our iVis Suite (Figure 14) is designed to execute several therapeutic strategies such as corneal regularization for complex cases, customized combination corneal collagen crosslinking and laser treatment for keratoconus,



Figure 14. The iVis Suite.

customized lamellar transplantation, and pterygium excision, to name a few.

Several innovative features will be introduced in 2013, including a closed-loop link to exchange patient and surgical data wirelessly, allowing remote operation and monitoring. This software will include validation of surgical outcomes as a match between target ablation and effective postoperative outcomes.

Giuseppe D'Ippolito is the Owner and Chief Executive Officer of iVis Technologies. He may be reached at e-mail: g.dippolito@ivistechologies.com.

Physician perspective: Giovanni Alessio, MD

I have been using the iVIS Suite for several years, and it has given me freedom to plan the ideal custom surgical treatment for each patient. The iVis Suite allows me to plan and execute the ablation profile with the utmost accuracy, thanks to its fully automated processes.

Giovanni Alessio, MD, is an Associate Professor of Ophthalmology, Department of Ophthalmology and Otorhinolaryngology, University of Bari, Italy. Professor Alessio states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +39 0805592058; fax: +39 0805478918; e-mail: g.alessio@oftalmo.uniba.it.

MEL 80 and VisuMax Laser Systems (Carl Zeiss Meditec)

Industry perspective: Ludwin Monz, PhD, MBA

In the corneal refractive surgery segment, Carl Zeiss Meditec focused on two clinical procedures in 2012: ReLEx smile and Presbyond Laser Blended Vision (Figure 15).

ReLEx smile allows surgeons to perform laser treatment using the company's VisuMax femtosecond laser (Figure 16) without creating a corneal flap. In one treatment step, a thin intrastromal lenticule and a tiny incision (less than



Figure 15. Screen shot of the Presbyond Laser Blended Vision software module.

4 mm) in the intact cornea are created. The surgeon then manually removes the lenticule through the opening. One year after market introduction, ReLEx smile has been launched in major markets worldwide. After the company received permission from the FDA to initiate a clinical trial in April 2012, the first 15 cases were treated, and 1-month results were scheduled to be revealed at the American Academy of Ophthalmology (AAO) meeting in November (after press deadline). This and other clinical studies demonstrated faster recovery of corneal sensation, which may lead to less appearance of postoperative dry eye syndrome, preserved corneal biomechanical stability, and excellent predictability and stability of refractive outcomes.

Presbyond Laser Blended Vision extends the use of the CRS-Master treatment planning station and the MEL 80 excimer laser (Figure 16). Unlike conventional monovision, Presbyond achieves excellent intermediate visual acuity with virtually no loss in contrast sensitivity. Using this method, the nondominant eye is corrected to around



Figure 16. Carl Zeiss Meditec's integrated refractive surgery platform consists of the VisuMax femtosecond and MEL 80 excimer lasers.

Courtesy of Dan Z. Reinstein, MD, MA(Canada), FRCS(C), DABO, FRCOphth

Courtesy of Dan Z. Reinstein, MD, MA(Canada), FRCS(C), DABO, FRCOphth

-1.50 D (slight myopia) instead of the standard -3.00 D correction in conventional monovision, and the dominant eye is corrected for distance vision (0.00 D). Additionally, the depth of field of the two eyes is increased, generating a so-called *blend zone*. As a result, patients experience a more natural fusion of the images for near and distance vision.

Ludwin Monz, PhD, MBA, is President and Chief Executive Officer of Carl Zeiss Meditec. He may be reached at e-mail: monz@meditec.zeiss.com or j.ohlendorf@meditec.zeiss.com.

Physician perspective: Dan Z. Reinstein, MD, MA(Cantab), FRCSC, DABO, FRCOphth

The ESCRS 2012 annual meeting in Milan, Italy, showcased the latest developments in Carl Zeiss Meditec's Presbyond Laser Blended Vision and ReLEx smile offerings. For a video description of laser blended vision, visit eyetube.net?v=peege and for a video description of ReLEx smile, visit eyetube.net?v=gulos. As originally conceived, Laser Blended Vision offered a solution for presbyopia correction that provided good vision at all distances, did

not compromise visual quality, and maintained stereo acuity while correcting a wide range of refractive errors and astigmatism levels. The upgraded version, Presbyond, launched at the ESCRS meeting, includes extra features such as incorporation of wavefront data, adjustment for the patient's functional age, and manual adjustment of the spherical aberration component of the ablation profile.

ReLEx smile is becoming the preferred procedure for myopic patients (Figure 17). Presentations at ESCRS 2012 demon-

strated that updated energy and spot spacing settings have improved the visual recovery time to be similar to LASIK and that the superior biomechanical stability achieved by leaving the stronger anterior stromal lamellae intact may allow ReLEx smile to extend the range of myopia correctable on the cornea.¹ In the next few years, the company plans to integrate the Laser Blended Vision protocol and develop a hyperopic profile for the ReLEx smile technique.

Dan Z. Reinstein, MD, MA(Cantab), FRCSC, DABO, FRCOphth, is Medical Director of the London Vision Clinic, London. Professor Reinstein states that he is a consultant to Carl Zeiss Meditec. He may be reached at tel: +44 207 224 1005; e-mail: dzr@londonvisionclinic.com.



1. Reinstein DZ, Pradhan KR, Carp GJ, Archer TJ, Gobbe M. Comparison of early visual recovery and biomechanical influence on higher order aberrations between small incision lenticule extraction (SMILE) and femtosecond LASIK. Paper presented at: the European Society of Cataract and Refractive Surgeons annual meeting; September 8-12, 2012; Milan, Italy.



Courtesy of Dan Z. Reinstein, MD, MA(Cantab), FRCSC, DABO, FRCOphth

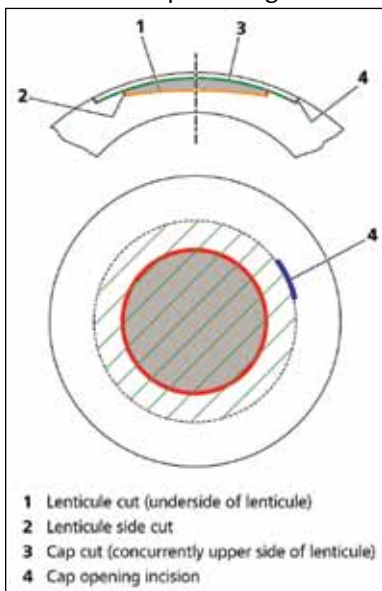


Figure 17. Incision geometry of the ReLEx smile procedure. (1) The lenticule cut is performed (the underside of the lenticule), (2) followed by the lenticule sidecuts. (3) The cap interface is created (the upper side of the lenticule), and finally (4) a 2- to 3-mm small incision is created superotemporally. The lenticule interfaces are separated using a flap separator and the lenticule is extracted manually, all via the small incision.

Technolas Excimer Workstation 217P (Technolas Perfect Vision GmbH/Bausch + Lomb) Industry perspective: Frieder Loesel

Several upgrades and updates to Technolas Perfect Vision GmbH's (TPV's) excimer laser platform were made over the past 2 years, including launch of the Supracor procedure (CE Mark approved for hyperopic presbyopes) for the Technolas Excimer Workstation 217P (Figure 18). This corneal approach to treatment of presbyopia is performed as easily as a LASIK procedure. It is a varifocal treatment providing excellent near and intermediate vision results, with the goal of maintaining or improving distance vision. During the past 1.5 years, more than 10,000 procedures have been performed in more than 60 clinics worldwide.

Supracor is designed for the full refractive treatment range, and TPV is working to expand indications; CE Mark approval for myopic presbyopes is expected in the first half of 2013. Additionally, Robert Ang MD, is conducting studies in pseudophakes and post-LASIK patients.

TPV also focused on refining the daily routine of its customers in 2012. The High Speed Session Manager (HSSM) hardware upgrade for the excimer laser was developed to streamline the surgeon's workflow from preoperative examination at the Technolas Diagnostic Workstation to the start of surgery with the 217P excimer laser. Advantages include all-in-one data management, high-speed data transfer, high-performance treatment calculation, easy treatment mode



Figure 18. The Technolas 217P with HSSM Technolas pad.

selection and scheduling and fast treatment at the laser.

In diagnostics, TPV has introduced a new tool to provide accurate detection of early keratoconus. The Screening for Corneal Objective Risk of Ectasia (SCORE) Analyzer is available as an upgrade for the Orbscan IIz (CE Mark pending). Developed by Damien Gatinel, MD, and A. Saad, MD, in association with TPV, the SCORE Analyzer provides a straightforward detection tool for early-stage keratoconus.

Frieder Loesel is the Chief Strategy Officer of Technolas Perfect Vision GmbH. He may be reached at e-mail: f.loesel@technolaspv.com.

Physician perspective: Sheraz M. Daya, MD, FACP, FACS, FRCS(Ed), FRCOphth

This past year has been fairly action-packed for TPV, with the introduction of the Victus as both a cataract and refractive platform and the growing number of Supracor treatments performed with the Technolas Excimer Workstation 217P. The addition of online OCT to the femtosecond laser platform has phenomenal potential for the future, but next year we also look forward to seeing new therapeutic applications for the Victus.

The use of Supracor for the correction of presbyopia has grown over the past year, with more than 10,000 procedures performed, mainly in hyperopes. This presbyopic LASIK treatment, which can be performed in both eyes at

the same sitting, has had exceptional results. I look forward to myopic, pseudophakic, and enhancement applications with this treatment in 2013. Another addition is the recently developed SCORE software (Figure 19). Using Orbscan files, the SCORE software looks at multiple parameters including Placido-disc topography, anterior and posterior elevation maps, and thickness profile to provide a probability score for keratoconus and form fruste keratoconus. In the few weeks I have used this analysis, I found that it can provide me with definitive and calculated risk factors.

Sheraz M. Daya, MD, FACP, FACS, FRCS(Ed), FRCOphth, is Director and Consultant at Centre for Sight, East Grinstead, United Kingdom. Dr. Daya is a Chief Medical Editor of CRST Europe. He states that he is a consultant to Technolas Perfect Vision GmbH and Bausch + Lomb. He may be reached at e-mail: sdaya@centreforsight.com.



Figure 20. The WaveLight Refractive Suite platform.

WaveLight Refractive Suite (Alcon Laboratories, Inc.) Industry perspective: Brian O'Neal

In 2012, Alcon continued to deliver innovation to corneal surgeons with its WaveLight Refractive Suite (Figure 20), which received regulatory approval in all major markets, excluding Japan. Additionally, the company introduced enhancements to the platform, including rollout of its Aqua software and a hardware upgrade for its WaveLight Lasers and Diagnostic Systems. The Aqua upgrade provides additional feature sets to enhance keratoplasty and LASIK flap creation with the WaveLight FS200 Laser. It also offers enhanced centration modalities on the WaveLight EX500 excimer laser to improve patient outcomes. Additionally, Alcon introduced to market a redesigned WaveLight FS200 Patient Interface Suction Ring to deliver enhanced performance and allow treatment of a broader range of patients.

Brian O'Neal is Head, Surgical Franchise, Europe, Middle-East and Africa, Alcon Laboratories, Inc. For more information (Continued on page 62)

Courtesy of Sheraz M. Daya, MD, FACP, FACS, FRCS(Ed), FRCOphth

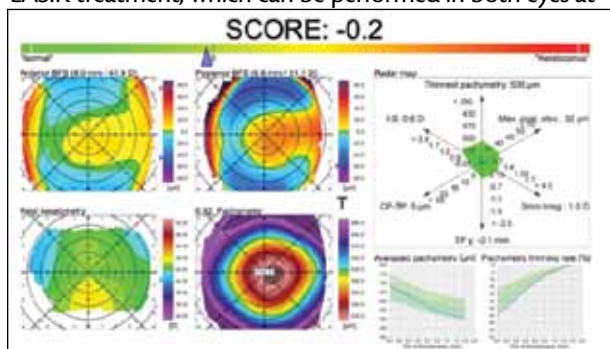


Figure 19. This SCORE analysis shows that the cornea is normal despite mild inferior steepening on Placido-disc topography.

(Continued from page 60)

on the WaveLight Refractive Suite contact Alcon Laboratories at e-mail: alcon.publicrelations@alconlabs.com.

Physician perspective: A. John Kanellopoulos, MD

What I found most exciting in 2012 was the release of Alcon's Aqua software. This software combines the advanced diagnostic devices networked with these two lasers, which includes the WaveLight Wavefront Analyzer, BioGraph interferometer, Topolyzer Vario Placido-disc topographer, an iris and limbal landmark recognition device, and the Oculyzer II. This software allows me to adjust my flap-making parameters, even at the last minute and with the planned treatment projected onto my flap-planning screen, and to perform large (9-mm) LASIK flaps within 6 seconds using the FS200. The fully customizable venting channel reduces the presence of an opaque bubble layer. The Aqua software includes a broad range of keratoplasty applications as well, such as ICRS channel creation using predetermined segment parameters and lamellar and penetrating keratoplasty with myriad graft-host interface configurations.

What I enjoy most about the Aqua software for the WaveLight EX500 is that I can compare five treatment options (wavefront-optimized, wavefront-guided, topography-guided with the Oculyzer II, topography-guided with the Vario, and Custom Q asphericity adjustment) side by side on the screen. By comparing these treatment plans next to a patient's topography maps and treatment parameters, I can choose the best possible treatment for that patient. The Aqua software also adjusts the treatment centration, either PRK or LASIK, in 10° steps anywhere between the pupil center and the corneal apex, as determined during topography capture. I especially enjoy using this software in eyes with post-LASIK ectasia or extreme corneal irregularities. When the software is used with topography-guided treatments, the tilt option is off as a default, thus improving safety. Additionally, the software labels left- and right-eye treatments as green and red backgrounds, respectively, to further improve safety.

I am excited by the offerings of these benchmark technologies to corneal and anterior segment surgeons, but, most important, to refractive surgeons. ■

A. John Kanellopoulos, MD, is Director of the LaserVision.gr Eye Institute in Athens, Greece, and is a Clinical Professor of Ophthalmology at New York University School of Medicine. Dr. Kanellopoulos is also an Associate Chief Medical Editor of CRST Europe. He states that he is a consultant to Alcon Laboratories, Inc. He may be reached at tel: +30 21 07 47 27 77; e-mail: ajkmd@mac.com.

