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Comprehensive detection of ganglion cell loss with posterior pole asymmetry analysis

By Dr Sanjay Asrani, MD, Associate Professor of Ophthalmology, Head Glaucoma OCT Reading Center, Director of Education, Duke University Eye Center, Durham, North Carolina, USA

To aid in the early detection of glaucoma we created a new protocol for the SPECTRALIS SD-OCT that detects ganglion cell losses in the posterior pole. This protocol is referred to as ‘Posterior Pole Asymmetry Analysis’. It measures retinal thickness in the posterior pole using a 61 line (30° × 25°) OCT volume scan covering a larger area that corresponds to a 24–2 visual field. The results are displayed as a colour coded thickness map with an 8 × 8 grid overlay centered on the foveal pit. The grid is positioned symmetrically to the fovea-to-disc axis for each eye. The grid consists of small 3° × 3° squares. The mean retinal thickness of each square is displayed. The entire retinal thickness rather than the ganglion cell layer is analysed because it is difficult for automated software to reliably identify thinning of layers that are hard to identify on OCT images. In patients that do not present with retinal pathology it can be assumed that thinning of the retina represents ganglion cell loss.

Asymmetry analysis: While examining RNFL and macular thickness measurements, one cannot help but notice that, besides the fact that the measurements of an individual may be outside the normative database range and thus classified as abnormal, there is tremendous value in evaluating the asymmetry between the two eyes of an individual and between the upper and lower half of the same eye. We have, therefore, created an asymmetry analysis for the posterior pole retinal thickness which is displayed as a gray scale map of difference in thickness from 0 to −30 microns with −5 microns being light gray and −30 microns being black.

Asymmetry between eyes: For each small 3° × 3° square area of one eye, the mean retinal thickness is compared to the value in the corresponding area of the other eye.

Hemisphere asymmetry: Displays the asymmetry between the superior and inferior hemisphere of each eye. The fovea-to-disc axis is the horizontal symmetry line. Each small area in the lower hemisphere is compared to the corresponding area in the superior hemisphere.

Utilization of two objective measurements such as the RNFL and the posterior pole asymmetry analysis helps early detection of tissue losses. The high reproducibility of the SPECTRALIS due

Figure 1: Right optic nerve of case study 1: patient demonstrating an inferno temporal RNFL loss.

Figure 2: SPECTRALIS measurement shows a loss of RNFL inferotemporally in the right eye compared to the normative database (long arrow) as well as compared to the measurement of the left eye (short arrow).

Figure 3: Posterior pole retinal thickness measurement demonstrating loss of retinal thickness inferotemporally in the right eye.
to its unique active eye tracking is of critical importance in this context. The following are two examples demonstrating the utility of posterior pole retinal thickness and the asymmetry analysis.

**Case 1**
A 53-year old Caucasian female patient was referred as a glaucoma suspect due to borderline IOP of 23 mmHg. Her right optic nerve (Figure 1) showed a 0.5 cup with an infero temporal RNFL loss (arrows). The visual fields were normal in both eyes along with the rest of the eye examination. On RNFL measurement by the SPECTRALIS (Figure 2), the right eye showed loss of RNFL inferotemporally (long arrow) compared to the normative database as well as loss compared to the measurement of the left eye (short arrow). The posterior pole retinal thickness measurement of the right eye (Figure 3) demonstrated a loss of retinal thickness inferotemporally (arrows). This loss is clearly depicted as an arcuate shaped black area on the OD–OS asymmetry analysis as well as on the hemisphere asymmetry analysis of the right eye. Note the early loss of retinal thickness inferiorly in the left eye detected by the hemisphere asymmetry analysis of the left eye.

**Case 2**
A 55 year old oriental female diagnosed with primary open-angle glaucoma OD presented for a second opinion. The visual fields demonstrated a double arcuate scotoma OD and isolated non-specific losses OS (Figure 4). On RNFL measurement by the SPECTRALIS (Figure 5), the right eye showed loss supero and inferotemporally OD. The RNFL measurements for the left eye however were classified as normal. The posterior pole retinal thickness measurement of the right eye using the SPECTRALIS (Figure 6) demonstrated significant loss of retinal thickness both supero and inferotemporally (long arrows). This loss is also seen in the OD–OS asymmetry analysis. The fact that the lower hemisphere is much thinner (corresponding to the larger visual field loss superiorly) is visible in the OD hemisphere asymmetry analysis. However, the most significant and unexpected finding was the loss of retinal thickness OS which is readily visible inferotemporally (short arrow) on the thickness map as well as detected on the OD hemisphere asymmetry map. This indicated to us that the retinal thickness measurement was able to detect early glaucomatous losses even before RNFL measurements and before visual field changes. This demonstration of loss of tissue thickness OS made us recommend treatment for the left eye as well.

**Reference**

Full details of the SPECTRALIS OCT can be seen on page 16

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The ologen® Collagen Matrix (Aeon Astron Europe B.V., Leiden, The Netherlands) is a collagen-glycosaminoglycan (GAG) copolymer matrix implant designed for glaucoma surgery. According to the manufacturer, the porous structure of ologen® Collagen Matrix enables fibroblasts and myofibroblasts to grow randomly into the pores to form a loose matrix of connective tissue and thereby reduce scar formation. After implantation, the device mostly degrades in approximately 180 days. Our 24-month randomized clinical trial suggested that ologen® Collagen Matrix could be a safe and effective alternative to Mitomycin-C (MMC) with similar long-term success rate in primary open-angle and exfoliation glaucoma.¹

Case study
In 2009, a 36-year-old woman with bilateral pigmentary glaucoma was referred to us. Her intraocular pressure (IOP) was above 40 mmHg with maximum therapy, deep papillary cupping, advanced visual field damage and best-corrected visual acuity (BCVA) 20/20 OU (for both eyes). In April 2009, she underwent trabeculectomy in her right eye (RE) and in her left eye (LE) in January 2010.

Methods
The technique used for the RE included a superior fornix-based conjunctival/tenons flap and scleral flap with 3.0 mm side incisions not completed up to limbus according to the ‘Moorfields Safer Surgery System’.² Pieces of weck-cell sponge soaked with MMC at a concentration of 0.2 mg/mL were placed under the conjunctiva surrounding the scleral flap and on the scleral bed to be left in the position for 2 min. Trabeculectomy was performed with a Crozafon-De Laage punch; the scleral flap was closed with one loose stitch and a ologen® Collagen Matrix implant (model number 830601: 2.0 mm in height x 6.0 mm in diameter) was then centred on top of the scleral flap and under the conjunctiva. The conjunctival flap was secured to the limbus with a tight 10-0 nylon running suture with buried knots. The filtration was assessed by injecting balanced saline solution (BSS) into a paracentesis. The same technique was used for the LE, but in this case no MMC augmentation was employed. The postoperative IOP, blebs, VA and complications were evaluated.

Results
In November 2011, 31- and 22-months after surgery respectively, the IOP was 11 mmHg in the RE and 10 mmHg in the LE, both without medications. The VA was 20/10 in both eyes with clear lenses. Both blebs were diffuse, but with a central avascular, cystic area in the RE in contrast to the normal vascularization in the LE (Figure 1).

Conclusions
In this case ologen® Collagen Matrix alone exhibited similar long-term success as MMC and ologen® Collagen Matrix created a more physiological bleb appearance than MMC.

References

Figure 1: Blebs photographs. Left: RE 31-months post-op; right: LE 22-months post-op.
The light-adjustable lens and the demanding patient

By Dr Lawrence Brierley, MD, Vision Rejuvenation Victoria, British Columbia, Canada

Virtually all patient groups have a subgroup of individuals who are notoriously difficult to treat, and cataract surgery patients are no exception. Post-refractive surgery patients are a recognized challenge for cataract surgeons. They are the hardest class of patient to achieve an accurate refractive outcome and they also have the highest demands and expectations. The majority of these patients have spent a sizeable amount of time and money trying to achieve good vision, and as such, spectacle independence is a high priority for them. Other patients may be tolerant of spectacle use or mild visual imperfections after cataract surgery; however, such outcomes are usually unacceptable to post-refractive surgery patients.

Use of laser-assisted in situ keratomileusis (LASIK) and photorefractive keratectomy (PRK) gained popularity around 20 years ago, with many refractive patients electing to have these procedures in their thirties and forties. Given that these patients are now approaching the classic cataract age, the number of post-refractive patients who require precise cataract surgery outcomes is currently increasing and, as such, the light adjustable lens (LAL; Calhoun Vision, Pasadena, California, USA) has never been more relevant than it is now.

Our clinic in Victoria, Canada began implanting the LAL 18 months ago. We have implanted about 300 in total. Since starting to offer LAL implantation, I have noticed a change in the referral patterns to our clinic. I am increasingly receiving referrals for patients deemed unlikely to achieve a targeted refractive outcome. Such patients include those with a history of refractive surgery, high hyperopia or myopia, and patients with high refractive expectations of cataract surgery. The common denominator in these referrals is the acknowledgment that their specific needs can be met by the precision and opportunity for postoperative adjustment offered only by LAL implantation.

I have found that in difficult patients, the real advantage of the LAL is the ability to achieve a very precise visual outcome. As the adjustment of refractive power is performed in stages after the initial implantation, the patient can see the process happening and the target outcome can be altered along the way if he or she has a change of mind about the desired visual outcome.

The LAL is designed to provide clear vision at a single fixed distance, although a surprising degree of depth of field is frequently seen. As the LAL is capable of precise power adjustment after implantation, LAL patients serve as perfect candidates for achieving enhanced near as well as distance vision via monovision. My default method of LAL implantation is now a monovision setup in which the dominant eye is fixed for distance vision and the non-dominant eye is fixed for about 0.75 D to 1.00 D of myopia. The patient has the first 2 postoperative weeks to adapt to seeing with a modest degree of monovision. This is followed by lens power adjustments, during which the patient can elect to increase or decrease the separation between the two eyes. Monovision is typically known to create asthenopia in some patients; however, I have found a surprising degree of tolerance of refractive disparity between the eyes of LAL patients. This may be due to the increased depth of field that is characteristic of the LAL, which in turn may provide a greater degree of inter-eye visual range overlap and minimize the sense of imbalance sometimes associated with monovision.

Although the end result achieved with the LAL is a major attraction for patients, the process by which this is obtained is demanding for patient and surgeon alike. Patients seem surprisingly accepting of the time spent refracting, dilating pupils, discussing the target for the next adjustment and adjusting the lens during each of up to 4 postoperative visits; but, this can be time consuming for clinical staff. Nonetheless, I remain a strong advocate of this IOL among difficult patients simply because I know that the final outcome is worth any short-lived inconvenience. The reality is that with the LAL, there is a lot of work in the first 3 or 4 postoperative weeks and once the desired visual outcome is achieved, that is the end of the difficulty. In contrast, with multifocal lenses, problems typically begin at 6 or 7 weeks and in some cases these problems never resolve until the IOL is explanted.

Since starting to use the LAL, I have noticed that my practice has changed in terms of patient demographics, flow, management timeline, repeat presentation, and overall efficiency. The level of patient satisfaction achieved with this lens is high and this drives patients to promote the practice and the LAL in a way I have never seen with other IOLs.

Full details of the Light Adjustable Lens can be seen on page 17
The presbyopia dilemma

Bobby Qureshi, MD FRCS (Ophth.), London Eye Hospital, UK

Effective, spectacle-free solutions for presbyopia patients remain a continuously evolving arena. Simply looking back over the last 10 years reveals a stepwise progression in the scientific reasoning behind the successive technologies developed to provide sharp vision at multiple distances without the use of spectacles.

Monovision with traditional multifocal IOLs was the original solution offered to such patients, however, not everybody is able to adapt to this method of seeing because they find the disparity between the two eyes disconcerting. This has been the major disadvantage of monovision with conventional IOLs. I started using multifocal IOLs over 10 years ago to provide near and far vision in each eye. However, these IOLs have their own problems, namely the occurrence of glare and halos, reduced contrast sensitivity, and the need for postoperative laser-based enhancements to achieve a good visual outcome.

Accommodating IOLs have since been developed as an alternative to multifocal IOLs. These IOLs bypass the light splitting and multizonal properties of multifocal IOLs by working with the eye’s ciliary muscles to mimic the natural accommodation process, resulting in a movement of the lens to change focus. Most of these implants have been disappointing with little genuine accommodation being achieved. Recently, our experience with dual optic accommodating IOLs has shown more promise in certain patients; however unpredictability is the key downside because the ability of ciliary muscles to move the implanted IOL varies greatly from person to person.

As a cataract and refractive specialist, I deal with a great number of presbyopia patients and have remained eager to find an optimum solution for such patients. The LAL was a technology I first came across three years ago. I followed it for some time and was intrigued by the science behind it. My attention was back over the last 10 years reveals a stepwise progression in the scientific reasoning behind the successive technologies developed to provide sharp vision at multiple distances without the use of spectacles.

Blended monovision is perhaps the most straightforward presbyopic option offered by the LAL. In contrast to monovision with conventional monofocal IOLs, the postoperative adjustment of refractive power permitted by the LAL’s design ensures that the degree of inter-eye refractive difference can be adjusted to provide every patient with a level of monovision that they can adapt to and try before the lens is locked. A second near vision option of the LAL is a customized near add (CNA) function that can be used to provide bifocal vision. CNA involves the inclusion of a small add zone in the central part of the LAL, which can be adjusted to meet the exact visual specifications required by a patient. Furthermore, CNA treatment can be performed incrementally until the desired outcome is reached. Another treatment option, in which monovision and CNA are used in conjunction, can often produce a more precise outcome.

Of all the treatment options offered by the LAL, the capacity to manipulate asphericity is perhaps the most exciting. Spherical aberration in our natural eye contributes to our depth of focus. By controlling the degree of spherical aberration, we have the potential to extend this range of focus. The LAL allows adjustments to be made to induce controlled amounts of negative spherical aberration before the lock-in procedure is performed. In doing so, patients reap the benefit of good near, middle and distance vision in each eye, while remaining free from the visual disturbances associated with multifocal IOLs. In my practice, we have had some very promising results with aspheric adjustments and we are working with Calhoun Vision to further refine the technique.

When I started using the LAL about two years ago at the London Eye Hospital on Harley Street, we used multifocal IOLs for approximately two-thirds of our patients, and the remaining third received monofocal IOLs. The introduction of the LAL into our practice has had a significant impact on these proportions. Half of our patients are now electing for LAL implantation and are achieving great results from the lens and I have now implanted more LALs than any other surgeon such is the demand from patients. The main limiting factor for LAL uptake is the initial inconvenience faced by the patient who must wear UV protective glasses for the first 2–3 postoperative weeks, and make four to five postoperative visits for the adjustments and lock-ins required to achieve their desired result. However, this is an area that is currently being addressed to reduce the number of postoperative visits required to a maximum of two or three.

Overall, I believe that the future holds very exciting things for the LAL. In its present form, the LAL offers a unique and effective solution for presbyopia. The addition of customized asphericity and a decrease in the number of postoperative adjustments required will undoubtedly make the LAL superior to any currently available IOL.

Full details of the Light Adjustable Lens can be seen on page 17.
SLT case studies

Three case studies are described looking at SLT as an initial therapy, replacement treatment and its repeatability

By Dr Ani Khondkaryan, MD, and Dr Brian A. Francis, MD, MS

Selective laser trabeculoplasty (SLT) may be used as initial therapy for intraocular pressure (IOP) control and as replacement therapy. Some of its advantages over medical treatment include improved compliance, avoiding side effects of glaucoma drops, and possibly improved cost profile. Its advantages over argon laser trabeculoplasty (ALT) include repeatability and less thermal damage to the angle (Figure 1). The following case summaries illustrate these various uses for SLT. Equipment used: Lumenis Selecta SLT Laser system.

Case #1:
WH, a 50-year-old Caucasian man, was diagnosed with early glaucoma with an IOP of 22 OU. He was offered the choice of starting medical treatment versus SLT as initial treatment. He elected to proceed with SLT. One week after treatment in both eyes, his IOP was 14 in the right eye and 13 in the left eye. Three months after treatment, it was 17 in the right eye and 16 in the left eye, and has been stable since. He has not required medical treatment of his glaucoma in the three years since initial treatment with SLT.

SLT for initial treatment: Discussion
This case illustrates the efficacy of SLT as initial treatment. Several clinical trials have shown an IOP reduction of approximately 30% with SLT (Figure 2). This is equal to the expected IOP reduction from prostaglandin analogues, which are to date the most potent class of glaucoma medical therapy. Moreover, both SLT and latanoprost were shown to significantly reduce IOP fluctuations. Advantages of SLT over medical treatment included eliminating concerns about patient compliance with medical treatment and avoiding the side effects of glaucoma medications.

Case #2:
JO, a 70-year-old Caucasian woman with bilateral pseudoexfoliation glaucoma and moderate optic nerve damage and visual field loss, was being treated with Azopt, Timolol, and Xalatan OU with IOP at target OU (14 in the right eye and 15 in the left eye). However, she complained of redness and irritation in both eyes as well as thickening of her eyelids. SLT was offered as an option to reduce her reliance on medical treatment. She elected to proceed, and both eyes were treated. Three months after treatment, her IOP on Xalatan alone was 12 in the right eye and 10 in the left eye. The side effects from her glaucoma drops had resolved.

SLT for replacement treatment: Discussion
As this case demonstrates, SLT is useful as replacement therapy to medical treatment of glaucoma to reduce dependence on medications. Especially in patients who are using multiple medications (Figure 3), SLT may improve compliance, control costs, and reduce side effects from medications.
Case #3:
JK, a 68-year-old man with advanced primary open angle glaucoma in the right eye, was being treated with maximum topical medications (Cosopt, Alphagan and Travatan), with IOP still above target of low teens at 16. SLT was performed on the right eye, with IOP 2 and 5 months later at 13. One year later, both Cosopt and Alphagan had been discontinued, with IOP being 13. Five years later, the patient’s IOP had again risen to 17 on Travatan-Z alone. Repeat SLT was performed. One month after second SLT treatment, the IOP on Travatan-Z was 11.

Repeatability of SLT: Discussion
One advantage of SLT over ALT is that it can be repeated, as shown in this last case.8–10 Studies have found that the final IOP was equivalent after the initial and repeat SLT, and when baselines were matched, the magnitude of IOP lowering was almost identical (Figure 4).

References
1. L.J. Katz et al., J. Glaucoma, 3 May 2011 [Epub ahead of print].

Full details of Lumenis’ SLT offerings can be seen on page 17
SUPRACOR varifocal presbyopia treatment in pseudophakic patients

Dr Robert Ang, Asian Eye Institute, Philippines

The SUPRACOR LASIK algorithm is a bilateral varifocal treatment for presbyopic patients developed by Technolas Perfect Vision (TPV). TPV’s extensive experience on Excimer LASIK procedures helped develop corneal profiles that minimize or control undesired aberrations, which tend to occur in other presbyLASIK-based procedures and lead to deterioration of distance vision. The procedure received CE Mark approval for use in presbyopic hyperopic patients in May 2011, whilst indications for myopic, post-LASIK and pseudophakic patients are currently undergoing clinical evaluations.

The rational to perform SUPRACOR LASIK on pseudophakic patients stems from the following reasons. The majority of the IOLs implanted are monofocal IOLs. Even after successful cataract surgery, pseudophakic patients can still have residual refractive errors and astigmatism, so may still require glasses for distance vision, and majority, if not all, will require reading glasses for near vision. A LASIK-based treatment is a logical option owing to its wide acceptance, plus LASIK is already being used for pseudophakes to touch up residual refractive errors. Given the opportunity, most patients would desire a spectacle free lifestyle. SUPRACOR may provide the answer for this unserved market by simultaneously correcting refractive errors and offering a presbyopic solution.

This case study is part of a prospective single site study for SUPRACOR LASIK in pseudophakic eyes. All patients recruited had been implanted with monofocal IOLs and have a best corrected distance visual acuity of least 20/25 and spherical error between +2.00 to −2.00 with up to 2.0 D of cylinder. For this study, only monolateral treatment will be performed. The eye with the worse visual acuity
for distance and worse refraction would be selected for treatment. If both eyes had similar distance visual acuity, then the non-dominant eye was treated. The recommended target in terms of postoperative refractive outcome at 3 months was $-0.50$ D SE.

A 68-year old female patient who had previously undergone uneventful cataract surgery in October and November of 2006 was recruited. The patient was implanted with the Acrysof Natural (OD) and Acrysof IQ (OS). YAG laser treatment was performed in both eyes in June 2011. The patient was then selected to undergo the SUPRACOR procedure in the dominant eye (OD) in August 2011. The LASIK flap was created using a 120 µm XP microkeratome. The SUPRACOR procedure was performed using the TECHNOLAS Excimer Workstation 217P (Technolas Perfect Vision GmbH). For standardization purposes with the SUPRACOR treatments, I always centre the treatment over the pupil.

Refraction and visual acuity data are presented in the Table 1.

| Table 1: SUPRACOR refraction and visual acuity results in pseudophakic patients. |
|---------------------------------|-----------------|-----------------|-----------------|
| **Manifest Refraction**         |                 |                 |                 |
| PreOP                           | $+0.75 / -2.00 / 85$ |                 |                 |
| 1-Month                         | $-0.50 / -0.25 / 145$ | $-0.25 / -0.50 / 90$ |                 |
| 3-Months                        |                 |                 |                 |
| **Study eye OD for distance**    |                 |                 |                 |
| PreOP                           | sc 0.8 binocular sc 0.8 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 |
| 1-Month                         | sc 1.0 binocular sc 1.0 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 |
| 3-Months                        | sc 1.0 binocular sc 1.0 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 | sc 1.0 binocular sc 1.0 cc 1.0 |
| **Study eye OD intermediate vision (80 cm)** | sc 0.8 cc 1.0 (distance corrected) | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 |
| 1-Month                         | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 |
| 3-Months                        | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 |
| **Study eye OD near vision**     |                 |                 |                 |
| PreOP                           | sc 0.5 cc 1.0 ADD +2.50 D | sc 1.0 cc 1.0 ADD +1.25 D | sc 1.0 cc 1.0 ADD +0.50 D |
| 1-Month                         | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 |
| 3-Months                        | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 | sc 1.0 cc 1.0 |

A subjective patient questionnaire found that at both 1 and 3 months post-op, the patient felt they now live their life without glasses, their vision had improved after surgery and that they would undergo the procedure again and recommend the procedure to a friend. Postoperatively, the patient could now read the newspaper, menus and package inserts without glasses, which was not possible prior to the procedure. In terms of intermediate vision, by 3 months post-op, the patient could use the computer without glasses. Note that post-LASIK dry eye syndrome was managed aggressively with silicone punctual plugs and artificial tears in all study eyes following the SUPRACOR treatment.

For my initial experience treating pseudophakes implanted with monofocal IOLs with the SUPRACOR procedure, I find that it is a very promising solution for presbyopia in this patient group. A mildly myopic target refraction can be achieved. The first few patients enjoyed good distance vision with a significant improvement in near and intermediate vision. The study is ongoing.

Full details of the SUPRACOR can be seen on page 18.
**Product Focus: Geuder Xenotron III, the new light source**

“More Light!” were supposedly Goethe’s last words. “Not more!”

**First part by Prof. Lars-Olof Hattenbach, MD, Clinic Ludwigshafen, Germany**

The modern pars plana vitrectomy works with ever-smaller incisions — and requires increasingly intensive light sources.

Since the introduction of trocar systems, incisions have become increasingly smaller — and the demand for new highly intensive illumination systems has increased. An efficient endoillumination is the precondition for using the full potential of trocar-supported PPV including protection of the sclera, conservation of the IOP with an even infusion flow, easy change of instruments and self-sealing incision. The Xenotron III is such a highly efficient light source that supports smallest incisions and provides a maximum light intensity even with smallest handheld light fibres.

**Chandelier fibre optic with 25G flat-head trocar for truly bimanual operating**

The Hattenbach 25 Gauge flat-head trocar can be safely introduced pars plana as one-step and self-sealing sclerotomy. A search of the incision, an ‘inflation’ of the conjunctiva caused by escaped infusion fluid or an post operative insufficient incision, as often the case in the two-step method, is not necessary anymore. The trocar is built so flat, that it does not impede the surgeon. The enormous intensity of the Xenotron III facilitates the use of the 25 Gauge chandelier fibre optic that completely illuminates the vitreous body cavity brightly and evenly and thus offers ideal overview during the whole operating procedure. The integrated PhototoxGUARD informs the surgeon reliably about up-to-date parameters in order to prevent light toxicity and allows retina-friendly surgeries.

**Second part by Prof. Stefan Dithmar, MD, Heidelberg University Hospital, Germany**

**Light exposure during vitreoretinal surgery**

Endoillumination can lead to damage of the retina. In the interaction of optical radiation and the retina, wavelength (nm), exposure time (s) and irradiance (W/cm²) play a decisive role. Shorter, high-energy wavelengths lead to light-induced, chemical reactions. In the process a considerably lower irradiance suffices, while exposure time is generally longer. Photochemical light toxicity is, under everyday conditions and with the intraoperative use of light sources, the crucial damaging mechanism of the retina. Because of the large number of membranes in the outer segments of the photoreceptors (the RPE) the photochemically induced lipid peroxidation in the retina plays a large role. In case of mild lesions the architecture of the retina can again, apart from a permanent hypopigmentation, normalize within 30 days. Also the toxicity of indocyanine green during peeling surgery could be increased by exposure to light during the operation. Functionally, there is evidence for a various pronounced decrease of visual acuity through light-induced damage.

**Geuder Xenotron III — unbeatably bright and still safe**

Regarding light exposure, until now the amount of light projected onto the retina by an instrument was not known so the surgeon could not effectively implement the directive ISO 15004-2 (protection against exposure to light). The PhototoxGUARD of the Xenotron III calculates the energy released into the eye and comprehensively informs the surgeon, at all times, about the light intensity at the fibre optic exit, the amount energy released into the eye and the remaining time for a safe operation via a countdown. The high intensity not only offers the surgeon an outstandingly bright and consistent illumination, but also facilitates the use of a single 25G optical fibre as a chandelier without affecting illumination. This not only reduces the risk of phototoxic effects during long operations, but also allows the surgeon to truly work bimanually with two handheld instruments.

**Confusion-proof colour code simplifies OP-preparation**

The Uno Colorline series by Geuder distinguishes itself through a uniform colour code (where red stands for 20G, green for 23G and blue for 25G). The colour code simplifies OP-preparation and helps to prevent potential confusion. Depending on size and geometry, the limit values for the Xenotron III PhototoxGUARD will be loaded and displayed. Particularly for highly intensive endoillumination it is important to use the correct fibre optics with the corresponding fibre optic size and geometry to avoid unintentional phototoxic effects.

**PhototoxGUARD and touchscreen**

The Xenotron III is operated via a colour touchscreen on which the surgeon, the fibre optic and the intensity can be selected. The Xenotron III also allows settings of preferred fibre optic based intensities to be saved for up to six operators. The PhototoxGUARD provides all the relevant information via the touchscreen. Depending on the fibre optic, limit values are displayed. A ‘traffic light system’ informs the surgeon about the light-toxic status. Green signifies that all parameters are within the recommendations of ISO 15004-2; yellow, that the remaining safe operation time is relatively short; and red, that more than 10 J/cm² have been released into the eye, and that safe operation time has been exceeded. Obviously the operation can, even in this case, be pursued and finished under full illumination.

Full details of the Xenotron III can be seen on page 18

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A recent prospective, randomized, single-masked study, including a within-patient comparison, has revealed that the easyTip 2.2 mm phaco tip in co-axial MICS uses 30% less energy than the 20G CMP tip during cataract surgery. According to Dr Sabine Schriefl (Department of Ophthalmology, Waehringer Guertel, Vienna, Austria), downsizing incisions has been a driving force of the evolution of cataract surgery in recent years. Dr Schriefl and colleagues, Dr Eva Stifter and Prof. Rupert Menapace, performed a comparative study to determine the intraoperative efficacy and postoperative outcomes of two different phacoemulsification tips, the easyTip 2.2 mm and the 20G CMP tip (both from Oertli Instrumente AG, Berneck, Switzerland).

Comparing phaco tips

The prospective, randomized, single-masked study consisted of 114 eyes of 57 patients. Dr Schriefl explained that preoperative examinations were performed 1-week before surgery. “One week before surgery, we graded all cataracts (i.e., both groups) using the Lens Opacities Classification System (LOCS) III and we measured endothelial cell density by non-contact specular microscope,” she said. To maintain integrity in the study a single surgeon performed all the operations. Dr Schriefl added, “The surgeon operated on each patient in a single session where one eye was randomly assigned to undergo phacoemulsification with the 20G CMP (group 1) and the fellow eye with the easyTip 2.2 mm (group 2). Group 1 were operated on with low fluidic setting (aspiration flow: 20 mL/min; vacuum: 400 mmHg) while group 2 were operated on with enhanced fluidic settings (aspiration flow: 35 mL/min, vacuum: 500 mmHg).” She went on to explain that efficacy was measured in terms of surgery time (to divide and conquer the nucleus of the lens), the amount of phaco energy consumed and the fluid consumption. “The safety of each phaco tip,” she continued, “was judged in terms of visual acuity (VA) and endothelial cell loss.” The follow up periods for visual outcome and endothelial cell loss were 1-week and 18-months post-op. Complete analysis was made postoperatively at the end of the study.

Differences in the phaco tips

In their preoperative analysis Dr Schriefl and colleagues found that there was no statistically significant difference in the mean cataract grade. With regards to the phaco tips, Dr Schriefl revealed, “When using the easyTip 2.2 mm the overall phaco energy consumption was reduced by 30% while overall fluid consumption was only 12% higher compared with the CMP 20G.” She added, “Sadly, we observed no difference in surgery time but with the easyTip 2.2 mm the effective phacoemulsification time was reduced.” Additionally, Dr Schriefl and colleagues found that with the easyTip 2.2 mm the amount of energy required to conquer the nucleus of the lens was also significantly lower than that of the CMP 20G tip. This added to the fact that the effective time taken to perform the phacoemulsification was lower, led the team to conclude that the easyTip 2.2 mm phaco tip was more efficacious than the CMP 20G. All surgeries were uneventful. Both options gave similar safety profiles after analysis of the postoperative visual outcomes and the level of endothelial cell loss.

Conclusions

“At the final follow up, one and a half years post-op, we found no significant difference in the VA or endothelial cell loss,” said Dr Schriefl. “So, the phaco efficiency increased and overall energy consumption was 30% less with the easyTip 2.2 mm. Also, despite the increased fluid consumption there was no increase in endothelial cell loss, indicating that the enhanced fluidic settings did not augment tissue damage. Currently, there is a study underway to determine efficiency and safety of even higher fluidics,” concluded Dr Schriefl.

• easyTip 2.2 mm has a lower overall energy consumption, especially when conquering the nucleus.
• easyTip 2.2 mm reduces the emulsification time.
• easyTip 2.2 mm with its high fluidic settings, has no affect on tissue damage.

easyPhaco is a registered trademark of Oertli Instrumente AG

Full details of this product can be found on page 19
SPECTRALIS OCT

Precise detection of smallest structural changes
For serious diagnosis and individualized treatment of patients, the precise detection of even smallest structural changes is vital. In particular with glaucomatous and neurological diseases, early structural changes of the optic nerve head and the retinal nerve fibre layer are often undiscovered. A valid and early diagnosis is all the more important for delaying or stopping the progression of the disease and initiating the therapeutic options specifically to the patient’s needs in time. Anti-VEGF therapies of patients suffering from wet AMD and diabetic macular edema (DME) are based on the secure detection of the smallest morphological changes over time.

The general rule is: Reliable monitoring of pathological changes is the basis for individualized patient treatment.

For years, the Heidelberg Retina Tomograph (HRT) is known for detecting and documenting the smallest changes reliably. This tradition is being continued by the SPECTRALIS models and describes the superior benefit in comparison to other SD-OCT systems on the market. The AutoRescan function enables the system to exactly compare different measurements. The Active Live Eye Tracker positions the follow-up OCT cross sectional images accurately on the very same spot of the retina. This way, the system ensures that the changes detected in morphology and thickness are associated with the pathology and not generated by measurement uncertainties in layer positioning. The importance of these unique properties of SPECTRALIS OCT systems have been confirmed in various comparative studies: In comparison to other SD-OCT devices without Active Live Eye Tracking, changes in retinal nerve fibre layer as small as 1 µm can be reliably detected.1–4 Every model of the SPECTRALIS product family is equipped with this unique feature.

References
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ologen® Collagen Matrix

ologen® Collagen Matrix is a biocompatible and biodegradable implant specifically designed to promote scar-less wound healing without the use of MMC.

ologen® Collagen Matrix is a highly porous scaffold which has been shown to be as effective as adjunctive MMC to trabeculectomy for reducing IOP in a 2-year randomized controlled study.1 Additionally, the dangers of handling MMC are avoided. The surgery is made more time efficient by eliminating the need for handling, application and disposal of MMC. ologen® Collagen Matrix has been demonstrated to be safe and biocompatible according to a series of biocompatibility requirements under ISO 10993.

ologen® Collagen Matrix has been used in over 16000 glaucoma surgeries and other ophthalmologic surgeries including pterygium, strabismus, non-penetration deep sclerectomy, and bleb revision surgeries.

ologen® Collagen Matrix is CE accredited for ocular tissue repair. When applied in trabeculectomy, ologen® Collagen Matrix leads to vascular and well-functional blebs in contrast to the avascular bleb morphology and the complications of MMC are avoided. Implantation of ologen® Collagen Matrix is easily adapted without altering the standard trabeculectomy technique. The scleral flap is closed with a single loosely tied suture or releasable suture. ologen® Collagen Matrix has been administered in over 30 countries as a potential alternative to MMC because it produces prominent vascular blebs without any fibroblast inhibition. This new approach, making use of biodegradable collagen matrix is revolutionizing ophthalmologic practice to offer a potential alternative without the toxic side effects of MMC.

For more information please visit www.ologen.com

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**LAL**

**Product description**

The light adjustable lens (LAL) is a biocompatible intraocular lens (IOL) that can be irradiated with UV light to alter its refractive properties. It is implanted using conventional cataract surgery techniques. Implanted patients receive a refractive assessment to determine the level of lens power adjustment required at 2–3 weeks post-implantation.

Adjustment is achieved using a light delivery device (LDD) that irradiates the LAL with UV light of a specific wavelength and spatial irradiance pattern to trigger photopolymerization. This is followed by precise migration of untreated macromers to the irradiated lens area, leading to a change in lens curvature and an alteration of overall lens power. This process may be repeated as necessary until the desired lens power is achieved. Once this power is obtained, the whole lens is irradiated in a ‘lock-in’ step that removes all macromer thereby ensuring that no further adjustment can be made to the lens power.

Precise selection of target area, beam intensity, exposure time and spatial intensity profile achieves the amount of lens power change required by each patient. The light-induced polymerization technique associated with the LAL permits the addition or subtraction of spherical power, removal of astigmatic error, introduction of asphericity, and addition of multifocality.

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**Lumenis SLT**

At Lumenis, pioneering ophthalmic laser technologies is something we excel at; that is after all only one of the privileges reserved for the company that pioneered the first argon laser photocoagulator for ophthalmology, the first multicolour laser and the revolutionary SLT technology, to name only a few. It is also precisely the reason why the decisive majority of general ophthalmologists and glaucoma specialists around the globe have actively chosen to purchase Lumenis SLT products — making Lumenis the global market leader and the company with the largest installed-base of SLT lasers worldwide.

As the company that pioneered, developed and brought SLT technology to market, Lumenis is the only company that offers you an extensive and robust product portfolio of SLT standalone and combination lasers.

Selective Laser Trabeculoplasty (SLT) reduces intraocular pressure by enhancing drainage of excess aqueous fluid. Our products include:

- **First is the Selecta II**, a portable laser for SLT therapy for open angle glaucoma; followed by the Selecta Duet an anterior segment laser for both SLT and photo-disruption applications. Last but not least is the Selecta Trio, the next generation of multi-modality laser products. It can be used for retinal photocoagulation, secondary cataracts and for open and closed glaucoma therapies.
### SUPRACOR

The SUPRACOR excimer presbyopia treatment, developed by Technolas Perfect Vision, is a bilateral, varifocal LASIK solution designed to provide patients with good vision at near, far and all intermediate distances in both eyes. The varifocal SUPRACOR treatment uses a progressive ablation profile designed to provide a smooth transition from distance to near correction, eliminating segment lines, to allow viewing of all intermediate distances. Furthermore, SUPRACOR’s sophisticated algorithm provides the expected near addition while minimizing the induction of undesired aberrations within the pupil.

SUPRACOR is designed for the full refractive treatment ranges and can be customized to individual patient needs. CE mark approval for the treatment of hyperopic presbyopes was received in May 2011 and studies for myopic, emmetropic and post-LASIK patients are currently under clinical evaluation. Results from a multicentre European evaluation on hyperopic presbyopes treated with SUPRACOR found that at 1 week post-op, 91% of 23 patients (46 eyes) achieved binocular uncorrected near visual acuity (UNVA) of 0.8 (J2) or better. These results remained stable through the 6 months post-op period. Ninety-six percent of SUPRACOR patients achieved binocular UDVA of 20/25 or better at 6 months. A subjective patient questionnaire found a very high level of patient satisfaction. While all patients needed reading glasses preoperatively, 96% were able to read the newspaper and short messages without glasses at 6 months postoperatively. Similarly, 96% of patients were able to use the computer without glasses at 6 months post-op compared with 22% preoperatively.

The SUPRACOR procedure is performed using the TECHNOLAS Excimer Workstation 217P, incorporating safety and precision features such as Advanced Control Eyetracking (ACE) Technology and iris recognition. SUPRACOR is as easy to perform as a LASIK procedure, and is suitable for subsequent enhancement surgeries.

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### Xenotron III — the New Generation of Endoillumination

The Xenotron III offers excellent endoillumination with even the smallest fibre optics. By means of maximal light intensity, the Xenotron III optimally illuminates the fundus to provide the surgeon with the best view. The Xenotron III is the first light source that provides 80 Lumin at the tip of a 20G Uno Colorline light fibre in spot geometry. The unique integrated PHOTOTOXGUARD system continuously monitors the emitted light intensity, displays the energy already brought onto the retina and warns the surgeon of possible phototoxicity, displaying the save remaining operation time. Incorporating this increased safety feature, Xenotron III is the first cold light source that takes phototoxicity into account and informs the surgeon as well as the nurses when the input energy exceeds 10 Joule/cm², the limit that is recommended by the ISO 15004-2:2007 (light hazard protection). The PHOTOTOXGUARD uses an easily understandable traffic light system. Nevertheless, surgery can be performed even if this limit has been exceeded. The Xenotron III provides save and easy operation using a clearly coloured touchscreen. To increase convenience and avoid errors, up to six individual surgeon profiles can be saved. Through its compact design the Xenotron III requires minimal space and is free flexible. The device is designed as a standalone unit for maximal mobility.

Using the new Xenotron III, prepares you for future smaller than 27G PPV, makes phototoxicity visible and improves your operation with its HID touchscreen.

For more information visit www.geuder.com/xenotronIII
easyPhaco

Discover the Magic of easyPhaco
Thanks to high fluidics and vacuum, easyPhaco Technology allows you best possible followability and holdability of fragments while maintaining tremendous chamber stability. This is the principle of easyPhaco Technology.

• Unequaled chamber stability.
• No turbulences and efficient aspiration without repulsion of fragments.
• Concentrated axial ultrasound energy delivery for perfect emulsification.
• No vacuum surge thanks to a capillary aspiration path.
• Perfect emulsification even with hard nuclei.

Intelligent needle design and drastically improved fluidics properties — Oertli easyPhaco technology brings visible and perceptible advantages.

• Optimized bevel for best holdability (42° or 30° available)
• Strongest power coupling achieved by novel port geometry
• Snugs into 2.2 mm incision, guarantees powerful inflow
The Oertli easyTip 2.2 mm is designed for Oertli OS3, faros and SwissTech systems with the Hexadisq handpiece. An unparalleled system for more safety and better results.

Oertli easyPhaco — the leading technology in your hands!

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