

Innovative Future Technology for Ultra-Precise Corneal Surgery

SCHWIND eye-tech-solutions introduces for the first time at the ESCRS in Paris a groundbreaking concept laser system that means a paradigm change in laserguided refractive and therapeutic corneal surgery. The innovative, multifunctional and mobile SmartTech Laser impressively substantiates the company's claim to technological leadership. Furthermore significantly reduced life cycle costs are projected. The laser system is based on nanosecond laser technology and uses the principle of plasma creation for separation of the corneal tissue. Instead of a highly complex femtosecond laser, an innovative microchip laser is applied with a shorter wavelength in the UV range (355 nm) which enables significantly higher precision. The focal spot size of the SmartTech Laser is only one third of the spot size of standard femtosecond lasers. The low-density plasma combined with the shorter wavelength



SmartTech concept laser system

ensures definitely finer structures. That leads, for example, to more precise cuts and smoother cutting surfaces in LASIK and more safety in flap preparation. The flap can be as easily lifted as with the mechanical microkeratome. Besides its use in refractive surgery, the SmartTech Laser will offer a highly-developed platform for therapeutic applications: These include lamellar

keratoplasty as well as corneal rings and corneal inlays or the treatment of astigmatic keratotomy.

„The SmartTech Laser is designed in such a manner that it offers greatest safety for the patient and highest reliability for the surgeon. For that purpose it comes with a highly precise

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optical system and a perfectly guided microchip laser", says project director Stefan Schwed.

Significantly reduced life-cycle costs

The concept laser system aims to keep costs during the entire product life cycle as low as possible. Still, refractive surgeons refer in comparison presentations to the very high life cycle costs of a femtosecond laser compared with a mechanical microkeratome. With the SmartTech Laser, users will benefit from an investment providing low maintenance costs and high operating safety. Furthermore, the SmartTech Laser, through its highly compact construction and its light weight, can be used with the SCHWIND AMARIS product family as well as in combination with all standard excimer laser systems on the market.



Today, SCHWIND eye-tech-solutions is one of the technological world leaders in refractive and therapeutic corneal surgery.

Due to the high development speed, the company is often ahead of its competitors in terms of the new and further development of products and services. SCHWIND continuously sets new standards in high technology, such as the first-time presen-

tation of the SmartTech concept laser system and the market launch of the extended SCHWIND AMARIS product family on the occasion of the ESCRS 2010 in Paris. Our major technological achievements are developed in-house – guided by market requirements and in close co-operation with eye surgeons.

Beyond that, SCHWIND differs from its competitors by combining the marketing of high-technology products with the positive characteristics of a family business.

I personally vouch for this.

Yours sincerely,

Rolf Schwind, CEO

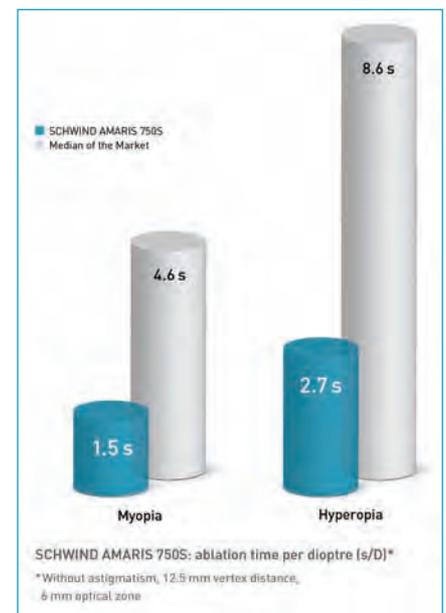
New SCHWIND AMARIS® Generation with 750 Hertz

With the introduction of the new SCHWIND AMARIS 750S laser generation at the ESCRS 2010 in Paris, the TotalTech Laser expands its leading position in corneal refractive surgery. The 750S is a further development of the successful SCHWIND AMARIS laser system and impresses with a pulse frequency of 750 Hertz. The most important benefit is the extremely short treatment time combined with unmatched safety features, such as the six-dimensional, active 1050 Hertz eye tracking. One dioptre of myopia is corrected

with very high precision in only 1.5 seconds.

Furthermore, SCHWIND introduces the new SCHWIND AMARIS 500E laser system. The SCHWIND AMARIS 500E combines a pulse frequency of 500 Hertz with five-dimensional eye tracking and, with its compact design, constitutes the economic line of the SCHWIND AMARIS product family.

Both systems provide the advantages of the unique SCHWIND AMARIS technology documented in numerous scientific publications.



Front-Runner in Technology Comparison

HQ-Metric Provides More Market Transparency

SCHWIND has developed a metric to systemize and objectively compare the performance of excimer laser systems offered on the market. The HQ (High Quality)-Metric includes the decisive technological performance attributes and weights them with a scoring equation (see Fig.1). Clinical results were intentionally left out: These are determined by numerous factors which hinder an objective comparison.

Conclusion: The new SCHWIND AMARIS 750S, with a value of 206 points, achieves undisputed – and far ahead of the competing lasers – the top position in the technology comparison (see Fig. 2). It is the only laser that comes close to achieving the currently best attainable value of 218 points, composed of the best scores in each individual category. The median value of all systems offered on the market is 57 points. The SCHWIND AMARIS 750S exceeds this value by far. „The HQ-Metric aims at contributing to look beyond the usual commercial superlatives across the market and to rate the performance of the systems based on objective parameters and there-with enable more transparency in the market“, comments CEO Rolf Schwind.

$$HQ-Metric = \left[\frac{PulsRate \cdot SamplingRate \cdot (StaticDim + DynamicDim)}{BeamDiameter \cdot TreatmentTime} \right]^{1/3}$$

Fig. 1: Scoring equation for calculation of HQ-Metric

	SCHWIND AMARIS 750S	Median of the Market Systems	Best Achievable Value
Pulse Rate (Hz)	750	250	750
Spot Diameter (mm)	0.54	0.70	0.54
Treatment Time (s/D) ¹	1.5	4.6	1.3
ET Rate (Hz)	1050	400	1050
Static Dimensions ²	3	3	3
Dynamic Dimensions ³	6	3	6
HQ-Metric	206	57	218

Fig. 2: Individual performance parameters and results of HQ-Metric

¹ Treatment time corresponds to myopic treatments without astigmatism, in 6 mm optical zone, at a vertex distance of 12.5 mm and with maximum fluence values
² Static dimensions correspond to the number of registered dimensions from diagnosis (Maximum value 3 = X-pupil, Y-pupil, and static cyclotorsion)
³ Dynamic dimensions correspond to the number of registered dimensions during ablation (Maximum value 6 = X-pupil, Y-pupil, X-roll, Y-roll, Z-movements, and dynamic cyclotorsion)

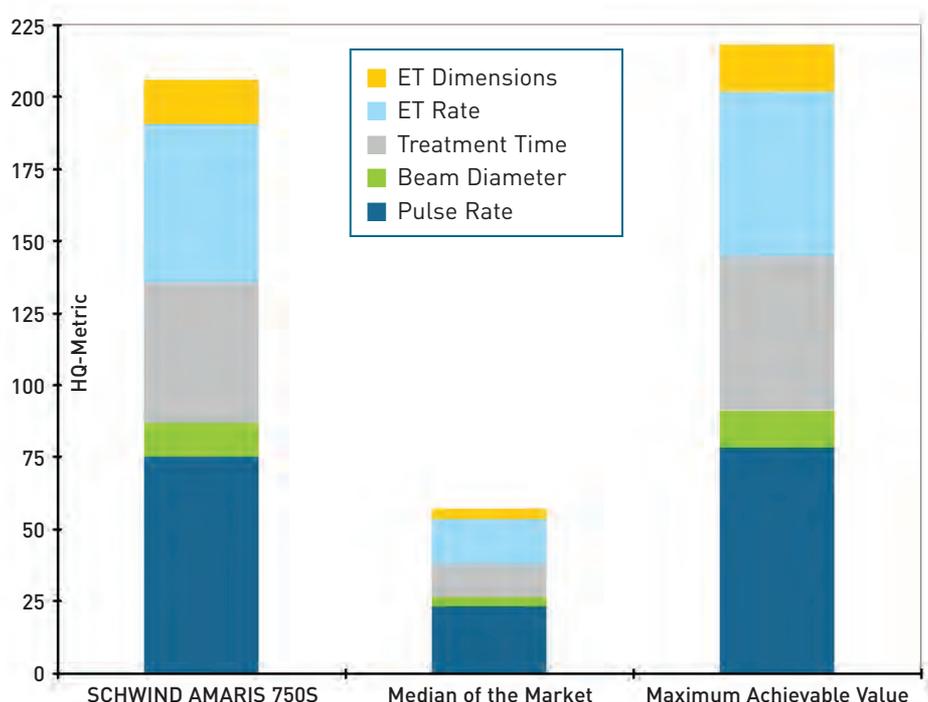


Fig. 3: Ranking – Cumulative weighting of the single performance parameters

More than 85,000 SCHWIND AMARIS® Procedures Performed Shinagawa LASIK Center Applies SCHWIND AMARIS® in the Premium Segment

Shinagawa LASIK Center is Japan's leading operator of eye laser centres and is among the clinics with the worldwide largest treatment volume. More than 800,000 laser procedures (eyes) have been completed in Tokyo, Osaka, Nagoya, and Fukuoka since the centre was founded in 2004. About 70% of the treatments are performed at the headquarters in Tokyo.

In August 2009 two SCHWIND AMARIS lasers were applied for the first time. "We finally decided for a total number of eight lasers as this system provides best patients results at a reasonable price," says Dr. Minoru Tomita, Executive Director of Shinagawa. By August 2010, more than 85,000 patient eyes have been treated with the SCHWIND AMARIS. The trend continues to rise: Currently an average of 10,000 SCHWIND AMARIS treatments are being performed each month.

Comprehensive performance tests

The decision was taken in accordance with Shinagawa's basic philosophy concerning new technologies: Performance and results are thoroughly tested before making larger investments. "We focus on providing patients with the best possible treatment quality. We do this by remaining at the forefront of new technology and new procedures. By operating at a high volume, we are able to bring this new



Dr. Minoru Tomita and staff members present the SCHWIND award Shinagawa received for the worldwide highest treatment volume achieved with the SCHWIND AMARIS

technology to many patients and maintain a reasonable price structure," says Dr. Tomita. Refractive surgery is constantly making improvements in both the equipment and the procedures used, continues Dr. Tomita. "By implementing the latest technologies such as the SCHWIND AMARIS with 6D eye tracking and the PresbyMAX® software for presbyopia treatment, we are able to offer better treatment options with improved patient results." With its large customer base and skilled staff, consisting of 113 doctors and 407 other employees, Shinagawa can bring these benefits to market faster and more effectively than its competitors.

70 percent market share in Japan

LASIK treatments make up 85 percent

of the total volume of treatments. LASEK and PRK account for another 10 percent, while the remaining five percent are phakic and multifocal intraocular lenses, intrastromal corneal rings, corneal inlays and conductive keratoplasty. On average, 500 eyes are treated from Monday to Thursday and 600 eyes from Friday to Sunday, which makes a total of approximately 3,800 eyes per week. The impressive volume can only be achieved by implementing optimal and clearly defined processes and high safety and quality standards at all sites. This is also true for the Shinagawa LASIK Center in Singapore, which was opened in 2008 as the first branch clinic abroad. Among experts, Shinagawa is renowned worldwide for its efficient quality assurance concept.

Consistent quality initiative

Within its own treatment portfolio, Shinagawa has positioned the SCHWIND AMARIS in the premium segment. It primarily targets at potential candidates for laser treatment who are willing to pay a slightly higher price for achieving better results. SCHWIND AMARIS procedures are priced 400 to 800 US Dollars higher than treatments with other laser systems applied at Shinagawa LASIK Centers. The consistent quality initiative is yielding fruit: By now, more than 65 percent of the patients are selecting the premium treatment with the TotalTech Laser. Dr. Tomita: "The advantages of the SCHWIND AMARIS are easily explained to the patient. The main benefit of the SCHWIND AMARIS as compared to other systems is the very efficient 6D eye tracking. The patient's eye movements are continuously tracked and actively compensated during the whole treatment. As a result, patients feel more secure during their treatments."

Motivating discount programme

In the field of LASIK treatments,



Dr. Minoru Tomita and Rolf Schwind



Diagnostic room at Shinagawa Lasik Center in Tokyo

Shinagawa has a share of 70 percent on the Japanese market, which is characterized by an intensive price competition. "As long as we continue to offer the highest treatment quality as compared to our competitors, patients will prefer us," comments Dr. Tomita. As a consequence, the marketing strategy is also principally based on customer referral. Through a discount programme, patients are encouraged to describe their positive experience with laser treatment to family, friends or co-workers. Patients typically place high value in the recommendations of people they know and trust. Since the patients are very satisfied with their results at Shinagawa, it is easy to get referrals and the process simply repeats itself with new patients.

Excellent results with 1.000 eyes

The excellent treatment quality stan-

dards set by the SCHWIND AMARIS are demonstrated by a study with 1.000 eyes Shinagawa recently performed. The mean preoperative spherical equivalent (SEQ) and astigmatism were -5.10 ± 2.31 D (mean \pm SD, range from -0.25 to -12.38 D) and -1.02 ± 0.85 D (range from -0.25 to -6.25 D). At three months post surgery, a mean SEQ of 0.14 ± 0.35 D was observed. 82 percent of eyes achieved an uncorrected visual acuity of 20/16 or better (97.5 percent: 20/20 or better). Result: LASIK surgery using the SCHWIND AMARIS is very effective and safe for the treatment of low to high myopia with astigmatism.

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Clear Vision for EuroEyes ALZ Staff Member Head of Patient Care Receives Laser Treatment with SCHWIND AMARIS®

In her daily work at the EuroEyes ALZ eye clinic Anne Junker professionally occupies herself with eye laser treatment. The private clinic for refractive surgery situated at the Stachus in Munich was founded in 1993. More than 30,000 laser treatments have been performed since then. The 27-year-old optician is head of the patient care department, performs preliminary diagnostic examinations, prepares laser treatments and assists in refractive laser surgery. Now, she changed sides for her own benefit and received laser treatment with the SCHWIND AMARIS for correcting defective vision.



Chief Surgical Nurse Therese Fajga (left) with Anne Junker

Anne Junker first considered undergoing laser surgery in autumn 2009. She was myopic, with a refraction of -1.25 dioptres in her right eye and

-1.75 dioptres in her left eye. Since she did not tolerate contact lenses and was annoyed by wearing glasses, she opted for laser treatment two months

later. Her decision was significantly influenced by the performance features of the TotalTech Laser SCHWIND AMARIS, which has been used in the EuroEyes ALZ eye clinic since 2009. „Advanced technology and numerous safety features were the decisive factors. In addition, I had been involved in the tests and handling of the laser right from the start. I was convinced by the excellent treatment results and high patient satisfaction,” she says. She knew she was in good hands with the experienced refractive surgeon Dr. Barbara Lege, who has been one of the medical directors of the eye clinic since 2002. Dr. Lege performed a Femto-LASIK procedure based on corneal wavefront measure-



Anne Junker ...



... and her surgeon Dr. Barbara Lege

ments, which documents each and every optical error generated on the anterior corneal surface, thus permitting highly precise diagnostics and treatment.

Gaining quality of life

„I must admit that I was quite nervous during the treatment despite my comprehensive knowledge of the matter. The procedure was not painful at all, I only experienced a slightly unpleasant feeling of pressure during flap preparation. I perceived the blinking lights of the SCHWIND AMARIS and the futuristically designed particle aspiration system,” Anne Junker remembers. She had both eyes lasered in one session, the whole procedure only took 15 minutes.

Only one day after the laser treatment, visual acuity had improved to 1.6, the value she had preoperative reached with glasses. „What a great feeling: For the first time, I was able to read the number plates of cars parked further away. My improved vision definitely improves my quality of life, which also increases motivation when doing sports,” says Anne Junker. And Dr. Barbara Lege sums it up as follows: „At the EuroEyes ALZ eye clinic, patient satisfaction is our number one priority. Every patient is unique and deserves only the best, be it a relative, a friend, or none of both.”



Anne Junker (left) and Dr. Barbara Lege, doing the split lamp test



**Professor Thomas Neuhann, MD,
Medical Director and founder of the
ALZ eye clinic Munich**

In all respects, the SCHWIND AMARIS fulfils a long list of crucial needs and wishes expressed by eye surgeons in all areas and meets current technology and treatment standards. These include, in particular, abilities that I have required for years – such as cyclotorsion control as part of 6D eye tracking, centration on the visual axis or corneal wavefront analysis.

In our experience, patients are highly satisfied with the treatment results obtained with the SCHWIND AMARIS. Indeed they cannot compare their results with others – but the surgeon can. A „complaint rate” due to optical phenomena does not exist so far. That is remarkable.

My Techniques in Surface Treatments

Massimo Camellin, MD, SEKAL Micro Chirurgia, Rovigo, Italy



Massimo Camellin performs exclusively surface treatments (LASEK/EpiLASEK) with the SCHWIND AMARIS. He sees the advantages particularly in the high safety of these methods because no preparation of a corneal flap takes place, thus no enduring weakening of the cornea: "The treatments are in nearly every case painless. Quality of vision is restored within 10 days and remains stable over the long-term." In the following Dr. Camellin outlines his techniques and treatment ranges.

LASEK technique

- Powerfully use a microtrephine on the epithelium to create a 270° treatment area.
- Apply 20% alcohol in distilled water (32° C) to the epithelium for 20 seconds.

- Dry the alcohol solution with a cotton sponge and rinse with preservative-free diclofenac sodium solution.
- Detach the epithelial edge and afterwards roll the flap with appropriate instruments.
- Perform the laser surface treatment.
- Apply a small drop of BSS on the flap and the corneal tissue.
- Reposition the epithelial flap and dry the edge with a sponge, then dry for 30 seconds with a fan device.
- Apply a soft contact lens for 4-5 days.
- Medicate with preservative-free gentamicyne, tropicamide, ketotiphen, desametazone.

EpiLASEK technique

- The only difference in the EpiLASEK technique compared with LASEK is the use of an epikeratome (nasal hinge) for separation of the epithelium.
- This is my preferred technique because the epithelium is easily separated, excellent hinge width is achieved and putting the epithelium back in place is easier than with LASEK or EpiLASIK.

Treatment spectrum

LASEK	Myopia up to -3 D
EpiLASEK	All other cases
Myopia	up to -12 D
Hyperopia	up to +5 D
Astigmatism	up to -6 D

If the mesopic pupil is larger than 8 mm, I place a limit on the treatment spectrum of -4 to +1.5 D.

Treatment ranges

In myopia, a central residual corneal thickness of at least 350µm including the epithelium must be considered. The postoperative corneal curvature should be ≥ 32 D to ensure achievement of good vision quality.

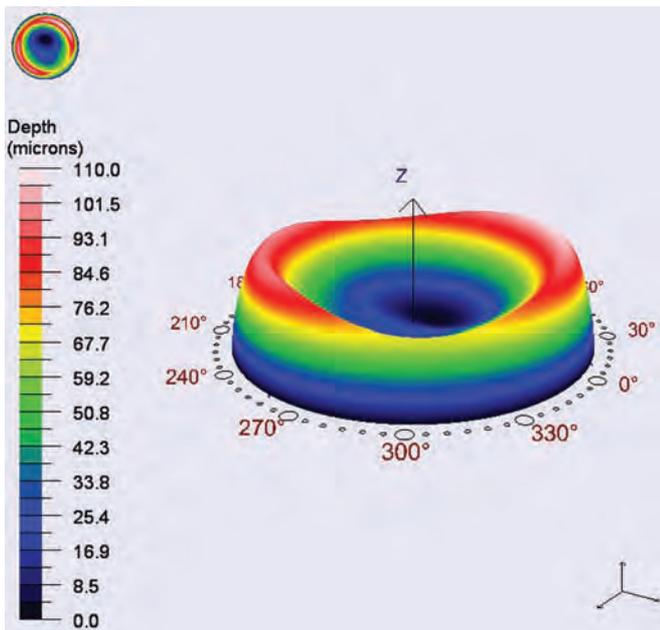
The optical zone should normally be at least 7 mm and correspond with the mesopic pupil diameter; I never go below 6.5 mm.

In hyperopia, an optical zone of 7.5 mm is preferred in order to minimize the risk of regression and possible halos at night. I never go below 7 mm. When necessary I protect the hinge with a spatula.

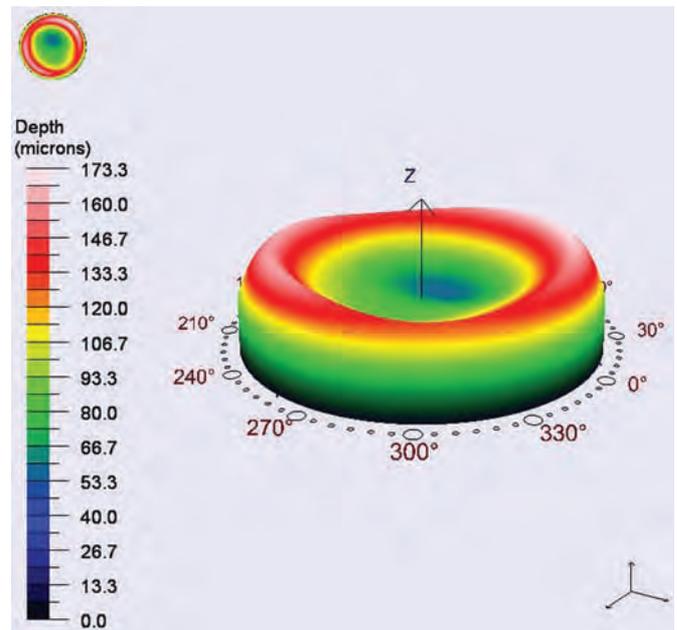
Additionally, the postoperative corneal curvature should be around 49 D, on the other side pay attention to preoperative very flat corneas (i.e. 40-42 D), because there might be a bad peripheral transition in case of high corrections (i.e. a significant step).

Corneal wavefront

I use corneal wavefront for hyperopia in combination with astigmatism in cases where the pupil centre differs more than 0.5 mm from the centre of the astigmatism (= corneal vertex).



PRK profile based on corneal wavefront measurement



TransPRK profile based on corneal wavefront measurement

In this way, results and centration are improved. I also use corneal wavefront for all retreatments in order to eliminate higher order aberrations.

TransPRK

TransPRK in combination with corneal wavefront is my treatment of choice for retreatments after a radial keratectomy or transplants. I also use it for haze, scarred corneal tissue and for keratoconus after cross-linking.

In keratoconus, I aim at minimizing the ablation of tissue and smoothing the existing astigmatism.

This method makes sense in all cases where a difficult epithelial flap is expected or where the epithelium covers corneal irregularities of the stromal tissue.

Special Medication

Autoserum is used in all cases in the first five postoperative days. Mitomycin C is diluted and applied with a merocel sponge:

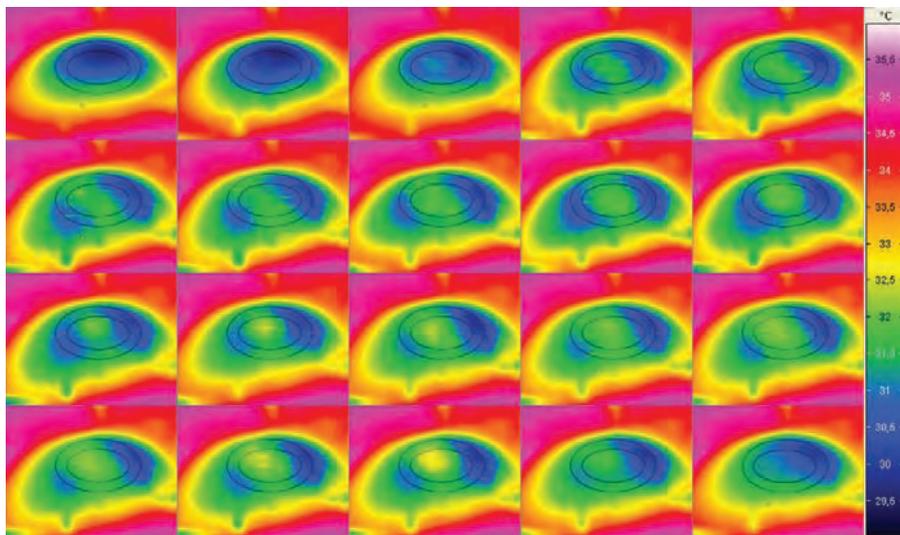
- 1) 0.02 % in TransPRK and retreatments over a time period of two minutes.
- 2) 0.01 % for hyperopia and astigmatism more than 2 D (just a brushstroke) as well as for myopia more than 6 D.
- 3) 0.005 % in all other cases (just a brushstroke). The surface is rinsed with a few drops of diclofenac. The usual administration of a larger amount of BSS is not necessary.

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The TransPRK (Transepithelial Photorefractive Keratectomy) with the SCHWIND AMARIS is the most advanced version of surface treatments as LASEK, EpiLASEK and PRK. Thereby the epithelium, which is the regenerative surface of the eye, is ablated by the laser system. The TransPRK is the only surface treatment where the eye doesn't require contact with an instrument. Furthermore, the epithelium is removed more precisely and more easily than through manual abrasion. Because the wound surface is smaller than, for example, with manual PRK, the healing process is shorter. Additionally, both the epithelium and the stroma are ablated in a single procedure. This shortens the overall treatment time significantly and minimises the risk of corneal dehydration.

Thermodynamic Measurements Confirm High Safety of the Intelligent Thermal Effect Control



Eye under thermographic camera

With the unique Intelligent Thermal Effect Control (ITEC) of the SCHWIND AMARIS, the patient's cornea heats up less than four degrees during the laser treatment. This is the result of scientific thermodynamic measurements carried out at the Eye Laser Clinic Recklinghausen, Germany (Diego de Ortueta, MD) by the University of Applied Sciences, Aschaffenburg. Seven myopic eyes were investigated with preoperative spherical equivalent (SEQ) ranging from -2.75 to -9.25 dioptres. The measurements were performed with a high-resolution infrared thermographic camera which recorded thermal images of the eye at a rate of one time per second from a distance of 66 centimetres. Cornea temperature rise

was evaluated within the optical zone as well as in the entire ablation zone.

The preoperative cornea temperature corresponded to the values cited in scientific publications with measured values ranging from 29.3° to 31.4° C.¹ At temperatures higher than 40° C the proteins of collagen

change their structure¹ and the cornea is possibly damaged.² This may cause corneal haze³ and may negatively influence the treatment result. In all measured eyes, an intraoperative temperature rise between 2.7° and maximum 3.8° C was observed. The maximum temperature was less than 35° C. This confirms that the ITEC method efficiently preserves the corneal tissue – despite the very high pulse frequency of the SCHWIND AMARIS. It furthermore showed that with ITEC the amount of the refraction and consequentially the length of ablation has no influence on temperature rise.

¹ Bende T, Seiler T, Wollensak J. Side effects in excimer corneal surgery. Corneal thermal gradients. Graefes Arch Clin Exp Ophthalmol; 1988; 226: 277-80

² Ishihara M, Arai T, Sato S, Morimoto Y, Obara M, Kikuchi M. Measurement of the surface temperature of the cornea during ArF excimer laser ablation by thermal radiometry with a 15-nanosecond time response. Lasers Surg Med. 2002; 30(1):54-9

³ Betney S, Morgan PB, Doyle SJ, Efron N. Corneal temperature changes during photorefractive keratectomy. Cornea. 1997 Mar; 16(2):158-61

Eye	SEQ (D)	Treatment method	Max temperature increase (°C)
OD	-2.75	LASEK	3.52
OD	-9.25	LASIK	3.73
OS	-5.75	LASIK	3.28
OD	-3.10	LASEK	3.10
OS	-3.10	LASEK	3.18
OD	-3.25	LASEK	2.95
OS	-3.50	LASEK	3.52

Result of thermodynamic measurements

Awards for SCHWIND Partners



Kumar Doctor, MD, Doctor Eye Institute, Mumbai, India (left) und Vipin Duggal, Director of the Indian SCHWIND distribution partner Care Group

Pace setter in India

250 Indian eye surgeons participated in a SCHWIND AMARIS symposium in spring 2010 hosted by SCHWIND user Kumar Doctor, MD. He was the first eye surgeon in India to perform laser treatments with the TotalTech laser using six dimensional eye tracking and online pachymetry. Furthermore, he was the first SCHWIND user on the Asian continent to treat patients with the innovative PresbyMAX® software. Last but not least, Dr. Doctor was the first eye surgeon worldwide to carry out presbyopia treatment using the LASIK method on pseudophakic patients and he obtained excellent results with this method. Vipin Duggal, Director of the Indian SCHWIND distribution partner expressed his appreciation for the brilliant pioneer work accomplished by Dr. Doctor, and honoured him with an award from SCHWIND.

Distributor of the Year 2009

The Korean distribution partner Wooree Technologies was honoured by SCHWIND as „Best Distributor 2009“ for selling 16 laser systems in Korea. This success is not only based on the superior AMARIS technology, but also on a targeted marketing strategy, as

Chance Jung, Wooree's managing director comments: „We concentrated our efforts on laser clinics treating more than 100 patients per month. The SCHWIND AMARIS was positioned as „Premium Treatment with a Premium Laser“. At the beginning the patient marketing of a Korean SCHWIND user turned out to be a determining moving spirit. Attention-getting advertisements in consumer magazines with high circulation resulted in more and more laser candidates inquiring through internet portals about LASIK with the AMARIS. The great consumer interest in turn inspired the big players to think about premium treatment with the AMARIS. Additionally, the exhibition of three lasers at the National Autumn Meeting in Seoul made a positive impact. Result: Presently, with SCHWIND lasers a market share of around 70 percent is achieved in Korea.



The Wooree Technologies team, Korea

12th International SCHWIND User Meeting 2010

The SCHWIND User Family Got Together in Oman

Save the date
13th SCHWIND User Meeting
28.-29.05.2011, Beijing, China



The direct dialogue with a committed user family is a fundamental element of the SCHWIND company philosophy: More than 150 participants from 27 countries came to this year's User Meeting on 29th and 30th of January 2010 in Muscat, Oman. The international meeting, which was hosted by SCHWIND together with the reference clinic and investigator Muscat Eye Laser Centre under direction of Maria Clara Arbelaez, MD, was all about innovative technologies and methods, as well as exchange of experiences. The event provided a perfect platform for a well-balanced mix of guest lectures and practice-oriented workshops. Communicative networking continued even during leisure activities – for example an excursion with traditional “dhow” boats.



Imprint

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