

**A.R.C.
LASER**

enlighten your surgery.

100%
Single-Use
Probes.

**CETUS
NANOLASER**

EXPERT GUIDE

Today's cataract surgery
with the NanoLaser.



MAXIMUM PATIENT PROTECTION



The CETUS NanoLaser uses only sterile, single use accessories for cataract surgery that is 100% safe.





CETUS

Typically, it takes decades for medical technology to evolve from an idea to commercial viability.

The introduction of a novel method of surgery requires persistence and determination to continually improve the methodology.

In today's world of pandemic risk, single-use technology has rapidly become the new standard.

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NANOLASER

A HISTORY OF SUCCESS

The technology of phaco emulsification has remained relatively the same since it was developed by the legendary phaco pioneer, Dr. Charles D. Kelman – but it is time for a change.

Here's what is necessary:

No moving parts, no thermal gradient and the entire surgery must be performed using single-use accessories.

Today, surgeons worldwide predominantly offer cataract surgery using CLE which stands for Clear Lens Extraction or Refractive Lens Exchange to correct a refractive error such as short-sightedness. Endothelial protection and the highest standard of hygiene are essential when carefully removing the human lens.

At the turn of the century, the era of photo fragmentation began and the first surgeries were performed maximizing protection of the corneal endothelium.

The Nano Laser is the first and only device to satisfy all of these requirements.



ENDOTHELIAL PROTECTION IS ESSENTIAL.

STUDIES SHOW THAT THE CLINICAL EFFICACY OF THE NANO LASER IS RELIABLE

Even though cataract surgery performed using phaco emulsification (with or without femto laser assistance) is a commonly used method, it has demonstrated some negative side effects. The high level of ultrasound energy can potentially damage ocular structures such as corneal tissue resulting in swelling of the corneal tunnel and loss of endothelial cells of the entire cornea. (Lesiewska-Junk et al. 2002; Dick et al. 1996).

Patient benefits

Thorough health education is key to contributing to the highest level of patient satisfaction.



01

Protection of the endothelium

The Eye Clinic Hildesheim-Alfeld-Bockenem and employees of DGFG (corneal bank) in Hannover, conducted a pilot study to examine the endothelial cell count and measurement of the corneal thickness following cataract surgery using a nano laser.

The delivery of energy is between 0.5 to 1 joule from the laser probe which creates no thermal gradient at the corneal tunnel during the entire photo fragmentation process. This is significantly lower when compared to the use of conventional phaco emulsification (up to 10 joules) or the femto laser assisted phaco emulsification (up to 50 joules), depending on the nucleus (Sauder et al. 2017; Kanellopoulos 2013; Tanev et al. 2016).

(Sauder et al. 2017; Kanellopoulos 2013; Tanev et al. 2016)...

Dr. Lutz Blomberg, FEBO ¹*2, Dr. Imke Wübbolt¹*2, Dr. Katrin Wiese ¹, M. Awe ¹ und Dr. Martin Knabe ¹

02

Totally Safe

For the first time ever, the nano laser system enables cataract surgery without the use of ultrasonic energy. By comparison to the conventional phaco emulsification technique, only a fraction of the energy is exposed to the eye. Since there is no direct emission of laser light, there is no longer a risk of thermal damage.

The possibility of a complete single-use system is highly attractive from a hygienic and economic perspective. This means that there is no need to sterilize used instruments, which may risk contamination. However, the surgeon must adapt to the new novel laser surgery... Since the laser unit does not incorporate any irrigation/aspiration, it is necessary to be used together with a conventional phaco system.

Priv.-Doz. Dr. Bernd Kamppper (Bayreuth) / DER AUGEN-SPIEGEL DEZEMBER 2014

03

Efficient

Purpose: A major obstacle to the widespread implementation of nanosecond laser cataract removal has been limited in its efficacy...(LOCS III) grade 3. The latest technological modifications seem to have overcome this obstacle.

Results: The nanosecond laser system effectively removed the cataract in all patients. This result was statistically significant ($P < 0.000001$) compared with an expected conversion rate to ultrasound phacoemulsification of 100%.

Conclusions: Harder cataracts should no longer be considered a limitation for the use of nanosecond laser in cataract ... I consider cataract surgery with the NanoLaser to be my preferred technique when maximal protection of the corneal endothelium is needed, for example in patients with previous penetrating or lamellar keratoplasty or those with advanced cornea guttata or Fuchs endothelial dystrophy.

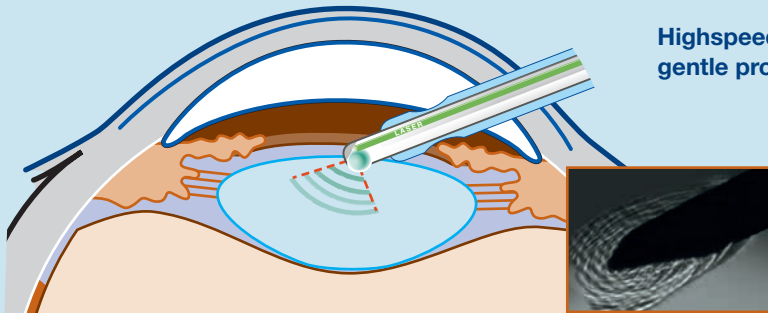
(Gangolf Sauder Professor and Chief Physician, Charlottenklinik für Augenheilkunde, Stuttgart, Germany - JUNE 2018 | CATARACT & REFRACTIVE SURGERY TODAY EUROPE)

ENDOTHELIAL PROTECTION

TECHNOLOGY

THE NANO LASER UTILIZES A SHORT-PULSED NEODYMIUM-YAG MICRON LASER

The laser beam is transferred to the probe via a **silicon quartz fiber** and is absorbed by a **titanium target** located on the tip of the probe. Each laser pulse **emits 10 mJ** of energy of **5 ns duration** which hits the titanium target and triggers an optical breakdown. The **resulting shock waves** propagate conically from the opening of the tip and achieves **photo fragmentation** of the cataract.



Highspeed shadow photography shows the gentle propagation of the shock waves

Like phaco emulsification, these waves are purposely directed downwards away from the endothelium. Thus, the endothelial cell layer is thoroughly protected.

Your phaco machine foot pedal controls the aspiration and pulse frequency, plus triggers the laser with the vitrectomy air pulse.





LESS TRAUMA

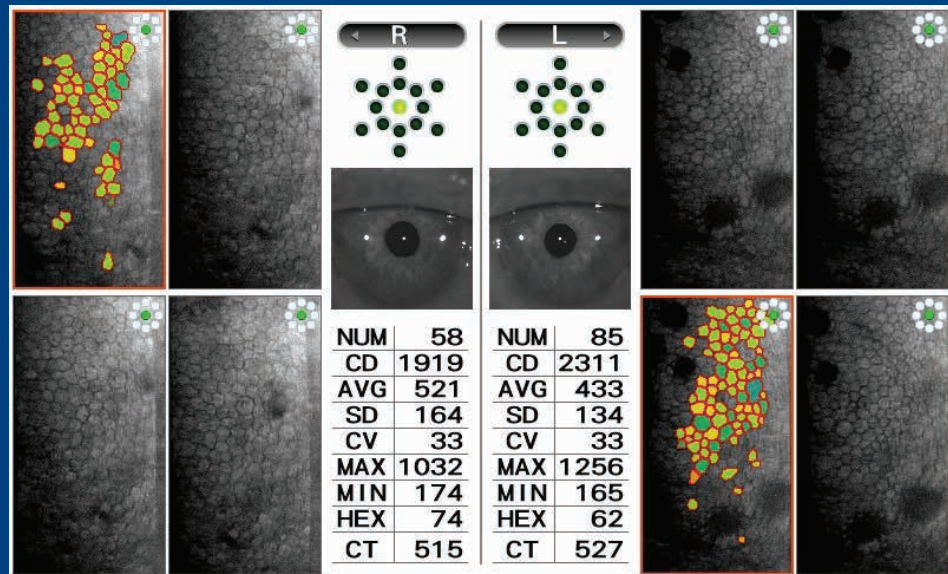
NANO REPLACES PHAKO ?

STUDIES

IN CONVENTIONAL CATARACT SURGERY, THE NANO LASER IS CONSIDERED AN ALTERNATIVE TO THE ULTRASONIC BASED PHACO EMULSIFICATION.

“We recommend nano laser surgery to patients with endothelial problems (endothelial cell count < 2000) or with corneal dystrophy after a corneal transplant (pCPL, DMEC). ... as the entire surgery can be performed with single use instruments.”

Dr. Lutz Blomberg, FEBO,
Ärztlicher Leiter und Gesellschafter
Augenzentrum Hildesheim-
Alfeld-Bockenem



Endothelaufnahme ein Jahr nach Cataract-OP:

R: milde Fuchs-Endotheldystrophie, Zustand nach klassischer Phakoemulsifikation.

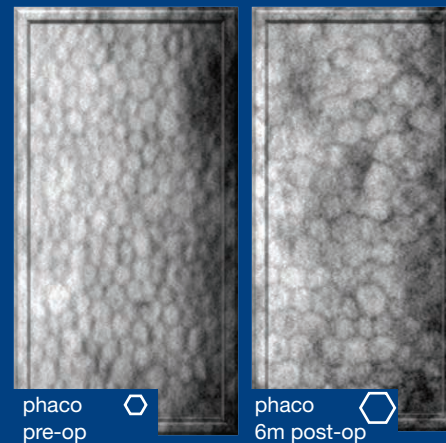
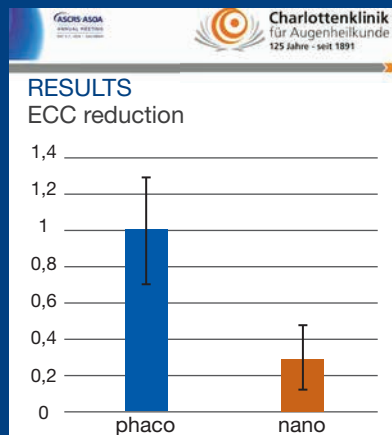
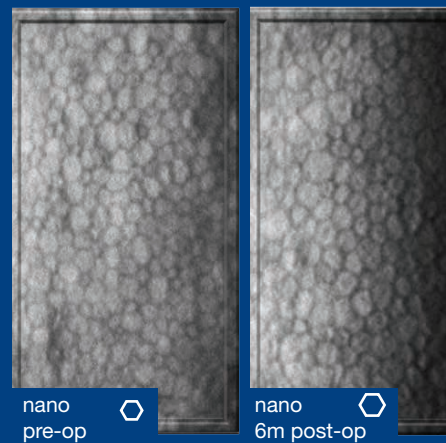
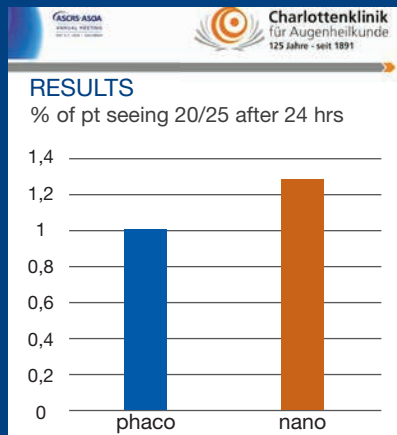
L: deutlich mehr ausgeprägte Guttata, Zustand nach Nano-PPD.

Zelldichte PräOP beidseits 2400 Zellen/mm² mit links mehr Guttata-Ausprägung als rechts.

Zu sehen ist eine signifikant höhere Endotheldichte nach Nano-PPD obwohl hier die kritischere Ausgangslage am Endothel vorlag. (Aufnahme mit freundlicher Genehmigung von Dr. A.M. Parasta, Augenzentrum München)

Advantages compared to phaco:

- Faster visual recovery
- Reduced endothelial cell loss
- Enhanced safety benefit of single-use hand pieces



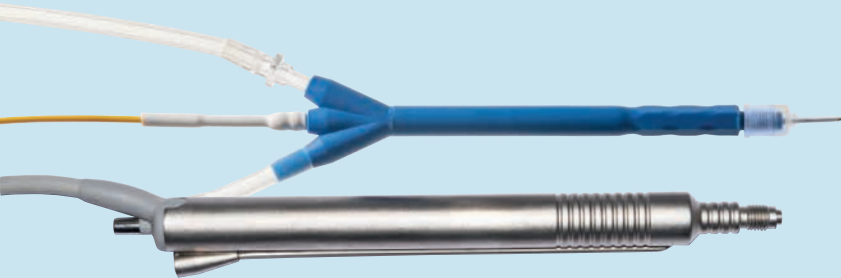
“FEATHER” LIGHT HAND PIECE – HIGHLY MANEUVERABLE

WHY IS THE PHACO HAND PIECE SO LARGE AND HEAVY?

The body of the phaco hand piece is bulky in order to house the elements necessary to control the reciprocating movement of the tip, but this complex construction is the reason for the unwanted high energy load into the eye.

...so it is not a surprise that the high energy load into the tissue may potentially result in invasive trauma...

Less is more!



$$E = m * c^2$$

Einstein's theory of relativity states $E = mc^2$, helps to explain that the high mass of the phaco hand piece = more energy being delivered into the eye since c^2 is constant

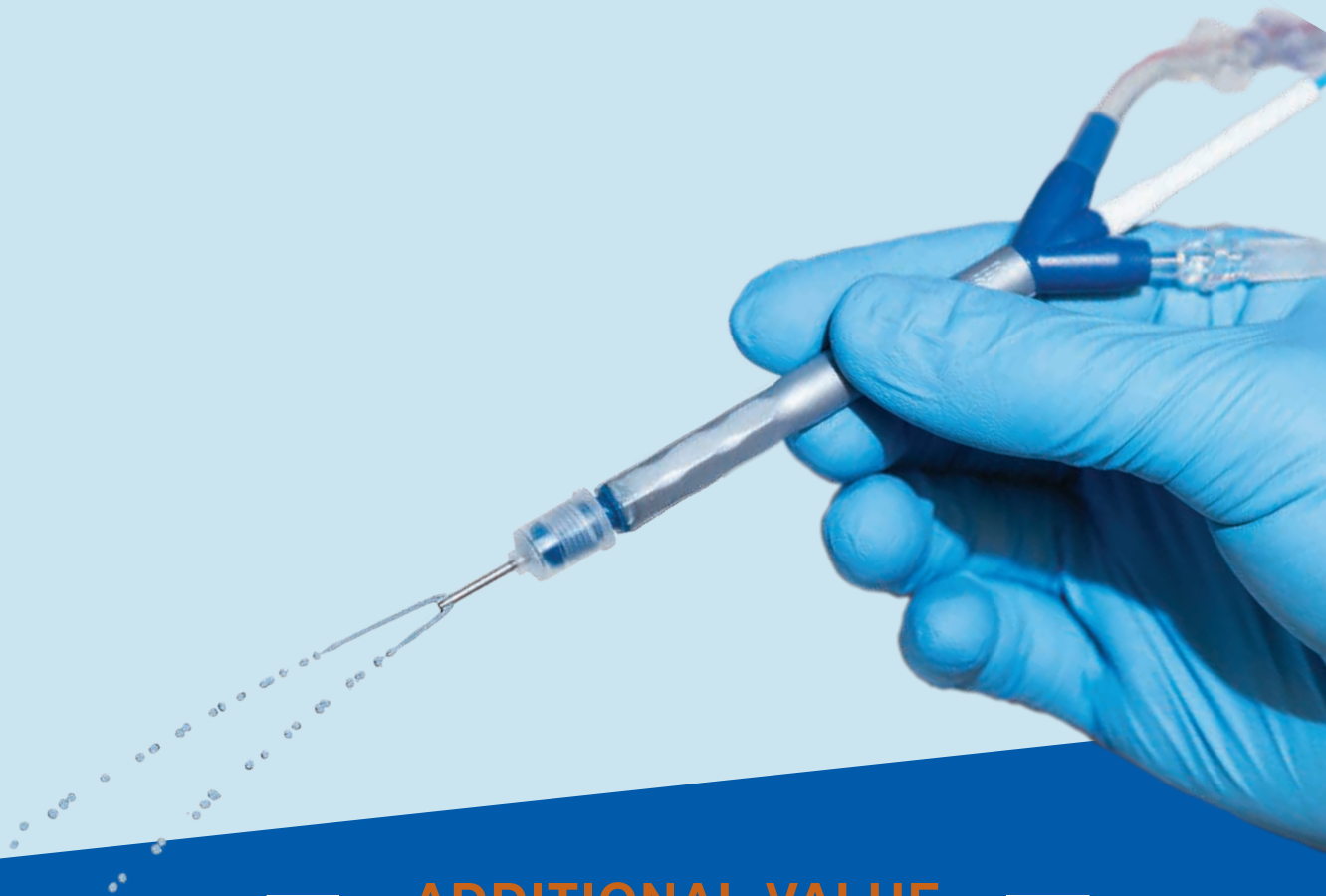
By comparison, as a result of its clever and sophisticated design, the low mass of the small, lightweight, single use Nano Laser hand piece delivers much less energy to maximize patient safety - plus it is much less likely to cause surgeon fatigue.



VIDEO:

Scan below to experience one of our live surgeries:





ADDITIONAL VALUE

with maximum convenience

Thanks to its ingenious design, the innovative Nano Laser probe enables today's cataract surgeon to both fragment and aspirate the nucleus simultaneously; thus, being the only cost-effective way of offering your patients the most benefit with modern laser cataract surgery.

SUCCESS

IS THE RESULT OF AN
INNOVATIVE PROCESS

Here are four testimonials reporting the
successful use of the Nano Laser.



DR. L. BLOMBERG
HILDESHEIM

... it does not develop any thermal gradient inside the corneal tunnel. The energy load during the entire photo fragmentation process is minimal, between 0.5 to 1 joule.



DR. M. PARASTA
MÜNCHEN

Working with A.R.C Laser is highly commendable. Thorough instructions and individual support.



DR. I. ROHRBACH
DÜSSELDORF

The doctors at AHR have been pioneers in eye surgery. Integration of the most advanced technological devices is essential for us.



PROF. G. SAUDER
STUTT GART

As one of the first to reduce intraocular trauma, the NanoLaser has become indispensable in our clinic.

AN INVESTMENT THAT PAYS OFF

ECONOMICALLY SECURE

- **GUARANTEED ROI**
- **STREAMLINES PROCEDURES**
- **ELIMINATES RISK OF REPROCESSING MISTAKES**
- **OPTIMIZES SAFETY**
- **LOW CONSUMABLE COSTS**
- **MAXIMUM PROTECTION OF THE ENDOTHELIUM**
- **MAXIMUM PATIENT SATISFACTION**

Higher level of safety with a higher level of cost control

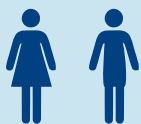
Reprocessing instruments require a huge effort and increases contamination risks.

Single-use instruments are a much safer and more cost-effective alternative.

Eliminating the need for reprocessing instruments, also eliminates the manpower responsible for cleaning and sterilization, plus the cost of cleaning agents.

There is no need for sterilization devices, or their respective service or repair – in fact, the autoclave may eventually become obsolete.

The profitability analysis is impressive:



“ IN 5 OUT OF 6 CASES, PATIENTS CHOOSE EXPENSIVE SPECIAL LENSES.



“ PATIENTS PREFER CATARACT SURGERY WITH LASER, BECAUSE THE WORD “LASER” HAS A POSITIVE CONNOTATION.



“ THE LEARNING CURVE CAN EASILY BE MASTERED.



NO RISK OF INFECTION



No reuse of instruments

Maximum level of hygiene and no need for sterilization. Each surgical instrument offers a maximum level of viral protection. Realizing the importance of single-use instruments, a new

Nano Laser probe is always available for use – safe and sterile. Maximizes hygienic safety for the patients and eliminates the risk of any cross contamination.

Also eliminates the risk of deposits or other residue which may not be removed even with the most thorough cleaning process.

THE ENTIRE SURGERY IS PERFORMED WITH STERILE,
SINGLE-USE INSTRUMENTS

**ONLY DISPOSABLE
INSTRUMENT KITS CAN BE
COMPLETELY SAFE.***

ONE INSTRUMENT KIT PER PATIENT

It is important to note, that the **Robert Koch Institute**
and **FDA** do not recommend the reuse of instruments
with small lumen because they cannot be
thoroughly cleaned.

* FDA. Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling. Guidance for Industry and Food and Drug Administration Staff 2017:1-77.

Empfehlung der Kommission für Krankenhaushygiene und Infektionsprävention (KRINKO) beim Robert Koch-Institut (RKI) und des Bundesinstitutes für Arzneimittel und Medizinprodukte (BfArM). Anforderungen an die Hygiene bei der Aufbereitung von Medizinprodukten. Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz 2012;55(10) 1244-1310.

**A.R.C.
LASER**

**CETUS
NanoLaser**





SPECIFICATIONS



NanoLaser

Model CETUS	Nd:YAG Laser, 1064 nm
cooling	air, internal
weight	12 kg
W/H/D	478 mm / 135 mm / 421 mm



Single use probe (Cetus)

Model CETUS	3-10 mJ / 5 ns / up to 25Hz
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SOME PUBLICATIONS

As of may 2020

01.01.14	Matt Young, John A. Vukich, MD	Int. Editors of Eyeworld Interview mit Walker, Sauder, Kanellopoulos	Back to the future: Ultrasound gets replaced by laser, again	ASCRS Eye World
<ul style="list-style-type: none"> - Vorstellung des Cetus im Rahmen der ASRCR 2014, Oberflächl. Vergleich zu Femto und US. - "Grade 1 to 3+ cataract is ideal [for nano]," Dr. Walker said. "Grade 4 is possible but efficiency drops the harder the nucleus gets. It takes longer. " - Sauder hat Ergebnisse von 20 Patienten präsentiert. OP-Dauer 9,5 min. - Kanellopoulos: Hinweis auf Paper mit Dodick Photolysis, 15 Jahre Erfahrung 				
https://www.eyeworld.org/back-future-ultrasound-gets-replaced-laser-again				
01.02.16	L. Mastropasqua, MD, PhD P. Mattai, MD, PhD L. Toto, MD, PhD	Univ. G. d'Annunzio of Chieti and Pescara	All-Laser cataract surgery with femtosecond and nanosecond devices	Cataract & Refractive Surgery Today
<ul style="list-style-type: none"> - Kombination bringt die Vorteile beider Verfahren zusammen. - Analyse Endothelzellendichte und Zentralhornhautdicke. 7 und 30 Tage Post-OP. - Vergleich Femto-Phako, Femto-Nano, Nano-Manuell → Nano-Manuell am schonendsten. - Darstellung der Vor-Nachteile d. jeweiligen Techniken bzw. Kombinationen. 				
27.02.16	C.Karabatsas I. Kontari A. J. Kanellopoulos (Dr. B. Kampeter)	LaserVision.gr Clinical and Research Eye Institute, Athens, Greece	Clinical evaluation of disposable probe, nanosecond laser-assisted and clear cornea cataract extraction	ESCRS 2016 open Poster / Paper session
<ul style="list-style-type: none"> - To evaluate safety and efficacy of a novel surgical technique in small incision clear cornea cataract surgery. - 178 successive patients (83 male, 95 female) were included into a clinical study to compare nanosecond-laser –assisted (group A) versus manual phacoemulsification cataract surgery (group B) - consumption of irrigation fluid, duration and energy of phacoemulsification and laser pulse rate and total energy were evaluated. Furthermore, corneal edema and Descemet's membrane folds and cornea edema were measured at postoperative day one using an arbitrary scale ranging from 0 to 4 (0= no folds and no edema, 4=dense folds and significant edema obscuring iris detail). <p>Conclusions: Operating with low pulse energy provided by infrared nanosecond-laser may offers a safe and effective alternative to phacoemulsification for the majority of candidate cataract patients. This laser probe, which is adaptable to most existing phacoemulsification systems, offers low energy levels and essentially no thermal corneal damage at the incision site.</p>				
https://escrs.org/athens2016/Programme/free-papers-details.asp?id=24985&day=0				

01.05.16	Ivan Tanev, PhD V. Tanev Kanellopoulos, A. John, PhD	Department of Ophthalmology (I. Tanev), Faculty of Medicine, Medical University, and the Eye Hospital Zrenie (V. Tanev), Sofia, Bulgaria LaserVision.gr Clinical & Research Eye Institute (Kanellopoulos), Athens, Greece	Nanosecond laser–assisted cataract surgery: Endothelial cell study	Journal of Cataract & Refractive Surgery
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https://journals.lww.com/jcrs/FullText/2016/05000/Nanosecond_laser_assisted_cataract_surgery_12.aspx

01.01.17	Jérôme C. Vryghem, MD	Brussels Eye Doctors	Surgeon: Nanosecond laser provides safe cataract surgery at lower cost than femto	Ocular Surgery News Europe Edition
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<https://www.healio.com/ophthalmology/cataract-surgery/news/print/ocular-surgery-news-europe-edition/%7B96026e33-abd8-4ffc-839a-e0157d389429%7D/surgeon-nanosecond-laser-provides-safe-cataract-surgery-at-lower-cost-than-femto>

01.12.18	Dr. Lutz Blomberg Dr. Imke Wübbolt Dr. Katrin Wiese Dr. Martin Knabe	Augenzentrum Hildesheim-Alfeld-Bockenem DGFG Hornhautbank Hannover	Ist die Kataraktchirurgie mit dem Nanolaser endothelschonend?	Der Augenspiegel
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- Suche nach schonenden, atraumatischen Methoden. Vorteil auch für Präparation von Gewebe in der Hornhautbank.
- US-Phako hat systemimmanente Probleme: US-Energie kann okuläre Strukturen schädigen, Schädigung und Schwellung kornealer Tunnel, Endothelzellenverlust, zystoide Makulaödem
- Unterschied in Spenderhornhäute von US-Operierten und nicht operierten bei Endothelzellenzahl und Gewebeskultur feststellbar.
- Laser: Keine Wärme am Tunnel, geringe Energie (0.5 – 1 mJ), bis Härten LOCS 4,
- Studie: 131 Pat., LOCS 3, Post-, Prä-Operativ, 3 Monate – 2,5 Jahre.
- Laser ist Endothelschonend. Kein Unterschied in Endothelzellenabnahme zwischen operierten und nichtoperierten Augen im Langzeitverlauf. (kontralaterale Augen). (Zellabnahme 4 % nach 100 Tagen. US 8 – 9 %, besserer Visus)
- Empfehlung von Nano-Laser besonders bei Vorerkrankungen. (EZD < 2000/mm, Hornhautdystrophie, Transplantiert, Hepathitis C, HIV, Kreuzfeld-Jakob)

01.01.20	Ahmed Hamroush Balasubramaniam Ilango	Birmingham and Midland Eye Center, UK New Cross Hospital, Wolverhampton, UK	Nanosecond Laser Cataract Surgery The authors review the evidence of nanosecond laser cataract surgery: is this the future?	Eye News
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- Vorstellung Nanolaser, Vergleich zu Femto (Flacs)
- Verweis auf Mastropasqua L (2017), Tanev (2016), Kanellopoulos (2013)
- “In conclusion, nanolaser is an exciting new technology that continues to evolve with promising results, but more time and larger studies are needed to ensure safety and efficiency.“

<https://www.eyenews.uk.com/features/ophthalmology/post/nanosecond-laser-cataract-surgery>



SEEMLESS INTEGRATION.

From Alcon to ZEISS –
Nano-laser is the smart way to
advance lens surgery with your
existing phaco system.
Your most affordable choice to enter the
prestigious PREMIUM laser segment.

