Non–surgical procedures: the only way is up!

Beauty and the beam – breakthrough combinations

Multi–application aesthetic lasers leading the way

The Future of Aesthetic Lasers is Now
The demand for light–based aesthetic treatments continues to expand, as confirmed by a recent Medical Insight study. The top five light–based treatments consist of procedures for epilation, skin rejuvenation, tattoo and pigmented lesion removal, reduction of vascular lesions and acne treatments. As technology progresses, all of these treatments are becoming increasingly popular, effective and affordable.

As Dr Leonardo Marini points out in the main interview of this edition, the field of dermatology is continuously evolving, and the biggest breakthroughs are often the result of innovative practitioners willing to try new approaches, such as the multi–wavelength combination treatments for skin rejuvenation and tattoo removal that he discusses in detail.

At the Laser & Health Academy, we believe that the two complementary ‘gold standard’ Nd:YAG and Er:YAG laser wavelengths provide a solid foundation for the widest spectrum of applications and an ideal platform for future innovation. Amazing new possibilities have emerged from combining these two beams of light, with successful new treatment approaches that have already become common practice across the globe, as can be witnessed inside the pages of this edition.

This Laser & Health Academy publication is sponsored by the EU regional Competency Center for Biomedical Engineering (CC BME), and represents the CC BME’s research on the subject of laser aesthetics (including dermatology and surgery). The intent of this edition is to promote the research and development activities of the CC BME in the area of laser dermatology and surgery, and to invite new partners from this area to join the CC BME consortium.

We hope you enjoy this issue of LA&HA magazine. ‘We’ve only just begun’ would seem like a fair description of the forecast for what’s ahead in aesthetic medicine in the coming decades.

Dr Masa Gorsic
Non-surgical procedures: the only way is up! Medical insight’s overview of the global aesthetic market.

Beauty and the beam — breakthrough combinations. An in–depth interview with Leonardo Marini, medical director of The Skin Doctors’ Center of Trieste, Italy, and the chairman of the Task Force for Laser Dermatology of the European Academy of Dermatology. «Integrating knowledge and experience with technical developments gives me enormous satisfaction when I can find new indications and innovative treatment strategies.»

Multi-applicatin aesthetic lasers leading the way. Fotona’s 50 years of experience has inspired some of the world’s most advanced multi-application aesthetic laser technologies.«

A laser love at first sight. Interview with Robin Sult, RN. «I have been doing these treatments for many years with wonderful results and happy patients.»

“One of the very best lasers on the market today!” An interview with Mark B. Taylor, MD, dermatologist and cosmetic laser surgeon. «When I took a tour of the Fotona manufacturing facility in May of 2013, I realized what precision and care goes into the making of this fine piece of equipment.»

A thorough knowledge of lasers is absolutely necessary in today’s clinical practice! An interview with Mukta Sachdev, MD, DD and DD, professor of dermatology. «I have developed several new protocols with QX MAX for the treatment of pigmentation in darker skins and I am currently working on protocols and trials for low-fluence toning for darker skin types.»

The biggest challenge in laser practice? Patient expectations! An interview with Dr Jasmina Kozarev, MD, specialist in dermatovenerology. «Lasers are used in many dermatological protocols, and today, without their use, there simply would not be the same level of success in modern dermatology.»

“I am highly thankful for Fotona’s development efforts!” An interview with Reinhard Gansel, D.A.I.M. «I have been working with Fotona lasers for about 18 years and I find their systems to be absolutely necessary in today’s laser practice.»

Nd:YAG laser therapy: the most effective treatment of onychomycosis so far. Conventional treatments of advanced onychomycosis are time-consuming, cost-intensive, and subject to relatively high failure rates, while Nd:YAG 1064 nm laser irradiation seems to be well suited for the task.

intestinal cases

Skin tightening of the abdominal area with the Nd:YAG laser

Removal of Nevus of Ota using Q-switched Nd:YAG Fractional Er:YAG laser for scar-revision treatments

Onychomycosis treatment with Nd:YAG laser
Overview of the Global Aesthetic Market

Non-surgical procedures: the only way is up!

Demand for light-based aesthetic treatments continues to expand, particularly true for treatments that address major markets and offer significant benefits over conventional therapies, such as light-based epilation, skin rejuvenation, tattoo and pigmented lesion removal, reduction of vascular lesions and acne treatments. Since these treatments are simple to perform, physicians’ assistants often perform the procedures, freeing the practitioner’s time for higher-priced treatments.

Additionally, an increasing number of non-core physicians, such as family practitioners, internists and OB/GYNs, have expanded into aesthetic procedures as a means to supplement shrinking income from their conventional medical services. Such non-traditional segments of the market have contributed strongly to recent growth, and will likely continue to do so, even though sales have moved past the first adopters into the early majority in these sectors.

Light-based devices have a long history in the treatment of dermatological conditions. Shortly after the invention of the laser in 1960, medical researchers began investigating its use in a variety of dermatological procedures. Over the years, the technology has been commercialized into dozens of different devices, with functionality determined largely by the color of light used and the duration of each laser pulse.

Worldwide procedure volume for light-based aesthetic treatments by application, 2009 — 2014 (MM)

Since its introduction in 1995, light-based hair removal has become one of the most popular cosmetic surgical treatments. The market for hair removal services is enormous. More than 80% of men and women worldwide between the ages of 14 and 80 remove facial and/or body hair on a regular basis. However, over the past few years, skin rejuvenation has become the most popular light-based aesthetic procedure among all physician-performed treatments.

In North America, more than 50 million people are believed to have at least one tattoo and the worldwide figure may be three to four times greater. However, as lifestyles change, it’s not uncommon for individuals to wish to remove a tattoo. One physician who specializes in tattoo removal estimates that half of those who get tattoos later regret them. This has created a large and growing population of tattooed individuals who are now seeking treatment for removal.

Acne’s primary victims are teenagers, however, an increasing number of adults between the ages of 20 and 50 also suffer from acne that results from factors including heredity, stress, hormonal changes, medications, birth-control pills, heat, sun, friction against the skin, cosmetics, moisturizers and some industrial chemicals. Light-based devices for the treatment of acne offer excellent results without the often severe side effects caused by some medications such as isotretinoin.

Despite the convenience and excellent results offered by light-based treatment of vascular lesions, the procedure has not yet replaced needle-based sclerotherapy. Vascular lesions include a range of conditions including bulging varicose veins on the legs, thin spider veins on the face and discolored patches called rosacea. They are a common condition, affecting up to 50% of women age 18 years and older.

Percentage of worldwide sales growth of phototherapy, skin tightening & body shaping and skin rejuvenation

An ISAPS international survey on aesthetic/cosmetic procedures performed in 2009 revealed the top five non-surgical procedures as follows: toxin or neuromodulator injections (Botox, Dysport) — 32.7%, hyaluronic acid injections — 20.1%, laser hair removal — 13.1%, autologous fat injections (taking a patient’s fat from one location and transferring it in the same patient in another location) — 5.9% and IPL Laser treatment — 4.4%.

The countries where these non-surgical procedures are widely performed include the United States, Brazil, Mexico and China, and to a lesser extent by Japan, Hungary, South Korea, India and Germany.
Beauty and the beam—breakthrough combinations
An in-depth interview with Leonardo Marini, medical director of The Skin Doctors’ Center of Trieste, Italy, and the chairman of the Task Force for Laser Dermatology of the European Academy of Dermatology

By Edita Krajnovic

You have been working with lasers in dermatology for many years now. How did you get started?

Dr Marini: Innovative technologies applied to dermatology have always fascinated me. Mohs’ micrographic surgery and laser applications were my first love when I started my professional career as dermatologic surgeon. They moved me first to NYU in Manhattan in 1986 where I finished my training as a Mohs surgeon in 1987. I then went to Australia where I saw the first application of dye lasers on infantile port wine stains at the Royal Perth Hospital and subsequently to New Zealand to see an innovative copper–vapour laser system combined with a complex computer–controlled scanner able to fill anatomical areas previously outlined by photographic acquisition.

San Diego was my next stop where I visited Richard Fitzpatrick and Mitch Goldman at their office on Genesee Avenue and I saw excellent treatments performed. I shared experiences with Dr Alina Fratila in Bonn regarding laser–assisted blepharoplasty and full face CO2 resurfacing, and continued to improve techniques and clinical outcomes. I was fascinated by the effects of Q–Switched lasers when I visited Dr Stuart Nelson at the Beckman Laser Institute at Irvine, California, where I met with the research group who developed the first non–contact cryogen epidermal cooling system.

I continue to enjoy working with lasers and other energy sources, always studying new technical methods to improve clinical results, reduce post–op down-times and potential side effects, sharing my experiences with top laser experts around the world. So it is almost 25 years that I have been working with lasers in dermatology and every day is like the very first. Integrating knowledge and experience with technical developments gives me enormous satisfaction when I can find new indications and innovative treatment strategies.

ABOUT LEONARDO MARINI

Dr Marini concluded his training as a general surgeon in 1987 and as dermatologist in 1989. He is currently the medical director of SDC — The Skin Doctors’ Center of Trieste, Italy and has served as professor of laser dermatology at the University of Siena, Parma, and Verona. Dr Marini’s primary interests are the surgical management of skin cancer with Mohs’ micrographic surgery, advanced dermatological applications of lasers and energy sources, advanced photodynamic therapy and aesthetic dermatology.

His research work is mainly dedicated to the study of innovative surgical and laser–assisted strategies in dermatologic surgery combining different techniques to optimise clinical results. His contributions to this particular field of dermatology have led to the development of photo–peel, advanced photodynamic surgery, advanced tissue cryo-processing in Mohs micrographic surgery, sequential layering techniques to treat capillary-venular vascular malformations, post-acne scars, and premature skin aging.

Dr Marini is the chairman of the task force for laser dermatology of the European Academy of Dermatology. He has proudly served as founder president of ESLD — the European Society of Dermatology, established in Trieste in 1996, and as president of ESCAD — the European Society of Aesthetic and Cosmetic Dermatology.

Dr Marini also serves as an executive member of the boards of many national and international scientific societies such as DASIL, European LED Academy, ESMS, ILAD, and SIFCS. He has published numerous scientific peer-reviewed papers in international medical journals as well as many book chapters and delivered more than 400 clinical presentations at international congresses and scientific meetings.
How did dermatology practices look like before the laser era?

Dr Marini: Dermatology was a novel medical specialty back in the 1980s in many countries. Dermatologists performed minimally invasive procedures, mostly limited to superficial surgical acts like biopsies, cryosurgery, electrosurgery, small excisions, chemical peels. Phototherapy was limited to UV–treatments for psoriasis, other inflammatory dermatoses, and superficial lymphomas. Dermatologic offices were quite simple — and fast, simple procedures were preferred over longer and more complex ones, which were referred to other ‘more surgical’ specialties like surgery, plastic surgery, vascular surgery, ENT, or gynecology.

The wind of dermatologic surgery started to blow first from some European countries like Germany, Portugal, Holland and Spain, but the typhoon really came from the States where technology was at home and industry was highly receptive to innovative developments coming from other professional worlds, particular medicine. Great merit should be attributed to Dr Perry Robins from NY who, along with a close group of international friends, founded the ISDS — The International Society of Dermatologic Surgery. This Society was the ‘ambassador’ of dermatologic surgery in the world. Dermatologic offices started to get more and more ‘technical’, able to accommodate a continuously increasing number of systems, both diagnostic and therapeutic, with lasers being an important part.

From a doctor’s perspective, what are unique advantages of lasers in dermatology practice?

Dr Marini: Lasers have always attracted dermatologists because of their ability to be independent from direct skin contact. The idea of treating skin alterations with a beam of light, whether visible or not, was also very welcomed by patients. Bypassing superficial skin layers and coagulating deep dermal structures like capillaries and venules was incredible in the eyes of many physicians. Reaching difficult anatomical regions and treating them without the need of physically ‘touching’ them is clearly another advantage offered by laser technology. Dermatologists were among the first to prove the effectiveness of lasers on human tissue and contributed quite a lot to build the knowledge we have today.

What are your main applications with the Q–switch laser, and which system do you currently use?

Dr Marini: Advanced Q–S laser tattoo removal is quite popular now, due to the increasing number of people willing to remove their permanent skin markings. Tattoos are increasing among young populations around the world and it is estimated that roughly 65% of individuals are willing or strongly considering to have a tattoo. Many people nevertheless regret having a tattoo on their skin and wish to have them removed.

Besides tattoo pigment removal with our innovative multilayer technique, we successfully use our Q–switched laser system to treat eyelid xanthelasma, sebaceous nevi, sebaceous hyperplasia, solar keratosis. Treatments are fast and recovery time well accepted.

I have found the QX MAX system from Fotona to be truly a fantastic system: compact, reliable, powerful, and extremely effective. I really like to work with it also from the ergonomic point of view, not of secondary importance for a laser surgeon.

You perform many different combined treatments? Which are the most popular combinations?

Dr Marini: As I said before, I always loved to combine different laser systems and many other technologies, to the point that my friend Merete Haedersdal, a very famous Danish laser dermatologist presently working with the group of Rox Anderson in Boston, calls me ‘Mr Combo’. I am not joking when I say that the concept of sequentially layering many different lasers during the same procedure does make a major difference in comparison with a single–laser procedure. You can optimize each laser’s specific possibilities and minimize possible complications and side effects.

Presently our TwinLight skin rejuvenation is very popular along with super–long (1.5 sec) 1064 nm Nd:YAG laser combined with 2940 nm Er:YAG laser and 5–ALA in photodynamic treatments. I also recently proposed an innovative multilayer fractional and conventional Q–S laser procedure to optimise tattoo pigment removal, which is gaining quite considerable popularity among our tattoo patients.

Can you tell us more about the combined treatment for tattoo removal?

Dr Marini: Conventional Q–S laser intradermal pigment removal consists of a single laser pass per session inducing a very slow, progressive pigment clearing requiring an average 10–12 sessions for professional tattoos.
Anti–aging laser treatments are constantly requested and will be even more popular in the future. Patients want to improve their skin without long post-operative downtime and excessively invasive procedures. Skin aspect is very important in non-verbal human communication and, since people live longer than before, anti–aging treatments are a must in preserving a uniformly pigmented and youthful appearance. Irregular pigmentation and wrinkling are widely recognized signs of older age. Techniques aiming at improving these two major age signs are highly requested by the major-ity of subjects willing to keep a younger look.

**The art of combination**

There is no single treatment able to properly address all skin aging alterations, therefore, combining different laser systems sequentially during the same session is quite effective and rewarding. We have demonstrated the effectiveness of a sequential combination of short– and long–pulsed 1064 nm Nd:YAG laser, followed by 1–2 layers of 2940 nm ablative fractional laser to rejuvenate facial skin (TwinLight rejuvenation). Currently we are combining 2940 nm Er:YAG laser in fractional mode with 5–Aminuloevulinic acid (5–ALA) to induce an effective photodynamic rejuvenation.

We also combine 532 nm Q–S laser with the TwinLight rejuvenation protocol when dealing with severely dispigmented skins.

**Heat–shock for effective anti–aging strategy**

Lasers will always have a place in anti–aging treatments since selective, well–controlled thermal stimulation of collagen and adult stem cells — ultimately responsible for tissue renovation — are essential steps in prolonging healthy skin life. Fractional technology is able to eliminate part of already damaged collagen and cells, inducing a burst of biological activity able to effectively reno-vate skin tissue. Heat–shock protein response is now considered an active component of an effective anti–aging strategy and it can be triggered just by reaching 45°C temperature within tissue. An intelligent synergistic combination of thermal biostimulation and minimal tissue destruction is an ideal combination to induce a highly effective anti–aging effect. This kind of treatment can be successfully repeated on a regular basis in order to prolong the efficiency of functionally active skin.

I have found the QX MAX system to be truly a fantastic system: compact, reliable, powerful, and extremely effective. I really like to work with it also from the ergonomic point of view, not of secondary importance for a laser surgeon.

**DR MARINI ON THE MOST DESIRED ANTI–AGING TREATMENTS AND THE ROLE OF LASERS IN ANTI–AGING**

Anti–aging laser treatments are constantly requested and will be even more popular in the future. Modern technologies and innovative multilayer treatments allow for a significant decrease in the number of treatments, making tattoo removal more appealing to potential patients. We were able to reduce tattoo removal time down to 3–5 treatment sessions by combining 2094 nm fractional Er:YAG laser ‘priming’ followed by 2–3 passes of conventional Q–S laser superselective pigment removal, spaced 5 minutes apart. This innovative fractional priming technique allows the immediate escape of sub–dermal gas bubbles usually produced immediately after Q–S laser passes, opening the way to a subsequent immediate conventional Q–S laser pass. Presently, an innovative fractional handpiece is being developed by Fotona for the QX MAX system and is substituting for the fractional Er:YAG priming exceptionally well. I do love working with Fotona lasers because their technology is so reliable and their performance always matches the level of my expectations, which are not ‘low’. The vast number of accessories and the continuous innovations Fotona constantly develops contribute to keeping its laser systems always at the top, giving them a very long technical life, not bad during these times of economic crisis.

Integrating knowledge and experience with technical developments gives me enormous satisfaction when I can find new indications and innovative treatment strategies.
Multi–application aesthetic lasers leading the way

Fotona’s 50 years of experience has inspired some of the world’s most advanced multi–application aesthetic laser technologies

By Dr Masa Gorsic

With 50 years of experience in laser technology, Fotona’s line of aesthetic lasers systems is leading the industry forward with new levels of innovation and performance. The company offers a full range of aesthetic laser technologies, from specialized single–wavelength lasers to some of the world’s most advanced, multi–wavelength, multi–application aesthetic laser systems.

Fotona was the first manufacturer to introduce two complementary laser wavelengths (2940 nm Er:YAG and 1064 nm Nd:YAG) in a single system (SkinLight, 1994). Combining both wavelengths during a single treatment makes best use of the unique laser–tissue interaction characteristics of each laser wavelength, and can dramatically improve the outcome of laser–assisted treatments to achieve superior clinical results.

SP DYNAMIS: TWO LASER WAVELENGTHS — ALL MAJOR APPLICATIONS

Fotona’s newest SP Dynamis of high–performance multi–application laser system combines the complementary Er:YAG and Nd:YAG laser wavelengths into one highly versatile, multi–purpose system that can perform an exceptionally wide range of applications in aesthetics, dermatology and surgery.

The SP Dynamis delivers proven aesthetic treatments, including skin resurfacing & rejuvenation, removal of veins and vascular lesions as well as pigmented lesions & tattoos, plus permanent hair reduction and more. With functions ranging from superficial to deep peels, from non–ablative to fully ablative and from full–field to fractional resurfacing, treatments can be tailored to any specific skin condition to achieve exceptional results.

High performance aesthetic treatments

Fotona’s gold–standard Nd:YAG laser technology provides the power and performance needed to handle a wide range of aesthetic applications. Fotona’s Nd:YAG laser light penetrates deeper into the skin to selectively target even the deepest skin structures such as deep–lying veins and hair follicles. The thermal energy of the laser heats them to a point where the desired effect is achieved. The SP Dynamis also delivers the power of 3rd generation Er:YAG laser skin resurfacing. Fotona’s Er:YAG laser wavelength targets the uppermost layer of skin, enabling extremely precise, micron layer–by–layer ablation of the epidermis. The energy of the laser is absorbed by the water content in the skin cells and the tissue can be vaporized. This causes the skin treated to shrink, stimulating the production of new collagen in the dermis. The overall result is that new skin forms which is smoother and tighter.

Patented solutions — for ultimate safety and precision

Fotona’s exclusive VSP and EFC technologies in the SP Dynamis give you the peace of mind that the parameters selected are being safely and precisely delivered by the system throughout the entire treatment session, providing unmatched safety and confidence in the system’s ability. And with the SP Dynamis’s high power–generating capacity, optimal procedure speeds and efficiency are reached at only a fraction of the system’s maximum capacity, ensuring higher system durability and lower operating costs.
**KEY BENEFITS OF FOTONA LASERS:**

- High-precision, tissue-selective treatments
- Intuitive, easy-to-use parameter selection
- Low cost of consumables
- A hemostatic effect with simultaneous disinfection
- Less invasive, safer treatments, and shorter downtime
- Greater patient comfort and satisfaction

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**ADVANCED HANDPIECE TECHNOLOGY — FOR UNRIValed CONTROL**

Designed with the highest quality biocompatible materials such as titanium and gold, Fotona’s innovative handpiece technology optimizes the delivery of laser pulses to the treatment area.

The Nd:YAG laser on the SP Dynamis supports Fotona’s high-speed S-11 scanner for ultimate procedural speed, safety and efficiency in large-area treatments. The Er:YAG scanner F-Runner is a computer-controlled scanning device, specially developed to administer sharp fractional treatments unrivaled precision and accuracy.

**Engineered for ease of use**

To help you achieve perfection in clinical results while enjoying unmatched speed and efficiency, the SP Dynamis features an intuitive, easy-to-use interface with customizable memory presets to help every practitioner work faster and more effectively. Professionally designed handpieces, easy-to-select operating modes and many other advanced features further enhance the precision and performance of each Fotona laser system for optimal clinical efficacy and unrivaled control during treatments.

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**HIGH-PERFORMANCE SCANNER TECHNOLOGY**

**FULL-FIELD SCANNING**

Fotona’s computer-controlled S-Runner Er:YAG scanner with 4 mm spot size and 16 cm² scanning area is perfect for full-field Er:YAG resurfacing, while the high-performance S-11 scanner with adjustable 3, 6, or 9 mm spot size and 42 cm² scanning area provides unrivaled precision and accuracy with Nd:YAG thermal treatments.

**FRACTIONAL SCANNING**

Fotona’s ergonomically designed F-Runner fractional scanner with adjustable scanning field coverage (168 mm² max scan area) ablates 250 µm diameter channels (<5 µm to 1100 µm deep) over a just a fraction of the entire resurfacing area to facilitate a faster and more effective wound healing response with higher patient comfort.

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**WHY AN Er:YAG & Nd:YAG LASER COMBINATION**

The SP Dynamis’ VSP (Variable Square Pulse) Er:YAG laser inherently ablates skin more precisely than other laser technologies. Er:YAG energy is highly absorbed in water — the main target chromophore for skin resurfacing — and can thus vaporize skin with micron-precision and very little thermal conduction. This keeps undesired effects such as hypopigmentation and persistent erythema, as well as recovery time, to a minimum. The VSP Er:YAG laser in SP Dynamis systems can be accurately tuned from varying “cold” and “hot” ablative to non-ablative thermal ratios.

Full customizability allows you to precisely attain the clinical outcomes your patients desire.

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**KEY TREATMENTS WITH FOTONA SP DYNAMIS:**

- Non-ablative Skin Rejuvenation
- Ablative Skin Rejuvenation
- Skin Resurfacing
- Full Beam & Fractional Treatments
- Hair Removal
- Pigmented Lesions
- Vascular Lesions
- Acne & Acne Scar Revision
- Scar Revision
- Onychomycosis
- Warts
- Benign Lesions Removal
- Surgical Applications: Laser Lipolysis, EVLA, Hyperhidrosis

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**INNOVATIVE PULSE MODES — FOR HIGHER PERFORMANCE**

State-of-the-art scanners and fractional options make Fotona’s multi-application SP Dynamis a truly comprehensive solution for your practice. Fotona’s TURBO mode for high-definition fractional treatments and Fotona SMOOTH mode for high-speed, thermal, non-ablative skin rejuvenation deep in the dermis are just a few of the characteristics that make the SP Dynamis the cutting edge of Er:YAG laser technology. Like using an artist’s palette, you can precisely mix and match cold ablation and thermal effects to achieve perfect results.

In addition, the Nd:YAG laser also enables FRAC3® non-ablative rejuvenation treatments — a breakthrough fractional approach in anti-aging and aesthetics in which the tiniest age-related skin inhomogeneities are treated with a minimum of damage to the surrounding skin, ensuring superior results and quicker recoveries. The revolutionary new ultra-long-pulse Fotona PIANO mode enables deeply penetrating Nd:YAG bulk heating while simultaneously keeping the epidermis safe and comfortable.

**QCW mode for surgical applications**

In addition to its high performance infrared Er:YAG and Nd:YAG lasers, the SP Dynamis also includes one of the most powerful infrared QCW (Quasi Continuous Wave) Nd:YAG surgical lasers on the market. Surgeons have long preferred infrared lasers due to their unmatched efficacy, simultaneous disinfection ability and outstanding clinical results.

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**KEY BENEFITS OF FOTONA LASERS:**

- High-precision, tissue-selective treatments
- Intuitive, easy-to-use parameter selection
- Low cost of consumables
- A hemostatic effect with simultaneous disinfection
- Less invasive, safer treatments, and shorter downtime
- Greater patient comfort and satisfaction

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**FOTONA’S SP DYNAMIS IS A HIGHLY INNOVATIVE WORKSTATION,** which represents a complete ablative skin resurfacing solution capable of providing a wide variety of treatment options.” — Ming-Li Tseng, MD, Skin and Beauty Clinic, Taipei, Taiwan
**QX MAX: HIGH PERFORMANCE SINGLE-PULSE Q-SWITCHED LASER TECHNOLOGY**

In addition to the SP Dynamis, Fotona also manufactures a range of other high-performance medical laser systems, including the industry-leading QX MAX, one of the most advanced Q-switched lasers on the market today. It has the power to remove all common pigmented lesions and a broad spectrum of tattoo colors, and additionally offers the ability to provide aesthetic treatments. The QX MAX is built for maximum performance with patented, state-of-the-art innovations to make treatments safer and more effective.

**High performance aesthetic treatments**

The QX MAX’s high-energy, single-pulse technology is vastly more efficient at removing pigments than multi-pulse lasers that generate equivalently high energies. With 5 ns pulses of up to 1.6 J energy, the QX MAX’s single-pulse Q-switched technology generates larger spot sizes that remain effective with deeper lying pigments. Single pulses are not affected by the optical shielding phenomenon arising from pigment destruction, therefore, more and deeper lying pigments can be targeted and removed, and treatment efficacy and efficiency in a single session are thus maximized. The use of larger spot sizes also requires less fluence to be effective, reducing the risk of unwanted side effects such as tissue splatter, bleaching and textural changes.

**Ideal for removing tattoos and pigment lesions**

Q-Switched lasers are the ideal tools for effectively removing complex and multi-colored tattoos. The QX MAX’s extremely short energy pulses pass harmlessly through the top layers of skin to be selectively absorbed by treatment-specific tattoo pigments, causing them to break into smaller particles that are then removed by the body’s own immune system.

The QX MAX laser system is also the perfect tool for treating a wide range of pigmented lesions, including treatments for nevi (moles), ephelides, sunspots and melasma. Superficial lesions can be treated most effectively with the 532 nm wavelength, while the 1064 nm wavelength can be used to target deeper lesions.

**A STABLE & MULTI-FUNCTIONAL LASER SOURCE**

The QX MAX’s Nd:YAG laser has the ideal 1064 nm wavelength upon which to base a multi-functional pigment removal laser system. Its wavelength is minimally absorbed in melanin, allowing it to be used safely in all darker skin types – a characteristic that has led the Nd:YAG laser to become a gold standard in aesthetic medicine. In addition, Nd:YAG laser rods do not contain Cr^3+ ions and are therefore not as sensitive to environmental and operational temperature changes as other commonly used Q-switched laser wavelengths. The Nd:YAG nano-sec- ond laser is also the ideal modality to start wavelength conversion to attain other treatment wavelengths.

The QX MAX incorporates a built-in frequency conversion technology to obtain the 532 nm (green) wavelength, and dye laser wavelength conversion handpieces are available to expand the QX MAX’s wavelength range to include the 585 nm (red) and 650 nm (yellow) wavelengths. With the additional support of sub-millisecond Accelera infrared pulse technology, the QX MAX can thus be safely and effectively used in all common aesthetic treatments, including acne and wrinkle reduction.

**KEY TREATMENTS WITH QX MAX:**
- Tattoo removal
- Pigmented lesions

**ADDITIONAL TREATMENTS:**
- Rejuvenation
- Vascular lesions
- Hair removal
- Acne treatment

**THE QX MAX OFFERS FOUR TREATMENT WAVELENGTHS IN A SINGLE SYSTEM:**
- 1064 nm Nd:YAG to treat and remove dark pigments,
- 532 nm KTP for lighter pigments, vascular lesions and red, tan, purple and orange tattoo inks,
- 650 nm dye for green tattoo inks,
- 585 nm dye for sky blue inks and vascular lesions.
Four wavelengths for a complete pigment range

The laser’s wavelength is what determines which pigment color or chromophore will be predominantly targeted by the laser to selectively remove it. To ensure safe and effective treatments, you’ll need an optimized selection of wavelengths to target a wide range of pigments. The QX MAX’s Nd:YAG laser provides the ideal platform for initiating wavelength conversions to create a true multi-wavelength pigment removal solution.

The QX MAX’s optimal selection of four wavelengths provides the ability to treat even the most complex, multi-colored tattoos. Most tattoo procedures take only a few minutes, but several treatments are typically necessary to completely remove a tattoo. Three-week intervals between sessions are required to allow pigment residue to be cleared by the body.

Highest beam profile quality

Achieving a homogeneous beam profile is technically challenging due to the non-linearity of Q-switched lasers. Fotona’s advanced Q-switched technology relies on groundbreaking solutions such as patented OPTOflex® and Vacuum Cell technologies to produce an almost perfectly homogeneous beam profile. Homogeneity of the laser beam profile ensures greater safety during treatments since laser energy is evenly distributed across the treated area. Epidermal damage is minimized and the risk of bleeding, tissue splatter and transient textural changes in the skin is significantly decreased. Ergonomic design also allows the handpiece to naturally follow hand movement during procedures, further enhancing treatment precision and accuracy in the most delicate and demanding treatments.

Patented solutions for ultimate safety and precision

Fotona’s core technologies in the QX MAX provide the peace of mind of knowing that the parameters you have selected are being safely and precisely delivered by the system throughout each entire treatment session, providing unmatched safety and confidence in your system’s ability. EFC (Energy Feedback Control) technology, one of Fotona’s pioneering safety features, actively checks and controls each individual pulse’s energy level to ensure that the output energy is exactly matched for safe and effective treatment.

TECHNOLOGY FOR TODAY AND TOMORROW

Fotona’s unique R&D expertise and patented technological solutions have enabled the company to design and manufacture the world’s most advanced medical laser systems powered by Er:YAG, Nd:YAG and Q-Switched laser technologies. At the heart of Fotona’s medical lasers are high-performance, solid-state crystal laser sources that generate the industry’s most proven and effective treatment wavelengths. These ‘golden-standard’ wavelengths are ideally suited for handling an exceptionally wide range of aesthetic and clinical procedures. Fotona’s proprietary handpieces, innovative operating modes and advanced beam-profile technologies further enhance these golden-standard medical wavelengths to ensure maximum performance and efficacy.

“...The QX MAX’s multi-frequency feature, coupled with very high power reserves, helps me effectively treat even the most difficult to remove tattoos.” — Nina Sheffield, MD, Royal Tunbridge Wells Skin & Laser Clinic, UK
Experts
A laser love at first sight
Interview with Robin Sult, RN

You have been using Fotona lasers for many years. If you look back to the beginning, what was the most difficult thing to learn about lasers?

R. Sult: I fell in love with my Fotona laser that first day in 2001. But the first day was intimidating. There are a few buttons and screen pages, but once you are familiar it is easy to set up. I learned quite quickly how the laser worked in regards to the skin, its structures and target chromophores.

Once I understood those concepts I was able to apply that knowledge to a variety of clinical issues as I began to treat the patients who presented to our office. Having both Nd:YAG and Er:YAG wavelengths to start our practice allowed me to provide a very wide range of treatments. Over these years I have treated men, women and children from ages 4 to 85. It has been a great experience.

Which aspects of the Fotona laser system do you like best?

R. Sult: Fotona lasers are very user friendly. Every pulse is calibrated before delivery of the laser energy to the patient. We do not waste any time in having to calibrate the laser. This provides a high level of safety and comfort to the patient. The cost of long-term ownership is very low due to outstanding reliability and little or no consumables. The handpieces are works of art and fit comfortably in your hand. It has a clean design which I believe impresses my patients’ as they enter the laser room for the first time.

Which treatments do you like the most?

R. Sult: I prefer treatments that are done in one session. This ability to have a treatment result in one, or a low number of sessions, allows for a happy patient who usually opts for other treatments you have the ability to offer. I enjoy working with the laser on all levels. Vascular treatments and skin resurfacing are my two favorites.

ABOUT ROBIN SULT

Robin Sult began her career as a Registered Nurse in 1980. Her initial work was in Neonatal ICU. In 1988 she worked with a physician developing an aesthetic practice, and by 2001 Robin was running a laser aesthetic practice with a full complement of Fotona laser systems. She is actively involved with clinical research and protocol development in laser aesthetics and teaches laser medicine, practice management and patient management nationally and internationally.

Robin has also been instrumental in helping many doctors to open their own aesthetic practices. She has over 18,000 laser clinical operator hours and has provided formal training of 464 physicians in the use of lasers in clinical practice. She has presented over 184 lectures and workshops in 9 different countries. She is currently a faculty member with the Sharjah University Laser Training and Research Center in Sharjah, UAE.
You have had exceptional results with transdermal vascular treatments. What is your secret?

R. Sult: There is no secret. Understanding the chromophores in blood and always individualizing treatments with a test vein of 1–2 mm before moving forward is important. This allows you to choose your parameters for the desired treatment outcome. Smaller veins are often treated in 1 to 2 sessions with 6 weeks in between treatments. Larger veins of 5+ mm can also be treated with great success. I have developed a two-pass technique for large veins, which quite consistently has accomplished a successful outcome in just one treatment. I have been doing these treatments for many years with wonderful results and happy patients.

As a medical laser trainer, if you could give some advice to a beginner, what would it be?

R. Sult: Take training seriously! Understanding the target you are after and the various ways to get at that target is crucial. Use the minimum power needed to accomplish your goal in that particular patient. This will result in optimized outcomes with minimized risks. Read your Fotona manuals, learn from an experienced Fotona laser trainer, attend a Fotona conference in your part of the world or attend a Fotona laser seminar in Slovenia.

Give outstanding consults. Use analogies to help your patient understand what you are doing and what the realistic possibilities are. Help your patient understand their role in the treatment outcome through clear aftercare instructions. Through these steps you become a treatment team comprised of the patient, you and your Fotona laser.

I have developed a two-pass technique for large veins, which quite consistently has accomplished a successful outcome in just one treatment. I have been doing these treatments for many years with wonderful results and happy patients.
One of the very best lasers on the market today!

An interview with Mark B. Taylor, MD, dermatologist and cosmetic laser surgeon

By Daniel Levec

We typically perform at least 5 to 10 treatments on the lower face and neck each week using the PIANO mode. This method is extremely fast, effective, safe and comfortable for the patient.

Dr Taylor: I made a conscious decision in 1984, while attending the American Academy of Dermatology and listening to a lecture on lasers, to become an expert on the use of lasers in dermatology. It has been my focus ever since.

What made you decide to purchase a Fotona laser system?

Dr Taylor: I spent two hours discussing the Fotona SP Dynamis laser with Mr Zdenko Vizintin, a Fotona laser applications specialist, while attending the IMCAS meeting in Hong Kong three years ago. We talked about possible applications of fractional Nd:YAG laser treatment for difficult vascular lesions. I was impressed with the technology and I have come to view this laser as one of the very best lasers on the market today. When I took a tour of the Fotona manufacturing facility in May of 2015, I realized what precision and care goes into the making of this fine piece of equipment.

How does Fotona differentiate itself from the competition?

Dr Taylor: The Fotona SP Dynamis laser is extremely versatile with respect to the possible parameters available, and is an extremely reliable and versatile system in general. It has been used frequently in my clinic for 2 1/2 years with zero required maintenance. This is an amazing record compared to any other device I have ever owned.

Which applications do you perform the most?

Dr Taylor: Skin tightening is my number one procedure with the Fotona SP Dynamis laser. Fractional Nd:YAG treatment of vascular lesions is second, and Fractional Erbium resurfacing of acne scars and wrinkles is the third most used application.

Which method for rejuvenation do you prefer?

Dr Taylor: My preferred method of rejuvenation is a combined approach using PIANO mode skin tightening combined with fully ablative and fractional ablative treatment of wrinkles and sun damage on the face, neck and chest. Fotona’s PIANO mode for skin tightening is very good and is unique to this laser; it is the method used most often in my clinic for skin tightening. We typically perform at least 5 to 10 treatments on the lower face and neck each week using the PIANO mode. This method is extremely fast, effective, safe and comfortable for the patient.

ABOUT MARK B. TAYLOR

Mark B. Taylor, MD, is a world-renowned dermatologist and cosmetic laser surgeon who has been in practice for over thirty years. Since the origination of laser skin treatments, Dr Taylor has been a leader in the field of cosmetic laser surgery, pioneering and teaching many new laser techniques to over 4,000 doctors worldwide. Dr Taylor and his well-trained staff provide a range of high-quality services, including removal of birthmarks, hair, scars, spider veins, and tattoos; skin rejuvenation and resurfacing; eyelid restoration and lip enhancement; tumescent liposuction and cosmetic skin surgery, acne, cellulite, and stretch mark treatments.

Dr Taylor received his medical degree from the University of Utah and is board-certified in dermatology through the American Board of Dermatology. He is a member of the American Society for Laser Medicine and Surgery as well as many other professional organizations. In addition, Dr Taylor has developed new techniques for many laser treatments and cosmetic surgery, which he performs on a regular basis in his busy practice in Salt Lake City.
“A thorough knowledge of lasers is absolutely necessary in today’s clinical practice!”

An interview with Mukta Sachdev, MD, DPD and DD, professor of dermatology

By Romana Pahor

ABOUT MUKTA SACHDEV

Dr Mukta Sachdev is a professor of dermatology, trained in India, the US and the UK and specializing in skin of color. She has practiced dermatology since 1995, working both in the fields of clinical and aesthetic dermatology, with extensive experience in treating darker skin types.

She currently practices and works in a large regional, multi-specialty private hospital where she has practiced clinical dermatology since 1999 and served as head of the department of dermatology from 2011 to 2013. She also runs her own private clinical aesthetic practice in Bangalore, India, and supervises a dedicated clinical dermatology trial office for clinical and device trials in India.
Instead of wrinkles and lines as in Caucasian skin, the primary complaint in darker skinned patients is blotchy pigmentation. Thus the Q–switched laser is definitely the preferred laser option for darker skin types, especially for the treatment of pigmentation.

Why are Q–switched lasers especially good for skin of color?

Dr Sachdev: Pigmentation is now regarded as a sign of ageing in darker skin types. Instead of wrinkles and lines as in Caucasian skin, the primary complaint in darker skinned patients is blotchy pigmentation. Thus the Q–switched laser is definitely the preferred laser option for darker skin types, especially for the treatment of pigmentation.

Which are the most popular indications?

Dr Sachdev: The most popular indications are freckles and lentigines, and now also to even out uneven tone and facial pigmentation.

Have you developed any new protocols with QX MAX?

Dr Sachdev: I have developed several new protocols for the treatment of pigmentation in darker skins and I am currently working on protocols and trials for low–fluence toning for darker skin types. We have performed several biopsy studies for the monitoring of settings and fluence effects, and this is an ongoing process.

For which indications do you use the Fotona QX MAX laser?

Dr Sachdev: I am using the QX MAX for the treatment of melanocytic naevi, pigmentation of varied indications, freckles, lentigines, tattoo removal and also recently for low–fluence toning as a method of anti–ageing. I have also used it for post–inflammatory hyperpigmentation and hyper–pigmented scars, with good results.

Lasers are now almost mandatory treatments for many dermatological conditions, and a thorough knowledge of lasers and technology is absolutely necessary in today’s clinical practice.
The biggest challenge in laser practice?
Patient expectations!

An interview with Dr Ashraf Badawi, MD, associate professor of dermatology, venerology and lasers

By Zala Kerle

How many years have you worked with lasers?

Dr Badawi: It’s been 16 years.

From our understanding you have experience working in different countries. What differences have you observed in terms of working practices, acceptance and perception of laser medicine?

Dr Badawi: The patient’s expectations might vary from one country to another based on media influence and the types of lasers available, but basically most of the patients think lasers are magical devices and the practitioner has to spend enough time with the patient to explain the treatment procedure and treatment expectations. Patients having unrealistic expectations is one of the biggest challenges in laser practice everywhere.

What do you feel are the real benefits to patients when performing laser procedures?

Dr Badawi: The laser’s selectivity makes all the difference. Safety and efficacy are the major advantages of lasers but this requires a good machine and a well-trained practitioner too.

You have a great deal of experience using numerous laser systems. How does Fotona compare to other laser manufacturers?

Dr Badawi: Fotona lasers have a lot of science behind them and this explains why they have been around for 50

ABOUT DR ASHRAF BADAWI

With two PhD degrees in clinical medical sciences and laser applications in dermatology, a master degree in dermatology and a diploma in laser application in biology and medicine, Dr Ashraf Badawi is one of the leading experts in cosmetic dermatology worldwide. He is currently certified dermatologist and lecturer in the National Institute of Laser Enhanced Sciences, Cairo University, Egypt, and a visiting lecturer in Szeged University, Hungary.

He has over 15 years of experience in rejuvenation, treatment of photo damage, laser treatment of unwanted tattoos and unwanted hair reduction and has participated in over 100 international specialized conferences as a speaker and chairperson and has participated in providing training for over 1,500 practitioners in the field of cosmetic dermatology all over the world.
Fotona lasers have a lot of science behind them and this explains why they have been around for 50 years. No other laser manufacturer has been in the market that long to my knowledge.

How many vascular lesion treatments have you performed, and if you could offer some advice regarding the treatment of vascular lesions what would it be?

Dr Badawi: I’ve performed more than 2000 cases over the past years. The most important advice when treating vascular lesions with the Nd:YAG laser is to pay close attention to skin cooling before and after the laser pulses to avoid damaging the skin.

When performing hair reduction how does Fotona compare to the competition?

Dr Badawi: Fotona lasers, with their variable pulse options, can be used in different modes, such as the classic mode or the FRAC3 Avalanche mode. Even the QX MAX can be used for hair treatments, where pain–free hair removal can be achieved on any skin type.

Are there any advantages of using the S–11 scanner for hair removal?

Dr Badawi: For beginners it might be advisable to use a scanner for better precision and to avoid skipping some areas or creating too much overlap during the treatment.

In your opinion what are some of the newest trends in skin rejuvenation treatments?

Dr Badawi: Combination therapies involving different modalities like Er:YAG superficial ablation and non–ablative rejuvenation with the Nd:YAG.

Which areas of medicine or which treatment trends do you feel will grow in time?

Dr Badawi: Anti–aging and preventive procedures designed to delay the signs of aging before they occur will be a major practice in the coming few years.

Are there any advantages of using the S–11 scanner for hair removal?
“Working with lasers makes me happy.”

An interview with Dr Jasmina Kozarev, MD, specialist in dermatovenerology

By Marusa Bertoncelj

When did you start using a laser and which procedures do you perform?

Dr Kozarev: Twenty five years ago my first laser was a device for low–level laser therapy, then a continuous wave CO₂ laser. Later I began using a diode laser, and then ten years ago I started using Er:YAG, Nd:YAG long pulse and Q–switched, and recently an ultra pulse CO₂ laser. I am happy to have a mixed–type dermatological practice with an approximately equal number of visits for dermatological and aesthetic procedures, although, you will agree, sometimes sharp boundaries cannot be drawn. In addition to the broad band of aesthetic laser dermatological treatments, lasers are used in many dermatological protocols, and today, without their use, there simply would not be the same level of success in modern dermatology.

The implementation of the laser into standard dermatological procedures, e.g. atopic dermatitis, speeds recovery, decreases the time of application of drug therapy and increases quality of life. The application of lasers in localized scleroderma (morphea) cases enables quick treatments that alter the immune background of morphea plaque, where controlled laser tissue damage interrupts the inflammatory background reaction.

Over the years you have been involved in the development of new laser applications. What in particular has inspired you to want to continue researching and developing new medical laser applications?

Dr Kozarev: Working with lasers makes me happy. I once got the impression that I was an orchestra conductor and the lasers were skilled artists. I work in peace and a designed space that is fully adapted to the demands of high technology, and it is my stress–free zone. From the beginning, dermatology was my only choice, and lasers for me are not just about wavelengths.

ABOUT DR JASMINA KOZAREV

Dr Jasmina Kozarev is the Director of the Dr Kozarev Dermatology Laser Clinic and an experienced researcher and innovator in the field of dermatology and laser surgery. She specializes in all aspects of dermatology and venerology, with special emphasis on aesthetic laser surgery. In 2012 Dr Kozarev received her PhD degree in laser applications in vascular skin diseases from the Private Dental Faculty, Serbia, and since 2010 has been a visiting lecturer in Sharjah University, UAE.

During her career path, Dr Kozarev has actively participated in more than 100 international dermatology conferences with lectures and workshops. Within the past 20 years she was directly involved in training dermatologists all over the world in the field of aesthetic dermatology procedures and dermatosurgery. Her research interests are laser treatments of vascular and pigmented birthmarks, cutaneous laser resurfacing and the management of side effects and complications, non–ablative cutaneous laser remodeling of scars, Q–switched laser treatment of melasma and post–skin resurfacing skin care.

With more than 20 years of hands–on clinical expertise, Dr Kozarev founded the Dermamedica Dermocosmetics Line, incorporating natural dermocosmetics into professional skincare. She is member of the Serbian Dermatology Association, the European Academy of Dermatology and Venerology, the European Society of Laser Dermatology, the American Academy of Anti–Aging Medicine, and the World Association of Anti–Aging Medicine.
or pulse length, or fluence, but the possibility for positive and sophisticated manipulation in the right direction for better human health.

Every day the amount of knowledge acquired through the application of this technology opens many new possibilities and new indications, without end. I see many highly motivated people. The great writer B. Nusic said: “Knowledge has limits, while ignorance does not.”

**In your opinion which medical laser applications show the greatest efficacy?**

Dr Kozarev: It is hard to say. It depends on the indication, the type of laser and the cost of the procedure. If you want to ablate something superficially, the Er:YAG laser is a good choice. If you want a good venectasia treatment, the long-pulse Nd:YAG laser is an excellent choice. If you are treating a mixed type of melanoma, it is good to combine a fractional cold Er:YAG laser and a Q-switched Nd:YAG laser in the same session. Patients are very satisfied with laser removal of benign changes, venous blood vessels, and with scar, acne and onychomycosis treatments due to their high efficiency and fast visible results.

**Are there any new laser treatments that you feel will become more popular in the future?**

Dr Kozarev: Generally, the laser will be more popular in everyday dermatological non-aesthetic procedures. I am sure it will have a significant role in procedures that influence immune status and skin immune response. And I think it will be very important to establish protocols of laser application in the treatment of infectious skin diseases. In such cases we will have a targeted therapy without side effects like the development of drug resistance.

**You have developed a protocol for laser treatment of onychomycosis and conducted a large study. How successful is this treatment?**

Dr Kozarev: This study has initially shown good efficacy of treatment of fungal nail infections caused by Candida and Trichophytons. With continued work in the field of the applied laser therapy for this indication, it was shown that setting an initial accurate diagnosis is a key to treatment success. In 30% of patients from over 150 analyzed cases, we saw simultaneous presence of fungal and bacterial infection as a combined infection. Such unrecognized combined infections were the cause for unsuccessful treatments, where the laser light cured the fungus but did not achieve the desired aesthetic effect.

Second, a usually unrecognized problem is fungal nail infection in patients with either nail psoriasis, nail lichen planus, nail changes associated with atopic dermatitis or the patients undergoing systemic antiproliferative therapy. I like to say that laser onychomycosis treatment is a very good therapeutic option but only after establishing proper diagnosis.

**How many treatments do you usually perform to treat the nails?**

Dr Kozarev: Usually four treatments, once per week.

**Did you develop a protocol for any other new laser treatment?**

Dr Kozarev: It was a great challenge to develop a morphea treatment. The first idea was to resolve problems with atrophic cicatrisation, but during this time I found that we could achieve a nice, controlled and desired inflammatory tissue response that will reset previous immunology inflammation. This is not only important because we can act in the initial stage of the disease without any other drug therapy, but because we can help a lot of patients with massive facial conditions that will produce permanent disfigurement.

In addition to your full-time clinical practice, you’re also an educator: Do you like teaching?

Dr Kozarev: It is a part of my life and my professional mission. I have opened the doors of my practice to doctors from all over the world. Laser dermatology is a relatively young discipline and 25 years ago I started as a pioneer in the field in my country. Today I am proud to say that I have trained 74 young doctors in my laser clinic as well as during LA&HA and SULTARC courses. I like to hear a second opinion, to write articles, to share ideas, to hear new theories, and much more. I like to seek out medical truth. Sharing my knowledge in the field of dermatology and laser- and light-based therapies makes me happy and gives me hope that the new generation of young researchers dedicated to lasers will go much further.
“In skillful hands, a laser is one powerful and effective tool.”

An interview with Althy Au Shui Lun, MD, clinical dermatologist and aesthetic plastic surgeon

By Daniel Levec

How long have you been performing laser treatments?

Dr Au Shui Lun: I have been using lasers since 2009.

What is in your opinion the major advantage of lasers in comparison to other techniques?

Dr Au Shui Lun: I believe that a laser is a powerful and effective tool in skillful hands. Lasers have a unique advantage in the field of cosmetic dermatology and other areas due to the nature of the laser’s effective selectivity and preciseness, in addition to less downtime as compared to other treatment modalities, e.g. chemical peels, dermabrasion and surgery, etc.

ABOUT ALTHY AU SHUI LUN

Dr Althy Au Shui Lun received his bachelor of medicine and surgery from the Chinese University of Hong Kong followed by a second diploma in clinical dermatology and a master’s degree in aesthetic plastic surgery from Queen Mary University of London. He operates his own private cosmetic surgery practice in Hong Kong.

He has participated in several international conferences and workshops. Amongst others his prime skills are laser rejuvenation, resurfacing, scar and pigment removal.

What is the advantage of the Er:YAG laser for resurfacing treatments?

Dr Au Shui Lun: Er:YAG is a very effective tool for resurfacing treatments, in particular in Asian skin types, in terms of the balance between efficiency, downtime and the risk of PIH (post inflammatory hyperpigmentation).

Which treatments are you performing with Er:YAG?

Dr Au Shui Lun: I use Er:YAG for benign skin lesion removal (moles, warts, syringoma, xanthelasma, etc.), with the FS01 handpiece in light fractional mode for skin pore reduction, fine line reduction, and with the F–Runner handpiece in deep fractional mode for various forms of scar enhancement like acne scars, surgical scars and traumatic scars. Er:YAG is one of my main treatment modalities for scar treatments.

How does Er:YAG resurfacing compare to other available resurfacing options?

Dr Au Shui Lun: Chemical peels, dermabrasion, steroid injection, surgical treatment and laser resurfacing are common treatment options for skin resurfacing. Sometimes a combination of treatment modalities may be needed for difficult cases. The Er:YAG laser, however, will always play an important role in my practice due to its unique characteristics as I have already mentioned.
Experts

“I’m highly thankful for Fotona’s development efforts!”
An interview with Reinhard Gansel, D.A.L.M.  
By Romana Pahor

How many years have you been working with a Fotona laser, and which laser treatments do you perform in your clinic?

R. Gansel: I have been working with Fotona lasers for about 18 years and I find their systems to be very flexible and innovative. We do the full range of skin treatments including skin tightening, skin ablation, removal of pigments, hair removal, and removal of vessels. We also perform other medical/aesthetic treatments such as hair growth, lipo tightening and vaginal tightening.

You perform many non-ablative treatments for skin tightening. What do you see as the advantage of the Nd:YAG laser over other machines for skin tightening?

R. Gansel: The advantages of the Nd:YAG laser for skin tightening can be summarized as follows: effective, quick, reliable, cost effective, and no unnecessary consumables. Our patients are very satisfied with the treatment because it is safe, effective, quick and easy.

On a number of occasions you have submitted presentations regarding protocols you used to gain best results. Is there a particular protocol that changed your working style and philosophy?

R. Gansel: The former ‘Acc’ or ‘Accelera’ treatments, which are now indicated as ‘FRAC3’ treatments, really had an impact on my work. The treatments turned out to be so highly effective and the patients were so well pleased, that I am highly thankful to Fotona for their development efforts.

ABOUT REINHARD GANSEL
Reinhard Gansel is the founder of the Laser Medizin Zentrum Rhein–Ruhr in Essen, Germany, where he practices aesthetic laser medicine and has experience using a variety of Fotona laser systems, among which the SP Plus, QX and XP–2. R. Gansel completed his studies in medicine from the Universitaet–Gesamthochschule–Essen in 1988, after also having studied dentistry at the Dusseldorf University. Among others R. Gansel went on to receive professional training in operative dermatology, surgery and liposuction and in 2003 he received board certification from the International Board of Cosmetic Surgery.

He completed his diploma in aesthetic laser medicine from the University of Greifswald in Germany, where he is now a university lecturer. R. Gansel also lectures in cosmetic surgery at the New University of Bulgaria and the RWTH at the University of Aachen. R. Gansel is a widely-published author and member of numerous national and international professional organizations. He is a board member of the Deutsche Dermatologische Lasergesellschaft as well as president of DermExpert. Given his long-term experience with a tremendous variety of laser sources, R. Gansel is an expert in the field of aesthetic laser medicine. He contributes to the field both from a practical, clinical point of view, as well as research and development of applications.
Experts

Fractional lasers: when ‘less’ becomes ‘more’
An interview with Claudia M. Pidal, MD, ophthalmologist, laser surgeon consultant and researcher

As a Fotona educator, you have trained over 400 professionals in more than 15 countries in Latin America. Can you share with us some of the key points that have made these Fotona users successful?

Dr Pidal: The world of aesthetics has been very rewarding for all these professionals. Their secret has been their clear vision to invest in solid technologies that have enabled treatments which patients place in high demand. The natural trend in the population to invest in the improvement of personal appearance, coupled with Fotona’s ideal wavelengths for darker and sun-exposed skins, have provided the keys to success in this region.

Although Latin America has more than 1000 users of Fotona’s medical lasers, it is very rare to find one of their systems on sale or offered in used equipment ads. This testifies to the solid success of these colleagues who have stayed loyal to a reliable and profitable technology.

Fotona’s constant innovation in laser pulse modes such as VSP, PIANO, Accelera, SMOOTH and the upcoming Avalanche protocol has expanded even further my ability as a researcher to develop new and exciting treatments that generate continuous growth for my practice.

What trends do you see in aesthetic treatments for the following years?

Dr Pidal: It took us several years of fine-tuning laser parameters to reach exceptional outcomes in minimally invasive treatments and a correspondingly high level of patient satisfaction. Our new quest for excellence relies on a combination of technologies. Lasers will be a key component in this mix, but integrating with new and exciting breakthroughs in tissue healing and regeneration therapy will create the synergy to take our results to a new level.

As an example, just take a look at what is being done with Platelet Rich Plasma (PRP) treatments and you’ll see a bright new future in many fields of rejuvenation.

ABOUT CLAUDIA M. PIDAL

Dr Pidal graduated from the Faculty of Medicine of the University of Buenos Aires in 1982 and specialized in ophthalmology. She later obtained a degree in dermato-aesthetic medicine from the Bar Ilan, Hebrew University in 1999. She has been working with Fotona lasers for over 10 years in dermato-aesthetics, gynecology, urology and proctology and works closely with Fotona to develop various innovative applications and techniques. As a laser surgeon consultant and a researcher she has authored numerous guides on laser surgery techniques for a variety of laser sources, as well as several papers on laser treatments in the lower genital tract.

Dr Pidal has been medical counselor of the Laser Unit at the Faculty of Dentistry of the University of Buenos Aires. She also teaches laser application courses at the Institute of Advanced Technology in Monterrey, Mexico. She is a popular international speaker, consultant and trainer in over 12 countries in the fields of dermatology, aesthetic medicine, plastic surgery and gynecology. She runs her own Universo Laser Clinic in Buenos Aires.

When it comes to laser treatments, the Er:YAG and Nd:YAG have proven to be, for me, the best wavelengths to minimize complications and shorten recovery times while providing outstanding clinical results.

Claudia Pidal receiving LA&HA Expert Clinical Lecturer Certificate at LA&HA headquarters
How do you define the level of invasiveness with which a patient should be treated in order to achieve their aesthetic goals?

Dr Pidal: After having walked through the rough roads of deep laser ablative procedures and aggressive treatments, I can say that my motto is ‘less is more’. It’s more valuable to spend time convincing a patient to pursue less invasive and gradual improvements than to explain why things went wrong. Most colleagues are used to growing their practice based on word of mouth. The financial loss of having just one patient with complications due to an over-aggressive treatment is devastating when you consider the chain of referrals that has been lost. That patient will not recommend you to her three closest friends and those three to their nine, and so on. We must also consider that women are increasingly demanding of treatments with very short recovery times that allow a fast return to their daily activities.

Specifically, when it comes to laser treatments, the Er:YAG and Nd:YAG have proven to be, for me, the best wavelengths to minimize complications and shorten recovery times while providing outstanding clinical results.

Fotona’s constant innovation in laser pulse modes such as VSP, PIANO, Accelera, SMOOTH and the upcoming Avalanche mode has expanded even further my ability as researcher to develop new and exciting treatments that generate continuous growth for my practice.
A new two-step method for enhanced laser tattoo removal

By Leonardo Marini, Jasmina Kozarev, Ladislav Grad, Matija Jezersek, Boris Cencic

Laser tattoo removal has been proven as an effective and patient-friendly procedure. Most tattoo procedures take only a few minutes, but several treatments are typically necessary to completely remove a tattoo. Since it is highly desirable for patients and practitioners to maximize the efficacy of each treatment and to reduce the number of needed treatments, there has been extensive research conducted into the physical mechanisms of the laser–tattoo–tissue interaction process.

The treatment is based on a process of pigment disintegration caused by strong acoustic waves generated during the interaction between extremely short Q-switched laser pulses (of a few nanoseconds duration) and the tattoo pigment particles. The colored tattoo particles are then more easily removed by the body’s own immune system. Three-week-long intervals between sessions are required to allow the pigment residue to be cleared by the body.

Treatment efficacy of laser tattoo removal

Aside from the laser’s wavelength, the duration and energy of the laser pulse are the most important parameters for determining treatment efficacy. They define the peak pressure of the laser-induced acoustic waves in the tattoo pigment. To protect the surrounding tissue from heat and to achieve effective conversion of the absorbed laser light into the acoustic wave, extremely short laser pulses are required. Taking into account today’s commercial laser technology, Q-switched lasers in the nanosecond range are the most effective in generating acoustic waves.

Though Q-switched laser systems have become the gold standard in tattoo removal, they have their limitations. The main concern is that it is a multi-session treatment and that the removal of a complex professional tattoo might take more than a year. So it is imperative for patients and practitioners to maximize the efficacy of each treatment and to reduce the number of needed treatments.

The efficacy of each treatment depends on the energy of the disruptive acoustic wave produced during the interaction between the laser and tattoo color. A straightforward approach is by increasing the single-pulse energy. However, modern laser technology with single-pulse energies over 1.5 J have reached a limit where other approaches are needed to further increase tattoo-removal efficacy without causing skin damage or other side effects.

A new two-step approach to tattoo removal

A new approach in laser tattoo removal consists of two steps. In the first step, the skin is conditioned in a way to protect from damage at higher fluences. By preconditioning the skin with Er:YAG laser-drilled micro holes (known as skin perforations) in the skin to a depth close to the tattoo pigment, the subsequent Q-switched laser-induced internal pressure and gases can be released without breaking the skin structure.

The second step consists of classical Q-switched laser tattoo removal with the option to use higher fluences and to begin the second treatment at the same session with only a 20-minute delay following the first treatment.

Clinical evaluation of the new two-step procedure

Clinical evaluation studies of the new proposed tattoo removal procedure were performed in two clinics, with more than twenty patients with tattoos treated at each. In the first clinic, fractional Er:YAG laser skin conditioning (typical 10% coverage) was applied to a half of the tattoo, and afterwards a Q-switched Nd:YAG laser was used to treat the entire tattoo (typical spot size 4-6 mm and fluence 3.8-7 J/cm²). Between May 2011 and February 2012 the patients received three to seven treatments. Standard photographs were taken before each treatment. The treatment sites were evaluated compared with the initial (pre-treatment) condition regarding the skin texture, pigments, blister formation, scaring and pain level during the procedure according to VAS.

In the second clinic, higher fluences and multiple treatments at one session were applied to demonstrate how much faster the tattoo removal process can be.

Based on the results of both clinical studies, the proposed new two-step procedure for laser tattoo removal was found to be a faster, more effective and more patient friendly treatment, with a reduced probability for side effects. The results can be concluded as follows:

- **No whitish blister:** In all patients, skin conditioning with ablative fractionated Er:YAG laser allowed the increased dermal intercellular fluid to be released very fast, rather than to build up and form a sub-epidermal whitish blister.
- **Reduced pain level:** In the zone of fractional laser treatment, the pain level in the VAS scale was significantly lower (p = .001).
- **Faster healing time:** In the area of Q-switched–only laser treatment, the release of fluid, the edema and subsequent sub-epidermal blistering was higher, resulting in a 3–day longer healing time compared to the zone treated with fractional laser and Q-switched laser. Even by employing higher fluences, there were no pigment dyschromia.
- **Increased tattoo clearance:** This combined technique for laser tattoo removal appears to increase tattoo clearance. Probably some amount of the pigment is released out of the skin by the ablative process or through the ablated micro channels.
- **Reduced number of treatment sessions:** By enabling two effective treatments at one session and the use of higher fluences, the number of sessions can be substantially reduced. Typically a 30% reduction of sessions can be achieved. At the moment, adding more than two treatments per session does not provide any additional benefits.
In-depth

Avalanche FRAC3® – the ultimate laser technology for hair removal

By Abdelhalim Eltarky, Marko Kazic, Matjaz Lukac

One of the advantages of the latest technology Nd:YAG laser devices lies in their advanced variable square pulse technology (VSP), which enables the temporal delivery of sufficiently high laser energy in shorter time periods than the thermal relaxation time (TRT) of skin imperfections or hair. Exploiting the Nd:YAG VSP’s unique capabilities, an advanced, FRAC3®, non- ablative fractional laser method was developed that produces a self-induced fractional thermal damage matrix within the skin tissues. The method utilizes the fractional nature of the selective photothermolysis at short laser pulse durations, and has been found to be extremely suitable for performing hair removal treatments.

While standard LP treatments are performed with laser pulse durations within the 15–50 ms range, the FRAC3® method is optimized to deliver the laser energy in extremely short times, less than 2 ms, and preferably between 0.3 and 1.6 ms. The method is based on a finding that the thermal relaxation time of the epidermis is relatively long. The epidermal TRT is typically longer than 25–50 ms, while the target hair’s TRT is typically shorter than 2 ms. The duration of the FRAC3® high intensity laser pulses is thus sufficiently short for most hair types while still avoiding unnecessary damage to the epidermis (See Fig. 1).


Example case: multicolored tattoo removal in 3 sessions

Step 1: Q–sw. F22, MSP, turbo 3, 1.8 J/cm², 10 Hz and Q–sw. 532 nm, 3 mm, 1.8 J/cm², 6 Hz

Step 2: Q–sw. Nd:YAG, 4 mm, 5.0–7.5 J/cm², 10 Hz and Q–sw. 532 nm, 3 mm, 1.8 J/cm², 6 Hz

Taking into account that higher fluences are more effective in tattoo removal, it means that higher fluences can be safely applied. By pre-paring channels to allow pressure release, the damage threshold of the skin is enlarged, which means that higher fluences can be safely applied. Taking into account that higher fluences are more effective in tattoo removal, it means that with a single treatment a higher volume of tattoo pigment can be disintegrated and removed.

Increased efficacy of tattoo pigment disintegration by inducing multi-center plasma formation. By changing the surface of the skin with a network of ablated channels, the optical properties of the laser beam path have changed as well. Theoretically, multi-center plasma formation can occur, which may lead to enhanced mechanical pressure spots in the tattoo pigment. Nevertheless, this effect is pronounced only when fluences are used just above the plasma formation threshold.

Enable effective use of multiple treatments in one session. The observed increased release of dermal intercellular fluid without forming substantial sub-epidermal whitish blisters allows for multiple treatments in one session. However, preliminary results show that adding a third treatment in the same session does not yield an observable difference in tattoo clearance.

Removal of tattoo pigment by ablation. Q-switched laser tattoo removal is based on three mechanisms: transpidermal elimination, removal via lymphatics and repagocytosis by other cells in the dermis. By ablative elimination and elimination of the tattoo pigment through a perforated epidermis, the load on the lymphatic system is reduced and consequently also the possibility of allergic reactions.

Removal of tattoo pigment by healing of perforated skin. It is known that the wound-healing process is much faster in the case of a fractionated wound. It is assumed that in the case of a fractionated wound, additional tattoo ink might be removed during the healing process.

In conclusion, a new approach to laser tattoo removal has been presented, which for the first time utilizes a combination of ablative fractional treatment of the skin together with Q-switched Nd:YAG laser tattoo removal. An ablative fractional treatment used prior to the standard treatment with the Q-switched laser enables the use of higher single-pulse energies, multiple treatments in a single session, and finally, a reduced number of needed treatment sessions, while simultaneously avoiding various side effects.

An ablative fractional treatment used prior to the standard treatment with the Q-switched laser enables the use of higher single-pulse energies, multiple treatments in a single session, and finally, a reduced number of needed treatment sessions, while simultaneously avoiding various side effects.
Hair removal with Avalanche FRAC3®

When performing laser hair removal, what is typically desired is high treatment efficacy for all skin and hair types, with minimal discomfort for patients. With this in mind, we introduce an improved Avalanche FRAC3® hair removal protocol (See Fig. 3).

One of the challenges when performing laser hair removal is the relatively low absorption of laser light in the treated hair, especially when the hair is blond or grey. For this reason, early hair removal techniques were based on infiltrating black carbon into hair ducts in order to increase the absorption of hair at the treatment laser wavelength.

However, carbonization of the hair also occurs naturally when it is irradiated by a laser pulse density above its damage threshold (See Fig. 4).

This suggests that perhaps the absorption of laser light in hair could be enhanced by the treatment laser light itself. Namely, by delivering the treatment energy to the same skin area several times during the same session, the hair absorption might increase following each delivery. This would lead to an avalanche in the hair temperature changes, resulting in effective hair removal even at lower laser parameters than those required when a single-delivery hair removal is performed. The FRAC3® laser parameters that exhibit the lowest hair damage thresholds (See Figs. 2 and 4) are especially suited for this purpose.

Based on the findings of our study, effective pain free Nd:YAG laser hair removal, without any skin cooling, is now available using the new Avalanche FRAC3® protocol. This applies especially to patients with the hair type that is typical, for example, in the Middle East. As demonstrated in clinical use, for this segment of patients, hair removal can be performed painlessly and without cooling by treating their hair with 2–3 passes within a single treatment session, using the Avalanche FRAC3® fluence parameters of 15 J/cm² per pulse, and spot sizes of 9–15 mm.

To conclude: effective and completely pain–free

A new Avalanche FRAC3® Nd:YAG laser hair removal protocol has been introduced that improves the efficacy of current hair–removal procedures, reduces patient discomfort, and in most cases eliminates the need for skin cooling. For patients with darker skin types, in particular, the new ‘avalanche’ FRAC3® Nd:YAG laser hair–removal protocol provides effective yet completely pain–free hair removal with no external cooling required.


A thermal measurement study

A study conducted by the authors using thermal camera measurements demonstrates the avalanche hair darkening effect that occurs when hair is subjected to a series of laser pulses. This effect leads to an enhancement of laser absorption and therefore to a progressively larger temperature increase. Note that this enhancement is not a consequence of a temperature build-up during the consecutive pulse delivery. The enhancement can be observed also when pulses are delivered at very long interpulse intervals.

Figure 5 shows a typical measured hair temperature increase following three subsequent laser pulses with the same fluence per pulse.

Any fluence above the avalanche threshold will affect hair growth providing that a correspondingly sufficient number of pulses are delivered to the treatment area. A gradual pass–to–pass decrease of fluence, and/or an increase in pulse duration may also be employed in order to avoid the cumulative bulk skin temperature build–up at higher repetition rates, or the loss of thermal contact of the hair with surrounding cells.

Since the delivery of a large number of pulses may not be practical for performing hair removal, our study also measured the avalanche factor α = ΔT2/ΔT1 for two consecutively delivered pulses (See Fig. 6).

The advanced, FRAC3®, non–ablative fractional laser method utilizes the fractional nature of selective photo–thermolysis at short laser pulse durations, and has been found to be extremely suitable for performing hair removal treatments.
In-depth

Skin resurfacing: dual-wavelength TwinLight® is clinically and histologically superior

By L. Marini, T. Bevec

Various laser treatment modalities have become standard in cosmetic and non-cosmetic skin rejuvenation. Broadly, these modalities can be split into two basic categories: ablative and non-ablative. Non-ablative modalities emphasize patient comfort and a low- or no-downtime approach to treatment; in exchange they do not produce the dramatic results associated with ablative treatments, such as full-face Er:YAG resurfacing, which involve substantially longer healing periods.

In recent years, however, fractional treatments for skin resurfacing have gained popularity. One highly effective new approach, known as the TwinLight® method, combines two complementary fractional laser procedures into a single, synergetic treatment. In the first step, the skin is subjected to a proprietary Nd:YAG laser FRAC3® photo-thermal treatment, while in the second step, a fractional Er:YAG laser treatment is performed.

Introducing the TwinLight® skin resurfacing method

The TwinLight® skin resurfacing treatment combines the two complementary photothermal “core” treatments (Nd:YAG and Er:YAG) in one successively performed laser treatment protocol. In the first step, the skin is treated with a FRAC3® Nd:YAG photo-thermal therapy. Sometimes, this first step also includes an additional treatment with a long pulse Nd:YAG laser. The goal of this first, Nd:YAG laser step is to improve photo-induced textural alterations in the skin through neo-collagenesis and to improve the wound healing process following the second step, during which a fractional Er:YAG laser skin resurfacing treatment is performed.

FRAC3® skin rejuvenation has been shown to improve atrophic scarring, texture, wrinkles and PIH, even in dark-skinned patients. The Nd:YAG laser used in the FRAC3® treatment stimulates new collagen synthesis, as demonstrated by histology. The non-ablative FRAC3® Nd:YAG laser method creates a self-induced 3-D fractional effect which is localized at areas of pre-existing skin damage. However, because of its non-invasiveness FRAC3® does not lead to results as dramatic as, for example, full-face Er:YAG laser (2940 nm) resurfacing. So for cases in which more pronounced results are desired with minimal downtime, many aesthetic practitioners are opting for a combination of non-ablative FRAC3® rejuvenation with ablative fractional Er:YAG resurfacing using the TwinLight® technique.

The variable square pulse (VSP) Er:YAG laser (2940 nm) has long been used for ablative epidermal skin resurfacing. Due to the Er:YAG laser’s high absorption in water, this laser easily achieves temperatures above 1000 °C, resulting in a photo-vaporization effect in the superficial skin layers. This heating effect may also generate relatively deeper photo-coagulative and photo-biostimulative effects. However, the Er:YAG’s main photo-thermal “core” action concentrates on the superficial (<100 μm) layers of the skin. On the other hand, the Nd:YAG laser wavelength (1064 nm), due to its non-specific protein-water absorption and scattering within epidermal/dermal tissue, concentrates its highest photon density and therefore its main photo-thermal effect at 1–3 mm below the skin surface.

Fractional treatments for skin resurfacing have gained popularity. One highly effective new approach, known as the TwinLight® method, combines two complementary fractional laser procedures into a single, synergetic treatment.

A TwinLight® clinical study: overall higher and better improvement

A study by Dr Marini analyzed the immediate and delayed photo-thermal effects induced by two different laser procedures with a comparison of the clinical and histologic results. The clinical results following a single fractional ablative Er:YAG laser resurfacing alone were compared with the clinical results following a combined, TwinLight® skin treatment.

The combined method was found to be clinically and histologically superior to single-wavelength (2940 nm) fractional resurfacing alone. Two groups of subjects affected by mild photo- and chrono-aging were enrolled in his study. Group A (55 subjects) was treated with a sequence of FRAC3® and long-pulse 1064 nm Nd:YAG laser (0.3 ms–35 J/cm² scanner-operated 3 mm spot) immediately followed by two 2940 nm Er:YAG laser passes in a fractional mode (600 μsec–12 J/cm² scanner-operated 0.25 mm spot). Group B (46 subjects) was treated with two 2940 nm Er:YAG laser passes in a fractional mode (600 μsec–12 J/cm² scanner-operated 0.25 mm spot).

Overall clinical improvement was considered higher (37%) in Group A compared to Group B subjects. Group A also showed better improvement of epidermal dyspigmentation (28%), ridges (38%), and skin laxity (39%) when compared to Group B at 90 days post treatment. Positive rearrangement of collagen fibers were found more prominent (32% Day +90); flattening of rete ridges more evident (30% Day +90); and epidermal thickness positive rearrangement more pronounced (30% Day +90) in Group A. Intra-operative and immediately post-operative symptomatical acceptability reported by patients was 85% in Group A and 87% in Group B. Subjective clinical perception of overall skin improvement at Day +90 was higher (78%) in Group A than in Group B (62%).

Conclusion

When more pronounced effects are desired or required, non-ablative FRAC3® Nd:YAG laser rejuvenation can be successfully combined with an ablative fractional Er:YAG laser treatment using the TwinLight® skin resurfacing method. Clinical and histological studies have demonstrated that the superiority of the TwinLight® skin resurfacing method is due to the positive synergistic effects of the two wavelengths. The TwinLight® treatment is superior both in comparison with single non-ablative Nd:YAG and single ablative fractional Er:YAG laser treatments.
In-depth

Nd:YAG laser therapy: the most effective treatment of onychomycosis so far

By J. Kozarev, Z. Vizintin

Onychomycosis, a persistent fungal infection of the nail bed, matrix or plate, is the most common nail disorder in adults, accounting for one third of all fungal skin infections and up to 50 percent of all nail diseases. The causative agents of onychomycosis include dermatophytes (fungi that invade only dead tissues of the skin, nails, or hair), nondermatophyte moulds, and rarely, yeasts of the Candida species.

The overall prevalence of onychomycosis ranges from 2 to 14 percent. The risk of infection increases with age: 15–20% of persons between the ages of 40 and 60 have the condition, 32% of those who are between 60 and 70, and 48% of those older than 70. Recent evidence suggests that the incidence of onychomycosis is rising. Increasingly onychomycosis is being viewed as more than a mere cosmetic problem. Fungi from the nails may precipitate secondary bacterial infections, cellulitis, idiopathic reactions and chronic urticaria. Infected toenails may also act as a reservoir for fungi, facilitating their transmission to other areas of the body and even to other people.

Diagnosis & therapeutic options

Clinical diagnosis of onychomycosis is based on a patient’s history, a physical examination, microscopy and a culture of nail specimens. Predisposing factors like diabetes, age, hyperhidrosis, onychophyphores, nail trauma, poor peripheral circulation are likely to be present.

Therapeutic options for the treatment of onychomycosis include palliative care, mechanical or chemical debridement, topical and systemic antifungal agents, and various combinations of these modalities. The choice of therapy is influenced by the presentation and severity of the disease, other medications that the patient is taking, which previous therapies for onychomycosis have already been attempted (and their effects), physician and patient preference, and cost.

Conventional treatments of advanced onychomycoses are time-consuming, cost-intensive, and subject to relatively high failure rates. Even drug courses of potent systemic antymycotics, delivered over a period of several months, have cure rates of only 40 to 80%. Topical antifungal preparations are also widely used. Although safe and relatively inexpensive, topical therapy is seldom effective.

It is well known that laser light causes local hyperthermia, destruction of pathogenic microorganisms, and stimulation of the body’s reparative process. Statistically significant growth inhibition of T. rubrum was detected in colonies treated with the 1,064 nm O- and V-shaped Nd:YAG laser, respectively. The laser produced a significant inhibitory effect upon the fungal isolates T. rubrum in an in-vitro study. Meral, Tasar et al. reported a strong bactericidal effect on Candida albicans suspensions after Nd:YAG laser irradiation. The procedure is simple and quick with no noticeable side effects and complications. VSP Nd:YAG laser therapy of onychomycosis is a safe and very efficient method for treating all types of onychomycosis caused by various fungal species. This method is useful for the broadest range of patients and is especially beneficial for the elderly, compromised and hepatopathic patients, for which other alternative treatments could present some risks.

The successful clinical use of lasers to treat onychomycosis largely depends upon the wavelength, output power, pulse duration, exposure time, spot size, type, and color of the targeted tissue. The laser used in this study — VSP Nd:YAG 1064 nm, penetrates through the nail plate and produces heat deep within the dermis and nail tissue. Reduction of nail plate thickness with manual filing before laser treatment on severely dystrophic nails facilitates the optimal effect of the Nd:YAG laser procedure. The threshold average tissue temperature for laser irradiation of onychomycotic nails is about 43–45°C, at a treatment time of at least 2–3 minutes; these parameters provide an adequate therapeutic dose. Tolerance period of 18 months. The laser treatment consisted of four sessions with one week intervals, during which all infected nails were irradiated three times with laser light so that the nail plate was fully covered each time. Fluences of 35–40 J/cm² were applied at pulse duration of 35 ms to develop a nail-plate temperature of 45°C ± 5.

Follow up was performed at 3, 6, 9 and 12 months, with mycological checkpoints at 3 and 6 months. At the 3 month follow-up point, 96.8% of patients were cleared of all fungal infections. The full procedure was performed again on the three patients in which infection persisted after the 3 month follow up (4.2%). At the 6 and 12 month follow up, all patients (100%) were clear of all fungal infection. There were no noticeable side effects of the treatment and all patients were satisfied. This clinical study demonstrates that fungal nail infections can be effectively and safely treated with the VSP Nd:YAG 1064 nm laser.

The amount of laser energy that can deactivate 80–90% of the organisms present in an affected nail is the deactivating dose. That dose does not instantly kill the fungal colonies but results in their disability to replicate or survive according to apoptotic mechanisms. Temperature–induced protein denaturation leads to apoptosis of the fungal cell — a programmed cell death which plays an important role in normal and pathological processes.

Well suited for eradicating nail fungal infection

Nd:YAG 1064 nm laser irradiation, with the capability of delivering destructive high energy pulses to specific targets with minimized surrounding tissue damage, seems to be well suited for the task of eradicating nail fungal infection. This wavelength photo–inactivates fungal pathogens to a depth below the nail tissue surface, leaving the surrounding tissue intact, using safe energy densities in–vivo at physiologic temperatures. The procedure is simple and quick with no noticeable side effects and complications. VSP Nd:YAG laser therapy of onychomycosis is a safe and very efficient method for treating all types of onychomycosis caused by various fungal species. This method is useful for the broadest range of patients and is especially beneficial for the elderly, compromised and hepatopathic patients, for which other alternative treatments could present some risks.

Clinical cases
Clinical cases

Skin tightening of the abdominal area with the Nd:YAG laser

By Reinhard Gansel

CASE DESCRIPTION

A 46-year-old female patient came to our clinic wanting to reduce the appearance of wrinkles in the abdominal area. The Fotona XP Nd:YAG laser system was used to perform the so-called Essen Rejuvenation Protocol developed by Dr Reinhard Gansel and his colleagues. This rejuvenation protocol utilizes high powers and short pulse durations of the Nd:YAG laser wavelength to effectively treat deeper wrinkles. Namely, preliminary clinical studies have shown that with the Nd:YAG laser wavelength we can successfully tighten drier, thinner skin, characteristic for older patients.

PROCEDURE

In each treatment session we performed 3 laser passes, all with Fotona’s Accelera mode. In the first laser pass the area was heated for 2 minutes with a 6 mm–spotsize Fotona handpiece. In the second and third pass the same parameters were used. In order to achieve a noticeable effect, the power settings in the Essen Rejuvenation Protocol need to be set just above the pain threshold. Because the heat created by the laser is consistently applied to the tissue and automatically controlled by Fotona laser technology, safety during treatments is not a concern. The patient did experience some discomfort during the treatment.

Due to the mature age of our patient, the final result was achieved in 5 treatment sessions over a period of one year. We were extremely satisfied with the clinical efficacy of the Essen Rejuvenation Protocol. The patient had no post-procedure side effects and was also very happy with the result.

This case demonstrates that the high power Nd:YAG laser wavelength in Accelera mode can successfully be used in skin tightening treatments.

Removal of Nevus of Ota using Q-switched Nd:YAG

By Dr Serafettin Saraçoğlu

CASE DESCRIPTION

The patient presented with a Nevus of Ota on the left side of the face. Discoloration was more pronounced around the eye socket and faded toward the outer regions of the face. A series of six treatments was undertaken to lighten the Nevus of Ota with the Fotona QX.

PROCEDURE

Before each treatment topical anesthetic was used (EMLA or Ela–Max) and cooling was performed with the cryo cooling unit set at cooling level 5 or 6. During the treatment, the handpiece was held perpendicular to the treatment area as it was moved across the treatment area. The fluence settings for treatment were determined for each treatment based on the desired end effect. First a low, 2 J/cm² fluence was used and then increased in 0.5 or 1 J/cm² increments until the treated area began to turn white and crusty. Adequate time for recovery was allowed for between treatment sessions. During the last two treatments a large spotsize and low fluence were used at frequency settings, to deliver a clinically significant amount of energy and at the same time obtain wide area rejuvenation. Fluence settings between 2–12.5 J/cm² have been used to successfully treat Nevus of Ota. The results were very satisfactory; a vast improvement in skin color at the end of treatment was obtained.

This case demonstrates that the high power Nd:YAG laser wavelength in Accelera mode can successfully be used in skin tightening treatments.

The results were very satisfactory; a vast improvement in skin color at the end of treatment was obtained. In general, fluence settings between 2–12.5 J/cm² have been used to successfully treat Nevus of Ota.
**Clinical cases**

**Fractional Er:YAG laser for scar–revision treatments**

By Dr Althy Au Shui Lun

**CASE DESCRIPTION**

This case presents the use of a fractional ablative Er:YAG laser and scanner for scar–revision treatments. A 50-year-old man came to our clinical with a surgical scar over his right upper brow. Five sessions of fractional Erbium laser treatment (once per month) were performed to improve the color, texture and thickness of the scar. An ice pack was applied for 5 minutes before the treatment, and no PIH was observed post-treatment.

**PROCEDURE**

When performing scar–revision therapy with the Fotona F–22, we typically use 5% density, 20 Hz and 40 J/cm² to 100 J/cm² settings. The F–22 scanner delivers precise and accurate fractional treatments (250 μm diameter micro–channels) that reach several mm deep into the skin to improve the appearance of scar tissue, such as hypertrophic, keloidal, atrophic and acne scars.

Different treatment modalities may be used, either as a monotherapy or as a combination, such as steroid injection, surgery, and various laser platforms, including conventional ablative, non–ablative and fractional lasers. Fractional resurfacing initiates the body’s wound healing response at the targeted site, resulting in the stimulation of fibroblasts to produce new collagen and elastin. Downtime and pain are usually well tolerated by patients, although post–inflammatory hypopigmentation (PIH) and prolonged erythema are potential side effects that remain a concern when treating Asian skin. Patient education and post treatment use of sunblock and 1% hydrocortisone are encouraged and should be used to maximize cosmetic outcomes.

**Parameters:**

- Laser source: Er:YAG
- Wavelength: 2940 nm
- Density / coverage: 5%
- Pulse duration: LP (600 µs)
- Fluence: 50 — 80 J/cm²
- Frequency: 20 Hz
- Handpiece: F–Runner (fractional scanner)

**Onychomycosis treatment with Nd:YAG laser**

By Dr Thomas A. Sult and Robin Sult, RN

**CASE DESCRIPTION**

A 72 year old male patient came to our office with a fungal infection of the toes (Fig. 1). After securing the diagnosis of onychomycosis with a positive culture (Trichophyton Rubrum), we decided to use a 1064 nm wavelength Fotona Nd:YAG laser to perform the ClearSteps™ treatment.

**PROCEDURE**

First the infected nails were filed down in order to allow for full penetration of the laser light into the nails. A Fotona S11 scanner with a 6 mm spotsize was used to treat the nails. The treatment only takes about 10 minutes. We performed 4 treatments in a period of two weeks (2 treatments per week). No topical anti-fungal creams were necessary.

After 4 treatments a culture–proven clearance of the nails was achieved, meaning that the fungus was successfully eradicated. After a period of 4 months the growth of clear nails was observed (Fig. 2). The patient returned for a check–up visit after 27 months. The nails were still clear and there was no sign of reoccurrence of onychomycosis (Fig. 3). The patient was highly satisfied with the results.

**Parameters:**

- Laser source: Nd:YAG
- Wavelength: 1064 nm
- Spotsize: 6 mm
- Pulse duration: 35 ms
- Fluence: 45 J/cm²
- Frequency: 1 Hz

**Fig. 1: Before the treatment**  **Fig. 2: After 4 months**  **Fig. 3: After 27 months**
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