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DENTUS

Prof. Dr Norbert Gutknecht

ISLD President and Scientific Chairman

A brief history of dental lasers

Dear friends of dental laser technology,

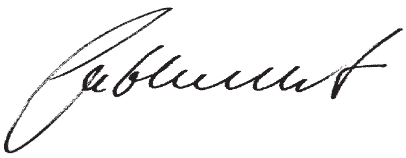
Exactly thirty years ago the first German users of dental lasers met for a "Laser Study Club" in order to find out what the first Nd:YAG laser of the company "American Dental Laser", which was especially developed for dental applications, was capable of. It was a free-running pulsed Nd:YAG laser with a power of 0.5–3.0W and 10–30Hz. The extraordinary thing was that, for the first time ever, the power could be transmitted to the tissue via a quartz fibre.

Even more "extraordinary" was the fact that the official brochure promoted the laser as being suitable for more than 30 indications, including hard-tissue applications. Unfortunately, this originated from the marketing concept that had been pursued by the company, rather than from actual research findings. Naturally, people had different feelings about this: on the one hand, universities and conservative opinion leaders were not just sceptical, but for the most part they downright rejected the approach, even though they were not able to present any reasonable arguments to the contrary at that point. On the opposite, it triggered a wave of euphoria among dentists, who were willing to spend as much as 115,000 Deutsche Mark on the new laser, which translates to roughly the same amount in Euro or US-Dollar today. In Germany alone, more than 3,000 of these laser systems were sold over the course of about five years, most of which were not used properly, however, since no further training on how to use the devices on patients existed back then. In the US, the number of laser units sold even exceeded 5,000.

Fortunately, the advertised applications of this laser type have since been thoroughly investigated and today, they are not only an integral part of laser-supported endodontics, periodontics and minor oral surgery, but they were also the basis for the establishment of the various diode and erbium lasers used in dentistry. These days, we have access to a large number of different wavelengths from the most diverse laser manufacturers from all over the world and we are able to treat a wide variety of dental indications with them. The once small study clubs in North America, Europe, South America and Asia have evolved into recognised scientific societies, which today are all united in one global organisation—the ISLD (International Society for Laser Dentistry). Our upcoming ISLD World Congress, held in October 2020 in Cairo, Egypt, will certainly be a highlight that we—laser researchers, users and manufacturers alike—can already look forward to with great anticipation.

With this in mind, I would like to wish you dear readers of our *laser—international magazine of laser dentistry* all the very best for the approaching holidays together with your loved ones and a happy and healthy start into the new year 2020.

Yours



Prof. Dr Norbert Gutknecht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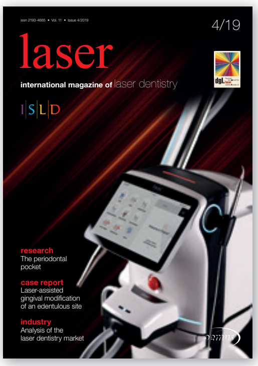

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The diode laser in a fully digital workflow for prosthetic treatment

Dr Carmine Prisco, Italy

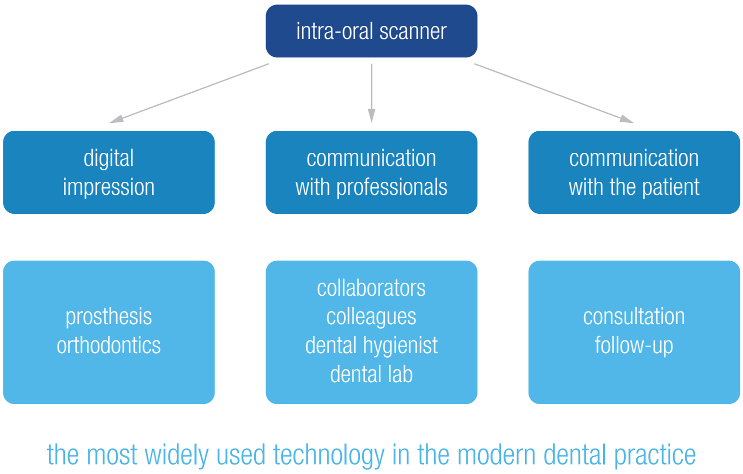


Fig. 1: The intra-oral scanner is the most widely used technology in today's dental practice.

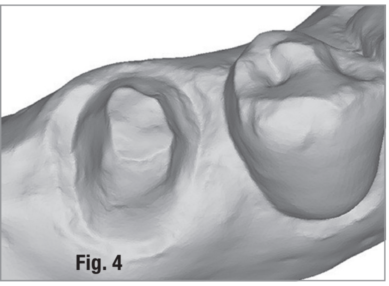
Modern dentistry has undergone an incredible evolution owing to the many new available technologies. The digital transformation and the technological evolution in dental surgery represent a very interesting opportunity for the modern dentist to develop his or her practice. Technologically supported dentistry is completely oriented towards patients' needs, well-being and comfort. Reduced treatment times, minimal invasiveness and better care with predictable results are the guiding principles.[1] A fully digital workflow in prosthetic dentistry respects these principles. The purpose of this article is to show how the use of a diode laser can be integrated into the procedures of a fully digital workflow to make it more effective, simpler and faster.

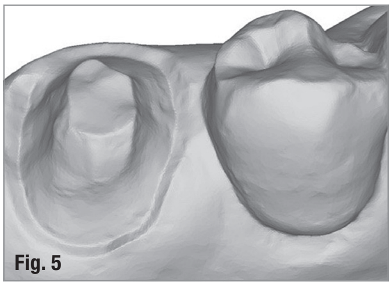
The intra-oral scanner is the most widely used technology in the modern dental practice (Fig. 1) and its use is the first step to a fully digital workflow in prosthetic dentistry. The optical impression is used both for a virtual 3D diagnostic analysis of a dentition to plan a minimally invasive treatment[2] virtually and for taking impressions during the various phases of the digital workflow.[3] Transferring a correct impression to the laboratory is fundamental for the success of a prosthetic treatment, and the use of a diode laser is effective in obtaining a clearly readable impression. Versatility and simplicity of use make the diode laser particularly useful in digital prosthetic dentistry for the following: periodontal health, pre-impression troughing and haemostasis, minor pre-impression surgery and second-stage implant surgery.

Periodontal health

Good periodontal health is an essential condition for any prosthetic treatment: the prosthetic patient always needs adequate periodontal pretreatment for a correct digital impression and for the full success of the therapy. While many laser-assisted therapeutic protocols have been reported in the literature, the laser-assisted full-mouth

Fig. 2: The settings of the 980 nm diode laser used with single-use fibres. **Fig. 3:** The laser settings for completely drying the sulcus with a programme in continuous-wave mode.





Figs. 4 & 5: Comparison of the impression without and with treatment of the sulcus shows that the use of the diode laser yields a clearer and more defined impression. **Fig. 6:** There is no significant gingival retraction one year after crown positioning.

disinfection protocol[1] is the one used in our daily clinical practice and is naturally adapted to the patient's periodontal health status. In accordance with the guiding principles of technologically supported dentistry, our goal is to perform the tooth preparation and the optical impression in a single session. The absence of gingival inflammation is an essential condition. Therefore, a session of photodynamic and photothermic therapy a few days ahead is always recommended for a bactericidal effect. A 10% povidone-iodine solution is placed in the gingival sulcus before inserting the fibre of the laser (PRIMO, MEDENCY), employing a pulsed mode of 50 microseconds on and 50 microseconds off for 30 seconds at a power of 2W.

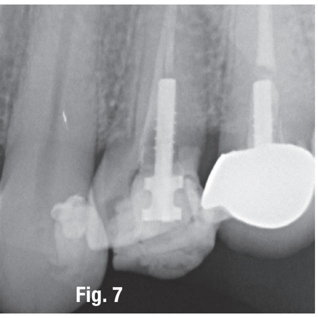
Pre-impression troughing

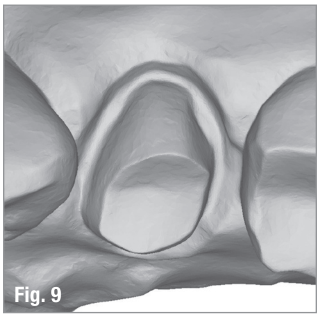
Many tooth preparation systems for one-piece complete-coverage crowns, bridges[4] and veneers,[5] like vertical preparation without a finishing line, are discussed in the literature. In our clinical experience, in order to obtain a good optical impression, a simple principle of tooth preparation must be respected when using an intra-oral scanner: juxtagingival preparation in non-aesthetic areas whenever possible and minimal intra-sulcular preparation in aesthetically relevant areas. However, a minimal gingival displacement can help the dentist while taking the impression. Many studies on the evaluation of non-invasive gingival displacement systems are reported in the literature.[6] The diode laser can be used for gingival displacement. While techniques involving gingival retraction cords or a diode laser lead to similar amounts of gingival retraction, use of the diode laser requires less time, is simpler for the operator and is more comfortable for the patient than are retraction cords.[7] Pre-impression taking with a diode laser does not create gingival retraction problems compared with use of a cord impregnated with aluminium chloride. The amount of recession has been reported as clinically insignificant for both techniques.[8]

A 980nm diode laser is used with single-use fibres of 10mm and 400µ. The laser is set on a pulsed mode of 10 microseconds on and 10 microseconds off for 20 seconds at 2.2W (Fig. 2). A single rapid and gentle movement of the activated fibre in the gingival sulcus is sufficient to achieve the desired result. The optical impression is taken with the WOW intra-oral scanner (Biotech Dental). Sometimes, a haemostasis treatment may be recommended to achieve the complete drying of the sulcus with a programme in continuous-wave mode for 20 seconds at 2W (Fig. 3). Comparison of the quality of the impression without (Fig. 4) and with (Fig. 5) treatment of the sulcus showed that the use of the diode laser yielded a clearer and more defined impression. In accordance with the results reported in the literature,[8] there was no significant gingival retraction one year after crown positioning (Fig. 6).

Minor pre-impression surgery

In some cases, minor gingival surgery is necessary for a good result of a prosthetic treatment. Modern dentistry, thanks to the use of advanced technol-





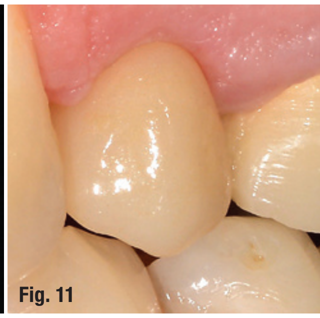


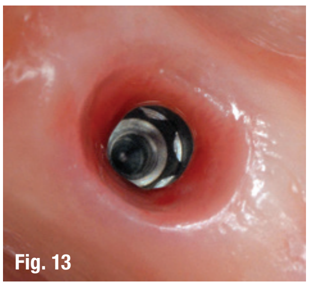
Fig. 7: The radiograph shows a subgingival partial fracture of a tooth which had undergone endodontic treatment at one time. **Fig. 8:** A diode laser can be used to remove excess gingival tissue and thereby bring the fracture margin outside the gingival sulcus. **Fig. 9:** Correct impression files need to be sent to the dental laboratory. **Fig. 10:** An all-zirconia crown was fabricated by Laboratoire LDA. **Fig. 11:** At the two-month follow-up visit, the results appeared stable in terms of the crown fit and gingival healing.

ogies, makes it possible by reducing the number of sessions and the inconvenience to the patient. A classic case is a subgingival partial fracture of a tooth that had undergone endodontic treatment at one time (Fig. 7). After tooth reconstruction with a root fibre-reinforced post and composite, the use of a diode laser for minor surgical gingival correction is strongly recommended. The aim was to remove the excess gingival tissue and bring the fracture margin outside the gingival sulcus (Fig. 8). The laser is used with single-use fibres of 10 mm and 400 µ, and the programme is set to a pulsed mode of 25 microseconds on and 50 microseconds off, 6.5 W and an average power of 2.17 W. Its cutting performance without oedema and with immediate coagulation allowed for preparation of the abutment and impression taking in the same session.

It is recommended to allow the gingival tissue to rest for 10–15 minutes between abutment preparation and impression taking. We use this time for the adaptation of a temporary crown. A correct temporary crown is necessary to gain good healing of the gingiva without retraction. Immediately before the impression taking, a haemostatic treatment with the laser allows the practitioner to obtain a clear and defined digital model, sometimes supported by the gentle use of an intra-oral scan powder spray. The WOW scan software immediately shows the STL and the PLY colour files. To send a correct impression to the dental laboratory, analysis of the STL file is essential (Fig. 9). A week later, an all-zirconia crown (Laboratoire LDA; Fig. 10) was positioned on the dental abutment. The quality of the crown fit and of the gingival healing yielded a stable result at the two-month follow-up visit (Fig. 11). The dentist who uses a diode laser and an intra-oral scanner, and who is supported by a dental laboratory using a fully digital workflow, can solve similar cases in just two sessions.

Second-stage implant surgery

The use of lasers for second-stage implant surgery is a widely discussed topic in the international literature. Implant surgery consists of two distinct techniques: the transmucosal one-stage technique and the two-stage technique. Diode lasers represent a good aid for the two-stage technique in implant dentistry, resulting in decreased trauma to bone and soft tissue, a reduction of pain, an immediate haemostatic effect and a reduction of the risk of postoperative infections. The effects of diode and Er,Cr:YSGG lasers in second-stage implant surgery applications were compared in a cross-sectional study, and the use of these two different lasers showed no statistically significant differences in clinical results.[9] Diode lasers are cheaper and smaller, and meet clinicians' needs, being their preferred choice for second-stage implant surgery. Another study showed that laser utilisation



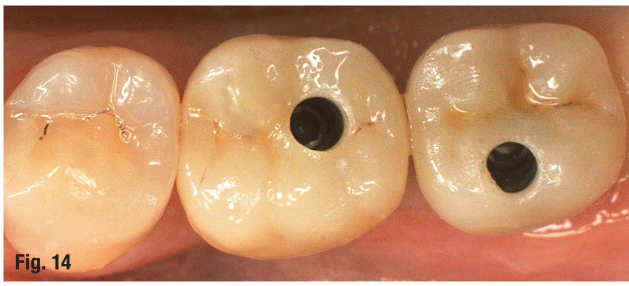


Fig. 12: The laser allows immediate screwing of the scanbodies on to the exposed implants to obtain a correct digital model to be sent to the dental laboratory.
Figs. 13 & 14: After successful healing of the gingiva, the healing screws can be removed and the crowns can be positioned.

with the recommended parameters yielded no risks of dangerous thermal elevation to the tissue and implants.[10] The laser is used with single-use fibres of 10mm and 400μ, and the programme is set to a pulsed mode of 1 microsecond on and 1 microsecond off, 1.6W and an average power of 0.8W. The protocol facilitates implant exposure and immediate optical impression taking in a single session.[11] The use of the laser, thanks to its immediate haemostatic effect, allows immediate screwing of the scanbodies on to the exposed implants to obtain a correct digital model to be sent to the dental laboratory (Fig. 12).

The choice of healing screw after the impression taking is essential to obtain an excellent final result. The Kontact series of implants (Biotech Dental) has a wide range of healing screws, and the choice depends on the type of tooth to be replaced, on the condition of the gingiva and on the patient's occlusion. A week later, when the gingival healing was complete (Fig. 13), it was possible to remove the healing screws and to position the crowns. Two screw-retained single zirconia crowns on Ti-base abutments were produced by the laboratory, checked by the practitioner and then positioned in the patient's mouth. The occlusion, gingival health and points of contact were respected and the result was achieved in just two chair sessions (Fig. 14). The diode laser can be used effectively for second-stage implant surgery, providing both the dentist and the patient with additional advantages over the conventional methods used for implant exposure.[12]

Conclusion

Modern dentistry is patient-centred in order to ensure maximal comfort to the patient throughout the whole treatment. Correct use of modern technologies to adequately address the patient's needs and expectations through effective and high-quality therapies is the principle on which modern dentistry is founded. The goal is to achieve a minimally invasive treatment, which reduces the number and duration of chair sessions, overall duration of the treatment and inconvenience to the patient. Technology that is correctly chosen and employed represents a fundamental aid to achieving this desired result. The combined use of the diode laser in the ideal surgery and of the intra-oral scanner, supported by a specialist dental laboratory in a fully digital workflow, represents a way of achieving the aforementioned result in prosthetic dentistry.

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Innovative endodontics using SWEEPS technology

Drs Giovanni Olivi & Matteo Olivi, Italy

The ultimate goal of endodontic treatment is the eradication of microorganisms responsible for endodontic disease.[1,2] Enlarging and shaping the root canals to a size sufficient for delivery of irrigants into the endodontic space allows for pulp tissue dissolution and antibacterial activity in the full space.[3] A stable and hermetic sealing of the endodontic space permits long-lasting success of the therapy. Present-day endodontic research is more focused on instrumentation than on irrigation to improve the success rate of root canal therapy. The newest high-performance nickel-titanium alloys reduced the stiffness and increased the elasticity of endodontic instruments, permitting simplified and faster root canal preparation with reduced diameter and taper and greater preservation of the dental structure. However, Peters et al.,[4] more recently confirmed by other researchers,[5,6] demonstrated the incomplete action of the tested instrument systems, which left 35 % or more of the canal's surface area unchanged. Furthermore, the reduced operating time arising from using new mechanical rotary systems reduces the contact time of decontaminating agents (chemical and mechanical cleansing) with the root canal surfaces, and from this perspective, improving the fluid dynamics of irrigants in the endodontic space appears to play an important role.[7]

Irrigation techniques

The fluid dynamics of the irrigants in the confined canal space is one of the main problems in endodontics and very few innovations have been introduced in this regard. Many techniques are currently used to deliver and activate the irrigants in the endodontic space. A constant flow of irrigants helps to dissolve inflamed and necrotic tissue, to disinfect the canal walls by removing bacteria and biofilm, and to flush out debris and the smear layer from the root canal, and hence is essential for the success of endodontic therapy. The complex macro- and micro-anatomy of the root canal system limits the access, flow and turbulence of irrigants in the endodontic space and finally the deep penetration of antibacterial agents into the dentinal walls, thus limiting their 3D cleaning and disinfecting ability.[8,9] Ricucci and Siqueira reported that chemomechanical preparation partially removed vital and necrotic tissue from the entrance of lateral canals and apical ramifications, leaving adjacent tissue inflamed and infected, and associated with periradicular disease.[10] Sodium hypochlorite (NaOCl) is the most commonly used endodontic irrigant because of its antimicrobial and tissue-dissolving activity. Many factors influence its effectiveness. Optimisation of surface tension, concentration, temperature, agitation and flow can improve tissue-dissolving effectiveness by as much as 50-fold.[11] When the NaOCl was modified with the adjunct of a surface active agent, it showed lower contact angle on dentine, resulting in more effective tissue dissolution compared with conventional NaOCl solutions.[11] Also, agitation and higher temperatures considerably enhanced the efficacy of NaOCl. However, the effect of agitation on efficacy was greater than that of temperature, and continuous agitation resulted in the fastest tissue dissolution.[11]

Comparing the efficacy of different agitation systems on the activity of NaOCl, De Gregorio et al. found limited penetration of the irrigant into lateral canals using an apical negative pressure irrigation system—it was however the most effective in reaching the working length—in comparison with the other tested systems (sonic irrigation; passive ultrasonic irrigation; F-file; and positive pressure irrigation).[12] In contrast, passive ultrasonic irrigation demonstrated significantly greater penetration of irrigant into lateral canals.[12] The efficacy of NaOCl depends on the quantity and reactivity of its free-chlorine form. Macedo et al. verified that Er:YAG laser activation of the irrigant produced a greater reaction rate of NaOCl, producing more active chlorine ions in three times less time than with passive ultrasonic irrigation.[13] In the last ten years, the use of laser in promoting the activity of intra-canal irrigants (laser-activated irrigation) has been investigated and successfully introduced in endodontics.

Laser in endodontics

Lasers are used with different techniques in endodontics (Table 1, Fig. 1). They can be used to directly irradiate the canal walls or to irradiate and activate fluids introduced into the canal (photosensitisers or irrigants), thus performing their clinical action on the endodontic system indirectly.

Wavelength	Laser technique	Target chromophore	Laser–tissue interaction	Laser effects
Near infrared	Conventional direct irradiation	Bacteria pigment	Diffusion	Photothermal
Medium infrared	Conventional direct irradiation	Water content of dentine Bacteria	Absorption	Photothermal
Visible near infrared	PAD indirect irradiation	Photosensitisers	Absorption	Photochemical
Medium infrared	LAI indirect irradiation	Water content of irrigants	Absorption	Photothermal cavitation
Medium infrared	SWEEPS indirect irradiation	Water content of irrigants	Absorption	Photothermal Photoacoustic cavitation Shock wave

PAD = photoactivated disinfection; **LAI** = laser-activated irrigation; **SWEEPS** = shock wave enhanced emission photoacoustic streaming.

Table 1: Classification of laser techniques used in endodontics (modified from Olivi[14]).

Conventional laser endodontics

The term "conventional laser endodontics" was coined by Olivi in 2013 to describe the conventional use of laser fibre inserted inside the canal, up to the working length (–1 mm), to directly irradiate the dentinal walls.[14] The laser fibre inserted inside the canal is activated during the withdrawing movement. Laser irradiation interacts with the canal surface according to the various modalities typical of the wavelength used. The primary effect produced is a photothermal one, followed by a secondary bactericidal effect, but undesired morphological modification of dentinal walls is also generated. The main problems associated with conventional laser endodontics are the irregular fluence supplied along the canal and the inability of laser fibres to passively negotiate the canal without interference with the dentinal walls. Contact of laser fibre with dentinal walls can create thermal damage varying from ablation to melting, and bubbles of recrystallisation of the hydroxyapatite and microcracks.[15]

Photoactivated disinfection

Photoactivated disinfection involves the use of a photosensitiser that is introduced into the root canal and selectively activated by an affine wavelength. The visible wavelengths (from 635 nm to 675 nm) activate toluodine and methylene blue, while the near-infrared (810 nm) wavelength activates indocyanine green. The laser irradiation produces a photochemical effect that activates the photosensitiser solution with release of reactive radicals and singlet oxygen. There is no direct laser interaction with the dentinal surface, eliminating any undesired collateral effect. Owing to the low oxygen concentration inside the dentinal tubules and the prevalence of anaerobic/aerobic facultative bacteria in the root canal system, the use of photoactivated disinfection is considered only an adjunct procedure to the conventional one.[16]

Laser-activated irrigation

Laser-activated irrigation (LAI) involves the irradiation of commonly used irrigant solutions in the canal by a laser. The minimum common denominator of different LAI techniques is the wavelength that can be used: the wavelengths of erbium lasers (Er,Cr:YSGG [2,780 nm] and Er:YAG [2,940 nm]) are the only ones absorbed by water, the main component of common irrigant solutions (17 % EDTA and 5 % NaOCl). The greater the absorption coefficient of the molecule for a wavelength, the lower the

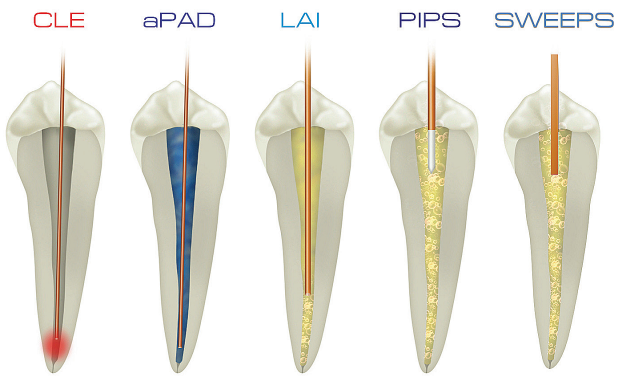


Fig. 1: Graphic representation of various laser techniques used in endodontics: CLE = conventional laser endodontics; aPAD = antibacterial photoactivated disinfection; LAI = laser-activated irrigation; PIPS = photon-induced photoacoustic streaming; SWEEPS = shock wave enhanced emission photoacoustic streaming.

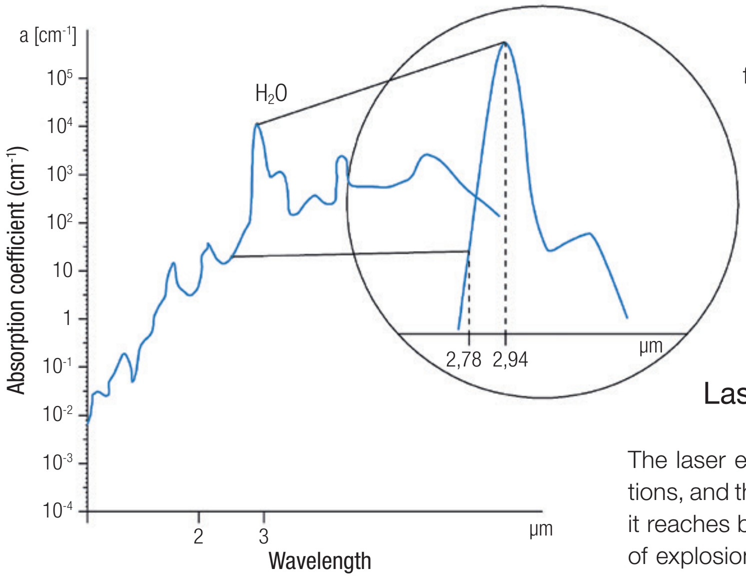
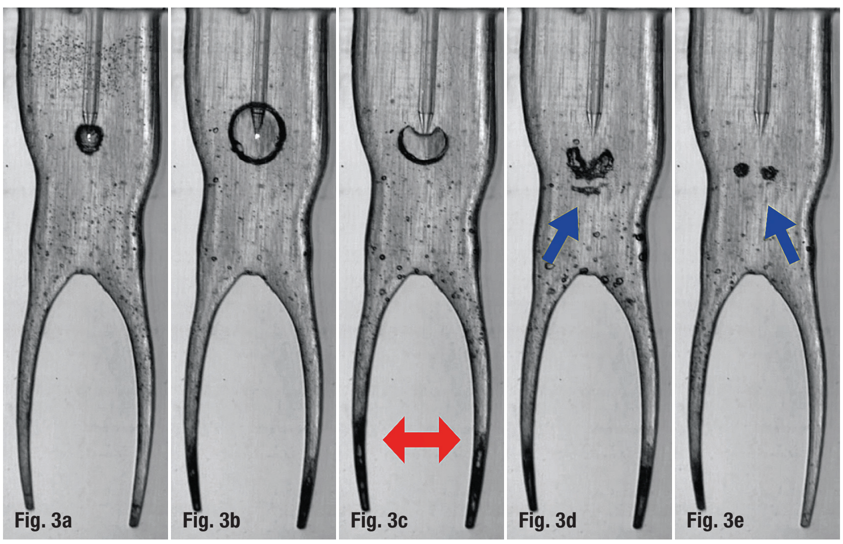


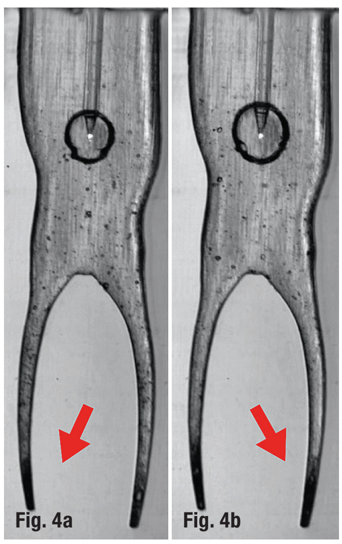
Fig. 2: Different water absorption coefficients in the medium electromagnetic spectrum for 2,780 nm and 2,940 nm. The absorption of Er:YAG laser radiation at 2,940 nm by water is three times greater than that of Er,Cr:YSGG laser radiation at 2,780 nm.

energy required to obtain its absorption (Fig. 2). Specifically, the absorption of Er:YAG laser radiation by water is three times greater than that of Er,Cr:YSGG laser radiation and requires less energy to obtain the same effect.[17] To thoroughly understand the mechanism of LAI, the various devices and settings used, and consequently the proposed protocols in recent years, it is important to consider all the parameters that determine the difference between one laser system and another. Indeed, regardless of the positive results achieved in various LAI investigations, the use of the different protocols can confuse readers. Besides the wavelength specificity (2,940 nm and 2,780 nm) for the target (water), it is important to consider the laser setting used, including energy, pulse repetition rate, fluency, pulse duration and peak power. Also important is to choose the correct laser fibre or tip and position inside the tooth, including tip end design and diameter.

Laser setting

The laser energy is absorbed by the water of the solutions, and the water rapidly increases in temperature until it reaches boiling point (100 °C), forming typical bubbles of explosion (photothermal/photoacoustic primary phenomenon) and thus generating immediate cavitation in the canal (secondary phenomenon; Figs. 3a–e).[18–21] The higher the energy applied, the bigger the bubble size and the more efficient the cavitation produced. However, the application of high energy with the tip inserted inside a canal can have obvious contra-indications owing to rapid vaporisation of liquid from the canal, dry irradiation and consequent undesirable thermal effects on the dentinal walls. A fundamental concept, which explains the efficiency of one system over another, is the peak power emitted by the laser pulse as a function of the energy applied in the time, according to the formula: *peak power = energy/pulse duration*. The goal is to reach a high peak power (400 W) with very low energy applied at subablative levels (20 mJ), to avoid any thermal or ablative effects. This is possible when the pulse duration is very short (50 microseconds), to produce an efficient photoacoustic effect. The higher the peak power of each





Figs. 3a–e: Premolar model showing an Er:YAG laser (LightWalker) equipped with a SWEEPS conical-end tip of 400 µ firing a single 25-microsecond pulse at 20 mJ in water: bubble explosion **(a & b)**, bubble implosion and primary cavitation (blue arrows) **(c–e)**, red arrows show secondary cavitation in the apical third **(c)**. **Figs. 4a & b:** Premolar model showing an Er:YAG laser (LightWalker) equipped with a SWEEPS conical-end tip of 400 µ: single 50-microsecond pulse at 20 mJ in water: bubble explosion at the tip end **(a)**, single 25-microsecond pulse at 20 mJ in water: bigger bubble explosion at the tip end **(b)**.

pulse, the greater the pressure wave generated by the primary bubble explosion (Figs. 4a & b). The pulse duration and the peak power of a laser depend on the technology utilised by the various laser devices. Also, the efficiency of the irrigant streaming depends on the tip used and its position in the endodontic space.

Laser tip

A high peak power, closely related to the pulse duration, of the various erbium lasers used explains the different energy settings used and the different positions of the tip, as reported in the various techniques. During LAI, the tip may be used in motion, up and down, in the canal and withdrawn slowly towards the pulp chamber or may be used in stationary position or with small movements in the apical third or middle third of the canal.[22,23] In contrast, when using PIPS (photon-induced photoacoustic streaming), the laser pulse (of 20mJ emitted at 50-microsecond pulses [super-short pulse], with the Er:YAG laser LightWalker, Fotona) generates a high peak power (400W) and creates primary phenomena of explosion and secondary cavitation even at a relevant distance from the area of activation (access cavity), at an average speed of about ten times higher than that measured for passive ultrasonic irrigation.[24] Accordingly, the PIPS technique requires the specific and easy positioning of the laser tip, not inserted into the canal, but held stationary in the pulp chamber, where the irrigant solution is supplied by a syringe.[17] Today, the PIPS technology has been updated, improved and presented as SWEEPS (shock wave enhanced emission photoacoustic streaming) technology (Fig. 5).[25]

SWEEPS technology

SWEEPS represents the technological evolution of PIPS. The laser is the same Er:YAG laser (2,940nm), now produced in two models (LightWalker and SkyPulse, Fotona). The endo-mode permits emission of energy in two modalities: single pulse and dual pulse. The single super-short pulse modality (50 microseconds; the same as for PIPS) is today accompanied by the ultra-short single pulse modality (25 microseconds, USP) that allows better modulation of the emitted energy, maintaining the same peak power (i.e. 400W peak power using only 10mJ) or a more powerful peak power (800W) using the same energy (20mJ) as PIPS. In addition, the emission of the dual-pulse modality is now available, firing a second laser pulse after the first in rapid succession. The emission interval between one pulse and another varies randomly from 250 to 600 microseconds (SWEEPS-Auto; Figs. 6a–d). More sophisticated is the emission of the second pulse in resonance with the first (X-SWEEPS); this can happen when the delay of the second pulse permits exact firing when the first bubble is still in the implosion phase, thus implementing the primary cavitation produced. This technology makes it possible to optimise the pressure waves produced depending on the internal volume of the tooth to be treated (molar, premolar, incisor).[25] Also the possibility of modulating the peak power of the single pulse and consequently of the intracanal irrigant pressure wave allows better management of the irrigation in the case of particularly wide canals and resorbed apices of large dimensions.

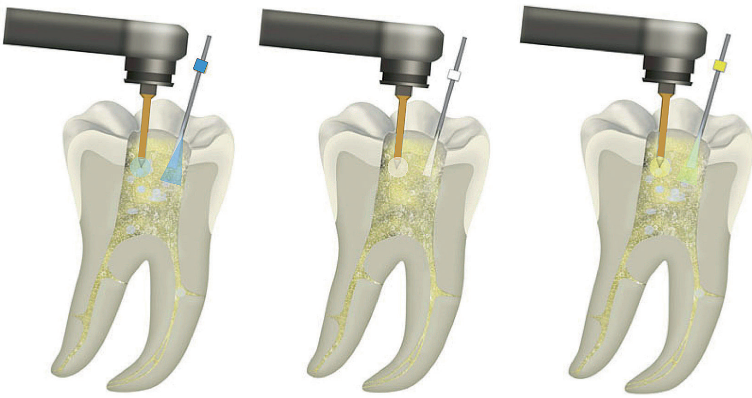
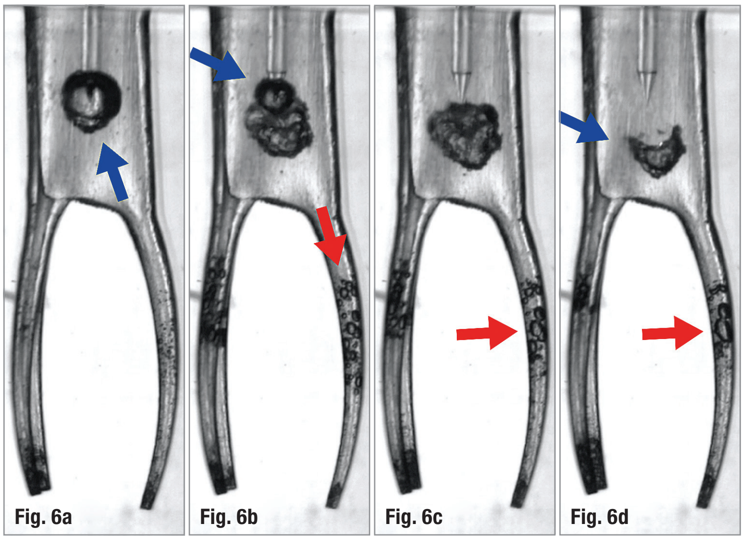


Fig. 5: SWEEPS final irrigation protocol: at the end of therapy, a final irrigation protocol entails two cycles of 17% EDTA activated by SWEEPS for 30 seconds each, followed by rinsing with distilled water activated by SWEEPS for 30 seconds, then three cycles of 5% NaOCl activated by SWEEPS for 30 seconds each and a resting time of at least 30 seconds.

Advantages of LAI (SWEEPS)

Laser activation and agitation of irrigants introduced a new standard among the several irrigation methods.



Figs. 6a–d: Molar model showing an Er:YAG laser (LightWalker) equipped with a SWEEPS conical-end tip of 400µ. Dual-pulse modality at 20mJ in water: blue arrows show the first bubble **(a)**, the second bubble **(b)** and the induced shock waves **(d)**; red arrows show the secondary cavitation in the middle and apical thirds of the canal **(b, c & d)**.

Fig. 7: SWEEPS tips: conical end and 9–14 mm flat.

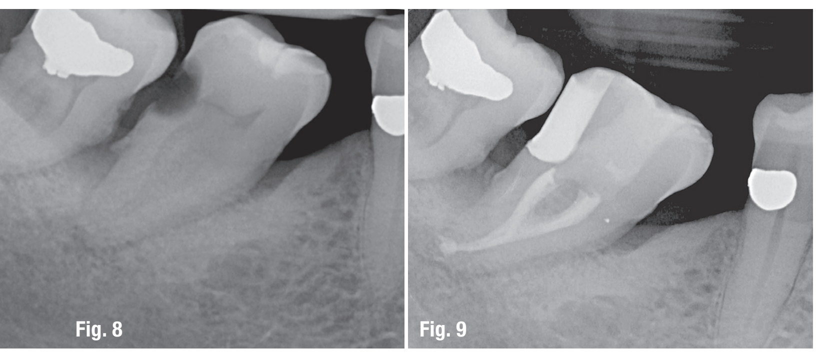
Er:YAG laser activation offers various advantages over the other methods and has been validated by several peer-reviewed papers:

– It provides superior chemical activation of NaOCl.[13]
– It produces superior chemical dissolution of pulp remnants by NaOCl.[26]
– It provides superior physical disruptive action on biofilm.[27]
– It provides a superior smear layer cleaning ability to that of EDTA.[28–30]
– It produces a superior bactericidal effect.[31–33]

In addition, the easy positioning of the tip in the access cavity offers new clinical possibilities in endodontics (Fig. 7). LAI in the access cavity can start just after the opening of the access cavity, allowing progressive reduction of the bacterial load, even before scouting and preparation of the canals. Moreover, using NaOCl, it dissolves the pulp tissue, reducing the possibility of irreversible dislodging of pulp remnants laterally and apically in the endodontic space during instrumentation. In addition, it allows irrigation of narrow and/or long canals with the same simplicity as irrigation of wider canals. Furthermore, it produces, in narrow canals, a more effective and faster flow of fluids in the apical direction, but with reduced pressure (hydrodynamic paradox or Venturi effect). Also, it provides irrigation throughout the entire endodontic space, one or more canals, at the same time. Clinically, it greatly helps in calcified canals, in case of a separated instrument, as well as in endodontic retreatment (Figs. 8 & 9).

Conclusion

The Er:YAG laser, at low energy and with ultra-short pulse duration, has been found to perform very well for activation of intra-canal endodontic irrigants. Owing to the lack of uniformity of parameters used in the various studies (including wavelength, pulse duration, energy, frequency and tip design and diameter) confusion still remains in LAI procedures regarding how to achieve the best results. However, there is now an overwhelming published evidence of the benefits of Er:YAG laser-supported root canal irrigation. Of course, in-depth study of advantages and possible complications of the LAI technique is advisable before *in vivo* clinical application.



Figs. 8 & 9: Tooth #47 with deep decay on the distal proximal wall. One-visit therapy was performed with SS White and ProTaper Next X2 rotary instruments. The SWEEPS irrigation technique allowed good decontamination and cleaning prior to the final sealing (EndoSequence BC Sealer, Brasseler).

about the authors

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The periodontal pocket

Alternative treatment with the Er:YAG laser and PRF

Dr Fabrice Baudot, France

Introduction

Developments in our knowledge in the fields of biology, microbiology, tissue engineering[1] and technological progress have motivated the proposal of new therapeutic approaches and new surgical protocols to treat periodontal diseases. Periodontal diseases are chronic inflammatory pathologies resulting from an imbalance between the oral microbial flora and the patient's defence systems.[2,3] They are characterised by the presence of periodontal pockets, which are actually open wounds in a septic environment. The treatment of periodontitis consists of managing the risk factors of the imbalance and, in particular, of ensuring the disappearance of its chronic inflammatory wounds, which are the periodontal pockets.[4] The fundamental therapeutic concept for treating these wounds is simple: they must be cleaned so that they heal. A minimally invasive Er:YAG laser-assisted protocol is proposed here, as a supplement to conventional instrumentation, to transform these chronic inflammatory wounds into clean surgical wounds. Platelet-rich fibrin (PRF) is used to protect these wounds and stimulate healing (Figs. 1 & 2).

The periodontal pocket: A chronic inflammatory wound

The pockets represent the progression front of the pathology. They are the site of an aggressive and complex microbial proliferation which induces a cascade of inflammatory reactions, leading to the tissue destruction of the periodontium.[5] All of these events occur in a confined space relatively inaccessible to oral hygiene and produce an inflammatory infiltrate within the periodontal pocket. An acquired inflammatory reaction turns chronic because the presence of pathogenic agents is permanent and continually renewed in this open space. The inflammatory infiltrate is located in the internal layer of the gingival margin of the periodontal pocket. The epithelium of the pocket is completely destroyed by the proteolytic enzymes induced by the inflammatory reaction and allows the microbiota to pass and penetrate the tissue (and beyond), representing a chronic inflammatory infiltrate.[6]

In order to stop the progression of this inflammatory state, the infiltrate must be specifically eliminated and the periodontal pocket must be cleaned;[6,8] thus, the chronic

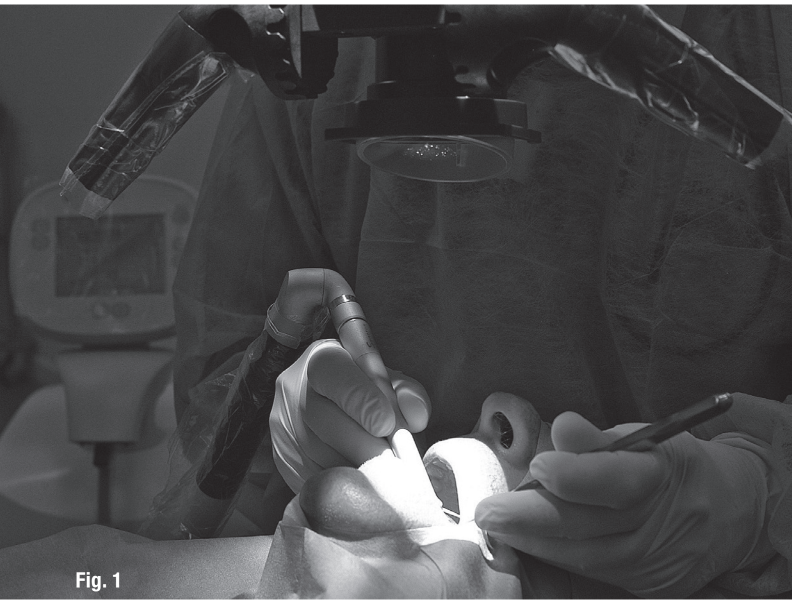


Fig. 1

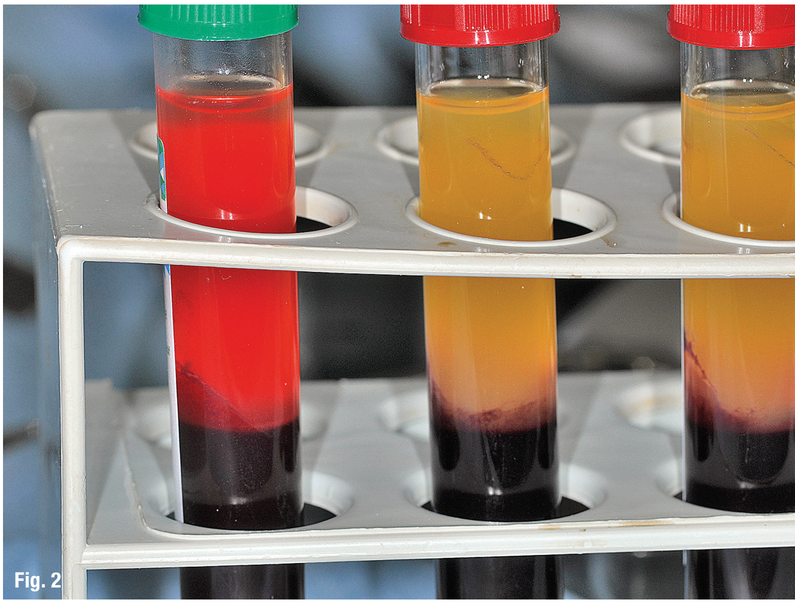


Fig. 2

Figs. 1 & 2: The Er:YAG laser and PRF synergy with the use of optical aids in the microsurgical treatment of periodontal pockets, a therapeutic breakthrough in the treatment of periodontitis.

inflammatory wound becomes a clean surgical wound which will be able to heal.[9] The pathogenic agents and the local risk factors are eliminated. The acquired immune reaction resulting from the persistence of pathogenic agents will disappear, allowing healing and tissue reconstruction. In this simple therapeutic concept, natural healing will be stimulated by a tissue engineering procedure consisting of protecting the clean periodontal wounds using PRF pellets. To maintain and optimise the healing potential of the periodontium, which is considerable, the surrounding vascular and tissue structures should be preserved. It is for this reason that minimally invasive periodontal cleaning protocols are favoured for the cleaning of the periodontal pockets.

The Er:YAG laser: A microsurgical cleaning tool

There are numerous mini-invasive protocols for cleaning the deep periodontium: PPT,[10] ITM,[11] MPPT,[12] SPPT,[12] SFA[13,14]. The protocol proposed here is becoming part of the family of minimally invasive surgical protocols.[15] It is performed entirely with optical aids of a minimum of 3.5x magnification. The hard wall of the periodontal pocket is traditionally cleaned using ultrasound with micro-inserts and under visual control. The Er:YAG laser is used to eliminate the inflammatory infiltrate on the internal part of the marginal gingiva and on the bone. It also allows fine decontamination of the radicular surface after the elimination of calculus using ultrasound.[16] The Er:YAG wavelength (2,940nm) has the principal characteristic of being significantly absorbed by water.[17] This physical property gives it minimally invasive clinical effects. The energy delivered by the beam to the targeted tissue is massively absorbed by the first cellular layers, which are significantly hydrated in human tissue. This irradiation causes vaporisation of the first tissue layers. The Er:YAG laser acts on the surface through tissue micro-ablation. Since the energy is massively absorbed at the surface, there is no transmission of this energy to deeper levels, thus the risk of increased temperature in the neighbouring tissue structures is almost zero. The thermal alteration layer from Er:YAG radiation is between 5 and 50µ.[18]

The impact of the Er:YAG beam with matter generates a shock wave. This is the second clinical effect of the Er:YAG laser: the photoacoustic effect. Generated in a confined space (the periodontal pocket), this shock wave causes intense agitation of the irrigating solution and contributes to the destabilisation of biofilm and flushing of the cleaned space.[19,20] This photoacoustic effect takes place in the three dimensions of the space being treated and in the zones which are completely inaccessible to conventional instrumentation, such as root furcations or deep angular pockets. The Er:YAG laser realises its full potential where conventional instrumentation reaches its limits. The Er:YAG laser constitutes a key element in the

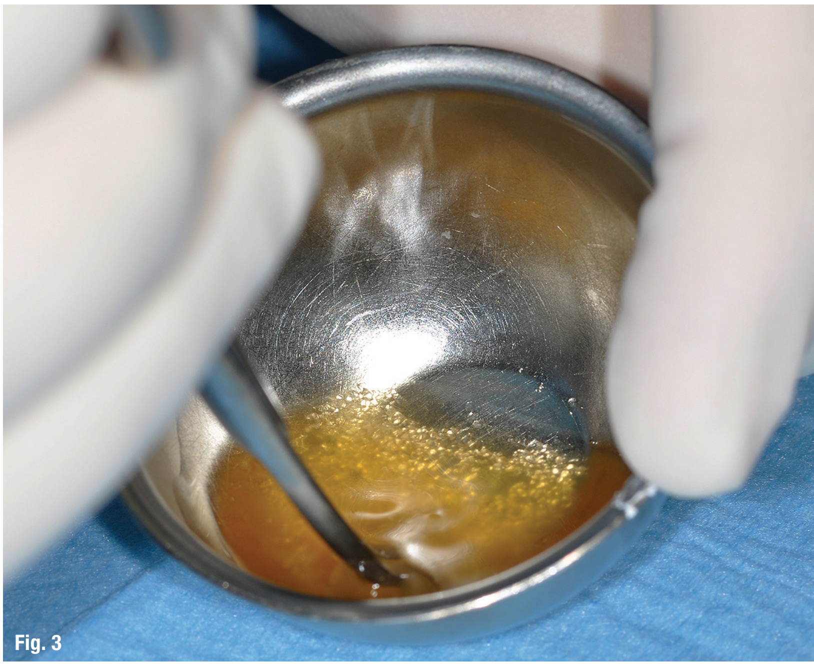


Fig. 3

Fig. 3: The serum from the pellet provides chemotactic factors, growth factors, stem cells and all of the immune cells which will contribute to and stimulate healing.

microsurgical cleaning protocol proposed here. It acts selectively on the various tissues of the periodontal pocket. There is in fact a water load gradient within the different tissues treated. The selective aspect of the Er:YAG laser lies in the fact that the beam will primarily eliminate the most hydrated tissue and will do so with micrometric precision. Thus, using the appropriate settings of the laser energy beam,[21] the inflammatory tissue and the biofilm will be destroyed while leaving the healthy and less hydrated tissue (gingiva, ligament, bone and dental structures) intact.

Description of the Er:YAG laser-assisted microsurgical cleaning protocol

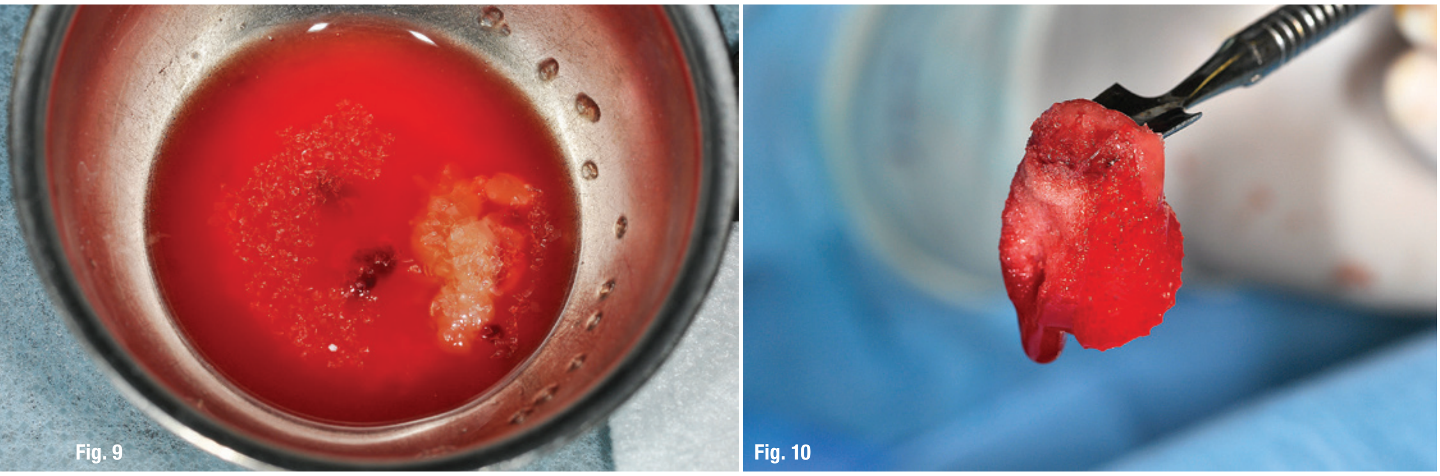
The Er:YAG laser is not a therapy on its own. It is a microsurgical tool used as a supplement to conventional instrumentation to optimise scaling and root planing in the cleaning of the deep periodontium.[15] Its use in this protocol allows a flapless surgical intervention. The protocol proposed here is based on the approach which Yukna already described in 1976.[22] The Er:YAG laser is used to descend layer by layer via tissue micro-ablation along the internal wall of the gingival pocket in order to selectively remove the inflammatory infiltrate. It uses the natural pathway created by the pathology. No healthy tissue is detached or removed. This process involves cleaning the wound under visual control through a space of about 1 mm throughout the full depth of the pocket and to the bone. Once the inflammatory tissue has been removed, visual access to the calculus is improved and it

Figs. 4–8: The plasma pellets are cut into pieces calibrated to the periodontal pockets to be filled. They will be compressed *in vivo*. Minimally invasive treatment of the periodontal pockets up to 8–9 mm and filling with autogenic plasma inserted into the space cleaned with the Er:YAG laser.

can be removed conventionally. The laser is once again used at the end of the protocol to decontaminate the root surface and flush the periodontal pocket. Komatsu clearly demonstrated that the Er:YAG laser, compared with the use of conventional curettes, allowed postoperative bacteraemia to be significantly reduced.[23] The bactericidal effects of the Er:YAG laser allow one to go further than conventional instrumentation in the cleaning of periodontal pockets.[18]

PRF: Protection of the wound and stimulation of healing

Periodontal wounds cleaned according to the Er:YAG laser-assisted protocol will be protected by pellets of blood plasma. PRF will constitute a protective barrier for the periodontal pocket and stimulate its healing.[24] The collagen present in the PRF will serve as a matrix for the cellular bridging necessary for the tissue reconstruction

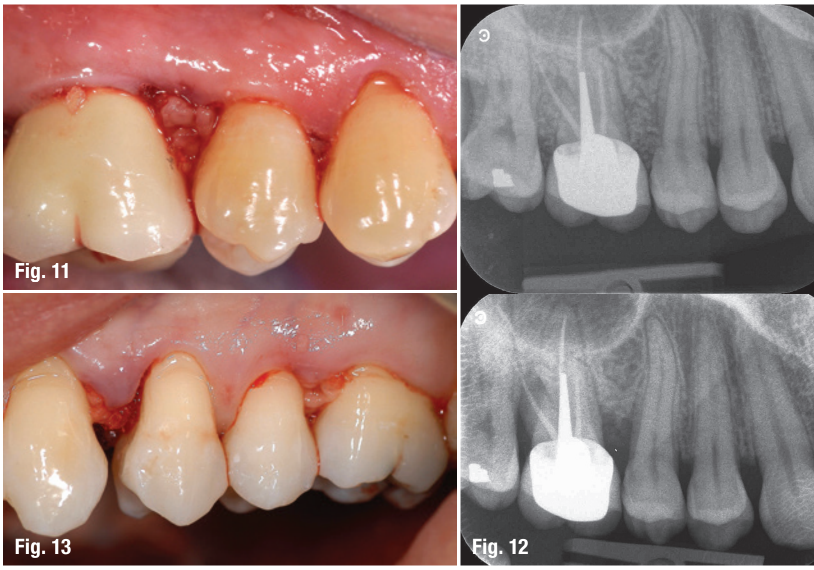


Figs. 9 & 10: Mixture of PRF and bioglass; the coagulum formed is very ergonomic to handle.

process.[25] The plasma will also protect the wound from microbial invasion through closure, which it ensures, and the concentration of the immune cells it contains. The high platelet concentration in the PRF pellet will improve the coagulation mechanisms, thus contributing to the stabilisation of the blood clot, which is the first fundamental step in proper healing. The serum from the pellet will provide chemotactic factors, growth factors, stem cells and all of the immune cells which will contribute to and stimulate the healing process (Fig. 3).[26,27] PRF is used alone or added to a resorbable filling material after deep cleaning of the periodontal pockets. In the protocol proposed here, the plasma pellets are not compressed in a membrane *ex vivo*. They are cut and stored in a pellet to be calibrated to the space to be protected and are compressed *in vivo* in the periodontal pocket to fill it.

The recommendations are fairly specific: PRF is used alone in pockets measuring 3–5 mm and without any angular lesions (Figs. 4–8). PRF, in combination with filling material, is used in pockets greater than 6 mm, and in angular and crateriform lesions (Figs. 9–12). For cases involving filling, the material used is a bioglass, which demonstrates perfect adaptation to this type of protocol. This material, which is very ergonomic in its surgical handling, has the characteristic of being synthetic and resorbable, resorbing slowly to accompany the natural bone remodelling. When resorbed, it releases bacteriostatic components, thus limiting bacterial contamination. The material is mixed with whole plasma pellets (not compressed in a membrane) which are cut in a bowl. The mixture is packed into the pockets for filling, taking care to fill the entire space without excessive pressure on the material. Once filled, the pocket is protected at the surface by a pellet of plasma alone to ensure closure and cellular bridging at the surface.

Postoperatively, the patient is advised not to perform mouth washing to avoid destabilising the pellets and to allow the natural healing process to proceed. It is not necessary to administer significant amounts of antiseptics because the concentrated immune cells present in the plasma ensures the antimicrobial protection of the initial stages of healing. The tissue reconstruction which is going to take place will help create a protective barrier effect. In this protocol, patients are re-evaluated two months postoperatively (Fig. 13). At this stage, the disappearance of more than 80 % of pockets measuring 4 mm or greater was noted. Healing continues for six to eight months.[15] It is accompanied by a programme of strict periodontal maintenance, which is often assisted by the Er:YAG laser, during which the residual pockets close up once again. In this minimally invasive approach, which allows pockets of up to 8–9 mm in depth to be treated, it is thus possible to reduce the need for an intervention with a surgical flap to access the deep periodontium to 2–3 %.



Figs. 11 & 12: Clinical and radiographic views of a PRF–bioglass filling. **Fig. 13:** Immediate post-op clinical views of the small pellets inserted into the pockets.

Conclusion

The synergy between the Er:YAG laser used with optical aids and the application of PRF for the treatment of the chronic inflammatory wounds which are the periodontal pockets is the result of technology and better knowledge regarding microbiology and tissue engineering. This progress allows us to push the boundaries imposed on us by conventional protocols. The operative protocol is simplified and optimised to be accessible to a greater number of therapists.

about the author

Dr Fabrice Baudot is a French dentist specialised in periodontics and implantology. He currently leads a practice that is specialised in laser-assisted microsurgery. His therapeutic approach is always based on minimally invasive surgery. Dr Baudot is frequently invited to speak at international dental conferences, and he is the author of numerous scientific publications.

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Laser-assisted gingival modification of an edentulous site

Dr Foteini Papanastasopoulou, Greece

Introduction

Despite the increasing availability of dental implants, many patients still choose to replace their missing teeth with fixed partial prostheses. In order to have a positive outcome and prolong the lifespan of the fixed prosthesis, the treatment plan must be designed carefully. The edentulous site and the pontic's shape can be decisive factors for the treatment success. There are several pontic designs, including saddle, modified ridge lap, hygienic, conical and ovate. The type of pontic selected depends on the case and should meet some basic requirements. The pontic should restore function, prevent food impaction, have a cleanable shape, maintain the healthy tissue of the edentulous ridge and have good aesthetics, especially if used in the aesthetic zone.

Fig. 1: The edentulous ridge at the area of the maxillary right canine. The gingival tissue was excessive and movable. **Fig. 2:** The edentulous ridge immediately after the laser recontouring.

The dentist should examine the edentulous ridge carefully before the final dental impressions are taken. If the edentulous ridge has irregularities, then the soft tissue and sometimes even the hard tissue may be modified surgically to facilitate the pontic design and achieve better aesthetics. Nowadays, with the help of laser technology, modern dentistry can be less invasive and more patient-friendly. The Er:YAG laser with a wavelength of 2,940 nm can perform a wide range of hard- and soft-tissue procedures with high therapeutic effectiveness and accuracy.

Case presentation

A 57-year-old male patient was referred by his general dentist and presented with excessive, movable gingival tissue in the edentulous ridge in the area of the maxillary right canine (Fig. 1). The patient had started dental treatment, in which his 15-year-old three-unit fixed partial prosthesis with abutments on the maxillary right lateral incisor and the first premolar and with a pontic in the position of the maxillary right canine would be replaced. He had opted for a new fixed partial prosthesis instead of implant placement. After removal of the old prosthesis, the edentulous site appeared to be swollen and irregular. This gingival enlargement was induced by inflammation due to chronic plaque accumulation. When asked whether discomfort was experienced in the edentulous area, the response was negative but occasional odour exuded from the prosthesis.

The dental and medical history revealed that the patient was healthy and had no systemic diseases, did not take any regular medication and had numerous old dental restorations that needed to be replaced. His oral hygiene was average. After the clinical examination, it was concluded that the edentulous ridge did not have a good contour and regardless of the pontic design, the enlarged gingiva would entrap food and it would be challenging for the patient to keep it clean. Also, the excessive gingival tissue would cause an aesthetic issue, since it would be difficult for the technician to fabricate a suitable pontic that would be both functional and appear natural. Therefore, it was decided that the edentulous ridge needed to be recontoured. The new prosthesis was considered to be in the aesthetic zone; thus, the pontic design could

Fig. 3: Two days after laser treatment. **Fig. 4:** One week after laser treatment.

be either modified ridge lap or ovate. The technician requested a modified ridge lap, since it was the design that he most often used.

The edentulous site could be modified conventionally, such as surgical removal using a scalpel, or using a dental laser. In this case, the gingival recontouring was performed with a 2,940 nm Er:YAG laser (LightWalker, Fotona) with the following settings: energy of 120 mJ, frequency of 10 Hz, pulse duration of 1,000 µs (VLP), and power of 1.2 W, with water and air spray. A R14 handpiece and a cylindrical sapphire tip (1.3 mm in diameter and 8.0 mm in length) were used. The procedure was completed without the use of local infiltration anaesthesia; only a topical anaesthetic gel (20 % benzocaine; HurriCaine, Beutlich Pharmaceuticals) was applied to the area. The tip was placed 1–2 mm from the tissue surface at an angle of 30°. During the laser irradiation, the tip was kept in continuous slow motion. The excess tissue was ablated with precision, layer by layer (Fig. 2). Minimal bleeding was observed, as was expected owing to highly inflamed tissue and the use of water spray. Haemostasis with the Er:YAG laser was adequate, so there was no need to achieve complete coagulation. The treatment lasted only a few minutes, and during the procedure, the patient did not feel any pain or discomfort. He was released and was redirected to his general dentist to resume dental treatment.

The patient returned for a follow-up after two days (Fig. 3) and one week (Fig. 4). After two days, excellent tissue healing was observed. The tissue appeared healthy and had a pale pink colour and a firm texture. The surface of the attached gingiva was smooth and regular. No signs of swelling or other postoperative complications could be seen. The patient reported that he did not have any discomfort after the procedure; painkillers were thus not a necessity. After one week, it was observed that the edentulous ridge was ideally shaped. Before releasing the patient, he was instructed on how to properly clean a fixed partial dental prosthesis in order to maintain a healthy, plaque-free edentulous ridge. The general dentist was informed that he could start the procedures for the definitive fixed partial prosthesis.

Conclusion

Sculpting of the gingival edentulous site with the Er:YAG laser is highly advantageous. It is a simple and fast procedure for the clinician. The alteration of the tissue can be done with a predictable outcome, which is especially crucial if the aesthetic zone is being treated. The duration of the procedure was shortened, as the step of local infiltration anaesthesia was excluded in this case. Owing to the antibacterial activity of dental lasers, less postoperative swelling and minimal healing time can be observed; hence, other dental procedures, such as placement of a fixed or removable dental prosthesis, can start earlier. Lastly, the patient benefits from the laser treatment. Dental lasers are well accepted by patients, since little to no anaesthesia is needed compared with conventional surgery and there is minimal discomfort to them during or after the therapy.

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Dr Foteini Papanastasopoulou DMD, M.Sc. obtained her dental degree from the Semmelweis University, Budapest in 2009. In 2010 she was certified as a Laser Safety Officer (LSO) and in 2011 she completed the "Laser therapy in Dentistry" course at the RWTH Aachen University, Germany. In 2013 she obtained her Master of Science degree in "Master of Oral Laser Applications" from the same University. Since 2009, she practices laser therapies at her private office "Alimos Laser Dental Clinic" in Alimos, Greece.

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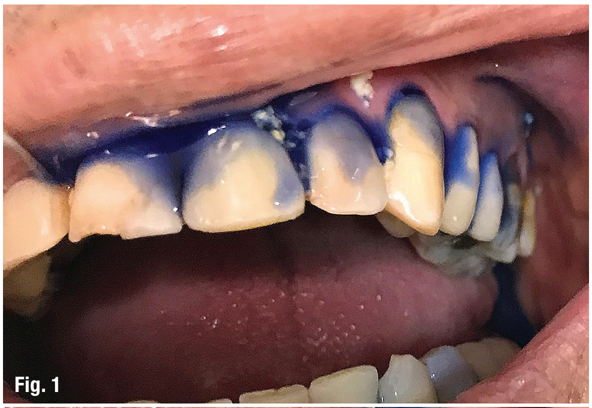
Treatment of a patient with multiple myeloma

Dr Maziar Mir, Germany; Dr Mina Mazandarani & Dr Masoud Shabani, Iran

Introduction

Patients with cancer are generally considered high-risk patients. When treating these patients, dentists should always be aware of a variety of factors that might pose the risk of adverse health effects. For one thing, they should be aware of possible neutropenic sepsis in patients with dental infections who are currently undergoing chemotherapy or who have received chemotherapy in the recent past. Dentists should never provide emergency dental treatment or elective invasive dental treatment to patients currently undergoing cancer treatment in the form of radiotherapy or chemotherapy to the area of the head or neck, or who received these kinds of treatment in the recent past, without contacting the patient's oncology team first to assess whether the intended dental procedures can be carried out in a safe manner. Primary care should also only be carried out after obtaining advice from the patient's oncology team and only if it is considered as minimally invasive as possible for the patient. In this regard, laser-assisted treatment can be an effective alternative to the more conservative and invasive treatment modalities. In the following, a case will be described in which a cancer patient was treated by means of a laser over the course of one year.



Figs. 1 & 2: A photosensitiser solution was injected into all the periodontal pockets of the teeth.

Initial clinical situation

A 56-year-old patient was referred to our dental clinic for laser-assisted photodynamic therapy. He complained about severe gingival bleeding when brushing his teeth. The patient, who was a practising physician, had a medical history of blood cancer. He suffered from multiple myeloma and, at the time of the appointment, was regularly receiving cancer treatment in the form of chemotherapy. Owing to this medical history, his periodontist refused to carry out any intervention and immediately referred him to our dental clinic. Furthermore, the patient, being a medical expert himself, knew about the benefits of laser-assisted dental treatment, which is why he specifically asked for such a treatment.

During and after treatment

As a first step of the treatment, thorough scaling and root planing were carried out. Thereafter, a photosensitiser solution (Hager & Werken) was injected into the gingival pockets and rinsed out after a duration of 2 minutes (Figs. 1 & 2). A dental laser (PDT Laser, Hager & Werken) designed for photodynamic therapy was then used to treat the periodontal areas that had shown bleeding (Figs. 3 & 4). The red laser operated at a wavelength of 660 nm, which is the wavelength that is most commonly used for photodynamic therapy. Moreover, the laser was set to an energy/power of 100 mW. Each periodontal pocket was irradiated for a duration of 30 seconds with a 400 µm fibre and an energy density of 3 J/cm^2. This treatment was repeated twice a week over three weeks in order to reduce the amount of harmful bacteria in the periodontal pockets (Fig. 5). In a subsequent step,

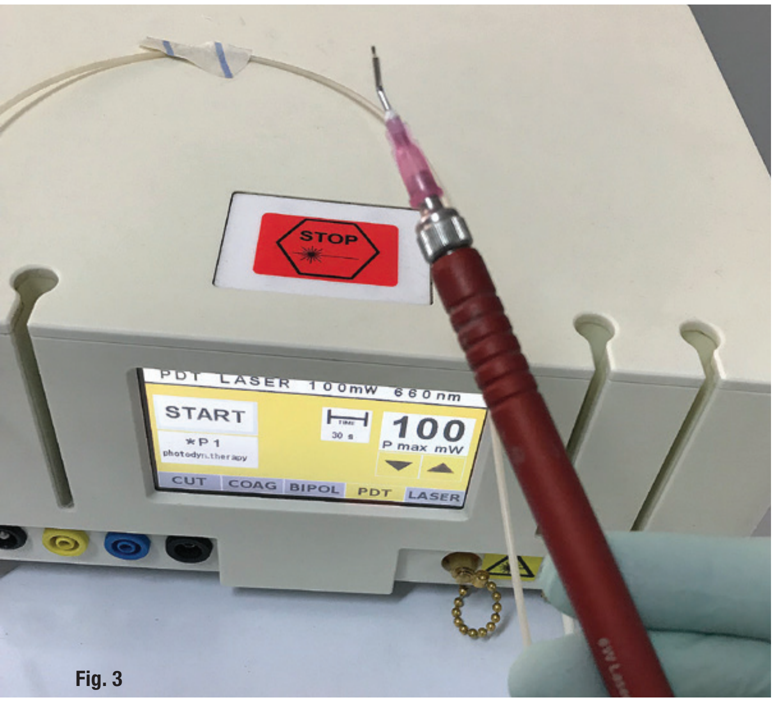


Fig. 3

Fig. 4

Figs. 3 & 4: A dental laser at a wavelength of 660 nm was used to treat all the periodontal pockets.

pocket debridement was carried out regularly over the course of one year. During this time, the patient was very cooperative and comfortable. He did not voice any concerns about physical discomfort, owing to the pain-relieving and biostimulating effects of the laser that was being used.

After one year, the patient had successfully completed chemotherapy and was then selected for subsequent bone marrow transplant therapy. As part of this new treatment protocol, his own blood was to be drawn, and the helper T cells therein were to be multiplied and subsequently injected back into his body. However, in the context of planning this medical treatment and assessing its long-term success, the roots of two broken molars that were still present in the mouth of the patient at that time were considered a risk that could potentially jeopardise the new cancer treatment protocol. As a result, the two remaining roots were extracted by means of a laser-assisted tooth extraction protocol. The roots were very infected however, for which reason laser-assisted photodynamic therapy was performed again before and after extraction around the surgical site (Fig. 6). After the surgery, the patient said that he had had maximum physical comfort throughout the extraction procedure (Fig. 7).

Discussion

In case of doubt, or if dental infections do not respond to initial treatment, cancer patients should always be

Fig. 5

Fig. 6

Fig. 5: Photodynamic therapy was carried out to reduce the amount of harmful periodontal bacteria. **Fig. 6:** The roots that were about to be extracted were infected, and thus the surgical site needed to be treated with laser-assisted photodynamic therapy before and after extraction.

Fig. 7: The patient was very happy and satisfied after the treatment.

referred to a specialist clinic for further treatment, as was done in this case. Laser-assisted photodynamic therapy is a highly useful and effective approach to treating high-risk patients such as cancer patients who are undergoing radiotherapy or chemotherapy. Laser-assisted treatment can often be safely used for treating cancer patients owing to the minimal invasiveness of the treatment. Apart from that, dental lasers have further clinical benefits in that they have biostimulating and pain-relieving effects. Psychological benefits for the patient are among the advantages of laser-assisted photodynamic therapy. These were reflected in the positive feedback from the patient, who was very comfortable throughout the treatment and did not express any discomfort at any time. Today, we are even adding adjuncts such as chitosan to photosensitisers in order to reduce the number of *Streptococcus mutans* bacteria found in the oral cavity. This bacterium is considered to be the chief contributor to the development of dental caries.

When treating cancer patients, the dentist should always be very insistent with regard to follow-up appointments and should carefully monitor patients for possible adverse health reactions and deterioration. After the treatment, medicine should only be prescribed after having thoroughly discussed it with the patient's oncology team. The possibility that the medicine will have adverse interactions with the patient's cancer treatment must be ruled out. Apart from that, patients suffering from blood cancer, as in the described case, should ideally be in remission before undergoing dental treatment. Lastly, dentists should be aware of the possible risk of osteonecrosis of the jaw, which is an increasing problem caused by bisphosphonates, which are often administered intravenously to cancer patients.

Conclusion

As shown in this case, laser-assisted treatment can be considered an effective modality for treating cancer patients who are receiving chemotherapy or have received chemotherapy in the recent past. However, further and more extensive research in this regard needs to be conducted and the findings need to be made widely available. Case studies such as the one reported here are still quite rare, and it is therefore suggested that multicentre studies are conducted. Scientists and clinicians from all over the world are hereby encouraged to engage in this area of research and contact us for possible scientific collaboration.

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Dear authors, **thank you**
for your contributions in **2019**.

Looking forward to working with you in **2020**!

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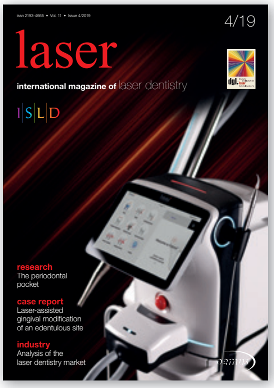

Laser protection in the medial range

LASERVISION, Germany

Life Energy Light—Lasers are the future in medicine as well, but require special protective measures

In 1960, Theodor Maiman built the first apparatus, which used the principle of "Light Amplification by Stimulated Emission of Radiation". A principle that allows light to be bundled so that tattoos can be removed; skin can be cut or treated with the help of photodynamic therapy. According to recent research, the laser is even used in the context of cancer therapy. With the growing application of laser technology, adequate laser protection becomes more and more important.

Danger due to laser radiation

This advanced laser technology has specific dangers that must be considered. The greatest danger is the accidental, unintentional irradiation of humans. In particular, the eyes are at risk because they react much more sensitive to light and there is a risk of irreversible blindness even when looking into a laser beam with low power. When we consider that 90 per cent of our perception works through the eyes, this is an unlikely event that must be avoided. This has also been recognised by the legislator and therefore regulations have been drawn up at EU level to prevent accidents involving lasers. To understand why you need to be protected from laser radiation, let's take a quick tour of the basics, hazards and norms.

Classification in laser classes

First, the manufacturer of a laser device recommends classification according to DIN EN 60825-1:2008-05. The classification of laser devices in different laser classes described therein is intended to make the potential danger immediately recognisable for the user, so that he can easily estimate which protective measures are necessary. The assignment is selected in such a way that as the number of the class increases, the risk becomes greater, which is why the protective measures are becoming more extensive. The limits of accessible emission (AEL) for the individual classes are chosen so that the maximum permissible exposure values (MPE) with respect to the respective time base for class 1 are not exceeded. Most devices used in medicine are class 3 or 4 lasers, the two highest laser classes.

Protection against laser radiation

There are currently two limit values in Germany that must be complied with—those in accordance with the accident prevention regulations (MPE values) and those of the OStrV (Occupational Safety and Health Ordinance on Artificial Optical Radiation). The exposure values according to OStrV can be determined by formulas and depend i.a. on the wavelength and duration of the irradiation. The results are to be compared with the corresponding limit values. There are tables for this which can be viewed in OStrV. Based on these results, the appropriate precautions can now be decided. The precautions result from the risk assessment of the OStrV in which first the danger area must be determined. Afterwards is has to be considered how this danger area can be reduced by structural/technical measures. Nevertheless, if it is unavoidable that employees must be present within the laser danger area, personal protective equipment—eye protection—must be used. The following should be noted:

- All persons who are in the laser area during laser operation must wear laser safety goggles that are designed to mitigate the harmful radiation of that specific laser—all laser safety eyewear MUST be matched to the wavelength of the device.
- Each user of a laser safety goggles must ensure that the goggles do not show any changes (cracks, changes in colour, etc.) that could impair the protection before use. Such errors must be reported immediately to the laser safety officer.

The new occupational health and safety ordinance stipulates that, as of laser class 3, an expert laser safety officer must be appointed in written form. The laser safety officer shall be considered competent if he has acquired, sufficient knowledge of the lasers which are used and is thus fully informed of the effect of the laser radiation, the protective measures and protective provisions, so that he can arrange the necessary precautions. The laser safety officer must have successfully taken part in a course to gain the expertise and has to prove this (see OStrV). More detailed information on eye protection against laser radiation (laser goggles) may e.g. also from DIN EN 207 (standard for eye protection products against laser radiation) or obtained from the manufacturers of the protective products.

In addition to laser safety goggles, all laser protection devices in the hospital, a doctor's office or in the operating room generally have to be carefully selected due to the high risk potential of the laser. In addition to the most commonly used goggles against laser radiation, this also applies, to adding laser protection of existing windows with laser-safe curtains, roller blinds or additional screens for shielding the laser radiation. The user, the purchaser and the laser safety officer can therefore only be strongly recommended to make use of the know-how and the experience of the providers as early as possible in the early planning phase in order to be able to realise a safe and cost-effective laser protection solution.

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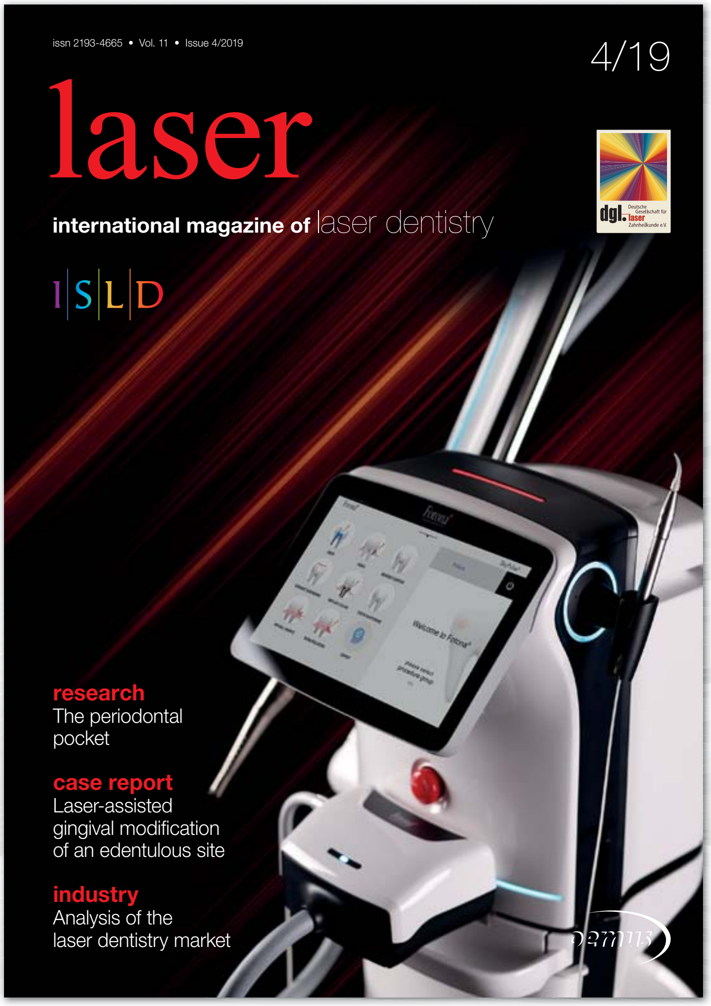

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Analysis of the laser dentistry market

Dr Dimitris Strakas, Greece

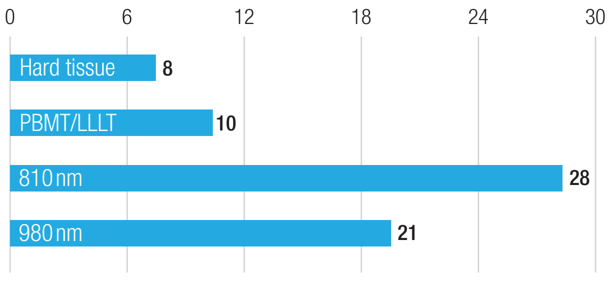

Fig. 1: Majority manufacturers of specific lasers. PBMT = photo-biomodulation; LLLT = low level laser therapy.

Laser dentistry is experiencing a boom time. Although the financial situation globally is constraining the market, laser companies—both big and small, yet all with unique corporate histories—continue to bring new devices to the market to support us and our patients, developing new technological implementations and therapeutic protocols, and surprising us with new wavelengths.

It is safe to say that the most prominent trade fair for dentistry is, of course, the International Dental Show (IDS), which is held every two years in Cologne in Germany. It is organised by the Gesellschaft zur Förderung der Dental-Industrie, the commercial enterprise of the Association of the German Dental Industry, and hosted by Koelnmesse. At the 2019 show, the vast exhibition area of 170,000 m^2 filled with the exhibition booths of manufacturers, importers, service providers, and associations and institutions directly related to products and systems for dental medicine and dental technologies attracted more than 160,000 visitors from 166 countries. The exhibitors included 2,327 companies from 64 countries. Naturally, these gargantuan numbers gave abundant opportunity for research and quantification, especially with regard to the laser dentistry industry. Walking 45 km over the course of 4.5 days, I managed to visit all the booths of the dental laser manufacturers and meet with their respective representatives, who were so kind as to complete specially developed questionnaires, through which I obtained a great deal of information. Hopefully, the following analysis will help laser dentists around the world gain a clear idea of what is offered by the companies, what technologies are available on the market, and which tools dentists can implement in their dental clinics. It must be noted that not all companies are present at IDS and that this analysis is restricted to those that attended this year's instalment of the dental event. The data was collected in cooperation with the representatives of each company and was subsequently

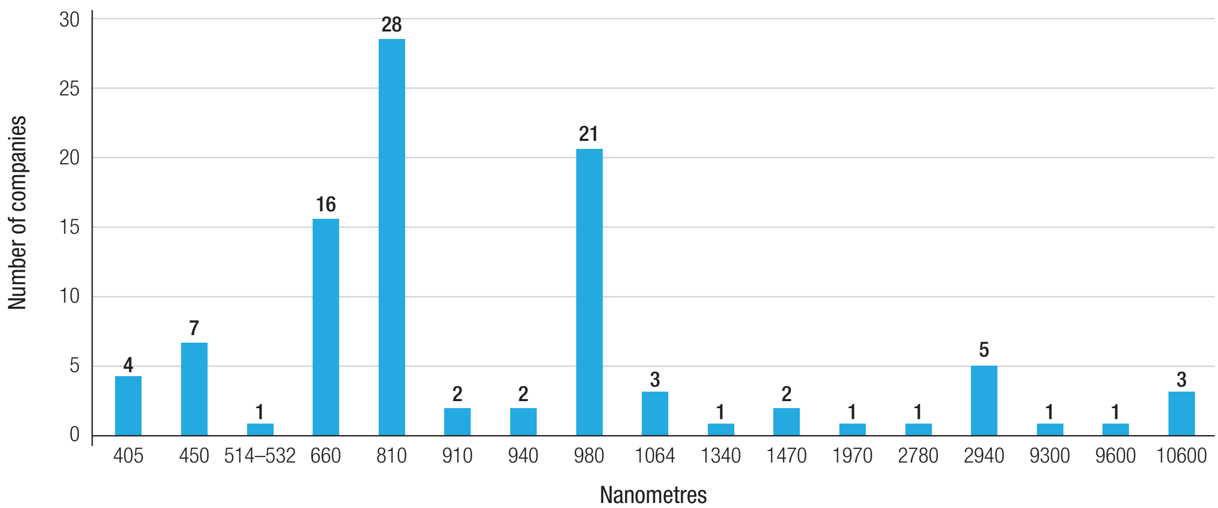

Fig. 2: Available wavelengths according to number of manufacturers. For some wavelengths, one dominant one was selected, but a range of ± 20 nm was included (e.g. 445–450–470 nm, 630–650–660–670 nm, 808–810 nm, 908–910 nm, 970–980 nm).

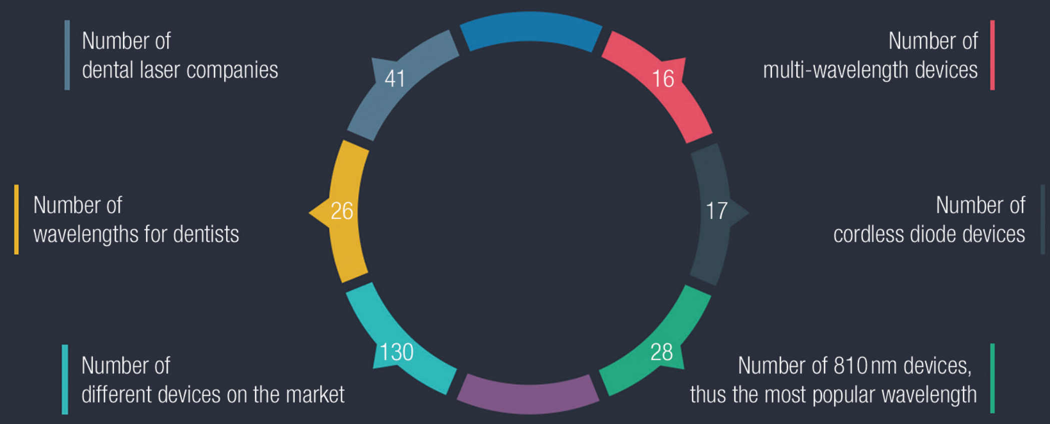

Fig. 3: Number of dental laser manufacturing companies present, dental laser wavelengths, devices overall, multi-wavelength devices, cordless diode devices and 810 nm devices.

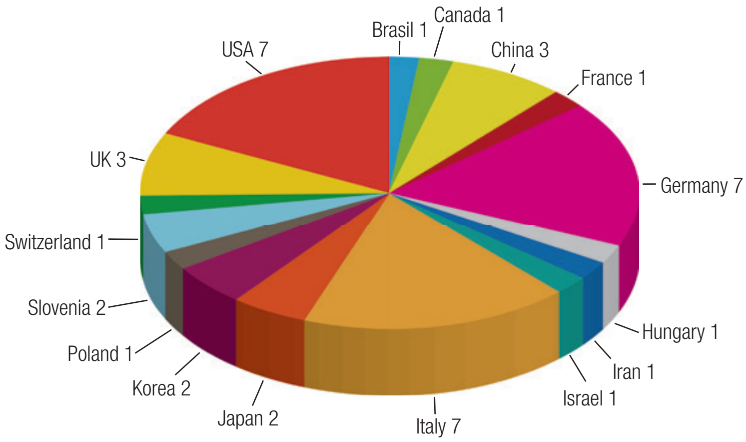

Fig. 4: Number of laser manufacturers by country.

double-checked against the information provided on the websites of the respective companies. However, there may be inadvertent errors or omissions.

Many different wavelengths have continued to appear on the market on an annual basis. Lasers of certain wavelengths are produced by numerous companies, whereas for others, there may be only one manufacturer. The most popular wavelengths in dental laser manufacturing are 810 nm (28 companies produce them) and 980 nm (21 manufacturers; Fig. 1). Lasers in the visible red light spectrum (630, 650, 660 and 670 nm), which are used in photo-biomodulation and photodynamic therapy, occupy the third place in this category, being produced by 16 companies (Fig. 2). Eight devices are available on the market for hard-tissue procedures with the four wavelengths of 2,780 nm (Er,Cr:YSGG), 2,940 nm (Er:YAG), and 9,300 nm and 9,600 nm (carbon dioxide; Fig. 1). Also, there are 11 dental systems which are used exclusively for photo-biomodulation and photodynamic therapy (Fig. 1).

In total, 41 dental laser manufacturing companies were present at IDS 2019, showcasing an overall portfolio of 130 different devices. Among those were 16 multi-wavelength devices and 17 cordless devices. The number of available wavelengths offered globally for dental applications comes to the astonishing number of 26. The 41 laser companies that were present during IDS 2019 come from 16 countries, mainly Germany, Italy and the USA. Each of these countries was represented by seven companies.

The 38th IDS ended after five intensive days during which practitioners and industry representatives met and interacted with one another in an unparalleled way. At the event, companies specialised in laser dentistry were present to a significant extent, highlighting that this discipline is a benchmark for future dentistry. With sophisticated state-of-the-art technology, a dental office can be transformed, the quality of care can be elevated, and dentists can offer their patients treatment options that are faster, more convenient and—in many cases—performed exclusively through the power of the biophysical interactions of laser light and human tissue. I would like to thank every company that so willingly shared its information with me. I am already looking forward to meeting the entire dental laser family again during the 39th IDS, which will be held from 9 to 13 March 2021.

about the author

Dr Dimitris Strakas completed his DDS at the Aristotle University of Thessaloniki in Greece in 2002 and his M.Sc. in Lasers in Dentistry at RWTH Aachen University in Germany in 2006. In 2017, he obtained his PhD from the Aristotle University of Thessaloniki, and in 2013, he founded the laser clinic department there. Since 2017, he has been a university scholar in the Department of Operative Dentistry of the same university. He runs a private laser dental clinic in Volos in Greece. In addition, he is the Secretary General of the International Society for Laser Dentistry.

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Successful communication in your daily practice

Part XII: Turning medical tourists into loyal patients

Dr Anna Maria Yiannikos, Germany & Cyprus

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This series covers the most common and demanding scenarios that might arise in your dental practice and presents successful ways to manage them in order for you to enjoy greater peace of mind. Each article of this series teaches you a new, easy-to-use specialised protocol which can easily be applied and adapted to your own dental clinic's requirements from the outset.

There are many more interesting aspects of the topic of medical tourism to explore that you, as the leader of your clinic, can capitalise on. The topic of medical tourism is quite a broad one and it is a special field in and by itself. Therefore, our efforts should be concentrated and focused. Today's challenging topic deals with how to turn your newly won patients who came to you as medical tourists into loyal advocates who will promote your practice in their respective home countries. In the following, five effective and easy steps will be discussed that are crucial to retaining a relationship with medical tourism patients in order to make them loyal advocates.

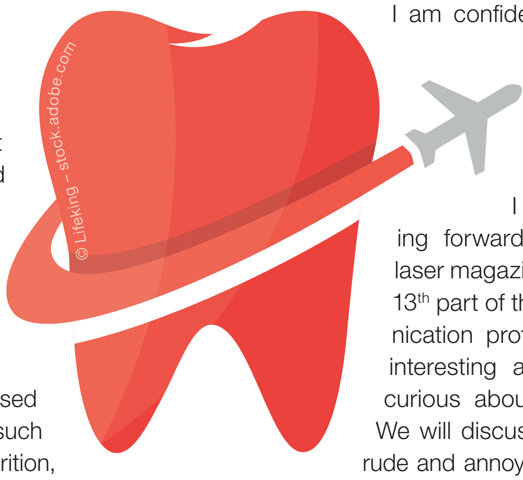
Step 1

Send the patient an e-mail immediately after the treatment and wish him or her safe travels back home. Use the opportunity to also thank the patient for visiting your clinic and to remind him or her via e-mail of the advice that you gave him or her during treatment. This is your chance to refresh your patient's memory about the many benefits of the therapy for him or her.

Say that you carried out root canal therapy, in which you additionally used a dental laser in order to sterilise both the main and lateral canals of the tooth. The tooth might be a bit sensitive for a few days thereafter. However, in the e-mail you should emphasise the benefits of sterilising the main and lateral canals by means of a laser, in that it significantly increases the success rate of the treatment (compared with conventional root canal therapy, without the use of a laser).

Step 2

Send a second e-mail to the patient after one week with a full and detailed report of the treatment that he or she has undergone. If you give warranties for certain treatments, such as for restorations, you should attach these. In addition, you should attach any document regarding information that you might have discussed with the patient during his or her stay, such as tips on brushing techniques or nutrition, based on his or her individual lifestyle.



Step 3

One week after the second e-mail, you should send the patient another e-mail, this time featuring your proposed treatment plans for the future. For example, if the patient needs further treatment, then he or she should be informed of the costs involved, the time frames and, of course, the benefits of the therapy. In this third e-mail, emphasise the benefits for the patient's overall health and improvements to his or her attractiveness and lifestyle.

Step 4

One month after the patient has left the clinic, you should send him or her a fourth e-mail. However, you must remember: never ask him or her whether he or she is okay or not. Why? Because all human beings love to complain. Rather tell him or her that you want to check in on him or her to make sure that everything has gone according to his or her wishes and expectations regarding the treatment. Also, thank him or her one more time for choosing your clinic and for his or her trust in you.

Step 5

As a last step, send the patient an e-mail on his or her birthday or name day, wishing him or her all the best for the future. In addition, you could send him or her best wishes on the relevant religious holidays via e-mail. In doing so, you will make your patient feel special and acknowledged by you, his or her dentist. As a result, his or her trust in you will likely be bolstered.

That was easy, wasn't it?

Use the above-mentioned steps as a protocol in your daily practice and you will soon notice an influx of new patients from abroad and—most importantly—feel in control of this new situation. You now know the exact steps required to turn medical tourists from abroad into loyal advocates of your practice. Moreover, I am confident that you will most likely experience an increase in income as a consequence. Just try it and let me know what you think!

I am sure that you are looking forward to the next issue of the laser magazine, in which I will present the 13th part of this unique series on communication protocols and consider further interesting and useful topics. Are you curious about what's coming up next? We will discuss how to deal with difficult, rude and annoying patients effectively. There are most likely patients that you feel nervous and anxious about each time they visit your practice. In the next article, I will teach you the five most important points that will help you to stay sane and focused when you are dealing with these dreaded patients.

about the author

Dr Anna Maria Yiannikos (DDS, LSO, MSc, MBA) is one of the first two women worldwide to have obtained a master's degree in laser dentistry. She has owned a dental clinic for 30 years now and leads the innovative Dental Business Administration Mastership Course at RWTH Aachen University in Germany. She is an adjunct faculty member of the Aachen Center for Laser Dentistry.

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On challenges, excellence and embracing what once was

Leon Vanweersch at Cumbre Mundial de Laser 2019 in Puerto Vallarta, Mexico.

At its 2018 international congress in Aachen in Germany, members of the World Federation for Laser Dentistry (WFLD) left the expert society in order to revert to the original International Society for Laser Dentistry (ISLD). In this interview with *laser magazine*, Leon Vanweersch, a member of the ISLD organisation board and the Academic Coordinator of the Aachen Dental Laser Center (AALZ), talks about the current state of the new old expert society, the major challenges that laser dentistry is facing today, and the benefits for aspiring laser dentists of the reselection of RWTH Aachen University as a University of Excellence for the third time—the Excellence Initiative seeks to promote the German higher education sector.

Mr Vanweersch, in 2018 some members of the WFLD set out to reinvigorate the International Society for Laser Dentistry (ISLD). What are the key reasons behind this?

I don't want to go into too much detail here, since this is a rather sensitive topic. However, I can say that the main reason for some WFLD members leaving the executive board to form the new (and original) ISLD were internal conflicts which had been going on in terms of differing core philosophy and differing approaches to organising conferences. In addition, topics such as genuinely transparent structures in terms of clear membership forms, information availability and elections conform to by-laws became increasingly important to some WFLD members. As a direct consequence, the newly established ISLD took important steps towards creating greater transparency. For instance, it created simple and efficient ways for members to register online through its website. In addition, it developed the world Academic Map, on which ISLD members can look each other up online and see which laser wavelengths their peers use. The ISLD is very clear about its new goals as an expert society. It is now looking to organise its congresses in a more efficient and modern fashion. In this context, it is drawing from the congresses in Thessaloniki, Greece, in 2017 and Aachen, Germany, in 2018, which were appraised by laser manufacturers. As a result of hard work and the newly established transparency, the ISLD has come from only 40 yearly paid memberships in October 2018 during the late WFLD times to more than 750 registered ISLD members today, all of whom will receive membership certificates as proof of membership every year. This is in keeping with the original objective of the society back in 1988, when all processes were meant to be transparent to all members.

What are the overriding challenges laser dentistry is facing at the moment? Where are the technological developments headed?

I personally think that many dentists are concerned about investing in a technology that they cannot make use of without having the requisite education, in-depth knowledge and skills to operate the different wavelengths that are most commonly used in laser dentistry. For comparison, when a dentist buys an intra-oral scanner, he or she knows exactly what he or she is buying and how he or she is going to use it in a clinical setting and his or her established workflow. I would argue that the learning process is steep and easy. With a laser, however, the dentist can be easily misled because it is a matter of correctly selecting different wavelengths for different treatment possibilities and indications. And once the dentist has found the correct wavelength, he or she still has to choose the correct power settings and so on. The treatment options given by many laser manufacturers often do not correspond correctly to the wavelengths of their laser devices. This, of course, leads to confusion for users, which in turn results in lasers having a bad reputation, and thus to a lower integration into dental care. This is in stark contrast to how it should be with this amazing technology. I think that there are two great barriers to successful use of this unique technology. Firstly, there is a lack of motivation of a lot of dentists to invest in profound evidence-based education and further training, which is exactly what we've been doing at the AALZ since 1992 under the direction of Prof. Norbert Gutknecht. Secondly, dentists probably struggle with finding a balanced financial relation between the high initial investment in a laser system and the number of daily clinical procedures that they are looking to carry out with it in order to recoup the investment.

> "As a direct consequence, the newly established ISLD took important steps towards creating greater transparency."

This year, RWTH Aachen University was named a University of Excellence again. What are the associated benefits for aspiring laser dentists looking to begin their studies there?

With the latest approval by the German Federal Ministry of Education and Research in June 2019, RWTH Aachen University ranks once again among the eleven German universities that comprise the Universities of Excellence. This means that it will now be funded again for a period of at least seven years, receiving some of the annual amount of more than €500 million. With these funds, RWTH Aachen University is able to invest an awful lot in its different clusters of excellence and stay on top of research rankings not only in Germany but in the whole world. For us at the AALZ, this means that we are able to offer both a two-year Master of Science course and a one-year Master of Science course, in cooperation with RWTH International Academy, which both follow the highest scientific and educational standards possible. Since the educational market for master's programmes is not a regulated one, it might be very difficult for some dentists to figure out which such programmes in laser dentistry offer true scientific value and are recognised on an international level. The AALZ Master of Science in Lasers in Dentistry course has been approved and facilitated by RWTH Aachen University since 2004, and we can confidently say that the AALZ has since become the first German institution to provide education and further training in laser dentistry which is internationally recognised by academic institutions for its high scientific and educational value.

You are professionally involved in many projects in Latin America. Could you please elaborate on these? What distinguishes the Latin American laser market from the European one?

The biggest difference is that, in Latin America, laser technology has only been used more extensively for four to five years compared with Europe, with the exception of some laser pioneers, of course. Only in Brazil have lasers been used for a longer period. However, the market there was initially rather limited to diode laser systems, and within that to single-diode low-level laser therapy in particular. About three years ago, the AALZ started to expand its educational offering to Latin America, and as a result, we are now seeing a rapid increase in the number of users of this amazing technology in the various countries of Latin America. However, the laser market of the Latin American countries there is still rather virgin in comparison and most of the laser manufacturers are not yet really present there. Dentists in Latin America are very open-minded regarding new technologies and they are particularly looking to invest in laser technology. However, the prices are still very high, even for diode lasers. This naturally creates a barrier to investing in laser technologies for dentists. The import regulations and tariffs create far higher prices than in Europe. The prices for erbium lasers, for example, are horrendous. However, it is obvious to me that dentists in Latin America see the potential of dental laser technologies and that they are becoming increasingly ready to invest in laser therapy. The ALAIO [Academia Latinoamericana de Innovaciones en Odontologia], which is the AALZ's representative academy in Latin America, is working very hard under my guidance to offer our unique AALZ laser education and training systems in the entire region of Latin America.

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BLOOD CONCENTRATE DAY

The application of blood concentrates in regenerative and general dentistry

On 11 September 2020, the Blood Concentrate Day will be held at Goethe University Frankfurt am Main in Germany. The objective of the conference, hosted by the Blood Concentration Academy (BCA) under the scientific direction of Prof. Shahram Ghanaati and Prof. Robert Sader, will be to further the understanding of autologous blood concentrates and to discuss the numerous application possibilities within the scope of regenerative and general dentistry. Produced from the peripheral blood of patients, today's autologous blood concentrates are commonly used to improve wound healing and relieve pain in a wide variety of clinical indications. The success of dental implants can also be optimised with the aid of bioactive blood concentrates rich in platelets, fibrin and growth factors. In addition, blood concentrates are successfully used as an aid for tooth preservation, making them an effective tool in periodontology. At the first Blood Concentrate Day, it will be discussed in what ways autologous blood concentrates as adjuncts to dental surgery contribute to the current trend towards a biologisation of bone and soft tissue within the context of modern dentistry.

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Note: The final programme will be available in early 2020.

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My practice, my future—current trends on trial

Dr Stefan Grümer, Germany

Under the theme “My practice, my future—current trends on trial”, the 2019 German Dentists’ Day (Deutscher Zahnärztetag) was held at Congress Center Messe in Frankfurt am Main on 8 and 9 November. In keeping with the congress theme, the German Association for Laser Dentistry (Deutsche Gesellschaft für Laserzahnheilkunde–DGL) again hosted a session on the current trends in laser dentistry this year.

The conference room Symphonie 2 was occupied almost up to the last seat when Dr Rene Franzen kicked off the lectures with a talk on the physical principles of dental lasers. He introduced the attendees to this complex and challenging topic in his own unique and entertaining way and shared numerous examples taken from everyday life. It could be seen that some attendees experienced moments of enlightenment whilst listening to the opening lecture. As a replacement for DGL President Prof. Norbert Gutknecht, DGL treasurer Dr Stefan Grümer delivered a presentation on laser-assisted implantology, in which he explained how the therapy spectrum can be widened through the purposeful use of different wavelengths. He also presented ways in which dentists can make their implantological treatments simpler, faster and less stressful by utilising dental lasers. In addition, he discussed a laser-assisted concept for the treatment of peri-implantitis, which is currently being clinically tested and which is expected to possibly establish itself as the golden standard in the future, owing to excellent and promising first results.

Thereafter, Prof. Andreas Braun spoke about laser-assisted endodontics. He presented research findings that also indicate a clear trend towards the adjuvant use of dental lasers, since it allows for a significant extension of the zone which is therapeutically accessible in the complex endodontic canal system. He argued that endodontic treatment can be improved significantly in terms of safety and predictability by the selective effect of lasers. Afterwards, Dr Olaf Oberhofer, a long-standing member of the DGL Advisory Board, shared his insights on the periodontological therapy concept that he employs in his own specialist practice. He argued that successful periodontal regeneration can only be achieved, if various laser systems become an indispensable part of the treatment sequence. The last lecture of the morning was delivered by Dr Johannes-Simon Wenzler from RWTH Aachen University, who presented the latest research results on “laser and photo-acoustics”, an innovative form of endodontic therapy. Cavitation forces triggered by the use of erbium lasers inside of the root canal have proven to be an excellent modality for cleaning and disinfecting the canal system not only *in vitro*, but in clinical studies as well—especially in accessory and lateral canals, which are usually difficult to access. Here, too, a trend towards making endodontics easier and more predictable by means of lasers could be seen. The whole session was met with broad approval from the attendees, who did not shy away from asking in-depth questions after each lecture. This proved again that laser technology is among the major trends that will contribute to furthering the advancements of dental practices.

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Master of Science course "Lasers in Dentistry" offered in 2020

The University of Excellence, RWTH Aachen University, has been offering the accredited postgraduate "Lasers in Dentistry" Master of Science programme in collaboration with the AALZ Aachen Dental Laser Center and RWTH International Academy since 2004. In 2020, the programme aimed at dentists who want keep pace with their patient's wishes for innovative and gentle treatment methods will be offered again in Aachen.

In standard academic studies in dentistry, the use of dental laser technology and laser-assisted treatment concepts are usually not part of the curriculum. Building on a university degree in dentistry, the two-year extra-occupational M.Sc. course teaches the necessary professional knowledge for laser applications in the dental practice at the highest academic level in theoretical and practical modules. The most important theories and application options regarding the use of lasers in dentistry are taught. Participants obtain sound theoretical knowledge in lectures and seminars led by renowned and experienced international researchers and practitioners. Skill training sessions, exercises, practical applications, live surgeries and workshops with intensive assistance from scientific associates with doctorates guide participants towards the successful and professional use of dental lasers in their own surgeries.

AALZ
Aachen Dental Laser Center

During the ten modules, students remain in ongoing contact with the RWTH Aachen University and the lecturers between attendance days via an e-learning system. This allows established dentists to remain active in their surgeries while completing their Master's degree. Participants receive a certificate for every module that they pass. Students complete the Master course by handing in a Master thesis in which ten clinical cases are presented and discussed. On graduation day, the RWTH Aachen University confers the Master of Science (M.Sc.) degree. In addition, graduates receive a Diploma Supplement from RWTH Aachen University upon completing the programme.

What you can expect:
- Different laser systems from leading manufacturers with all available wavelengths are offered for skill training and practical exercises
- Instructions for the correct handling of lasers and the subsequent practical use
- Surgeries on human patients carried out live right in front of the students
- Necessary organic materials and laser safety goggles are provided for students to practice independently
- Specialist literature is available for students to fully immerse into the subject
- Students are trained to become certified laser safety officers
- Certificates with ECTS credit points are given out upon successfully finished modules
- Comfortable learning environment thanks to state-of-the-art seminar rooms
- Master's degree certificates are legitimised by apostilisation for applications abroad

The 2020 instalment of the M.Sc. course "Lasers in Dentistry" will start on 17 September 2020. For more information, visit www.aalz.de or contact info@aalz.de.

contact

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Soft drinks—crucial link between

Obesity and tooth wear

The premature wearing of teeth due to dietary or gastric acids is the third most common dental condition after caries and periodontal disease. A new study by scientists from King's College London has shed more light on the topic of tooth wear in relation to obesity, exploring how the consumption of sugar-sweetened acidic drinks is a common factor in obesity and tooth wear among adults. The scientists drew on data from the National Health and Nutrition Examination Survey 2003–2004 and analysed the body mass index and level of tooth wear of 3,541 patients in the USA. The intake of sugar-sweetened acidic drinks was recorded through two non-consecutive 24-hour recall interviews during which the patients were asked to provide details of diet intake across the two days. The results indicated that the consumption of sugary soft drinks is a major cause of dentine and enamel erosion in obese patients. The study, "Obesity and tooth wear among American adults: The role of sugar-sweetened acidic drinks", was published online in October 2019 in *Clinical Oral Investigations*.

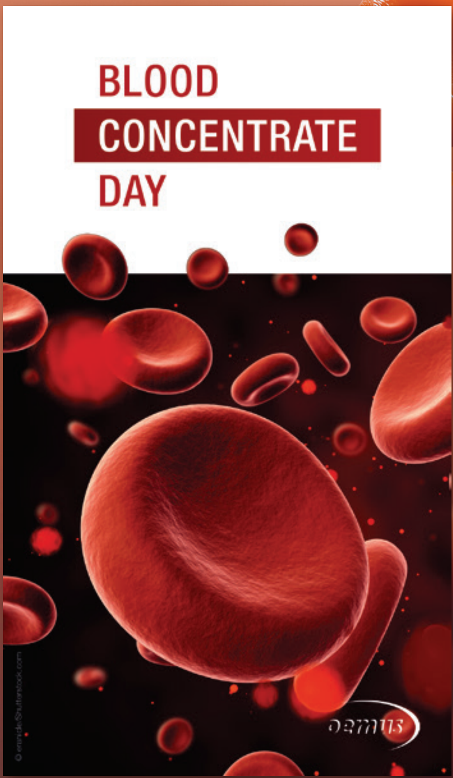
Source: DTI

The 18th ISLD World Congress

To be held in Cairo in 2020

Following the great success of the congresses in Aachen, Germany, in 2018 and Plovdiv, Bulgaria, in 2019, the board members and the general assembly of the International Society for Laser Dentistry (ISLD) have decided to make Cairo the destination for the 18th ISLD World Congress, to be held from 1 to 3 October 2020. Application for the dental event in Egypt is now open. At the congress, attendees will have the opportunity to experience high-rate lectures and presentations from the most prominent researchers in the field of laser dentistry, participate in numerous workshops and engage in enlightening conversations with other laser enthusiasts from around the world. In addition, there will be an industry exhibition featuring the world's leading dental laser manufacturing companies. Compared to the 2019 congress in Plovdiv, the ISLD is expecting even more participants and researchers to attend the event in Egypt, which is why the number of tickets is restricted. Further information on the upcoming event hosted by the leading expert society worldwide for laser dentistry and the registration can be found online at www.isldcairo2020.com.

Source: ISLD



Blood Concentrate Day

To be held in September 2020

On 11 September 2020, the first Blood Concentrate Day will be held at Goethe University Frankfurt am Main in Germany. The objective of the conference, hosted by the Blood Concentration Academy (BCA) under the scientific direction of Prof. Shahram Ghanaati and Prof. Robert Sader, will be to further the understanding of autologous blood concentrates and to discuss the numerous application possibilities within the scope of regenerative and general dentistry. Produced from the peripheral blood of patients, today's autologous blood concentrates are commonly used to improve wound healing and relieve pain in a wide variety of clinical indications. The success of dental implants can also be optimised with the aid of bioactive blood concentrates rich in platelets, fibrin and growth factors. In addition, blood concentrates are successfully used as an aid for tooth preservation, making them an effective tool in periodontology. At the first Blood Concentrate Day, it will be discussed in what ways autologous blood concentrates as adjuncts to dental surgery contribute to the current trend towards a biologisation of bone and soft tissue within the context of modern dentistry. For more information on the event visit **www.abc-day.com** or contact **event@oemus-media.de**.

Source: OEMUS MEDIA

TV linked to sugar consumption and

Rotten teeth in children

A new study discovered that young people are a third more likely to eat sugary foods (33 %) and significantly more likely to have decaying teeth (39 %), if they watch over 90 minutes of television each day. More than one in two (53 %) children watching television for more than 90 minutes a day have some form of tooth decay. Youngsters who eat sugary foods while watching TV are also more than twice as likely to have decaying teeth than those who choose to avoid them. Dr Nigel Carter OBE, CEO of the Oral Health Foundation, believes there needs to be a change in the snacking culture around television: "There is a clear relationship between the time children spend watching television and how much sugar they are consuming. As a population, our children are having too much sugar too often and it is leading to unacceptable rates of tooth decay." The study, titled "The influence of television on the food habits of schoolchildren and its association with dental caries" can be accessed online at doi.org/10.1002/cre2.244.

Source: Oral Health Foundation

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