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25 years of DGL!



Prof. Dr Norbert Gutknecht

Dear DGL members and fans of laser technology,

Be aware: while leafing through this issue of *laser international magazine of laser dentistry* you will encounter indications and laser systems that, 25 years ago, the DGL founding fathers would not even have dreamt of.

These include blue-light diode lasers in dental surgery, radial firing tips in endodontics, the combination of wavelengths of the near and medium infrared range in periodontology as well as special treatment concepts in paediatric dentistry and modern marketing strategies for adapting laser economically to the dental practice.

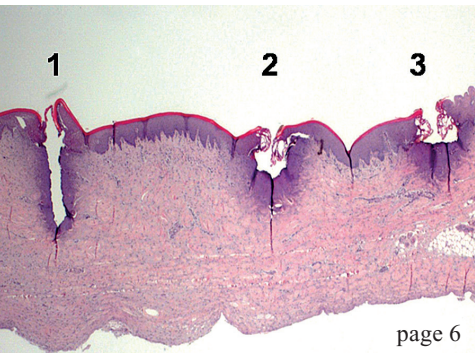
When the first DGL Congress was held in Stuttgart/Germany in 1991, speakers and participants only discussed one specific wavelength, the Nd:YAG laser. People were fascinated by the possibility that laser light was transported via quartz fibre to the root canal and periodontal pockets. Those were the days of dental pioneers, going from trial and error to success and failure in quick succession.

The development of laser technology, the discovery of new wavelengths, the establishment of training programmes and the integration in the German Society for Dental and Oral Medicine (DGZMK) prompted the DGL to become today's society for laser dentistry. We now feature high academic standards, distinct treatment concepts for laser application in the dental practice and, most importantly in my opinion, a congress platform which discusses all available laser systems and indications objectively.

For all of the above reasons, I hope you will enjoy both reading our current issue of *laser international magazine of laser dentistry* as well as attending our anniversary congress in Munich.

Yours faithfully,

Prof. Dr Norbert Gutknecht



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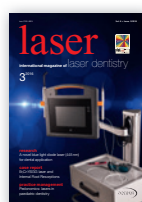
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A novel blue light diode laser (445 nm) for dental application

Biomedical testing and clinical aspects

Authors: Prof. Dr Matthias Frentzen, Dr Dominik Kraus, Dr Joana Reichelt, Dr Christoph Engelbach, Dr Claudia Dehn & PD Dr Jörg Meister, Germany

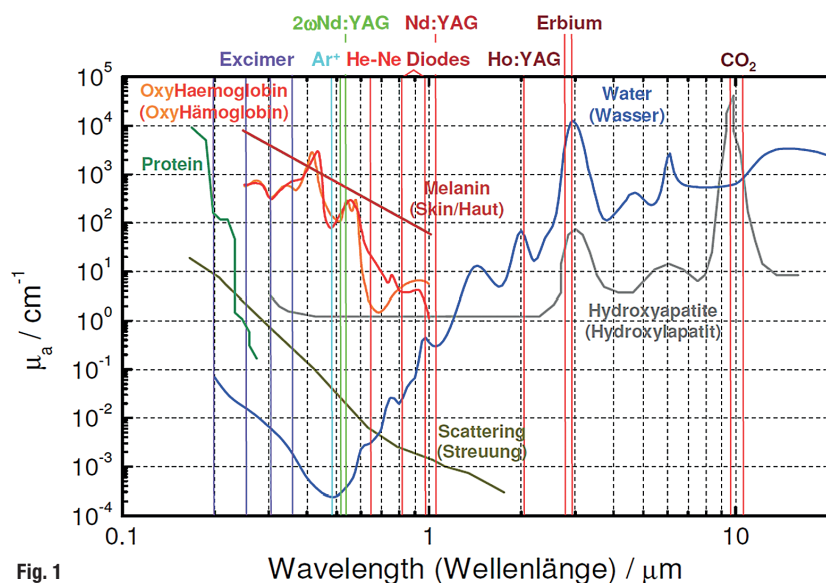


Fig. 1

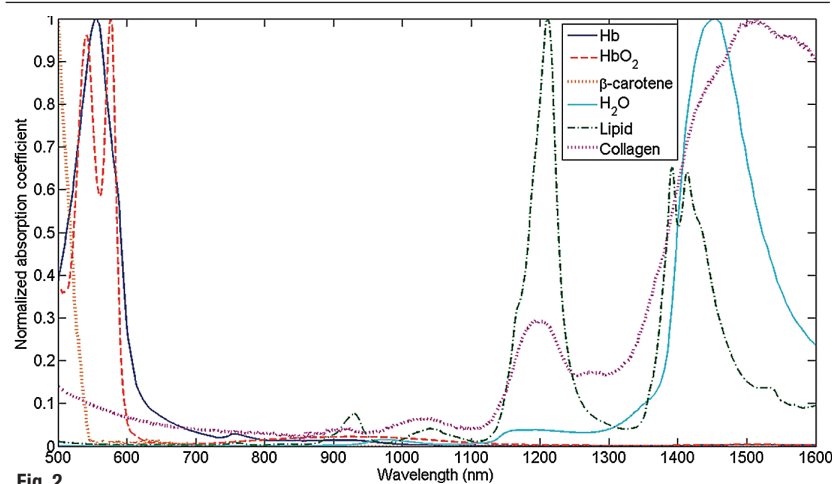


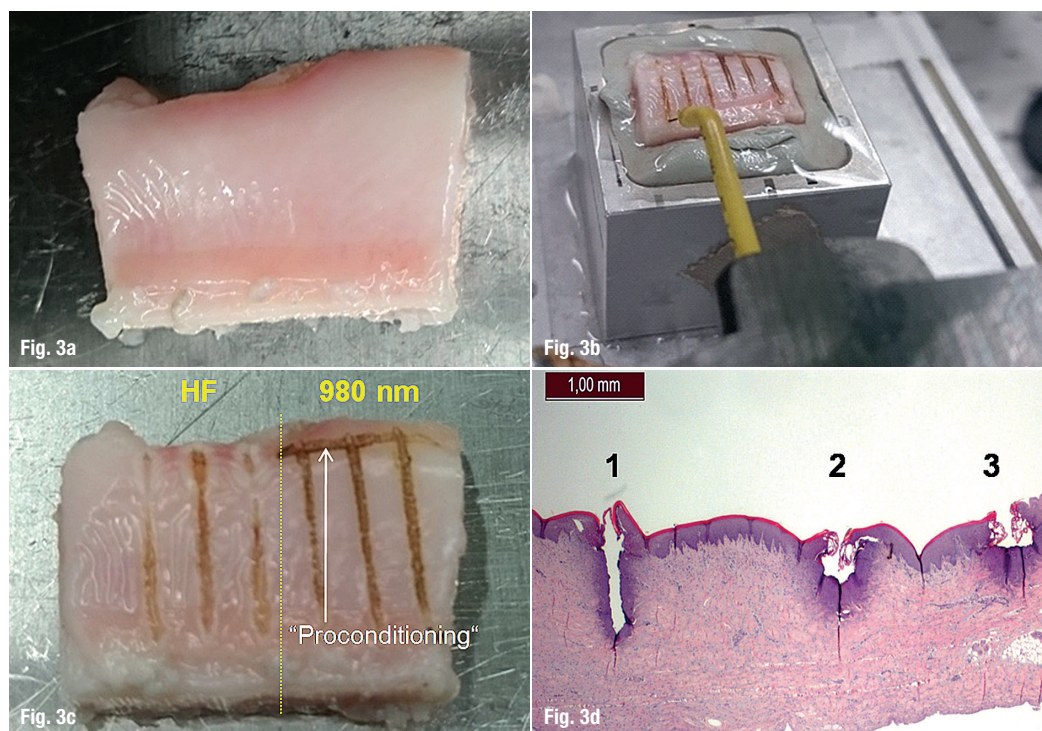
Fig. 2

The 445 nm laser represents an innovative extension to the already established diode laser systems. Improved cutting performance at a lower power level while retaining the advantages of the use of diode lasers for the treatment of oral soft tissue means that this is a further development in addition to the infrared systems with no apparent disadvantages.

Introduction

In the last ten years, diode lasers—primarily in the near infrared spectrum (NIR, 800–1,000 nm)—have become established in dentistry on evidence-based fundamentals for surgical indications.¹ They are used primarily for the cutting and removal of oral soft tissue but also for the disinfection of gingival pockets^{2,3} and root canals.⁴ From a technical point of view, this technology is not particularly error-prone or expensive compared to gas or solid-state lasers and, when used correctly, the side effects can be easily assessed from the clinician's perspective.⁵ The further development of laser diodes has enabled an expanded emission spectrum. As a result, laser application systems that emit in the blue light region are technically feasible nowadays.⁶ From a biomedical point of view, these wavelengths provide significant advantages while maintaining an established technology. Blue light is already used clinically in a large number of medical indications.^{7,8} As a result of the radiation

Fig. 1: Overview of absorption constants for different biological materials at different wavelengths. – **Fig. 2:** Absorption constants in the range of 500 up to 1,000 nm of soft tissue structures (according to 25).



Figs. 3a–d: Test setup for the implementation of standardised gingiva incisions:
a) gingiva sample (mandibula, soft tissue and bone/pig);
b) sample fixed on the optical bench;
c) example of irradiated sample (HF versus 980 nm, 3W cw, 5 mm/s);
d) histological section of Fig. 3c (HE-staining), 1: HF surgery, 2 & 3: laser 980 nm, 3W, cw.

output available up to now, surgical applications of the blue light lasers have not yet been realised to a significant extent. However, approaches to this have already been available in literature for a number of years.^{6,9}

The modification of diode laser technology in dentistry towards systems with emission in the blue light spectrum can open a large number of advantages in comparison to the established diode laser technology in the NIR as a result of the biophysical properties. This includes, among others, a huge working effectiveness at considerably lower power settings. Because of this, for instance the side effects can be reduced considerably. Furthermore, there is a favourable effect on wound healing.¹⁰ Antimicrobial effects are highly exceeded in comparison with infrared radiation and promote an effective disinfection of contaminated tissue areas.^{11–13} In this way, the blue light may prevent wound infections. Clinical experience with radiation in the region of 450 nm is already available in many disciplines of medicine without any disadvantages of these wavelengths.^{14–16}

Biophysical properties of 445 nm laser radiation

The possible use of a laser application system with an emission wavelength of 445 nm for surgical procedures on oral soft tissues (incision/excision as well as bacterial decontamination and haemostasis) requires a high level of absorption of the radiation used in these tissues to work effectively. These are primar-

ily well perfused gingival tissues of the oral mucosa including the subepithelial connective tissue. Examples are the free gingiva, attached gingiva, alveolar mucosa, buccal mucosa, palatal mucosa, and mucosa of the tongue.

The absorption constant for a wavelength of 445 nm shows a high level of absorption in melanin and haemoglobin (Fig. 1). Furthermore, the absorption in collagen also increases significantly in the wavelength range of blue light (Fig. 2). Absorption in water, however, is lower compared to conventional NIR surgical diode lasers. In addition, scattering in the blue light spectrum also increases (Fig. 1). These biophysical effects mean that, in comparison to the infrared diode lasers, the working effectiveness may be considerably higher at the same power settings as a result of the huge increased absorption in the tissues. With regard to tissue vaporisation, intensive absorption may improve cutting effects. The increased level of absorption in comparison with conventional diode lasers could lead to a reduction of the thermal side effects outside the work area. The specific absorption constants related to blue light are therefore a basis for an effective limiting of biological side effects outside the radiation field.

The absorption of light at 445 nm in water is low. This means that, during surgical procedures, the radiation energy is almost completely transmitted through the non-pigmented mucin layer. Therefore, the cutting procedure starts immediately; there is no need for a so-called initialisation of the incision needed in cases by using diode lasers in the NIR.

The biophysical effects of blue laser radiation therefore favour the effective ablation of tissue from the beginning. Transmission properties and thermographic investigations confirm these observations: Transmission through agar layers of 3 mm thickness is approximately 80% at 445 nm, independent of the laser power from 100 mW to 1 W for irradiation periods between 5 and 20 seconds. The increase in temperature in this layer cannot be measured when the laser power is 100 mW, with a laser power of 1 W, a temperature increase of $\Delta T = 2^\circ\text{C}$ could be observed. In contrary, in blood agar, high absorption ($> 98\%$) and temperatures were measured. The comparison of the biophysical properties of laser radiation between diode lasers with wavelengths of 445 nm and 810–980 nm shows that in both cases photothermal effects are responsible for the laser-tissue interaction. On the basis of the laser settings that are technically possible, no non-linear effects, for example the formation of plasma, are assumed. The different absorption constants, however, support the vaporisation

of oral soft tissue at 445 nm in comparison with IR lasers at 810 nm and 980 nm.

In vitro investigations using a 445 nm diode lasers

Preparations from pig jawbones are particularly suitable as a model system for the investigation of the effects after laser irradiation under *in vitro* conditions. The macroscopic structure, the dimensions and the histological structure are very similar to human tissue so that valid statements can be made.^{17–22} Gingiva preparations obtained from the vestibular mandibles of freshly slaughtered pigs were used for the investigation of the cutting effectiveness and histologically analysis of side effects during tissue preparation. They consisted of a rectangular segment of bone covered with gingival tissue (Fig. 3a). These samples were stored in physiological saline solution and were fixed to an optical bench immediately after removal (Fig. 3b). This bench was equipped with a linear micro-

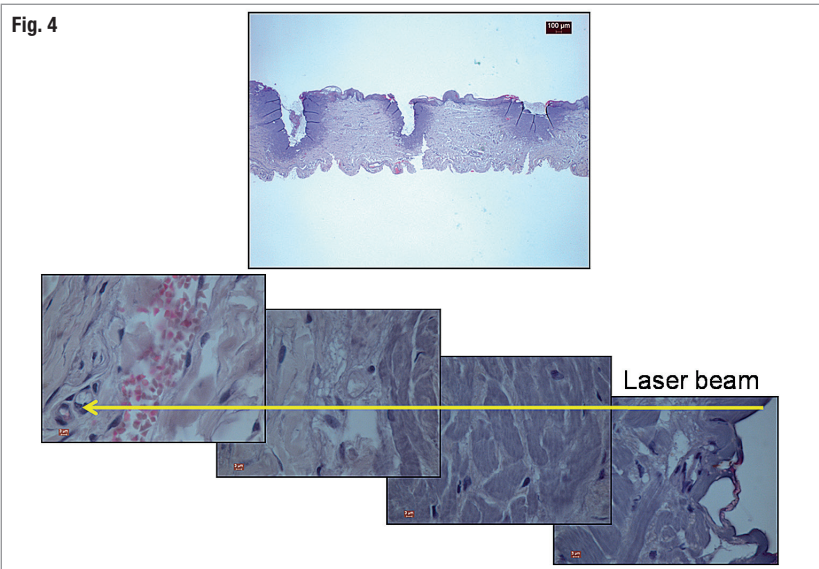
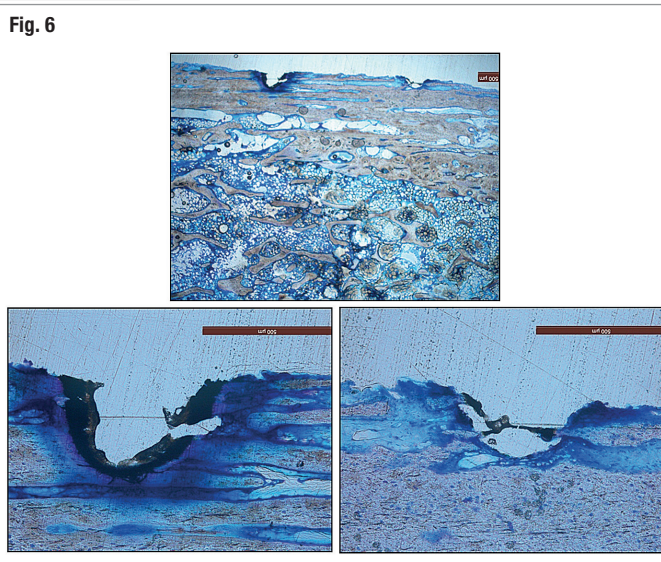
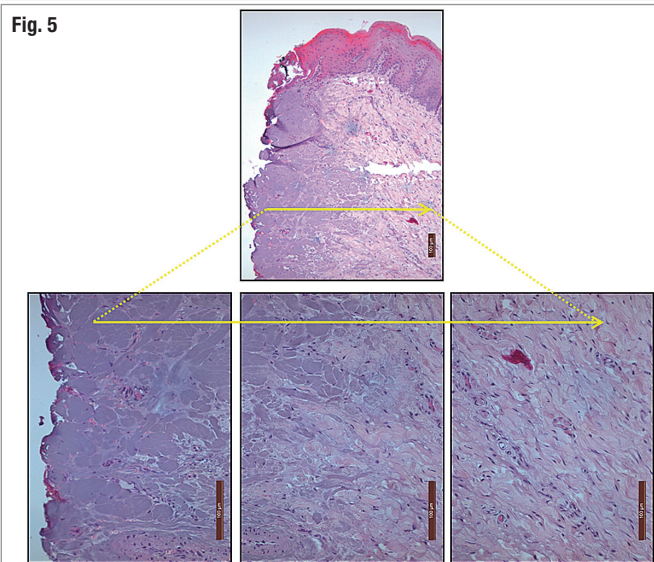


Fig. 4: Ex vivo sample from pig gingiva after 445 nm laser incision (2W, cw). The high resolution photo collage shows that, starting from the surface, the morphology of the tissue has been preserved with a thin carbonisation film. No vacuolar structures and bleeding into the connecting tissue were detected. The incision edge is covered by a very small carbonisation layer. – **Fig. 5:** Detailed images of the subepithelial connective tissue after incision with 445 nm/2W, cw. An undermined blistering (tissue destruction) in the area of the lamina propria as is known with the 980 nm is only very slightly pronounced. The micromorphology of the tissue is preserved underneath the cutting level despite increased staining; no tissue haemorrhage was detected. – **Fig. 6:** Histological thin section after irradiation of a pig jawbone specimen using a 980 nm diode laser (2W, cw, left) and using a 445 nm diode laser (2W, cw, right), undecalcified thin section, staining: toluidine blue. With 980 nm, wide carbonisation zone with surrounding necrosis; with 445 nm, narrow carbonisation and necrosis zones.



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Figs. 7a–c: Test setup and examples of the monolayer culture as well as the fluorescence detection of cytoskeletal changes and DNA double strand breaks:

- a)** sample mounted on a xyz-translation stage;
- b)** sample holder with coverslip;
- c)** laser incision of the monolayer with a 445 nm diode laser (2W, cw), thermal effects at the central irradiation zone (staining HE);
- d)** staining of the cytoskeleton after 445 nm laser irradiation with fluorophore conjugated phalloidine; no adverse effects (Alexa Fluor phalloidin, DAPI);
- e)** immunofluorescence microscopy: DNA double strand breaks characterised by red fluorescent foci (p-H2aX) occurs only after UV-irradiation as positive control.

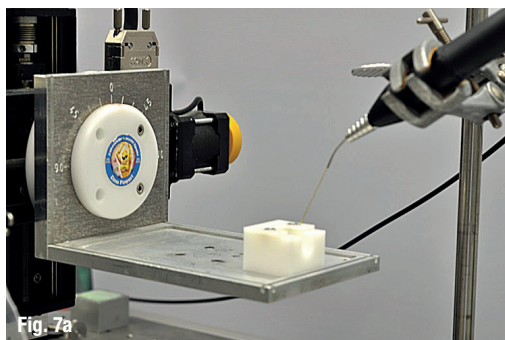


Fig. 7a

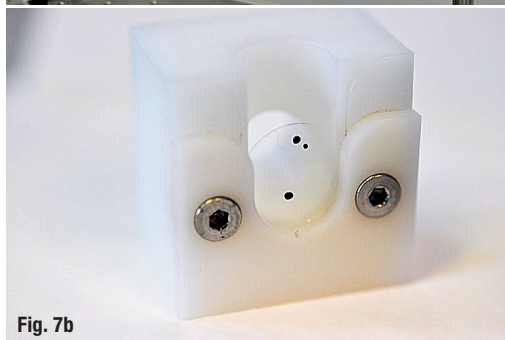


Fig. 7b

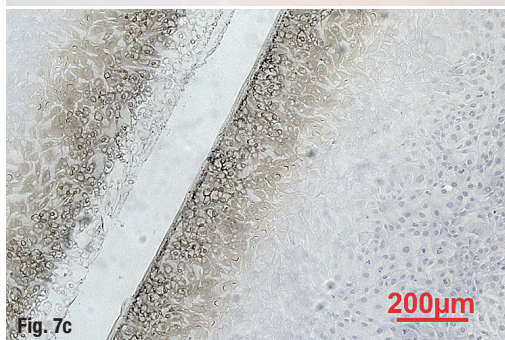


Fig. 7c

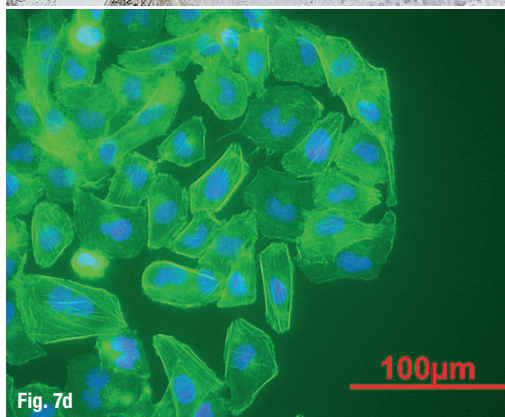


Fig. 7d

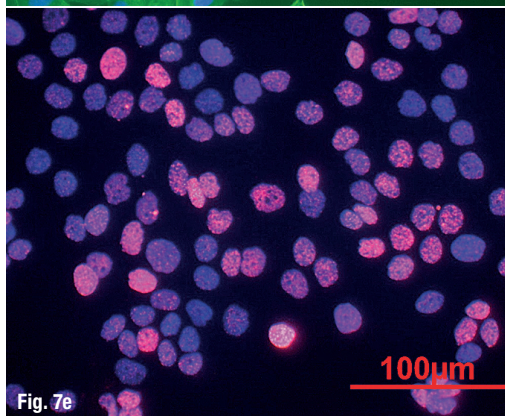


Fig. 7e

positioner that had been set to a feed rate of 1 and 5 mm/s to simulate constant cutting speeds. These cutting speeds were chosen to cover the spectrum of conventional laser applications. The specimens were irradiated using the same laser application system (diameter 320 μm) both with a wavelength of 445 nm and also with a 980 nm diode laser in contact mode. Linear incisions were carried out starting from the starting line that had been marked beforehand. The incisions were carried out with a 445 nm laser with a power of 1.5 and 2 W continuously and with a 980 nm laser with a power of 3 W in the same mode. Incisions that had been made additionally with a scalpel and with HF surgery served as references (Fig. 3c). From the gingiva of this sample, after removal of the soft tissue from the bone substrate, paraffin sections in HE-staining were examined under a light microscope (Fig. 3d).

The comparative histological evaluation of the specimens led to the following results:

1. The histological changes in the cutting area at wavelengths 445 nm and 980 nm are qualitatively identical.
2. The width of the coagulation zone and the cutting depth depends on the cutting speed (for both wavelengths and their parameters).
3. The width of the coagulation zone is, at the same cutting speed, larger at 980 nm compared to the 445 nm. With 445 nm, the width of the coagulation zone increases with rising power, in particular at a low cutting speed.
4. At a high cutting speed, the cutting depth is the same for 445 nm at 2 W and 980 nm at 3 W (output power).
5. The width of the coagulation zone is smaller with all 445 nm parameters than with 980 nm.
6. The HF surgical procedure led to histological results that are comparable with 980 nm.

With regards to "freehand" ex vivo procedures in pigs, 445 nm incisions (2 W, cw) demonstrated good cutting effectiveness and haemostasis for incisions of different depths (Fig. 4). Tissue vaporisation begins immediately after activating the laser. The working area remained clear due to haemostasis. The histological analysis (Fig. 4) shows three surgical incisions with differing depths. No mechanical effects (clefts/tissue deformation) were observed. The carbonising layer on the tissue surface treated is very narrow (approx. 1 μm). Around the incision, a zone of increased staining, which was clearly differentiated from the unchanged tissue, appeared. No undermining blistering was noted in the epithelium in the area of the cutting edge. The morphological structure of the tissue beneath the incision area is preserved despite the increased discolouration. Vessels in this area display no ruptures (Fig. 5). No red blood cells were detected outside of the vessels in the tissue.

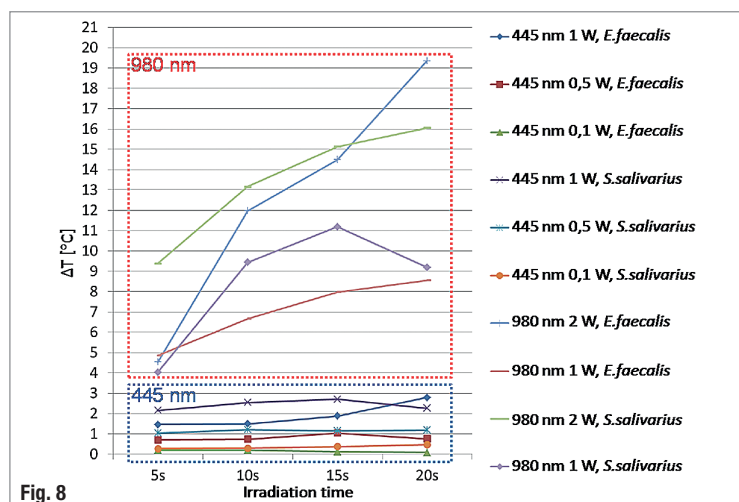


Fig. 8

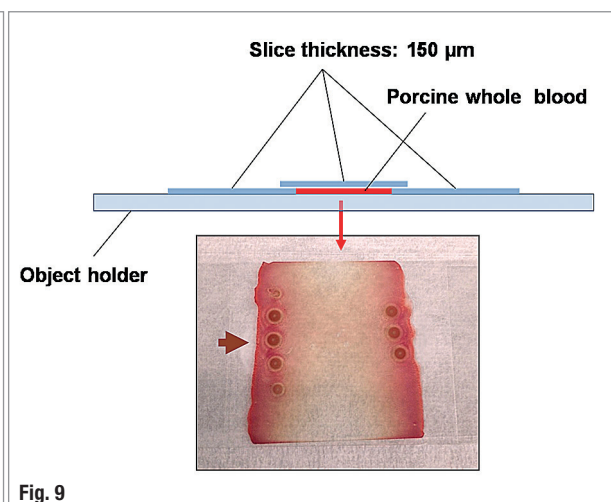


Fig. 9

In summary, it can be stated that, under "freehand" conditions ex vivo, only minimal carbonisation of the tissue was detected. Although the structures beneath this layer showed stronger histological staining, the tissue morphology was completely preserved. There is no detectable evidence of ruptures in the tissue or in the vessels. The results from these experiments indicate that the cutting efficiency at 980 nm with 3 W output power is at most about the same compared to the 445 nm at 2 W output power. The thermal damage zones and the proportion of carbonised tissue in the region of the cut appear more extensive when using 980 nm. In addition, the area of destruction of the epithelium (detachment of sub-epithelial connective tissue) lateral to the incision is larger when using 980 nm. The histological results correspond with the available literature when using 980 nm.

Irradiation of bone samples also show a considerably more pronounced carbonisation and necrosis zone with 980 nm compared to 445 nm (980 nm at 2 W, cw; 445 nm at 2 W, cw; Fig. 6). With NIR radiation, there is incineration on the surface with a pronounced carbonisation layer. It is connected to a wide necrosis zone. When comparing with the same cross-section specimen with 445 nm, there was a narrow carbonisation zone on the surface with an equally narrow necrosis zone beneath it.

Cell culture trials

Diode lasers primarily induce thermal effects. However, regarding to a wavelength of 445 nm, only a few reports of the effect of laser radiation at the cellular level are available. The goal of cell culture studies therefore was to investigate the interaction effects of this radiation in comparison with the established IR infrared lasers. First, it was to be investigated whether the wound healing behaviour after laser application of 445 nm and 980 nm differed from that from mechanical interventions. Furthermore, it was to be in-

vestigated whether this laser radiation leads to specific cell damaging effects.²³

For the simulation of oral soft tissues, HaCaT and MG-63 cells as monolayer cultures on cover slips were irradiated by diode lasers of wavelengths of 445 nm and 980 nm with power settings of 2 and 3 W in continuous wave operation (Figs. 7a–d). For the simulation of a surgical incision, linear irradiation with a defined traverse speed (3 mm/s) and a defined distance to the monolayer culture (1 mm) was applied. As reference, a mechanical wound was made with the laser application tip without the laser being activated (Figs. 7a–d). After irradiation, the morphology of the cells was documented using HE staining and the wound healing behaviour was assessed by light microscopy. The occurrence of cytoskeleton alterations and DNA double strand breaks after irradiation was analysed by using fluorescence staining (phalloidin, p-H2AX; Figs. 7a–d).

Using the 445 nm wavelength, thermal coupling occurred already at a power of 2 W, whereas at 980 nm this effect required a minimum output power of 3 W and a pigmented marking. Thermographic analysis indicated a considerably higher temperature increase on the monolayer surface during irradiation with 445 nm (> 400 °C) in comparison with 980 nm caused by the increased absorption of cells at 445 nm. The healing process of the lesions for both laser wavelengths in the monolayer are comparable to the mechanical injury (Figs. 7a–d). There was no evidence of an increased occurrence of double-strand breaks for both laser systems.²³ In contrast to UV irradiation as a reference, laser irradiation with both wavelengths did not increase the risk of DNA damages as an indicator for genetic risk (Figs. 7a–d).

Antimicrobial effects

For many indications, an antimicrobial effect has also been attributed to laser irradiation of differing

Fig. 8: Temperature increase ΔT (°C) after irradiation of cultures of *E. faecalis* and *S. salivarius* in agar plates at identical conditions with a 445 nm laser and a 980 nm laser in cw mode. The 980 nm laser causes a significantly higher temperature increase.

Fig. 9: Haemostatic effects of 445 nm laser irradiation. Coagulation of porcine whole blood (0.1 W, cw/non-contact mode, fiber to object distance 10 mm).

wavelengths. The basis for these effects are thermal and photochemical effects, e.g. known from aPDT (antimicrobial photodynamic therapy). This effect has been recognised for a number of years for NIR laser irradiation.

Studies in basic medical research have shown that blue light also has an antimicrobial effect.¹¹ As a result, a laser system with a wavelength of 445 nm has a significant potential for antimicrobial effects if such a laser is used within the scope of surgical indications.

Comparative studies were carried out whether the antimicrobial effect of a surgical blue light laser was comparable with the antimicrobial effects of infrared laser irradiation with a wavelength of 980 nm.²⁴ In particular, it was to be investigated whether decontamination of the surgical field with low thermal effects is basically possible. To test this, agar plates were coated with test bacteria (*E. faecalis* and *S. salivarius*) and irradiated with laser light at 445 nm and 980 nm. Identical application systems were used for this purpose. After laser irradiation, the agar was coated with an overlay agar that contained the specific nutrient components for the bacterial growth. Furthermore, the temperature of the irradiated area was measured using a thermographic camera during irradiation. Concerning the temperature change during the irradiation phase, only a small temperature increase had been observed when the laser radiation in the blue light spectrum was used. By contrast, there were significant temperature increases during irradiation with the 980 nm laser (Fig. 8). Under identical test conditions, bactericidal effects were demonstrated in the culture trials by the use of a 320 µm fibre diameter at 445 nm wavelength even at low output power (0.1 W) in non-contact mode.

At 980 nm irradiation, bacterial growth was firstly affected at 2 W output power. The effects were independent from the test species (*E. faecalis* and *S. salivarius*) that were used for this investigation. The results show a very high potential for a possible antibiotic treatment that can be achieved with only low-level stress to the region adjacent to the irradiated area—a maximum 3°C temperature increase in these investigations—in comparison to infrared laser irradiation. These results concur with a number of basic studies that assume a sustained antimicrobial effect of blue light.¹¹⁻¹³ This concomitant effect provides clinically relevant support for the use of a 445 nm laser for surgical indications.¹⁰

Haemostasis

Due to the strong adsorption of blue laser light in haemoglobin, pronounced coagulation effects were expected. To investigate coagulation, porcine whole blood in test samples with a thickness of 150 µm were examined (Fig 9). During irradiation with blue laser light, even with an output power of 0.1 W in cw mode, applied via a fibre with a diameter of 320 µm at an object distance of 10 mm, clearly visible coagulation effects occurred suddenly (Fig. 9).²⁴ These experimental results confirmed the prediction regarding the high haemostatic potency of the new blue light diode laser system (Fig. 1). This effect provides sustainable support to incision and excision procedures, in particular for patients with anticoagulation therapy.

Case report of surgical applications

Based on the existing *in vitro* investigations, a clinical study was required to prove the particular properties of blue light laser radiation in clinical situations.

Figs. 10a–c: Deep crown fracture 45 in a multi-morbid patient; gingivectomy using 445 nm (1.5 W, cw, 320 µm Ø);
a) OP situs before surgery;
b) one week post-op;
c) three months post-op.

Figs. 11a–d: Caries lesion up to the furcation area; adhesive restoration including endodontic treatment using 445 nm (1.5 W, cw, 320 µm Ø);
a) location of the caries lesion,
b) extensive excision of soft tissue, no bleeding after gingivectomy;
c) adhesive restoration after finishing the margin of the cavity (removing of the carbonised layer with hand instrument);
d) situation four weeks after vestibular composite restoration and endodontic treatment.



For this, a monocentric, prospective, randomised, two-arm, observer-blinded study was initiated, in which the effect of blue laser irradiation is compared with the established IR lasers with a wavelength of 980 nm (approval by the Ethics Committee of the Medical Faculty of the University of Bonn, No. 095/15). As part of these investigations, the clinical healing process after laser-based preprosthetic gingivectomies will be evaluated on the basis of a number of clinical assessment parameters. Among these parameters are bleeding on probing (BOP), sulcus fluid flow rate (SFFR), modified gingiva index (MGI), modified early wound healing index (mEHI) and attachment status. The laser parameters for the blue light laser were 2 W, cw and 3 W, cw for the 980 nm laser as these both power settings demonstrated comparable cutting efficiencies in pre-experiments. An identical handpiece with a 320 µm fibre was used for both lasers. Figures 10a–c shows examples of a gingivectomy after a crown fracture in a multimorbid patient (anticoagulants/diabetes). Figures 11a–d demonstrates the exposure of the marginal cavity margin in a patient with extended vestibular caries before root canal treatment. Figure 12 illustrates a comprehensive gingivectomy in a patient with idiopathic gingival hyperplasia.

Preliminary results from this study show that no adverse effects occurred either after the use of the 445 nm laser or after the use of the 980 nm laser. Wound healing was good with both lasers. In all of the cases that have been treated so far, no pain medication was necessary after the surgery. However, the 445 nm laser showed a higher level of cutting effectiveness that led to shorter operation times. Unlike the 980 nm laser, no fibre conditioning is necessary for the 445 nm laser wavelength. Furthermore, working in non-contact mode and periodic cleaning of the application tip improves the treatment outcome. In particular, it was determined that haemostasis was better with the 445 nm laser.

Conclusion

The wavelength of 445 nm displays a high level of direct coupling to tissue during incision or excision that is achieved by the favourable biophysical properties of this radiation. Comparison of the cutting ef-

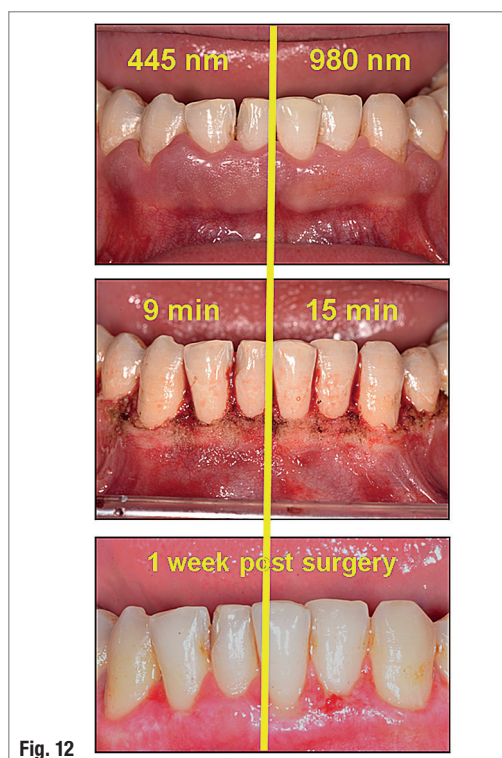


Fig. 12

Fig. 12: Gingivectomy in the lower jaw (idiopathic hyperplasia) using a 445 nm laser (1,5 W, cw, 320 µm Ø) and a 980 nm laser (3 W, cw, 320 µm Ø) in a split-mouth design. Surgical procedure using 445 nm was less time consuming.

fectiveness shows advantage effects with 445 nm in comparison to 980 nm. The consistent results from the histological investigations and the cell culture tests show that with both lasers tested, damage in the sense of an unspecific thermal interaction occurs. Therefore, modification of the emission wavelength of the diode laser does not shift the risk of application. No disadvantages in comparison to the already established IR diode lasers were found. Modifying the wavelength thus represents an advancement with clinical relevance regarding a desired range of indications (incision/excision/disinfection).

contact

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Literature



Er,Cr:YSGG laser and Internal Root Resorptions

Case report of an **endodontic treatment**
using **radial firing tips**

Authors: Dr Miguel Rodrigues Martins, Prof. Dr Manuel Fontes Carvalho, Prof. Dr Irene Pina-Vaz,
Prof. Dr Miguel André Martins & Prof. Dr Norbert Gutknecht, Portugal/Germany

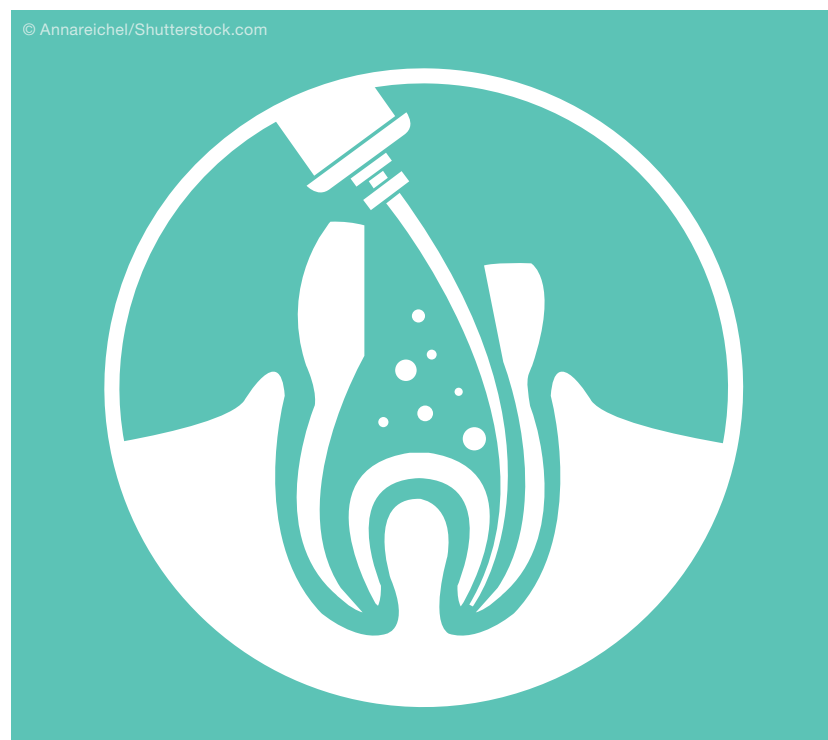
Introduction

Endodontic therapy is the treatment of choice for teeth with apical periodontitis and Internal Root Resorptions (IRR) as it aims to eliminate bacterial contamination, granulation tissue and blood supply of the clastic cells that are commonly reported to be involved with the process.^{1,2}

Sodium hypochlorite (NaOCl) is arguably chosen as primary endodontic disinfection solution. Nevertheless, the ideal concentration, temperature, contact period and extent of clinical effectiveness of NaOCl remains under discussion.³⁻⁶ Moreover, several clinical factors (e.g. root perforations, absence of apical constriction etc.) may accidentally induce NaOCl extrusion into periapical tissues with potentially severe and hazardous consequences.⁷⁻⁹

In spite of this, several clinical strategies were reported with regards to the management of root resorptions,¹⁰ their scientific evidence is limited to case reports and few present alternative disinfection techniques.¹¹⁻¹⁴ Lasers have long been presented as promising alternatives to conventional endodontic procedures.¹⁵ Each laser wavelength has a specific absorption coefficient for every tissue¹⁶ and erbium lasers demonstrate a high absorption coefficient for both water/aqueous solutions and hydroxyapatite.^{17,18} Thus, the rationale for using erbium lasers in endodontics may be briefly described as: (1) the ability of infrared light to interact with aqueous solutions and produce cavitation effects capable to remove smear layer, dentinal debris and filling materials from the root canal walls¹⁹⁻²¹ and (2) the ability of infrared light to propagate into the dentinal tubules, achieving significant bactericidal effects deeper than conventional chemical solutions.^{22,23}

Accordingly, the 2,780 nm Er,Cr:YSGG laser has been reported as an effective method for smear layer



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and debris removal in comparison with EDTA irrigation, hand activation or even ultrasonic activated irrigation,^{19,24,24–27} resulting in a significant clearance of canals/isthmuses prior obturation²⁸ and less microleakage of root canal filling materials.²⁹ Moreover, it has also been shown to be suitable for deep root canal system disinfection and to allow irrigation solutions to travel apically.^{22,30–32} In addition, Er,Cr:YSGG laser irradiation has been shown to produce clinically safe temperature increments along the root canal walls,^{32–35} together with absence of molecular dentine changes, signs of melting or carbonisation.^{18,34,36}

Previously, laser-assisted endodontic protocols consisted of using plain fibres (with a straightforward emission beam profile). Generally, these fibres were placed in the main canal and withdrawn from apical to coronal in a rotating motion. However, such technique is known to be sensitive and to produce inconsistent results.^{18,35,37}

Designed to overcome such limitations, radial firing tips (RFT) present a beam expansion pattern—promoted by the tip geometry—that favours a homogeneous energy distribution along the root canal

wall. In contrast with plain fibres, RFT have been shown to produce consistently relevant *in vitro* results. They are known to spread their energy in the direction of the dentinal tubules,²² to produce lower temperature increments,²⁷ to increase cavitation effects towards the root canal walls without harming periapical tissues,³⁸ to be highly efficient in bacterial and biofilm reduction^{39,40} and to allow irrigating solutions to travel apically by overcoming the airlock effect.⁴¹

Although some clinical studies have demonstrated the potential benefits and long-term outcomes after laser-assisted treatments,^{42,43} there is no mention of any IRR case treated with a laser-assisted technique. The report of distinct clinical cases with long-term follow-ups may be an additional support for an evidence-based proof of concept.

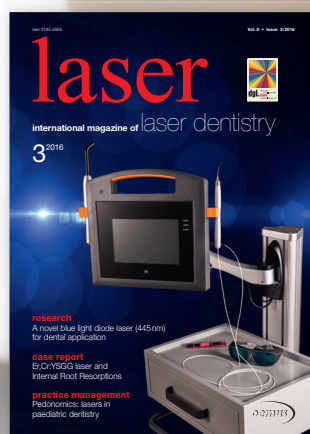
Case report

A 31-year-old female patient presented for consultation, complaining of recurrent swelling and painful episodes related to tooth 11, which had been treated with antibiotic prescriptions over the past few years. The patient's medical history was not con-

AD

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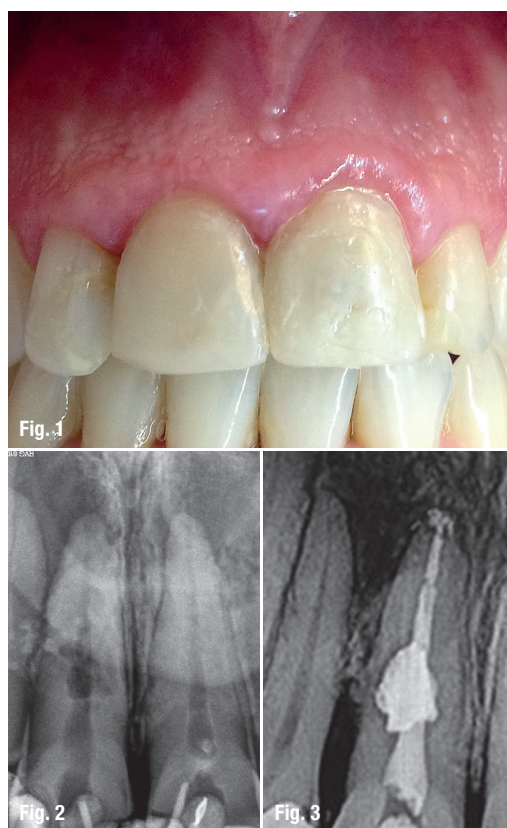
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Fig. 1: Clinical picture demonstrating aesthetic initial appearance of tooth 11.

Fig. 2: Initial radiographic appearance of tooth 11 demonstrating an extensive apical radiolucency and internal root resorption.

Fig. 3: Immediate post-operative radiograph of tooth 11.



tributary. The patient reported trauma to her upper teeth when she was 20 years old. After performing clinical and radiographic examinations, tooth 11 was diagnosed with pulp necrosis with internal root resorption and apical periodontitis. The tooth was slightly tender to percussion, periodontal probing depths were considered normal (< 3 mm), and there was no discoloration (Figs. 1 & 2).

Approval for the study protocol (N_682/068) was obtained. Treatment options were discussed and the required consent obtained (Helsinki Declaration, revised in Edinburgh 2000). No financial incentive was offered (i.e., patient was responsible for the usual root canal treatment fee).

Under local anaesthesia (2% lidocaine with 1:100,000 epinephrine, Scandonest, Saint Maur des Fossés, France) and rubber-dam isolation (Hygenic Non-Latex Rubber Dam, Coltène/Whaledent, Germany), an access cavity was prepared with a high-speed carbide bur (SS White, Lakewood, NJ) and Zekrya Endo burs (DENTSPLY Maillefer, Ballaigues, Switzerland). The working length (WL) was electronically established (Root Zx mini, Morita, USA) as 1 mm short of the biological apex of the root and confirmed by radiography. No bleeding was noted from the root canal. Patency was confirmed with an ISO #20 K-file and root canal preparation was performed with the Protaper system (DENTSPLY Maillefer, Ballaigues Switzerland) up to an F5 (#50.05)

instrument. Root canal irrigation was performed between each file with 3 ml of sterile saline solution (Monoject 27G, Kendall-Covidien, USA). No chemical irrigants or inter-appointment dressings were used.

For smear layer removal and root canal disinfection, a previously reported laser-assisted protocol was adopted.^{42,43} Following root canal preparation, the main canal was filled with distilled water and laser irradiation was performed with the 2,780 nm Er,Cr:YSGG laser (Waterlase MD; Biolase Technology, San Clement, CA) and radial firing Tip (RFT2 Endolase, Biolase Technology; calibration factor of 0.55) which was 270 µm in diameter, with panel settings of 0.75 W, 20 Hz (37.5 mJ), 140 µs pulse, 0% water and 0% air. The tip was placed at the working length and irradiation was performed, approximately, at the speed of 2 mm/s until it reached the most coronal part of the canal. The irradiation procedure was repeated four times: 2x with the canal filled with distilled water (for smear layer and granulation/pulp tissue removal) followed by 2x in dry conditions (to achieve deep dentine penetration and disinfection), with approximately 15 seconds between each irradiation. Afterward, a sterile cotton pellet was placed in the pulp chamber, and the access cavity was sealed with a reinforced zinc-oxide eugenol intermediate restorative material (IRM, DENTSPLY).

At the second appointment after seven days, the patient reported pain, tenderness to percussion and swelling upon questioning. Under local anaesthesia and rubber dam isolation, the canal was re-accessed. The main canal was filled with distilled water and laser irradiation was performed using a 320 µm radial firing tip (RFT3 Endolase, Biolase Technology; calibration factor of 0.85), with panel settings of 1.25 W, 20 Hz (62.5 mJ), 140 µs pulse, 0% water and 0% air. The irradiation protocol was identical to the first appointment. After irradiation, a final rinsing of sterile saline solution (3 ml) was performed, and the canal was dried with sterile paper points, checking for the absence of any suppuration or exudate. Filling was performed with a #50.05 auto-fit gutta-percha cone (DENTSPLY Maillefer, Ballaigues Switzerland) using a down pack-backfill technique (Calamus, DENTSPLY Maillefer) and a resin-based endodontic sealer (Topseal, DENTSPLY Maillefer). Both down pack motion and gutta-percha injection were performed with low pressure and extreme caution due to the root weakness. Radiographic images were taken immediately (Fig. 3) and after one (Fig. 4), two (Fig. 5) and three years (Figs. 6 & 7). Over this follow-up period, the tooth remained completely asymptomatic and periapical healing was noticed.

Discussion

Due to its insidious pathology, the following clinical findings enabled the establishment of the diagnosis of IRR: 44 initial absence of bleeding from the root canal confirming a necrotic pulp, normal probing depth (< 3 mm) and the complete resolution of apical radiolucency after endodontic treatment, followed by the cessation of the progression of resorption.

Given that there is insufficient clinical data supporting the superiority of any chemical irrigation regimen and no guidelines for the management of low-occurrence pathologies such as IRR, case reports may be of special relevance while adequately reporting new disinfection techniques and their clinical outcomes.^{3,45}

The present protocol adopted the use of an Er,Cr:YSGG laser and innocuous irrigants (e.g. saline solution as irrigation and distilled water for laser activation). The decision was primordial based on the assumption that IRR lesions may perforate external root surfaces without being detectable on conventional radiographic images,⁴⁶ and that anatomic variations are known to significantly contribute to the occurrence of sodium hypochlorite accidents.⁴⁷

While trying to achieve significant bacterial reductions, our protocol contrast with that recently reported by Christo et al. which used low concentrations of NaOCl and a Er,Cr:YSGG laser-activation technique. In fact, this protocol has been shown not to improve the antibacterial effects of NaOCl⁴⁸ and, therefore, the activation of NaOCl may seem inadequate for the management of such conditions. In accordance, it was shown that the use of Er,Cr:YSGG laser with relatively high output powers to activate irrigants such as NaOCl or EDTA may result in a high magnitude of pressure changes capable to induce irrigants extrusion during laser-activated irrigation.⁴⁹

In order to obtain adequate microbial control calcium hydroxide (CH) is often recommended for the management of IRR lesions.^{50–52} However, the use of CH as an intra-canal medication consistently fails to present improved clinical outcomes.^{53–55} In the present report we may support that CH medication should not be considered crucial as antimicrobial agent and neither as essential to stop the IRR progression.

In fact, the decision process for not using CH as intra-canal medication during the endodontic treatment of IRR was also supported by the following criteria: (1) no irrigation technique is completely able to remove CH from simulated internal root resorption cavities¹⁴ and (2) the long-term exposure to CH can cause a significant reduction in the mechanical properties of radicular dentine.⁵⁶

Due to their biophysical properties, lasers have long been seen as a promising disinfection tool in endodontics. However, each wavelength demonstrates different biophysical interactions with the main radicular dentine components.¹⁵ The high absorption coefficients in both water and hydroxyapatite may justify the selection of the Er,Cr:YSGG laser ($\lambda=2,780$ nm) for both smear layer removal and disinfection purposes.¹⁸ Conflicting evidence while using other wavelengths can be found consistently.^{57,58}

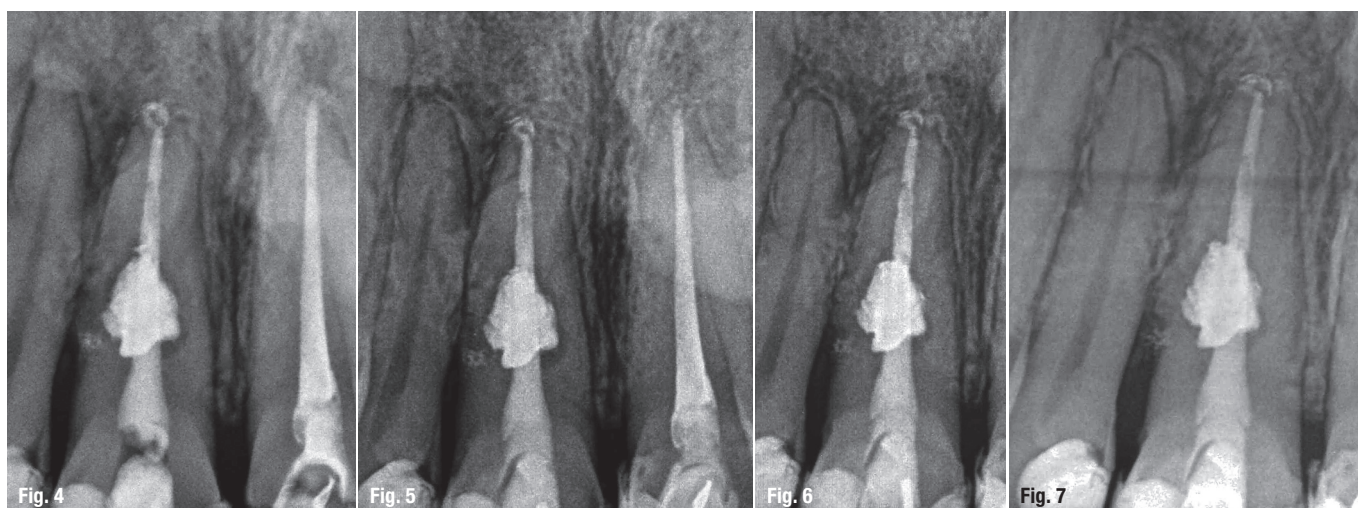
In the present report, the laser protocol consisted in two irradiations with distilled water in the main canal followed by two irradiations in dry conditions, respectively for smear layer removal and disinfection purposes.⁴² The rationale was that in wet conditions the Er,Cr:YSGG laser can promote beneficial cavitation effects inside the main canal without increasing the extrusion of irrigants.³⁸ Moreover, water-mediated cavitation has been shown to be highly effective for the removal of dentin debris in comparison with conventional or passive ultrasonic irriga-

Fig. 4: Twelve-month follow-up.

Fig. 5: Two-year follow-up.

Fig. 6: Three-year follow-up from the mesial direction.

Fig. 7: Three-year follow-up from the distal direction.



tion.^{19,38} Then, to achieve its maximum bactericidal properties, the Er,Cr:YSGG laser should work on a dry canal, allowing the energy to be transmitted deep into the dentinal tubules²² and to instantaneously interact with the water molecules trapped into the bacterial membrane and within endodontic biofilms.³⁹

RFT have been shown to overcome several limitations attributed to bare fibres, distributing the emitted laser energy in a uniform ring-shaped pattern.^{33,59} In similarity with any other innovative root canal treatment strategies, there are few reports demonstrating the prospective, long-term clinical outcomes associated with the use of Er,Cr:YSGG laser, namely with RFT. However, Martins et al. have shown that RFT can be considered predictable as the concomitant use of 3% NaOCl and CH for the endodontic treatment of single-rooted teeth with apical periodontitis.^{42,43} Our findings may provide further evidence that RFT can be considered safe in cases of teeth with wide apical foramina while being adequate to effectively reach all the contours of the resorption lesion.

The prognosis for the conservative treatment of IRR should increase due to the report of alternative endodontic techniques along with the use of new technologies (Al-Momani & Nixon 2013, Khojastepour et al. 2015, Nilsson et al. 2013).^{2,44,46} Therefore, clinicians may consider this laser-assisted technique

while selecting an appropriate endodontic disinfection strategy for the management of IRR.

Conclusion

Despite their intrinsic methodological limitations, the adequate report of single clinical cases may either help the understanding of unusual presentations of common diseases or assist in guiding new treatment concepts into clinical practice.⁴⁵ This case report presents potential benefits towards the use of Er,Cr:YSGG laser and radial firing tips in endodontics. Further randomised clinical trials should be conducted to clearly demonstrate its effectiveness.

Editorial note: A list of references is available from the publisher.

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Kurz & bündig

Im Gegensatz zur konventionellen, lasergestützten Wurzelkanalbehandlung mithilfe einfacher Laserfasern mit einem geraden Emissionsprofil stellt die RFT-Therapie mithilfe radial abstrahlender Faserspitzen eine vorhersagbare und sichere Alternative dar. Die spezielle Geometrie der Faserspitze ermöglicht eine homogene Energieverteilung entlang der Wurzelkanalwand in Richtung der Dentintubuli. Der entstehende Temperaturanstieg fällt geringer aus und die Kavitationseffekte entlang der Wurzelkanalwand werden verstärkt, ohne dass periapikale Gewebe beschädigt werden. Dabei zeigt sich die RFT-Therapie hocheffizient hinsichtlich der Reduktion von Bakterien und Biofilm und ermöglicht es, dass Spüllösungen sich apikal verteilen können.

Diese Eigenschaften der RFT-Therapie belegen die Autoren ausführlich anhand der aktuellen Literatur und stellen zudem selbst einen Patientenfall vor, bei dem diese für die Therapie einer internen Wurzelresorption angewendet wurden. Dies wurde in der vorliegenden Literatur bisher nicht dokumentiert.

Beschrieben wird diese Behandlung bei einer 31-jährigen Patientin ohne auffällige Vorgeschichte. Nach einem Zahntrauma elf Jahre zuvor litt sie unter wiederkehrenden Schwellungen und Schmerzen im Bereich von Zahn 11, bei welchem wir nach klinischer Untersuchung und Röntgenbefund eine Pulpanekrose mit interner Wurzelresorption und apikaler Parodontitis feststellten. Der Zahn war leicht empfindlich gegenüber Perkussion und die parodontalen Sondierungstiefen waren normal (< 3 mm). Verfärbungen wurden nicht festgestellt. Direkt nach der Behandlung sowie nach einem, zwei und drei Jahren wurden Röntgenaufnahmen angefertigt. Innerhalb dieses Zeitraums blieb der Zahn symptomfrei und eine periapikale Heilung setzte ein. Obwohl der vorliegende Fallbericht damit die potenziellen Vorteile der Anwendung des Er,Cr:YSGG-Lasers und radial abstrahlender Faserspitzen in der Endodontie bestätigt, empfehlen die Autoren weitere randomisierte klinische Studien, um diese eindeutig zu belegen.

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New treatment protocol for periodontal pocket treatment

Combination of Er:YAG and Nd:YAG lasers

Author: Kinga Grzech-Lesniak, Poland

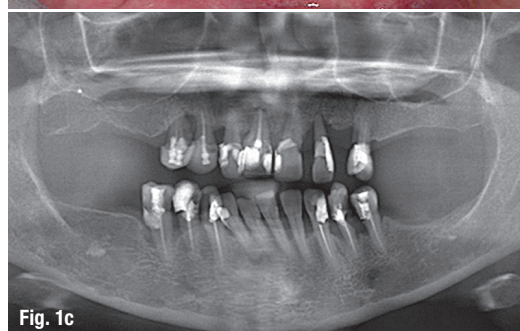
Periodontitis is the most common chronic inflammatory disease in adults of European populations. Eight out of ten over 35-year-olds suffer from some kind of gum complaint. It is associated with systemic diseases including type 2 diabetes, cardiovascular disease and stroke. Although they are so common, periodontal diseases are not very well acknowledged.^{1,2}

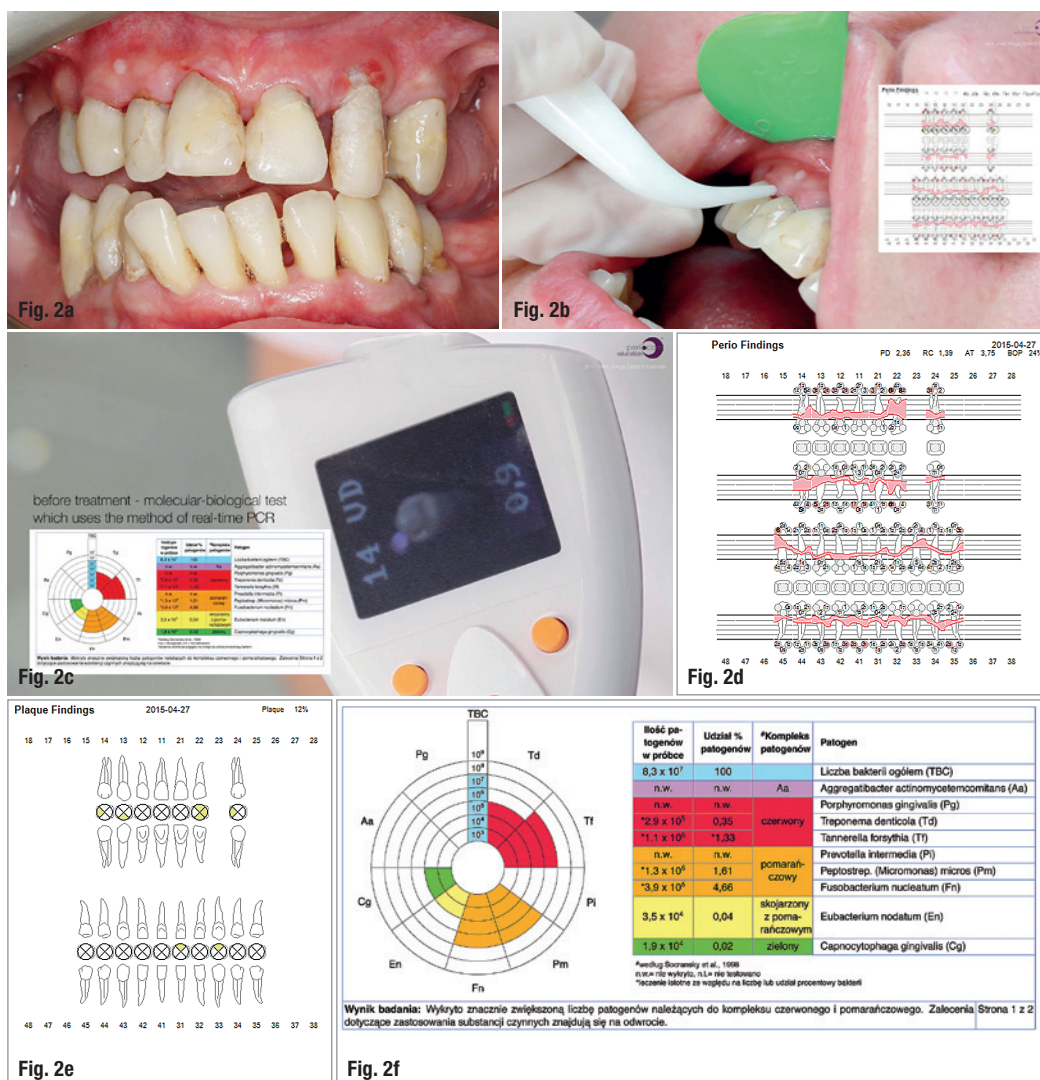
To date, mechanical therapy has been the general treatment for plaque-induced periodontal disease. A lot of studies have shown that mechanical treatment itself does not lead to a complete healing because it does not eliminate the periopathogenes.³

Laser therapy may constitute an efficient alternative to surgical treatment. Based on research, data and experience of many practitioners, we can enumerate potential advantages of laser therapy, such as bactericidal, detoxification and homeostatic effects and biostimulation. It is also easy to use, provides good access to anatomically difficult areas and makes a comfortable treatment for patients. Laser treatment provides for eradication of bacteria and better wound healing.^{4,5}

High-energy lasers are applied in periodontal procedures as adjunctive therapy or alternative conventional procedures have become standard treatment

Figs. 1a–d: **a)** initial state;
b) the situation of the gingival-tooth in the jaw;
c) orthopantomographic image;
d) the dental-gingival situation in the mandible.





Figs. 2a–f: a) Clinical improvement of the gum after hygienisation, reduction of swelling, bleeding and bacterial plaque; b) Clinical view of the periodontal treatment, electronic probe testing (pa-on, Orangedental); c) electronic probe, pa-on view and molecular-biological test; d) the result of pocket-depth probing (PD) and clinical attachment level (CAL), Bleeding on Probing (BOP), mean value of PD = 38; RC = 1.19; AT = 3.57; BOP = 33%; e) Plaque Index (PI), PI = 11%; f) baseline values of molecular-biological test (PET Plus test, MIP Pharma, Germany).

of periodontal pockets. Their effectiveness in eliminating periodontal pathogens and decreasing pocket depth is widely documented. Neodymium: Yttrium-Aluminum: Garnet (Nd:YAG) laser with a wavelength of 1,064 nm can decontaminate periodontal pocket without causing necrosis or carbonization of the underlying connective tissue.⁶ Periodontopathogens can persist within cells outside the pocket epithelium after mechanical conventional mechanical periodontal debridement, and Gianelli et al. reported that the Nd:YAG is capable of eradicating periodontopathogenic bacteria trapped within gingival epithelial cells.⁷

Erbium:YAG (Er:YAG) with a wavelength of 2,940 nm has been applied for effective elimination of granulation tissue, gingival melanin pigmentation and gingival discoloration. This laser is also used for contouring and cutting of bone with minimal damage and enhances healing.⁸ In addition, irradiation with the Er:YAG laser has a bactericidal effect with reduction of lipopolysaccharide, is efficient in calculus removal, with the effect limited to a very thin layer of the surface and is effective for implant maintenance.

A case report

A 47-year-old female patient was diagnosed with advanced generalised periodontal disease, numerous missing teeth, lack of prosthetic supplements in the posterior region, periapical lesions, and an incomplete endodontic treatment. The patient required a comprehensive dental treatment. To create a preliminary treatment plan, it is necessary to implement initial treatment (hygienisation) to check the patient's motivation to continue the highly specialised treatment and assess the prognosis of her teeth.

Detailed clinical examination should include, among others, data on the periodontal pocket depth (PD), bleeding on probing (BOP) and plaque index (PI). In the case of a significantly severe disease, high tooth mobility, numerous missing teeth, it is recommended to carry out a molecular-biological test to assess periopathogens quantitatively and qualitatively.

Before the treatment the patient underwent supragingival hygienic procedures done with ultra-

Figs. 3–7: Sterilisation of the periodontal pockets and decontamination.

Figs. 8–12: Removal of subgingival stone.

Figs. 13 & 14: Bleeding stop.

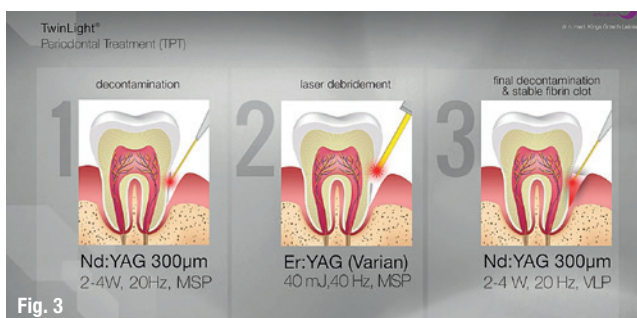


Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11



Fig. 12

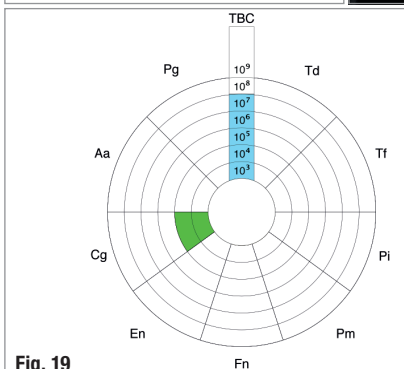
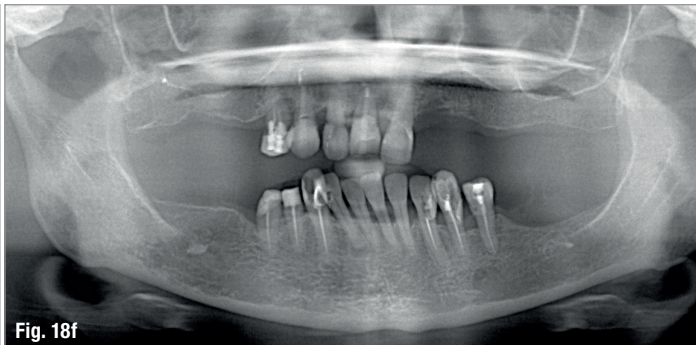
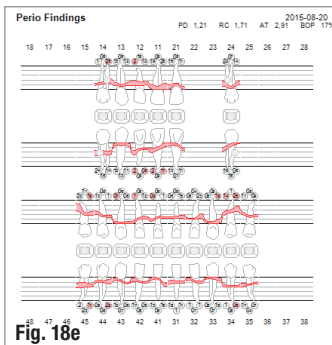


Fig. 13



Fig. 14

Fig. 19: Molecular-biological test results after 16 months (PET plus, MIP Pharma Germany)



Ilość a-togenów w próbce	Udział % patogenów	#Kompleks patogenów	Patogen
7,8 x 10 ⁷	100		Liczba bakterii ogółem (TBC)
n.w.	n.w.	Aa	Aggregatibacter actinomycetemcomitans (Aa)
n.w.	n.w.		Porphyromonas gingivalis (Pg)
n.w.	n.w.	czerwony	Treponema denticola (Td)
n.w.	n.w.		Tannerella forsythia (Tf)
n.w.	n.w.		Prevotella intermedia (Pi)
8,5 x 10 ²	0,00	pomarańczowy	Peptostrep. (Micromonas) micros (Pm)
6,7 x 10 ²	0,00		Fusobacterium nucleatum (Fn)
n.w.	n.w.	skojarzony z pomarańczowym	Eubacterium nodatum (En)
2,7 x 10 ⁴	0,03	zielony	Capnocytophaga gingivalis (Cg)

*według Socransky et al., 1998
n.w. = nie wykryto, n.t. = nie testowano
*liczenie istotne ze względu na liczbę lub udział procentowy bakterii

Summary

Er:YAG and Nd:YAG lasers have become the tool of choice in the treatment of periodontal diseases. They effectively reduce bleeding (BOP) and a pocket depth (PD) and are less time-consuming in comparison to conventional methods. Another advantage is the increased access of laser light to anatomically difficult areas compared to conventional hand tools, such as deep narrow pockets or furcations.

Lasers broaden the range of treatments offered in the dental office, increasing precision, enabling minimally-invasive treatments and better wound healing. The introduction of laser methods to the dental practice compels us to further learning, im-

proving professional qualifications and specialisation in the field. This in turn extends the range of non-surgical treatments of periodontal diseases.

Editorial note: A list of references is available from the publisher

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Kurz & bündig

Vorgestellt wird ein Fallbericht zur Anwendung des Er:YAG-Lasers in der Behandlung von Zahnfleischtaschen. Eine 47-jährige Patientin stellte sich in der Praxis der Autorin mit fortgeschrittener Parodontitis, einigen verlorenen Zähnen, mangelnder prothetischer Versorgung im Seitenzahnbereich, periapikalen Läsionen sowie einer unvollständigen endodontischen Behandlung vor. Sie wünschte sich eine umfassende Behandlung. Für die Erstellung eines ersten Behandlungsplans wurde mit einer gründlichen Prophylaxe begonnen, um eine exakte Prognose zu erhalten sowie Einblick über die Motivation der Patientin zu gelangen, sich konsequent auch komplexeren Behandlungen zu unterziehen. Weiterhin wurden Daten zur Taschentiefe, dem BOP-Index (Bleeding on Probing) und dem Umfang von Zahnbelag und Zahnstein (PLI) erhoben. Auch die molekular-biologischen Eigenschaften des Biofilms wurden getestet, um die Parodontalkeime qualitativ und quantitativ ermessen zu können. Nach der laserbasierten Reinigung speziell der Taschentiefe zeigte sich eine deutliche Verbesserung der klinischen Situation der Patientin. Sowohl Nd:YAG-Laser als auch Er:YAG-Laser kamen zum Einsatz. Die Autorin zeigt sich überzeugt, dass der Einsatz von Dentallasern in schweren Fällen, wie dem hier vorgestellten, das mögliche Behandlungsspektrum sowie den Patientenkomfort erweitert.

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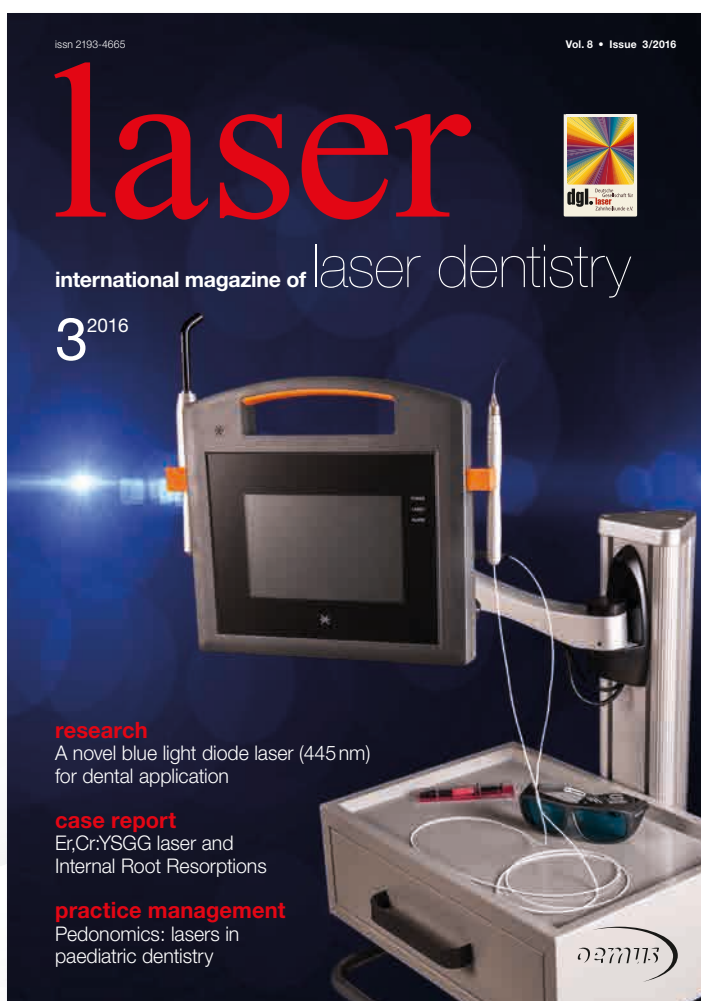
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Pedonomics: lasers in paediatric dentistry

Author: Dr Imneet Madan, UAE

We live in an era in which time is the basis for many decisions: what saves time is what gets chosen. Introducing better technology helps to work with time economics in paediatric dentistry. The recent term coined for this perspective of expanded thinking is "Pedonomics". Pedonomics refers to the impact of the changing world of paediatric dentistry in the dental practice.¹

Time economics goes hand in hand with pedonomics. The selective niches of dentistry are expanding far more today than in the past years. Few reasons that account for the need of this level of advanced healthcare are:²

1. Some parents who have their children later in life are referred to as drone parents. These parents self-educate a lot via social networks and extensive internet research. With less inherent trust in healthcare providers, they generally form a strong opinion about the dental care of their children and are most demanding of their paediatric dentist.
2. This category of parents are often techno-savvy and are quite updated with latest technologies. They appreciate a "no pain, no drill, no memory" dentistry.
3. Caries rate in dentistry is ever-increasing, with a heightened frequency of cariogenic diet and a decline in caries prevention.

4. There are more and more general dentists that would "do the job" and only if it is mismanaged, would they refer the child to the specialist. Increased availability of advanced technology can put an end to this trial practice.

Lasers as game changers

Lasers are introduced as excellent instruments in everyday dentistry. However, the idea of dentistry is generally connected to discomfort and pain in children's minds. Any treatment trend that can help our practice to remove this connection by the use of contemporary technologies can increase patient referrals and treatment acceptance.

Although the hand piece does remove the dental decay, it may also cause abrasion of the tooth structure and a significant amount of discomfort that may not be taken very well by the children. In addition, the vibration and noise of the drill could be unpleasant to young ears, thereby lasers can prove a better tool as they do overcome all these fears of drill dentistry.³ Additional benefits must far supersede the costs and investments when it comes to completing the laser requirements of any practice.

Patients' perception of laser dentistry

Generally, the treatment approach in paediatric dentistry is much different from adults. With Lasers bringing the additional benefits of no contact, no pressure, no drill, no anaesthesia and thereby a less negative perception of dentistry, higher success rates are likely to be seen. This is certainly because of an increased degree of satisfaction of the patients.

Marketing protocols help us to see a larger number of patients per day, but to have these patients accept the proposed treatments better, it is advisable to introduce to them tools that can truly help. As applicable in any field, an experience that exceeds the expectations will motivate the patients to keep appoint-



ments, accept recommended care and hence allow to build up positive clientele.

Laser indications in dentistry

Medicine began to integrate lasers in the mid-1970s for soft tissue procedures. The first laser specifically for dental use was a neodymium-doped yttrium aluminium garnet developed in 1987 and approved by the Food and Drug Administration in 1990.⁴

Benefits

- Less thermal necrosis of adjacent tissues is produced with lasers than with electrosurgical instruments.^{5,6}
- Haemostasis can be obtained without the need for sutures in most cases.^{7,8}
- Little or no local anaesthesia is required for most soft tissue treatments.^{9–13}
- Reduced operator chair time has been observed when soft tissue procedures have been completed using lasers.
- Lasers feature decontaminating and bactericidal properties on tissues, requiring less prescriptions of antibiotics post operatively.^{9,10}
- Lasers provide relief from pain and inflammation associated with aphthous ulcers and herpetic lesions without pharmacological intervention.¹³
- Erbium lasers can remove caries effectively with minimal involvement of the surrounding tooth structure because caries-affected tissue has a higher water content than healthy tissue.^{5,7}
- As erbium lasers have no direct contact with hard tissue, the vibratory effects of conventional high speed handpieces are eliminated, allowing tooth preparations to be comfortable. As a consequence, anxiety in both children and adolescents is reduced.^{9,11,14,15}

Lasers and profits in dentistry

Lasers allow the dental practice to balance well between business and dentistry. Offices that incorporate lasers in their practice have a unique psychological and promotional advantage over those who fail short to offer such services. Lasers are definitely the foundation of creating a referral-based practice.¹⁶

Benefits that add to the practice are always important, but how actually does one convince oneself to accept the resulting expenses for the practice. Usually, lasers are considered high investments and any high investment must prove reasonable enough to be accommodated in the practice. Return on investments with lasers can be easily pre-calculated. In general, laser treatments can cost 35 to 40 per cent more than the usual appliance, this calculation done for a return period of two to three years can yield on the investment.

	Laser Filling	Conventional Filling
One Surface	785	577
Two Surface	895	706
Three Surface	976	784
More than three surface	1082	847

Table 1

Mathematics in pedonomics

The introduction of lasers into the practice should be made in an orderly and precalculated manner. Proper financial planning will help ensure the successful introduction of laser and help to yield its benefits better. Calculation of economics used in paediatric dentistry and thus making decisions in favour of economic benefits to the practice are the basis of pedonomics. The concept of pedonomics and the time-economics model are based upon the profitability per unit of chair time which is the most important factor in determining the financial future of the practice. Pedonomics work on the presumption that the profit matters, not the income.¹⁶

Laser costs

Cost is the primary determinant in any acquisition. In the most common manner, it is defined as the amount or equivalent paid or charged for something. It is termed as price in the economic language. Another important factor here is the opportunity cost. It is the added cost of using resources (as for production or speculative investment) forms the difference between the actual value resulting of using this opportunity and that of its alternative.

Opportunity costs is a major determinant as it describes the following:

1. Cost of the acquisition of a laser.
2. Costs incurred when not having the laser, which include: loss of income due to loss of high-end, cutting edge dentistry, loss of referrals.

The final decision to purchase is worked out after looking at both financial and the opportunity costs.¹⁶

Laser as a profit centre

There are many ways that can help us calculate the profits based on Laser procedures. In any private practice, time is money. This can be best determined on the basis of the average hourly income. There should be a certain specific amount that needs to be earned per hour that can keep the practice flourishing. Apart from this basic income, any additional ability to perform the procedure more efficiently means extra income. The average amount of one hour chair time should be able to yield approximately 500–750 US Dollars. This is not the fixed amount but an

Table 1: Number of patients treated with laser vs. conventional approach.

Table 2: Cost comparison in UAE Dirhams between laser and conventional treatment.

Other procedures		
1	Laser Cosmodent	Cosmodent
	2250	1800
2	Laser Frenectomy	Frenectomy
	3100	2500
3	Laser Sealant	Sealant
	550	450
4	Laser Pulpectomy	Pulpectomy
	2100	1850

Table 2

approximate average that can keep the practice on profitable ends.

The procedures that can be effectively and efficiently performed by using laser in the paediatric dental office are:

1. Restorative laser dentistry
2. Laser-assisted endodontics
3. Frenectomy
4. Sealants
5. Minor surgical procedures
6. Tooth desensitisation
7. Lingual fraenum removal
8. Exposure of unerupted teeth
9. Laser tooth whitening
10. Treatment of orthodontic or drug-induced hyper trophy.

Return on Investment¹⁶

Once the laser is bought, pedonomics suggests that there should be a fair return on the investment made. Just to break even, the income generated by laser must include covering the price of the laser, maintenance, supplies as well as an additional amount to cover the income lost from the money used to purchase the equipment and not otherwise generating its own income. The profit that exceeds the break-even point is called the return on investment (ROI).

Some of the items that should be included in ROI would entail the profit from the following:

1. Novelty of procedures with lasers.
2. Reduced out-referrals, caused by the new laser procedures.
3. In-referrals due to the uniqueness of laser-assisted paediatric dentistry.

Tracking

To actually calculate the accurate financial return of introducing the laser to the practice, the income derived from laser must be monitored over time. A

new terminology used in pedonomics is KPIs which stands for key performance indicators.

These are the factors that are used in evaluating the success of the profit centre as follows:

1. Laser-assisted procedures.
2. In-referrals for laser procedures.
3. New patients that come asking for laser.

If KPIs seem to increase or even remain at a good level, this indicates that break-even and the much awaited ROI will not be far off.

Unique selling preposition

The USP is the unique cutting edge of any practice. When it comes to paediatric dentistry, lasers are indeed a unique selling preposition due to their contemporary benefits. In the field of marketing and management, USP is defined as the factor or consideration presented by a seller as the reason that the product or service is different from and better than that of the competition. The USP of lasers are as follows:

1. Non-surgical minor procedures.
2. No drill.
3. No anaesthesia.
4. No pressure on or contact with the tooth.
5. Easier healing.
6. Less need of analgesics and antibiotics.

Six Sigma approach of pedonomics

Six Sigma is defined as the set of techniques and tools for process improvement. It was introduced by Engineer Will Smith in 1986 while working at Motorola. Jack Welch centralised this as a business strategy in 1995 at General Motors. The main implication of the Six Sigma approach in any industry is to be flawless and error-free. It uses a set of quality-management methods, mainly empirical or statistical, and creates a spatial infrastructure of people within the organisation that are aware of this method.

A Six Sigma process is one in which 99.99966% of all opportunities to produce some feature of a part are statistically expected to be free of defects (3.4 defective features per million opportunities). When applied to medical or healthcare systems, the most important dimensions of the quality of the medical act are:

- Safety
- Professional competence
- Acceptability
- Efficacy and Relevance
- Efficiency 17 ref.
- Accessibility
- Continuity
- Interpersonal relations
- The patient's satisfaction
- Patient compliance.

Lasers as the Six Sigma in pedonomics

To make the delivery of the treatment best accepted by the family, it must be fit to comply with the level of patient acceptance. The average amount that can be generated by laser treatment quite exceeds the amount generated by conventional treatments.

The approximate amounts ranging in our practice which runs its costs parallel to the costs in the United States can be seen from table 1 and 2 and the following numbers:

- The average amount spent on purchasing as laser: 350,000 AED.
- Equated monthly instalments calculated with interest: the purchase of laser was made with complete down payment.
- Average cost per month over three years period: 10,000 AED.
- Average increase in treatments with laser vs conventional approach: about 200 per type of treatment:
- Fillings: approximately: 300 more with laser than Conventional way; average 45 per month.
- Pulpotomy: only lasers. Average 30 per month.
- Laser sealants: average 30 per month.
- Laser frenectomy: 2 per month.
- Laser pulpotomy: 15 per month.

Based on the above numbers, the approximate profit earned on laser vs. conventional approach:

- Fillings: 50x300: 15,000 AED.
- Pulpotomy: 30x300: 9,000 AED.
- Frenctomy: 600 AED.
- Seals: 30x200: 6,000 AED.
- Sealants: 20x300: 6,000 AED.
- Pulpotomy: 15x300: 4,500 AED.

Based on the above figures, the average amount gained from laser approach of treatment: 41,000 AED.

- Net profit: 41,000-10,000 (monthly investment on laser over three years period)
= 31,000 AED per month.

Break even was tentatively achieved at the end of 14 months. Profit started roughly after this period.

Conclusion

The Six Sigma approach with lasers teaches us to apply the zero-defects principal. This degree of excellence is not just in a word, but there is a realistic possibility of making it happen. It is an approach that can actually accelerate the rhythm of development and of the distribution of new ideas within an organisation. Laser is a tool that helps in the application of the Six Sigma principle in the dental office. In conclusion, it is statistically proven that laser with all its attributes is quite efficient in bringing "more dentistry" to a dental office.

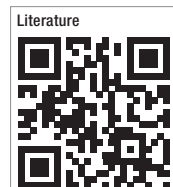
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Kurz & bündig

Im vorliegenden Artikel befasst sich die Autorin mit den wirtschaftlichen Aspekten der Kinderzahnheilkunde innerhalb der zahnmedizinischen Praxis. Mit dem Begriff „Pedonomics“, einer Kopplung aus pediatric dentistry (AE für Kinderzahnheilkunde) und economics (Wirtschaft) fasst sie dabei die wesentlichen Inhalte zusammen und erläutert diese im Verlauf des Beitrags ausführlich mit speziellem Hinblick auf die Laserzahnmedizin. Dabei sieht sie die steigende Nachfrage nach Laserzahnbehandlungen in der Kinderzahnheilkunde u. a. durch den zunehmenden Fokus auf moderne Technologien in allen Bereichen der Medizin begründet, aber auch durch die Ansprüche von besonders fürsorglichen Eltern (besonders die sogenannten Helikopter- oder Dronen-Eltern) an eine umfassende und fortschrittliche Dentalbehandlung ihres Kindes. Auch der kindlichen Perspektive werde die Lasertherapie gerecht, denn sie reduziert Schmerz und Beschwerden während der Behandlung und kann damit effektiv der Angst vor dem Zahnarzt entgegenwirken. Als Folge sieht die Autorin steigende Überweisungszahlen und eine generell höhere Akzeptanz der Therapie. Nach einer ausführlichen Kosten-Nutzen-Analyse des Lasereinsatzes in der Kinderzahnmedizin, bei der die Autorin u. a. die Aspekte der Kapitalrendite, Kennzahlen, Alleinstellungsmerkmal und die Methoden der Six Sigma-Analyse berücksichtigt, kommt sie zu folgendem Fazit: Die Laserzahnmedizin könne ein Schlüsselmoment für die Anwendung des Six Sigma-Verfahrens zur positiven Entwicklung einer Zahnarztpraxis darstellen. Dabei sei es statistisch erwiesen, dass Laseranwendungen ein effizientes Mittel seien, um den Umsatz einer zahnmedizinischen und speziell kinderzahnmedizinischen Praxis zu erhöhen.



Eleven tips for success in your dental clinic

Part V: VIP Seminars and Scripting

Author: Dr Anna Maria Yiannikos, Germany & Cyprus

Welcome to the fifth part of the series 'Eleven tips for success in your dental clinic'. Today I will teach you two new tips that I encourage you to use at your clinics in order to gain the power and control that you deserve. Let me introduce you to the concepts of VIP Seminars and Scripting!

VIP seminars

Over the years, many of my students – fellow dentists – complain that the promotion of their clinics costs them a lot of money. Today I will refute this statement by introducing to you VIP seminars that can reward your loyal patients, educate them and position yourself as an expert all in one shot. I know that this sounds a bit awkward, but I will explain this

great promotion tool in detail so you can also apply it in your dental clinic, without any serious cost. Let's start by describing the steps on how you can establish a successful and impactful way to promote your clinic.

Before the seminars

1. Use your reception area and, depending on its space, place 20–30 white plastic chairs. It is very important to cover them with elegant white chair covers (similar to the one that we see in wedding receptions).
2. Make a list with 40 loyal patients of your clinic that you feel you should reward and thank for the years of coming and referring patients to you. Why 40? My experience over the years says that if you want



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to get 20 at that day you should invite 40 to get 25 positive answers, although in the last couple of days previous to the event, three to five of them will cancel.

3. Send them an enticing e-mail invitation—like the ones that we receive for special events and weddings with a unique and glamorous design.
4. Ask your assistant to call them and inform them about the invitation as well as to confirm whether they have received it. You should call them again after approximately one week so they can feel how important their participation is to you. Two days before the seminar, ask your assistant to send them a text reminder.
5. Find a catering service that will prepare delicious finger food for your event.
6. Ask a company (dental supplier) to sponsor the event by offering a unique traveling dental kit for example or a dentistry-related present useful to your patients. Send each guest a warm note that is unique and special to them (for example what part of their character you admire).

During the seminars

Start on time! Choose topic relevant to your guests and elaborate on it. This will establish you as the expert. The duration of your speech should not exceed 15–20 minutes. Before cocktails, award your loyal patients with the promotional present—call them one by one, thank them for coming and give them their present.

After the seminars

Send them a warm personalised message (an e-mail or SMS), thanking them for coming and for being your patients.

Isn't that easy? I encourage you to use VIP seminars at least two times a year. It is your opportunity to thank your loyal patients, make them feel special but also to position yourself as the expert.

Scripting

The next tip that we are going to discuss is the importance of knowing what to say and how to say different things to our patients in order to make them increase our case acceptance. Let's start by being assertive and not aggressive. Since people are attracted to positive people, additionally this effect is contagious. To establish this, the key is the correct use of words. A very important tool that we use in my clinic and I encourage you to use it in yours as well, is a script of words. How can you create that?

Sit with your team and together brainstorm words with energy and passion that represent the philosophy of your own clinic. These will be the words that you are going to use in your verbal communication (face to face and phone) with your patients but also in all your media communication, for example when you make a presentation (VIP seminars) or for the video playing on the TV screen at the reception area, or in a Facebook post. Here are ten words of our script so you can get an example and inspiration for designing your own:

Passionate—Faith—Gifted—Share—Unique—Feel—Care—Pleasure—Creation—Enlighten

Isn't that easy, too? I encourage you to use them daily. It is your opportunity to increase patient loyalty, referrals, and overall case acceptance. The reason? People tend to place their trust in people they like.

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People are attracted to positive and enthusiastic people. The words we use have tremendous impact on others. Anyone can improve communication with a few simple changes.

The above tools are a very small part of the tools, ideas and protocols of the presentation skills module which is one of the ten modules that I teach during the DBA—Dental Business Administration Mastership course. DBA is a mini MBA that will not only teach you ten different modules in only ten days, but it will also give you examples and exercises based on our routine dental life. It is a unique educational programme that can show you how to gain the business success that you deserve.

In the next part of this useful series, we will discuss more business concepts that as always will assist you in revealing the opportunities and real potential of your dental clinic and staff. Until then, remember that

you are not only the dentist of your clinic, but you are also the manager and the leader. You can always send me your questions and request for more information and guidance at dba@yiannikosdental.com or via our Facebook account. Looking forward to our next trip of business growth and educational development!

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Kurz & bündig

Mittlerweile vier Teile der Serie "11 Tipps zum wünschenswerten Erfolg in Zahnkliniken" gehen dem Artikel dieser Ausgabe voraus. In diesen beschäftigte sich die Autorin damit, wie sich Praxisinhaber intensiv mit ihren eigenen Stärken und Schwächen auseinandersetzen können, mit der Suche nach dem idealen Praxismitarbeiter, dem optimalen Umgang mit Patienten und schließlich damit, wie man lohnenswerte Investitionen in die eigene Praxis ermittelt und das Praxisumfeld analytisch bewerten kann.

Im heutigen Teil zu VIP-Seminaren und Skriptsprache geht es darum, Patienten durch exklusive Veranstaltungen und eine durchdachte sowie individuelle Praxissprache an ihre Zahnarztpraxis zu binden. Die Autorin beschreibt, wie ausgewählte Patienten zu speziellen VIP-Seminaren eingeladen und dort für ihre Treue belohnt werden könnten. Hierbei können auch Dentalfirmen als Sponsoren fungieren. Darüber hinaus empfiehlt die Autorin, gemeinsam mit dem Praxisteam Schlagworte zu finden, welche das Praxiskonzept ideal widerspiegeln. Diese Skriptsprache solle dann aktiv in der Kommunikation mit Patienten und Partnern angewendet werden, sodass sich diese stärker mit der Zahnarztpraxis identifizieren und positive Assoziationen mit dieser knüpfen.

Auch in der kommenden Ausgabe der *laser* international magazine of laser dentistry erwartet Sie wieder ein Beitrag für den wirtschaftlichen Erfolg Ihrer Praxis. Seien Sie gespannt!



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SMART™ dental diode laser – Versatile and functional



LASOTRONIX is proud to present the diode-based laser platform especially designed for dentistry, the SMART™ series. SMART™ laser is offered as a combination of two lasers in one package:

10W at 980 nm wavelength for a wide range of applications in microsurgery, endodontics, periodontology, pain therapy and whitening as well as 400 mW at 635 nm wavelength for cold therapies

like biostimulation and PAD (Photoactivated Disinfection). Combining two wavelengths in one device made SMART™ laser a unique and advanced application for all soft tissue procedures in dentistry.

Thanks to thoughtful design that allows integration with the dedicated workstation or a dental unit, SMART™ laser meets the needs of every dental office and assures perfect operation comfort. In addition, accessories such as a wide range of fiber delivery systems, application end tips and a variety of surgical handpieces provide maximum versatility. As a result, the SMART™ laser is suitable for a vast number of therapies. If you want to join us and promote our innovative products please kindly contact us via E-Mail: mp@lasotronix.pl.

LASOTRONIX

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www.lasotronix.com

Light Instruments Ltd.

Sino-Lite Ltd. announces Acquisition of Light Instruments Ltd.

Sino-Lite Ltd., an Israeli corporation, has announced the acquisition of Light Instruments Ltd, a leading dental laser manufacturer, previously owned by Syneron Medical Ltd.

Light Instruments Ltd. is famed for its flagship product the LiteTouch™ Er:YAG laser. This product incorporates the innovative Laser-in-Handpiece technology, housing the entire laser mechanism within a small sized chamber, measuring 22 cm long by 2.6 cm diameter. Thanks to its technological design LiteTouch™ mimics the feel of the turbine drill and yet incorporates laser benefits: micro surgery, faster healing, minimal invasive treatments and higher acceptance of patients to dental treatments.

Sino-Lite Ltd. specializes in the acquisitions, development and management of dental and medical companies worldwide. The company is backed by strong Chinese groups headed by Sino-Ita International Trading Company, distributor of the

Italian brand NewTom Cone Beam 3D Imaging in China and South East Asia. Sino-Ita integrates the whole chain from research, sales to service.

According to Adv. Eric Ben Mayor, CEO of Sino-Lite Ltd. and Light Instruments Ltd., the acquisition of Light Instruments Ltd. is the first step, within a sequence of acquisitions of high technology companies and innovative companies that the group intends to acquire in the Israeli market. "Sino-Lite Ltd. will expand Light Instruments Ltd's workforce, variety of high-end dental lasers offering and add advanced technologies and solutions, increasing the company's position as a leading industrial innovator."

Light Instruments Ltd.

Industrial Zone, Tavor Building,

P.O.B. 223

20692, Yokneam Israel

www.light-inst.com



Adv. Eric Ben Mayor, CEO of Sino-Lite Ltd. and Light Instruments Ltd.

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Membership application form



Name/title: _____
Surname: _____
Date of birth: _____
Approbation: _____

Status: ☐ self-employed ☐ employed ☐ civil servant ☐ student ☐ dental assistant

Address:

Street: _____ Phone: _____
ZIP/city: _____ Fax: _____
Country: _____ E-Mail: _____

With the application for membership I ensure that

- ☐ I am owning an own practice since _____ and are working with the laser type _____ (exact name).
☐ I am employed at the practice _____
☐ I am employed at the University _____

I apply for membership in the German Association of Laser Dentistry (Deutsche Gesellschaft für Laserzahnheilkunde e.V.)

Place, date

Signature

Annual fee: for voting members with direct debit € 150

In case of no direct debit authorisation, an administration charge of € 31 p.a. becomes due.

DIRECT DEBIT AUTHORISATION

I agree that the members fee is debited from my bank account

Name: _____ IBAN: _____
BIC: _____ Credit institute: _____

Signature of account holder

This declaration is valid until written notice of its revocation

Reduced carbohydrates may

Alleviate periodontal inflammation

Aiming to test the hypothesis that diet helps reduce inflammation lead author Dr Johan Wölber from the University of Freiburg and his colleagues designed a study to investigate the impact of an oral health-optimised diet on periodontal health in a group of patients with a history of gingivitis. Of the 15 participants, ten were asked to follow a list of restricted and recommended foods and meals, such as omega-3 fatty acids, vitamins C and D, antioxidants and fibre. Five participants continued with their typical eating patterns. Apart



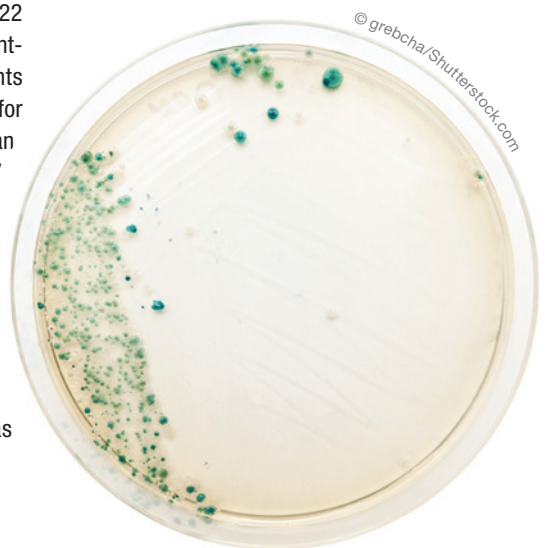
from not using interdental cleaners, participants were advised not to change their oral health routines throughout the study period. After four weeks, participants in the low-carb group showed significantly reduced gingival and periodontal inflammation compared with the control group. According to the researchers, reducing carbohydrates in particular led to a significant improvement in the gingival index, bleeding on probing and the periodontal inflamed surface area. Although the study had its limitations, the results support the assumption that modern Western eating habits, including consumption of refined carbohydrates and a high omega-6 to omega-3 fatty acid ratio, promote inflammatory processes. The study, titled "An oral health optimized diet can reduce gingival and periodontal inflammation in humans—A randomized controlled pilot study", was published online on 26 July in the *BMC Oral Health* journal.

Student develops

Artificial dental plaque

As part of a research project, a dentistry student from Germany has developed a new formula to synthesise dental plaque, which could help facilitate research on oral biofilm significantly in the future. As the first dental student ever to speak at the congress, she presented her findings at the 94th General Session and Exhibition of the International Association for Dental Research, which took place from 22 to 25 June in Seoul in South Korea. "Currently, researchers have to find study participants who are not allowed to brush their teeth for days," explained Ann-Kathrin Flad, who is an eighth-semester dental student at Witten/Herdecke University in Germany and has been involved in the project for three years already. "With the new formula for artificial dental plaque, however, this can be avoided, as it adheres to teeth like natural dental biofilm. It can be coloured in order to measure how much is being removed using manual and electric toothbrushes, as well as other oral hygiene tools."

Alongside her studies, Flad works at the ORMED—Institute for Oral Medicine at the university, a research and development organisation for scientific services with the focus on oral hygiene, robotic simulation of toothbrushing and medical plaque control. Flad's trip to Seoul was funded by the Fördergemeinschaft Zahnmedizin, a non-profit association of dentists.



Teeth reveal

Vitamin D deficiency

By analysing life traces in the teeth of six individuals who died hundreds of years ago, Canadian researchers have now been able to accurately backtrack episodes of vitamin D deficiency during these people's lifetime. However, these episodes of abnormalities do not disappear in teeth, but are evident in the formation of characteristic interglobular dentin spaces. In the study, researchers from McMaster University in Hamilton examined a total of 12 teeth in individuals with skeletal evidence of a vitamin D deficiency. The teeth came from four women buried

in a French cemetery between 1225 and 1798 and two people buried in rural Quebec between 1771 and 1860, a child believed to be 3 years old and a 24-year-old man. Based on the defects in the dentin, the analysis showed that all of the subjects had a vitamin D deficiency or rickets, a common childhood disorder caused by the condition that results in weakening of the bone and is often characterized by bowed legs and deformed hips. The study, titled "The rachitic tooth: A histological examination," was published online ahead of print on 30 June in the *Journal of Archaeological Science*.



SIROLaser Blue wins

Red Dot Award



The SIROLaser Blue handpiece has once again won over international design experts. It was presented the Red Dot Award in the category “Life Science and Medicine” for, according to the jury, “the elegant feel of its flowing, elongated shape and stainless steel finish”. This is the second design prize this year for the Dentsply Sirona Instruments laser for surgical dentistry. In February, the SIROLaser Blue handpiece was presented with the iF Design Award. The Red Dot Award is an internationally recognized quality seal that

has been awarded to products, design concepts and communication designs since 1954. This year, 41 jury members (made up of independent designers), design professors and specialist journalists assessed a record number of 5,214 products from 57 nations in 31 categories. The award ceremony was held on 4 July 2016, at the Red Dot Gala in the Aalto Theater in Essen, Germany.

Source: Dentsply Sirona

Frequent dental scaling to reduce

Infection risk after knee replacement

Oral bacteria that enter and spread through the bloodstream have been found to cause about 10 per cent of peri-prosthetic joint infections after total knee arthroplasty (TKA).

A team of Asian researchers analysed 1,291 patients who had undergone TKA between 1999 and 2002 and needed revision surgery within five years after the initial operation owing to a peri-prosthetic infection. They compared these cases to a control group of age- and sex-matched TKA patients who had not had any peri-prosthetic infection. The researchers concluded that regular dental scaling can improve oral health and thereby reduce the risk of transient bacteraemia caused by oral bacteria. The study, titled “Frequent dental scaling is associated with a reduced risk

of periprosthetic infection following total knee arthroplasty: A nationwide population-based nested case-control study”, was published online in the *PLOS ONE* journal on 23 June.

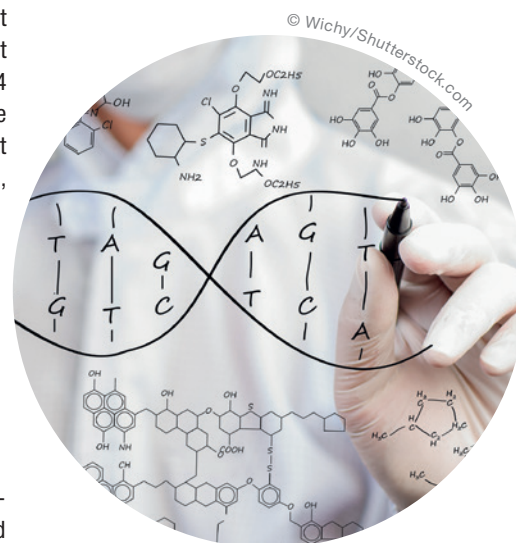


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Genetics affecting obesity's impact on

Periodontal disease progression

Studies have indicated that individuals with a high body mass index are more prone to developing periodontal disease than other people are. Being overweight or obese might also negatively affect one's response to nonsurgical periodontal therapy. In order to evaluate whether specific patterns of interleukin-1 (IL-1) gene variants, which are known to affect periodontitis severity, influenced the association between obesity and subsequent periodontitis progression, DNA was collected from 292 men (aged 29–64 at entry) in a recently published study. The participants had dental and anthropometric endpoints collected over multiple examinations, approximately every three years for up to 27 years.



The analysis showed significant interactions between IL-1 genetic variations and obesity-related traits in predicting periodontal disease progression. Participants who were both obese and IL-1-positive were 70 per cent more likely to experience periodontal disease progression than those without these risk factors. The study was conducted at the Boston University Henry M. Goldman School of Dental Medicine in collaboration with Interleukin Genetics. The study, titled “Influence of obesity on periodontitis progression is conditional on IL-1 inflammatory genetic variation,” was published online on 19 August in the *Journal of Periodontology*, an official publication of the American Academy of Periodontology.

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Prof. Dr. Norbert Gutknecht

25 Jahre DGL!

Liebe DGL-Mitglieder,
liebe Freunde der Lasertechnologie,

wenn Sie durch diese Ausgabe des *laser* international magazine of laser dentistry blättern, werden Sie mit Indikationen und Lasersystemen konfrontiert, von denen wir, die Gründungsmitglieder der DGL, uns vor 25 Jahren noch nicht einmal im Traum etwas hätten vorstellen können.

Wir sprechen heute sowohl von Blue-Light-Diodenlaser in der Chirurgie, von Radial Firing Tips in der Endodontie, von der Kombination von Wellenlängen aus dem nahen und mittleren Infrarotbereich in der Parodontologie sowie von speziellen Behandlungskonzepten in der Kinderzahnheilkunde als auch einer modernen Marketingstrategie für die wirtschaftliche Integration von Lasern in der zahnärztlichen Praxis.

Anlässlich unseres ersten DGL-Laserkongresses 1991 in Stuttgart hatten sich Referenten und Teilnehmer ausschließlich mit einer Wellenlänge beschäftigt, dem Nd:YAG-Laser. Man war fasziniert, dass Laserlicht von einer Quarzfaser transportiert in den Wurzelkanal und die parodontale Tasche geleitet werden konnte. Es war die Zeit der Pioniere, in der sich Versuch und Irrtum, Erfolg und Misserfolg rasch abwechselten. Die Weiterentwicklung der Lasertechnologie, die Entdeckung neuer Laserwellenlängen, die Schaffung von Ausbildungsprogrammen und die Integration in die DGZMK haben uns zu dem gemacht, was wir heute sind: eine Laserfachgesellschaft mit hohen akademischen Ansprüchen, mit klaren Behandlungskonzepten für die Anwendung von Lasern in der zahnärztlichen Praxis und – für mich ganz besonders bedeutungsvoll – ein Kongressforum, das sich objektiv mit allen verfügbaren Lasersystemen und Indikationen auseinandersetzt.

Deshalb wünsche ich Ihnen beim Lesen unserer Fachzeitschrift, und natürlich für all diejenigen, die unseren Jubiläumskongress besuchen, viel Freude und hoffentlich viele neue Erkenntnisse beim Vertiefen in die dargebotenen Themen.

Ihr

Prof. Dr. Norbert Gutknecht



- 25. INTERNATIONALE
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SEM surface observations of titanium implants irradiated by Er:Cr:YSGG laser (2,780 nm)

Prof. Dr Norbert Gutknecht, Dr Peter Fahlstedt
RWTH Aachen University, Department of Operative Dentistry and Periodontology, Germany

Unintended alteration of oral implant surfaces i.e. micro fractures, melting and ablation has been reported as a consequence of incorrect settings and handling of erbium-laser and diode laser of different wavelength. The aim of this pilot study was to compare the 2-dimensional surface structure by SEM (Scanning Electron Microscope) of an untreated and by different settings of dual wavelength laser irradiated oxidized titanium oral implant surface.

Material and methods

NobelBiocare titanium dental implant representing an oxidized surface

Laser equipment

Er:Cr:YSGG 2,780nm laser; Hand piece for fibre tip: MZ8, 6mm length, Diameter of fibre tip-end: 800 micrometer. Distance between fibre tip end and implant surface: 0,8–1,2 mm.

Laser parameters

0,75 W; 1,0 W; 1,25 W; 50Hz; Water 80 %; Air 20 %; Fluency 6.25 J/cm²

Analysis

Field emission Scanning electron microscope (SEM) Jeol JSM-7400F was used for 2-dimensional surface observations.

Results

SEM results after irradiations following adjusted protocol: laser irradiation parameters at 1 mm distance and Er:Cr:YSGG settings of 0,75W and 1,0W no signs of alteration of TiU surfaces was observed. The surfaces seemed similar to non-irradiated control areas. After distance increasing from 1 to 2 mm the same observations was made for 1,25W.

Kurzpuls laser in der Zahnheilkunde: vom Excimer-Laser bis zur UKPL-Technologie

Prof. Dr. Matthias Frentzen, Priv.-Doz. Dr. rer. nat. Jörg Meister, Bonn/Germany

Voraussetzung für die Abtragung von Zahnhartgeweben und Knochen sind gepulste Lasersysteme, um thermische Schädigungen der Gewebe zu vermeiden. Die Laserforschung hat sich hierbei neben Wellenlängen im 3 µm- und 10 µm-Bereich auch mit Nanosekunden-, Pikosekunden- und Femtosekunden-Lasertechnologien seit Ende der 80er-Jahre auseinandergesetzt.

Excimer-Laser (193 nm und 308 nm/Pulslänge im ns-Bereich), die primär für die Ophthalmologie entwickelt wurden, zeigten Möglichkeiten auf, Zahnhartgewebe und Knochen atraumatisch und formgebend zu bearbeiten. Die Materialbearbeitung konnte mit spektroskopischen Analysensystemen im Sinne einer Feedbacksteuerung gekoppelt werden. Aufgrund mangelnder Effizienz und hohem technischen Aufwand wurde dieser Weg zugunsten moderner UKPL-Systeme (Faserlaser gekoppelt mit Scannersystemen, ns- bis fs-Bereich) ver-

lassen. Die Möglichkeiten der neuen, standfesten Technologie mit kompakten Laserquellen stellen eine signifikante Weiterentwicklung gegenüber den UV-Gaslasern vor 25 Jahren dar. Die Technologie der heutigen UKP-Laser schreitet voran, sodass in Zukunft – vergleichbar der Entwicklung der Diodenlaser – auch leistungsstarke, miniaturisierte Kurzpuls laserquellen zu erwarten sind, die eine klinische Realisierbarkeit von Feedback-gesteuerten All-in-One-Systemen im Sinne einer Theragnostik ermöglichen können. Die bereits gewonnenen wissenschaftlichen Erkenntnisse dieser Forschung haben auch Einfluss auf die Weiterentwicklung von Erbium- und CO₂-Laser zur Hartgewebearbeitung.

Die Grundzüge dieser Entwicklung zur Bearbeitung von mineralisiertem Gewebe im Laufe der letzten 25 Jahre sollen resümiert werden und Zukunftsperspektiven aufgezeichnet werden.



Auf neuen Wegen – Der 445 nm-Halbleiterlaser in der klinischen Anwendung

Prof. Dr. Andreas Braun, Marburg/Germany

Lasersysteme werden in einer Vielzahl von zahnmedizinischen Behandlungsverfahren vor allem in den Bereichen Chirurgie, Zahnerhaltung, Endodontie und Parodontologie eingesetzt, um sowohl den Komfort des Patienten als auch das Behandlungsergebnis zu verbessern. Die Wirksamkeit des Lasers hängt dabei entscheidend davon ab, wie die elektromagnetische Strahlung vom Zielgewebe absorbiert wird.

Die Entwicklung eines neuartigen Diodenlasers im blauen Wellenlängenbereich (445 nm) verspricht eine gute Energiekopplung an pigmentierte Zellen und Gewebe. Kombiniert mit einer geringen Absorption in Wasser resultiert eine im Vergleich zu herkömmlichen Halbleiterlasern im Wellenlängenbereich 810–980 nm verbesserte Schneidleistung für chirurgische Eingriffe. Aufgrund seiner kürzeren Wellenlänge dringt blaues Laserlicht weniger tief in ein Zielgewebe ein, sodass durch die geringere Penetrationstiefe die Gefahr von unbeabsichtigten Verletzungen tiefliegender Schichten verringert und die Strahlführung präzisiert werden kann. Der thermische Energie-

eintrag des Lasers in das umliegende Gewebe ist durch die geringe Absorption in Wasser verringert, sodass blutungsarme Schnitte mit räumlich begrenzter Hitzewirkung beobachtet werden. Darüber hinaus eignet sich blaues Laserlicht, herkömmliche Maßnahmen zur Keimreduktion in parodontalen Läsionen oder Wurzelkanäle zu verbessern. Nicht zuletzt deuten Ergebnisse erster diesbezüglicher Studien an, dass die blaue Wellenlänge Effekte der Low-Level-Laser-Therapie (LLLT) induzieren kann, um Wundheilungsprozesse zu unterstützen.

Auf Lasertechnik basierende Behandlungsverfahren alleine scheinen in vielen Fällen oftmals zu Ergebnissen zu führen, die auch mit konventionellen Methoden erreicht werden können. Betrachtet man laserbasierte Behandlungsmaßnahmen wie den Einsatz des 445 nm-Lasers allerdings unter dem Aspekt einer adjuvanten Therapie, kann der Einsatz von Lasern die Ergebnisse konventioneller Behandlungsprotokolle verbessern und den Therapieerfolg insgesamt positiv beeinflussen.

Effect of varying pulse duration of Er:YAG laser on the microstructure of titanium implant surface

Dr Kenneth Luk, Aachen/Germany, Hong Kong

The irradiation of 10.6 J/cm² at 200 µs of Er:YAG energy density has been reported to be safe on implant surfaces. Varying the pulse durations with the same energy density may be a parameter which affects the RBT surface microstructure. An implant motor is employed at a speed of rotation in the implant placement mode. 40 µs, 100 µs and 300 µs pulse durations were chosen. For each sample, three threads were chosen for laser irradiation.

The samples were irradiated at the parameters set. The samples were observed under SEM. In all samples, there were melting, re-solidification and micro-crack formations under SEM observation. Er:YAG laser with articulated arm transmission at pulse durations of 40 µs and 100 µs and 300 µs at an energy density of 10.6 J/cm² in near contact mode are not suitable on preservation of implants with RBT microstructure.



Comparison of diode lasers in soft-tissue surgery using cw- and superpulsed mode—*An in vivo study*

Dr Ralf Borchers, Bünde/Germany

Dental soft-tissue surgery by diode lasers in cw-mode often causes carbonisation of the tissues with following necrosis and a delay of wound healing. *In vitro* studies have already shown that superpulsed diode-laser surgery has much less disadvantages for the tissues in an histological approach.

The purpose of this study was to investigate *in vivo* if the superpulsed mode of operation can realise an improvement for surgeon and patient in soft-tissue surgery. 26 patients were treated by diode lasers in different modes of operation for soft-tissue surgery.

Twelve patients were treated by the superpulsed ellexion claros diode laser: 810 nm; 10–50 W peak; 10–20 μ s pulse duration; 12,000–20,000 Hz; 400 μ m fibre. 14 patients were treated by Vision MDL-10 diode laser: 980 nm; 2.5 W; cw-mode and also a 400- μ m fibre. Clinical treatment was documented by photos and questionnaires for patients and surgeons. Questions concerned: carbonisa-

tion, coagulation, cutting speed, pain, swelling, bleeding, need for drugs, functional reduction and fibrin layer on wounds—during treatment, directly after treatment, after one day, after three days and after one week. Clinical observations and the questionnaires showed significant differences between cw-mode and superpulsed diode-laser treatment in surgery in most cases. It was shown that superpulsed diode-laser surgery is superior to continuous-wave treatment. Carbonisation and thermal damage of the tissues can be reduced to a minimum, therefore healing is faster than in cw-mode surgery. The generation of a soft-tissue cut is faster and more precise. Patients have less pain; in amount and duration. The need of drugs is reduced. There are less functional restrictions and there is less swelling. The advantages of superpulsed mode of operation for soft-tissue diode-laser surgery are evident. Continuous-wave mode should no longer be implemented in diode-laser surgery.

Investigations of radicular dentin permeability and ultrastructural changes after irradiation with dual wavelength (Er,Cr:YSGG and 940 nm diode laser)

Tamara Sardar Al-Karadaghi, Dr René Franzen, Hussein A. Jawad and Prof. Dr Norbert Gutknecht, Aachen/Germany

The aim of this study was to assess the effectiveness of dual wavelength (2,780 nm Er,Cr:YSGG, 940 nm diode) laser in the elimination of smear layer, comparing it to Er,Cr:YSGG laser in terms of radicular dentin permeability and ultrastructural changes of root canal walls. 51 sound single-rooted extracted teeth were instrumented up to size F4 and divided into three groups: group Co (non-irradiated samples), group A (irradiated with Er,Cr:YSGG laser), group B (irradiated with the dual wavelength laser). Afterward, the roots were made externally impermeable, filled with 2% methylene blue dye, divided horizontally into three segments, reflecting the cervical, middle, and apical thirds then examined under microscope. Using analytical software, the root section area and dye penetration area were measured, and then, the percentage of the net-dye penetration area was calculated. Addi-

tionally, scanning electron microscope investigations were accomplished. Analysis of variance (ANOVA) showed significant differences between all groups over the three root thirds. Dye permeation in the dual wavelength laser group was significantly higher over the whole root length, cervical, middle, and apical, compared to Er,Cr:YSGG laser group and non-irradiated samples ($p < 0.001$). Scanning electron micrographs of dual wavelength irradiated samples showed a distinctive removal of smear layer with preservation of the annular structure of dentinal tubules. Er,Cr:YSGG laser root canal irradiation produced an uneven removal of smear layer and inefficient cleanliness especially in the apical third. There was no sign of melting or carbonisation. Within the studied parameters, root canal irradiation with dual wavelength laser increased dentin permeability.

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Einfluss der Lasertherapie auf die Regenerationszeit nach erfolgter Gaumennahterweiterung – *Ein systematisches Review*

Dr. Ambili Mundethu, Prof. Dr. Dr. Heinrich Wehrbein, Dr. Dr. Collin Jacobs, Mainz/Germany

Das Ziel der vorliegenden Untersuchung war die systematische Analyse der vorhandenen Evidenz in Bezug auf die Low-Level-Laser-Therapie zur Knochenregeneration nach erfolgter Gaumennahterweiterung.

Im Zeitraum von September 2015 bis Januar 2016 wurde eine systematische Recherche der vorhandenen Literatur (Web of Science, PubMed, Cochrane Library, Handsuche) vorgenommen, welche sich mit dem Effekt der Low-Level-Laser-Therapie auf den Knochenstoffwechsel nach erfolgter Gaumennahterweiterung beschäftigte. Die Recherche erfolgte mittels der Suchbegriffe „laser“, „orthodontics“, „tooth movement“, „pain reduction“, „enamel debonding“, „gingiva“, „periodontal“ und „rapid maxillary expansion“. Hierzu wurden sowohl Cochrane- als auch Prisma-Richtlinien berücksichtigt.

Insgesamt erzielte die Recherche 1.522 Treffer bezüglich der Lasertherapie in der Kieferorthopädie. Hiervon blieben nach Anwendung der

Ausschlusskriterien 144 relevante Studien über. Nach Durchlaufen des Selektionsprozesses ergaben sich 13 Studien, welche in einem systematischen Review zusammengefasst wurden. Hierbei handelte es sich um elf Tierstudien und zwei prospektive, kontrollierte Patientenstudien. Die Knochenregeneration wurde entweder histologisch oder radiologisch analysiert. Alle 13 Studien konnten eine beschleunigte Knochenregeneration nach der Gaumennahterweiterung durch die Anwendung einer Low-Level-Laser-Therapie, verglichen mit der Kontrollgruppe, nachweisen.

Die vorliegende Übersichtsarbeit belegt, dass mittels der Low-Level-Laser-Therapie die Knochenregeneration nach erfolgter Gaumennahterweiterung beschleunigt werden kann. Hieraus könnten sich eine verkürzte Retentionszeit und eine verringerte Relapserate nach erfolgter Gaumennahterweiterung ergeben. Zu diesem interessanten Therapieansatz sind weitere klinische Studien erforderlich.

Surface layer erosion of artificial caries lesions using Er,Cr:YSGG laser in preparation for resin infiltration

Dr Berchem Kalender, Julian Lausch, Jale Gorucua, Prof. Dr Norbert Gutknecht, Ankara/Turkey, Aachen/Germany

The aim of this study was to compare four different pretreatments (15% hydrochloric acid, 37% phosphoric acid, 3.5W, 4W Er,Cr:YSGG laser) regarding their ability to erode the surface layer of artificial enamel lesions in preparation for resin infiltration *in vitro*. 88 bovine enamel samples (5x5x4mm) were demineralised for 21 days to create artificial lesions. After demineralisation, the samples were randomly allocated to four groups according to the pretreatment procedures (n=22). In the H₃PO₄-group, lesions were etched with 37% phosphoric acid gel (H₃PO₄-gel) (iBOND Etch, Heraeus Kulzer) for 5s. In the HCl-group, lesions were etched with 15% hydrochloric acid gel (HCl-gel) (ICON etch, DMG) for 5s. The two laser groups included the irradiation of the enamel surface layer using a Er,Cr:YSGG laser (2,780nm wavelength, 140m pulse duration, 80% water, 60% air) with sapphire tip (MZ#8), focused mode at 3.5W/100 Hz (Laser 3.5W) and 4W/100 Hz (Laser 4W). After preparation, two samples from each group were selected to determine the morphology of the treated enamel surfaces with Scanning Electron Microscopy (n=2). After preparation, all lesions were infiltrated (Icon, DMG) for 10s (n=20). Subsequently, light curing was performed for 60s. Samples cut perpendicular to the

lesion surfaces, polished and analysed using Confocal Laser Scanning Microscopy. Lesion depths (LD), the depth of erosion (ED) and penetration depths (PD) were measured. The percentage penetration was calculated as $PP = PD \div LD \times 100$. Statistical analyses were performed using the Kruskal-Wallis test and Mann-Whitney test.

The ED was significantly increased in lesions etched with HCl-gel or irradiated with Er,Cr:YSGG laser compared to those etched with H₃PO₄ (p<0.05). The percentage penetration of the infiltrant was significantly higher in the HCl-group and laser groups than in the H₃PO₄-gel group (p<0.05). The use of the laser at 3.5W and 4W revealed similar results. Using the laser at 3.5W and 4W created similar micromorphological etching patterns on enamel surfaces like conventional acid etching procedures.

It can be concluded that the pre-treatment using an Er,Cr:YSGG laser results in a deeper erosion of the surface of artificial enamel lesions compared with 37% H₃PO₄-gel and similar erosion compared with the use of conventional 15% HCl-gel. Thus, the use of an Er,Cr:YSGG laser seems to be suitable as a pre-treatment of artificial lesions in preparation for resin penetration.



Welchen Laser in der Kieferorthopädie? – Die Weisheit der Wahl

Dr. Peter Kleemann, M.Sc., Grevenmacher/Luxemburg

Eine Systematik der Laseranwendungen in der Kieferorthopädie entwickeln und daraus eine Methode zur Auswahl der passenden Laserwellenlänge/n und des geeigneten Lasergerätes ableiten.

Nd:YAG/Er:YAG, 2 ω -Nd:YAG und Diodenlaser mit 810, 970, 660 und 445 nm wurden bei ca. 3.000 kieferorthopädischen Patienten zwischen 2003 und 2016 eingesetzt, um Weich- und Hartgewebsprobleme zu lösen. Entsprechend der klinischen Hauptindikationen konnten vier Indikationsgruppen unterschieden und diese analog einer „Baumstruktur“ unterklassifiziert werden in Art des Zielgewebes (Hart- versus Weichgewebe) und weiter in Modus Ablation versus Nonablation. Am Ende steht die Laserapplikation, eindeutig beschrieben mit Protokollname, Konzept, Wirkungsweise und zu erwartendem Resultat.

Es wird eine Systematik der Laseranwendungen in der Kieferorthopädie präsentiert mit den Mengen: 1. Orthodontisch indizierte, 2. Ästhetisch, 3. Kariespräventiv indizierte, 4. Assoziierte Laseranwendungen. Aus diesen werden Schnittmengen gebildet mit den

Applikationsmöglichkeiten der getesteten Lasergeräte und daraus deren Leistungsprofil bestimmt.

Die Systematik enthält einen geordneten Überblick aller Laseranwendungen in der Kieferorthopädie. Wünschenswerte und häufige Laseranwendungen können identifiziert und den getesteten Laserwellenlängen und -geräten zugeordnet werden. In umgekehrter Weise kann das „Leistungsprofil“ eines Gerätes über das „Gesamtraster“ gelegt und die Grundsatzentscheidung für oder gegen das Gerät erleichtert werden. Externe Faktoren wie Bedienungskomfort, Design und Preis fließen in eine Bewertung mit ein. Am Beispiel eines hochgepulsten Diodenlasers 810 nm und eines niedriggepulsten Multiwave-Diodenlasers (970/660/445 nm) soll die Vorgehensweise bei der Bewertung und Auswahl erläutert werden. Die evidenzbasierte Systematik stellt sich als ein wissenschaftlich sinnvoller und praktischer Wegweiser in der Vielzahl kieferorthopädischer Laserapplikationen und der Auswahl passender Lasergeräte dar.

Der 445 nm Diodenlaser in der Endodontie. Erste In-vitro-Ergebnisse.

Dr René Franzen, Nour Al Hassan, Prof. Dr Georg Conrads, Prof. Dr. Norbert Gutknecht, Aachen/Germany

Aufgrund des Absorptions- und Transmissionsverhaltens in Hydroxylapatit, Wasser und Pigmenten ist von der 445-nm-Wellenlänge eines Diodenlasers ein sinnvoller Einsatz in der Endodontie zu erwarten. An der RWTH Aachen wurden hierzu erste In-vitro-Untersuchungen durchgeführt. Hinsichtlich der sicheren Anwendung wurden Temperaturmessungen im stabilisierten Wasserbad (37 °C) an humanen Zahnmodellen durchgeführt, die in ein Polyurethanresin mit vergleichbarer Wärmeleitfähigkeit humanen Knochens eingebettet wurden. Die Messungen zeigen, ob die als kritisch geltende Grenze nach Eriksson

und Albrektsson von $\Delta T=10^\circ\text{C}$ eingehalten wird. Hierzu erfolgte eine zeitlich und räumlich aufgelöste Temperaturmessung mithilfe von K-Type-Thermoelementen. Bakterizide Wirkungen wurden mit einem computergesteuerten Verschiebetisch an humanen Dentinscheiben der Dicken 300, 500 und 1.000 μm am endodontologischen Leitkeim *Enterococcus faecalis* durchgeführt. Ergebnisse zur Temperaturentwicklung und bakteriziden Wirkung werden für Laserparameter von 0,4 W cw und 0,6 W cw sowie für 1,2 W, 10 Hz bei 50 % Tastverhältnis bei Einsatz von 200- μm -Faserspitzen vorgestellt.



Chirurgische Interventionen mit Laser im Weichgewebe im Vergleich zu anderen schneidenden Verfahren – Beurteilung des Schädigungsvolumens

Dr. Michael Hopp, Dr. Alejandra Perez-Canto, Dr. Joachim Schiffer, Prof. Dr. Reiner Biffar, Berlin/Germany

Inzisionen an Schleimhäuten und Weichgeweben können mit Schneidinstrumenten, Instrumenten auf Basis von Hochfrequenz und Lasern durchgeführt werden. Es ergibt sich eine typische Defektzone, die die Art der Heilung beeinflusst. Zur Beurteilung kamen Exzise aus dem Mundbereich, die mittels Skalpell, Schere, Hochfrequenzchirurgiegerät und verschiedener Laser (Diodenlaser – 445 nm, 810 nm, 980 nm, Nd:YAG-Laser, Er:YAG-Laser und CO₂-Laser) entnommen wurden. Es wurden an den histologischen Proben das Schädigungsvolumen und die Art der Schädigung eingeschätzt.

Bei Verwendung schneidender Instrumente treten glatte Trennungen geringen Schädigungsvolumens im unteren Mikrometerbereich mit gelegentlichen Gewebsrissen auf (Skalpell) sowie Gewebsquetschungen (Schere) auf. Gefäße werden nicht geschlossen. Bei Aneinanderlage-

rung der Schnittkanten führt dies zu einer primären Heilung. Hochfrequenzchirurgiegeräte führen in Abhängigkeit ihrer Frequenz und Leistung zu einem unterschiedlich großen thermischen Schädigungsvolumen im unteren bis mittleren Mikrometerbereich, was den Übergang von der primären Heilung zur Defektheilung bedeutet.

Die weiteste Spanne des Schädigungsvolumens tritt bei Lasern auf. Während 445 nm-Dioden-, Er:YAG- und CO₂-Laser in Abhängigkeit von der verwendeten Leistung ein eher geringes thermisches Schädigungsvolumen aufweisen, führen Diodenlaser im Bereich zwischen 810 bis 980 nm sowie Nd:YAG-Laser zu ausgeprägten Schädigungszonen mit sistierender Blutung an den Schnittträgern. Die Heilung reicht von überwiegend primärer Heilung bei Verwendung von Er:YAG-Lasern bis zur ausgeprägten Defektheilung bei fast allen anderen Lasertypen.

Removal of failed dental implants using the Er,Cr:YSGG laser and the conventional trephine bur: an *in vitro* comparative study

Dr Mohammad Hajji, Dr René Franzen, Dr Stefan Grümer, Dr Ali Modabber, Prof. Dr Norbert Gutknecht, Aachen/Germany

Objectives

To compare between the conventional trephine bur and the Erbium, Chromium:Yttrium-Scandium-Gallium-Garnet (Er,Cr:YSGG) laser in removing implants in terms of the volume of removed bone, duration of the procedure and the morphological changes on the bone surface.

Materials and methods

Three human mandibles were utilised, four implants were inserted in each mandible using a drilling handpiece and burs. The implants were divided into two groups (n=6), where two implants from each mandible were removed using a trephine bur running at 1,200 rounds per minute (rpm) with water irrigation. The remaining implants (n=6) were removed with Er,Cr:YSGG laser (power 6 W, frequency 20 Hz, pulse duration 50 µs, Water 60, Air 30). The volume of bone loss was calculated by filling the holes with Mercury and measuring its volume,

the preparation time was measured with a digital stopwatch and the post-operative bone surfaces were examined under a scanning electron microscope.

Results

The laser group exhibited a smaller amount of bone loss than the trephine bur group, whereas the latter required a shorter time of preparation. The SEM revealed empty trabecular spaces with no signs of carbonisation and well-defined edges in the laser group, while the trephine group displayed a surface covered with a smear layer and micro-cracks.

Conclusion

The Er,Cr:YSGG laser provides superior results over the trephine bur in terms of bone preservation, thermal damage and cutting efficiency.

Antwort:

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Aufgrund des bestehenden Assoziationsvertrages zwischen der DGL und der DGZMK fällt zusätzlich ein reduzierter Jahresbeitrag für die DGZMK an (85,00 € p.a., falls Sie noch nicht Mitglied der DGZMK sind). Der Beitragseinzug erfolgt durch die DGZMK-Geschäftsstelle, Liesegangstr. 17a, 40211 Düsseldorf. Sie werden hierfür angeschrieben.

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Ich beantrage die Aufnahme in die Deutsche Gesellschaft für Laserzahnheilkunde e.V.

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SIROLaser Blue auf der

25. DGL Jahrestagung

Die Deutsche Gesellschaft für Laserzahnheilkunde zelebriert gemeinsam mit dem LASER START UP 2016 vom 30. September bis 1. Oktober das 25-jährige Jubiläum der internationalen Jahrestagung. Unter dem Motto „Von den Ursprüngen zu neuen Horizonten“ stellen Spezialisten aus aller Welt in München Neuigkeiten aus dem Bereich Dentallaser in spannenden Vorträgen und Workshops vor. Dentsply Sirona Instruments präsentiert vor Ort den innovativen und bisher einzigen im blauen Wellenlängenbereich arbeitenden SIROLaser Blue mit seinen vielseitigen Einsatzmöglichkeiten.

Im Workshop von Dentsply Sirona „SIROLaser Blue – the use of multiple wavelengths“ wird Dr. Carlo Francesco Sambri (Triest, Italien) die Vielseitigkeit des Lasers demonstrieren. Auch wie der Anwender bei der Arbeit mit CEREC vom SIROLaser Blue profitieren kann, wird ein Thema sein. Anschließend haben Teilnehmer die Möglichkeit, sich selbst ein Bild vom SIROLaser Blue zu machen und Hand anzulegen.

Dentsply Sirona Instruments bietet als Hauptsponsor der Jahrestagung der Deutschen Gesellschaft für Laserzahnheilkunde Nicht-Mitgliedern die Möglichkeit, eine von 30 Eintrittskarten im Wert von bis zu 318 Euro für die Jah-



restagung zu erhalten. Interessierte Zahnärzte sind herzlich eingeladen, sich dafür unter dem angegebenen Link zu registrieren: www.sirona.com/dgl. Durch die Teilnahme ist der Erhalt von 16 Fortbildungspunkten möglich. Um die blaue Wellenlänge in der eigenen Praxis anzuwenden, haben Teilnehmer zudem die Chance, einen SIROLaser Blue zu gewinnen: Voraussetzung dafür ist die Teilnahme an einem der beiden Workshops oder der Besuch der SIROLaser Blue-Vorführung am Stand 18.

Quelle: Dentsply Sirona

Power of Light beim

Henry Schein Laserkongress



Abb. 1

Abb. 1: Marcus Dahlinger (links), Vertriebsmanager Laser & optische Systeme bei Henry Schein Dental Deutschland GmbH, und das Referententeam bei der Podiumsdiskussion. –

Abb. 2: Die Kombination aus Vorträgen und Workshops gewährte Interessenten einen Einblick in die Technologie und Anwenden vertiefende Informationen.



Abb. 2

Am 17. und 18. Juni 2016 fand in Mörfelden-Walldorf (bei Frankfurt am Main) der Kongress „Power of Light“ statt. Im Fokus des Laserkongresses standen die Anwendung des Lasers in der zahnärztlichen Praxis, die Abrechnung, die Implementierung in den Behandlungsablauf und der Erfahrungsaustausch.

Als erster Referent des Kongresses gab Dr. Michael Hopp (Berlin) – zertifizierter Spezialist für Laserbehandlungen – einen Überblick zur Entwicklung der Lasertechnologie. Prof. Dr. Giovanni Olivi (Genua, Italien) bezog sich in seinem Vortrag

auf die Kinderzahnheilkunde. Dr. med. dent. Kresimir Simunovic, M.Sc. (Zürich) nahm die Zuhörer mit auf eine Reise durch die weite Indikationswelt des Fotona Lightwalkers. Wie die photothermische Therapie (PTT) in der Parodontologie mit dem A.R.C. Q810 Diodenlaser in Kombination mit dem Farbstoff EmunDo® angewendet werden kann, zeigte Prof. Dr. Gerd Volland, M.Sc. (Heilbronn). Dr. med. dent. Alexander Kelsch (Karlsruhe) sprach über die Veränderungen im Praxisalltag. Jeanette Deumer, M.Sc. (Berlin) stellte die photothermische Therapie (aPTT) der photodynamischen Therapie

(aPDT) gegenüber. Dr. Thorsten Kuypers, M.Sc. (Köln) sprach über die Antischmerztherapie mit dem Er:YAG-Laser und stellte die „NightLase“-Therapie vor. Wie man mit dem Laser am besten rechnen kann, zeigte der Zahnarzt Thorsten Wegner (Stadthagen). Die auf dem Laserkongress angebotenen Workshops gingen auf praktische Anwendungen ein. So stellte beispielsweise Dr. Schlichting die laseraktivierte Spülung von Wurzelkanalsystemen mit PIPS® dar.

Quelle: Henry Schein

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DGL-KONGRESS 2016

30. September/1. Oktober 2016
München – The Westin Grand München

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www.dgl-jahrestagung.de



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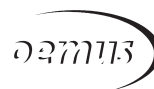
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