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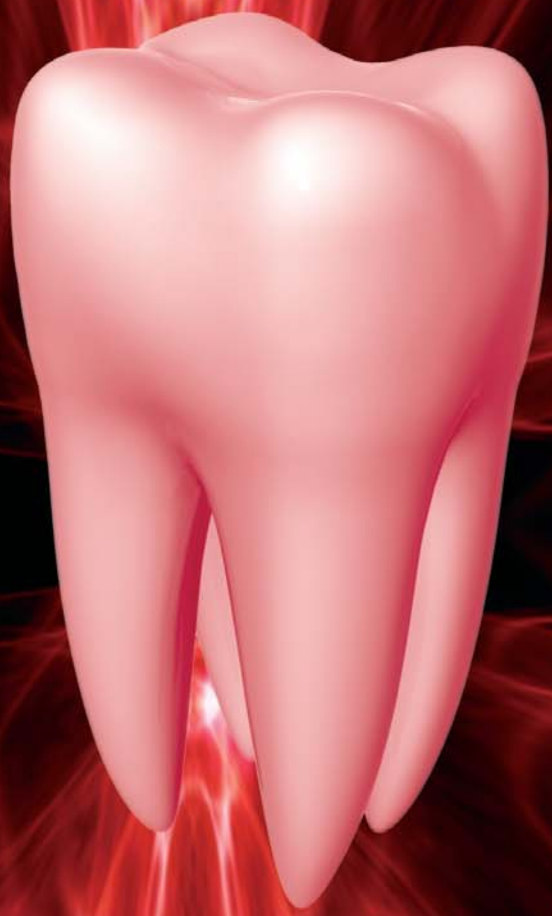

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Prof Dr S. Nammour
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Dear WFLD members, Dear readers,

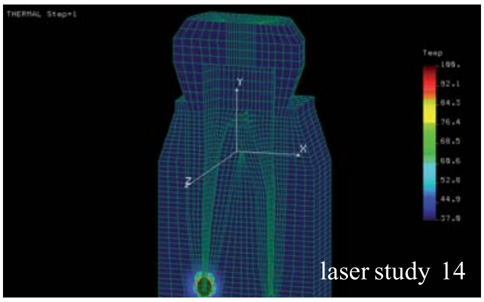
It is my pleasure to welcome you in the third issue of our WFLD (World Federation for Laser Dentistry) member journal. As you know this journal has many objectives. It is dedicated to inform, to spread and to share knowledge about laser dentistry. It offers to our members the opportunity to publish quickly their studies in laser dentistry, clinical experiences, interesting case reports, interviews, announcements of their activities and events, reports or minutes of interesting meetings or scientific activities, advertisements about any devices and technologies so as any call for scientific questions. "Laser" journal is dedicated to allow a quick diffusion of information, communications, fruitful dialogues, continuous debates between our members. It is an interactive tool for quick exchanges of ideas or new clinical procedures. According to this aim, your papers or items will always be welcome.

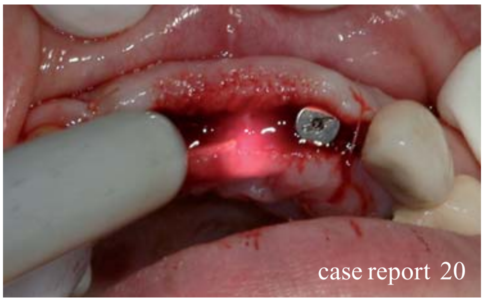
As you know, in some months, our general WFLD meeting is taking place in Dubai (9–11 March, 2010). On behalf of the scientific committee, I cordially invite you to participate in this important scientific congress. Together, we will have the opportunity to publish our researches, to discuss, to share our experiences and to improve our knowledge about the latest results in Laser dentistry. I would like to inform you that the abstracts could be sent via the website of the congress. We count on your habitual large participation. Your contribution is necessary to keep the high scientific level of the congress.

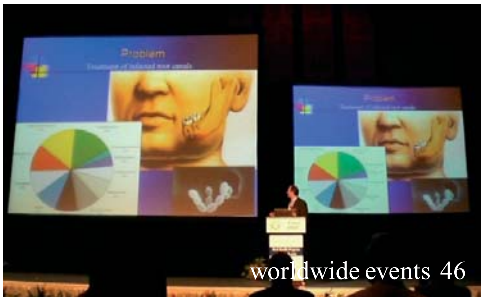
Looking forward to meeting you in Dubai.

Sincerely,

S. Nammour
WFLD past-president
Co-Editor-in-Chief


laser study 14


case report 20


worldwide events 46

editorial

03 Dear WFLD members, Dear readers
_ Prof Dr S. Nammour

report

_ case report
06 The Use of an Er:YAG Laser in Periodontal Surgery: Clinical Cases with Long-Term Follow-Up
_ Frank Y.W. Yung, DDS, Canada

_ laser study
14 Finite Element Study on thermal effects in root canals Lasertreatment with a surface absorbed laser
_ Norbert Gutknecht, René Franzen, Friedrich Lampert, Germany

_ laser report
18 Dental lasers for soft tissue surgery and periodontics What we know and what we've learned
_ Donald J. Coluzzi, USA

_ case report
20 A Novel technique of laser-assisted blood coagulation for tissue regeneration in implant dentistry
_ Kenneth Luk, Hong Kong

_ user report
22 Using photobiostimulating lasers in the practice of pediatric dentistry
_ Lawrence A. Kotlow, USA

_ scientific report
26 Minimally Invasive Laser Decontamination MILD®—A New Procedure for the Treatment of Marginal Periodontopathies and Periimplantitis
_ Georg Bach, Annette Wittmer, Klaus Pelz and Heiner Nagursky, Germany

_ case report
32 Using a Soft Tissue Dental Laser to Remove a Venous Lake
_ Angie Mott, RDH, USA

_ user report
34 Laser Technique „Quo vadis?"
_ Gerd Volland, Rudolf Walker, Germany

news

_ laser education
38 Continuing Education Courses of AALZ Part 2—Wavelength Workshops

_ laser education
39 EMDOLA Official Awarding Ceremony in November
_ Dajana Klöckner, Germany

_ laser education
40 The Plan of Development and Advancement of Laser in Dentistry (PDALD)
_ Reza Fekrazad, Katayoun AM Kalhori, Iran

_ manufacturer news
48 Manufacturer News

events

_ worldwide events
44 WFLD 2010 Dubai Congress in conjunction with AEEDC Dubai 2010

_ worldwide events
46 Lasers in dentistry introduction in Ajman, UAE very successful

_ laser events
47 Selected Events 2009/2010

about publisher

50 Imprint

The Use of an Er:YAG Laser in Periodontal Surgery: Clinical Cases with Long-Term Follow-Up

author_Frank Y.W. Yung, DDS, Canada

Fig. 1_An intraoral view of patient #1 with a transitional acrylic bridge (teeth #8 to 10) before laser crown lengthening.

Fig. 2_The initial outline of the new gingival level for tooth #8 was prepared with the Er:YAG laser.

Fig. 3_The attached gingiva was excised and the underlying alveolar crest modified.

_Introduction

While the regimen of scaling and root planing (SRP) remains an essential part of any management of periodontal diseases, there are clinical situations in which the surgical excision of infected tissues or modifications of healthy structures is required after the initial mechanical debridement. Conventional surgical techniques, such as curettage, gingivectomy, full- or split-thickness flap, and other procedures, have been proven to be effective in treating moderate-to-advanced periodontitis,[1, 2] but the need to improve postoperative morbidity and control over-treatment outcome have provided the impetus to explore further for better surgical techniques and treatment alternatives. The principle behind laser surgery is the selective absorption of optical energy delivered by a specific laser wavelength to produce thermal effects on the target tissues to be excised or modified. The advantages of utilizing a laser for surgery over "cold steel" or electrosurgery are well documented in the literature, with some specific benefit differences among wavelengths.[3-5] The overall recovery experiences and surgical results are so much more pleasant and predictable than those of conventional surgery so that for some surgical procedures, such as in the fields of ophthalmology[6], otolaryngology[7], and dermatology[8], the use of lasers have replaced other modalities in many instances. During the 1960s and 1970s, different kinds of lasers with different wavelengths were invented, and they were studied subsequently for possible dental applications. Laser instruments, including carbon dioxide (CO_2), neodymium:yttrium, aluminum, garnet (Nd:YAG), argon, gallium arsenide (diode), and erbium:yttrium, aluminum, garnet (Er:YAG) were found to be effective for soft tissue surgery, including periodontics.[9, 10] The Er:YAG laser, which was developed in the early 1970s,[11] also offered hard tissue applications. The 2,940 nm wavelength of the Er:YAG laser has absorption characteristics completely different from Nd:YAG, argon, and diode lasers; it is very highly absorbed by water and moderately so by dental enamel.[12, 13] This specific and selective laser energy absorption by water causes rapid micro-explosions of the water molecules initiated by the selective energy absorption within the target tissue, and provides the foundation for the water-mediated, photo-thermal-mechanical ablation of the Er:YAG laser.[14] Whereas the optical energy is very strongly absorbed by the water molecules within the superficial layers of the target tissue, the penetration depth of this laser beam is limited to a few micrometers close to the surface. Based on this unique combination of strong superficial absorption and shallow penetration, tissues with high water content, such as dentin or gingival tissues, can be ablated or excised precisely by these microexplosions with almost nonexistent thermal damage to the underlying tissues as long as there is proper water irrigation at the site. An Er:YAG laser de-

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KaVo Dental GmbH · D-88400 Biberach/Riß · Telefon +49 7351 56-0 · Fax +49 7351 56-1488 · www.kavo.com vice was cleared for marketing by the US FDA in 1997 for certain hard and soft tissue procedures, such as caries removal and cavity preparation, as well as incision and excision of intraoral soft tissues. Other Er:YAG laser instruments were then cleared for sulcular debridement in 1999, and in 2004 for osseous surgery. Animal studies have shown that this laser wavelength demonstrates suitability for vaporizing bone with minimal thermal damage and good postoperative healing.[15-18] While the use of this laser wavelength for dental hard tissue is relatively well-established in contemporary dentistry, there is some debate about its usefulness for soft tissue or periodontal procedures.[19, 20] On the one hand, the Er:YAG laser's radiation has been found to be strongly absorbed by many pathogenic bacteria that are related to periodontal infections,[21-23] and it has been shown to be effective in removing root-bound calculus without damage to the cementum and dentin.[24] Therefore, it has been studied for nonsurgical periodontal therapy, and significant gains in clinical attachments have been reported.[19, 25-27] However, for periodontal surgery, there are two common concerns for the use of this laser wavelength: (1) there is a lack of selective energy absorption between the target tissues and the contiguous nontarget tissues, such as the root and bone surfaces, and (2) the shallow energy penetration provides coagulation that is not as profound, and hemostasis is not concurrent with tissue ablation as the other soft tissue lasers, such as CO_2, argon, diode, or Nd:YAG. The purpose of this study, therefore, was to evaluate these concerns clinically and determine whether the Er:YAG laser with full-time water irrigation was suitable for periodontal surgery in a safe and effective manner.


Fig. 6


Fig. 4


Fig. 5

Fig. 4_Laser gingivoplasty or festooning of the new gingival margin completed.
Fig. 5_Two-week postoperative view, before the final insertion and after the abutments were etched with the same Er:YAG laser.
Fig. 6_Four-month recall with healthy gingival margin.

_Materials and Methods

In this study, 60 patients (33 males and 27 females with a mean age of 49 years) were treated for various periodontal conditions, such as acute periodontitis, refractory periodontitis, gingival naevi, pre-prosthodontic and orthodontic periodontal surgery. The patients were selected based on the following criteria: (1) no existing systemic diseases such as diabetes[28] or hemorrhagic disorder that could affect the treatment outcome, (2) no history of antibiotic therapy one month prior to the surgical procedures, and (3) teeth directly related to the surgical site should be vital and their periodontal conditions were, if possible stabilized with conventional scaling, root planing, and prophylaxis. Consent for periodontal and especially laser treatment was obtained. Provisions of the Helsinki Declaration of 1975, ethical principles in medical research involving human subjects, as revised in 2000, were observed throughout this study. Surgical interventions, such as surgical curettage, gingivectomy, gingivoplasty, osteoectomy, and osteoplasty, were considered only in cases of acute periodontitis or when the periodontal inflammation failed to improve in three months after conventional mechanical debridement. Documentation, such as clinical attachment levels, tooth vitality tests, intraoral photographs, and panoramic and periapical radiographs, were collected before the laser treatment. The surgical sites were locally infiltrated with Xylocaine (lidocaine HCl, with 1:100,000 epinephrine (DENTSPLY Canada Ltd., Woodbridge, Ontario, Canada), and no nerve block was used. All of the laser surgical procedures were performed with Er:YAG (2,940 nm) lasers (DELight™ and VersaWave®, HOYA ConBio, Fremont, CA, USA), and strict laser safety requirements in the operatories were observed.[29-30] The surgical sites were irradiated with multiple laser pulses, with individual pulse energies varying between 30 and 120 mJ, pulse repetition rates between 10 and 30 Hz, and pulse duration of approximately 250–300 µs. The laser beam was delivered through an optical fiber connected to a round-exit contact tip 600 µm in diameter. The exit power at the contact tip was monitored by a power meter (PowerMax 600™, Molectron Detector, Inc., Portland, OR, USA) before each procedure. This contact tip was kept in near or direct contact with the target tissues, with variations of spot diameters between 0.6 and 1 mm. Power densities of 162 to 12 W/cm², based on the 600 µm contact tip and power output measured by the power meter, were applied;

higher density was used for tissue ablation and lower setting for bacterial reduction and tissue coagulation. The surgical site was irrigated throughout the laser procedures with filtered water emitted from the contact tip itself and from an external air-and-water syringe. At the completion of the surgical procedure, hemostatic cotton pellets (Racellet #3, Pascal Co., Inc., Bellevue, WA, USA) and/or 4-0 silk sutures were used as necessary. The patients were instructed to follow the postsurgical care protocol, and no prescriptions for analgesics or antibiotics were prescribed. No special mouthrinse was given, and regular home care except at the surgical site was suggested. All of the patients were contacted the next day for postoperative assessment. Regular home maintenance resumed after the surgical sites were re-examined, and the sutures were removed at the one-week recall appointments. All of the clinical observations, along with the patients' assessments, were collected one week, one month, three months, and up to four years later. It is important to note that this study made no attempt to gather statistics that would be analyzed for probability significance; rather it attempted to show that the use of the laser was beneficial in the treatment of the patients' periodontal disease.

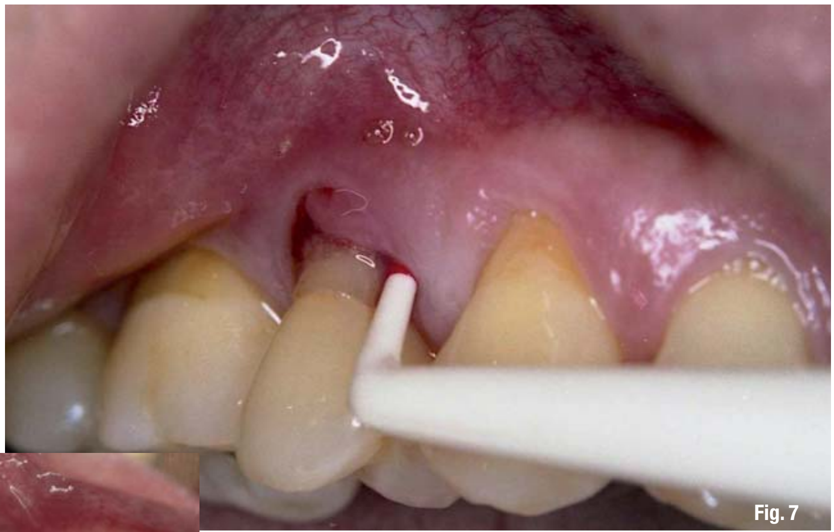
Fig. 7


Fig. 8


Fig. 11


Fig. 9


Fig. 12


Fig. 10


Fig. 13

_Results

A total of 67 vital teeth were directly treated with a combination of 104 individual surgical procedures for this group of patients. The most common procedures were surgical curettage (n = 52), followed by gingivectomy (n = 47). The most common surgical site was the posterior maxilla (n = 29), followed by the posterior mandible (n = 24). The most common indication for laser periodontal surgery (24 out of 60 procedures) was moderate-to-severe acute periodontitis. The average amount of local anesthetic used was 0.5 ml; only local infiltration was used and no nerve block was required. Despite the extensive nature of some of these procedures, there were only two cases in which conventional full periosteal flaps were raised; sutures were required for these two cases, as well as for five other surgical sites. The blood clotting process was enhanced through the use of the hemostatic cotton pellets in 16 sites. There was no report of air emphysema at any of the surgical sites. After the laser treatments, one of the patients was prescribed a course of antibiotics as a precaution due to the severity of the initial infection, and because the surgical site was very close to the maxillary sinus; otherwise no medication was prescribed for the other patients. They were contacted the next day and no bleeding or swelling was reported. One of the patients took an over-the-counter analgesic, and another complained of soreness but did not require any medication; mild soreness to no discomfort were reported by the rest of the group. One patient did complain of sensitivity to temperature which required one week for the symptoms to be resolved. Follow-up periods ranged from 6 to 54 months, with an average mean follow-up period of 2.4 years. The probing depths were normal, and there were signs of clinical attachment improvements. All of the treated teeth remained vital and functional during the follow-up period.

Fig. 7_An intraoral photograph of patient #2 showing buccal swelling and deep mesial pocket at tooth #4.

Fig. 8_A pretreatment periapical radiograph illustrating severe bone loss.

Fig. 9_A periosteal flap was raised, and the underlying granulation tissues on the roots, the adjacent alveolar bone, and the flap itself were ablated with the laser.

Fig. 10_One-week recall with no sign of complications.

Fig. 11_One-month recall on the same site with good periodontal recovery.

Fig. 12_Six-month recall with new buccal attached gingiva and reduced mesial pocket.

Fig. 13_A periapical radiograph with signs of bone regeneration six months later.

connective tissues, extracellular components, and high water content (approximately 70% for gingiva and 10 to 20% for bone), through selective laser energy absorption and by keeping the contact tip either angled away from the root and bone surfaces for the selective gingivectomy or along the edges of the alveolar bone for marginal osteoectomy, both the soft and hard tissues were ablated and modified with the same laser. With proper water irrigation, there was no surface carbonization, smoke formation, or tissue shrinkage. The treatment outcome of this procedure was relatively predictable, and hemostasis was stable enough that


Fig. 14


Fig. 15


Fig. 19


Fig. 20


Fig. 16


Fig. 21


Fig. 17


Fig. 18


Fig. 22

Fig. 14_Patient #3, a 26-year-old healthy female patient with generalized chronic periodontitis.
Fig. 15_Apical radiograph of the upper right lateral incisor.
Fig. 16_Seven months later, after conventional nonsurgical debridement and prophylaxis.
Fig. 17_Seven-month postoperative probing of the lingual pocket of the right lateral incisor still demonstrates significant depth.
Fig. 18_Exposure of the lingual pocket followed by laser removal of granulation tissue and bacterial reduction.
Fig. 19_Surgical closure with sutures.
Fig. 20_One-week postoperative view.
Fig. 21_Thirty-month postoperative probing, showing reattachment.
Fig. 22_Thirty-month postoperative Radiograph.

_Clinical Cases

Patient #1

The patient was a 63-year-old female recovering from breast cancer treatment. Although her medical history was not ideal, she was selected because her last chemotherapy treatment had been more than three months prior, and her periodontal health was excellent. For this patient to have a more balanced gingival appearance, crown lengthening was required (Fig. 1). After the surgical area was anesthetized and the new parabolic level was initially designed with superficial lasing (Fig. 2), the excess gingival tissues were removed with the Er:YAG laser. To achieve normal biological width at the new gingival level, the underlying dental alveolar bone was reduced (Fig. 3). Laser gingivoplasty, or festooning, was used to bevel the surface geometry of the new attached gingiva (Fig. 4), and the final impression was taken after the abutment was prepared. The subsequent healing was uneventful, mild sensitivity was reported, but she did not require any medication. The gingival margin was stable and healthy enough for the final insertion in two weeks (Fig. 5). The surgical results remained stable, and the central incisor was asymptomatic six months later (Fig. 6). Because gingiva and bone are composed of varying densities of fibrous

the final impression was taken at the end of the surgical procedure. There was a safety concern when this hard tissue laser was employed in such close proximity to the root surface and the alveolar bone. As demonstrated, if the intention and the direction of the energy


Fig. 23


Fig. 24


Fig. 25

Fig. 23_Initial view of periodontal abscess on the facial aspect of tooth #30 of patient #4.
Fig. 24_Periodontal probe being used to ascertain extensions of the pocket.
Fig. 25_Immediate postoperative view after laser ablation of granulation tissue

application are carefully planned ahead, this laser may be used safely for selective ablations, even in such a confined surgical site. In spite of the initial concern over her possible weakened immune response and healing capacity for which conventional treatment had been refused, as noted before, the wound healing was uneventful and took place without the assistance of medication.

Patient #2

For this patient, surgical periodontal treatment was also refused because the prognosis for his infected premolar was deemed hopeless. For this 66-year-old male patient, who was taking antihypertensive medication, it was recommended that his upper right second premolar be extracted because of acute periodontitis and severe bone loss (Figs. 7 and 8). The patient's blood pressure was stable and under control, and the rest of his dentition was functional and normal. After the buccal and lingual areas were anesthetized, a buccal mucoperiosteal flap was raised. The infected granulation tissues were removed around the root surfaces and on the raised flap (Fig. 9). Granulation tissues usually carry much higher water content than healthy fibrous tissues such as the attached gingiva, a fact that can be exploited quite well by the strong water-affinity of erbium lasers..

With water irrigation, the exposed bone surfaces were lightly irradiated in noncontact mode with the lowest power density setting. Once stable hemostasis was accomplished, the surgical wound was closed with a 4-0 silk suture. Despite the initial infection and gingival swelling, no antibiotics or analgesic medications were prescribed. There was no report of any swelling or pain, and, most importantly, there was no bleeding at the day-after reassessment. The surgical area was monitored further for one week (Fig. 10), one month (Fig. 11), and six months (Fig. 12). Clinically, the premolar was asymptomatic and functional in two months, and there were radiographic signs of bone regeneration in six months (Fig. 13).

Patient #3

This patient was only 26 years old when the extraction of her periodontally weakened right lateral incisor (Fig. 14) was recommended (Fig. 15).

Although her overall periodontal condition improved after sessions of conventional debridement (Fig. 16), this extensive periodontal pocket (Fig. 17) became an urgent concern when orthodontic treatment was considered. The surgical approach was very similar to the one taken for patient #5 in terms of controlled access, granulation tissue removal, root surface irradiation (Fig. 18) and suturing (Fig. 19). The recovery of her surgical site was uneventful one week later (Fig. 20) and remained asymptomatic throughout her ensuing orthodontic treatment. Two-and-a-half years later, both the periodontal probing (Fig. 21) and radiograph (Fig. 22) show quite satisfactory clinical reattachment (Fig. 21) and bone remodeling around the initially 'hopeless' incisor.

Patient #4

This patient was a healthy 58-yearold male who presented with an infected periodontal pocket (Fig. 23). After it was probed and calibrated (Fig. 24), the inflamed granulation tissues were selectively separated from the remaining healthy attached gingiva and within the periodontal pocket (Fig. 25).

Although infection was initially present, no medication was prescribed and the patient reported no need for any; the surgical site recovered without any incident (Fig. 26). Clinical attachment was eventually reestablished in a month (Fig. 27) and remained stable two years later (Fig. 28).

_Discussion

There were 23 similar clinical scenarios in the study. The patients typically presented with varying degrees of symptoms and contributing factors, which would normally require invasive conventional open-flap surgery and prescriptions for antibiotics and analgesics, followed by a long period of convalescence. With the flexibility of the Er:YAG laser contact tip, the surgical sites were carefully and precisely designed, the subsequent instrumentations were less invasive, and laser energy transfer was finely controlled. As a result, the healing experiences of these patients were much more pleasant, and the surgical outcomes were more controlled.


Fig. 26


Fig. 27


Fig. 28

Fig. 26_One-week postoperative view.
Fig. 27_One-month postoperative view.
Fig. 28_Two-year postoperative probing.

Although there were signs of clinical reattachments for all of the treated areas consistent with Gaspirc and Skaleric[38] in their fiveyear, 25-patient study, there was no attempt to compare the quantitative assessment of the clinical attachment levels, since the gold standard for surgical reassessment of the actual bone level is not appropriate for clinical studies of this nature. Then, again, if the main objective of periodontal surgery is the establishment of a new connective tissue attachment to a root surface previously exposed to periodontal disease, the collective clinical and radiographic observations are quite supportive of the effectiveness of this new treatment modality. With the ablation of both hard[26] (alveolar bone) and soft tissue[32] (granulation and gingival tissue) precisely controlled, periodontal tissue reshaping or recontouring can be planned and performed efficiently with the Er:YAG laser. The bactericidal[21-23] and possible biostimulation[33] effects of this radiation with no carbonization or intense coagulation allow faster wound healing without any major postoperative swelling, pain, or bleeding. By allowing the various growth factors involved in wound healing to work soon after the surgery, the less-than-profound hemostasis from the Er:YAG lasers compared with other intense coagulation, can be beneficial and, in many situations, preferable. While these laser surgical benefits can be helpful in certain aspects of periodontal surgery, it is important to note that the use of lasers should be considered as an addition to our present armamentarium, not as a replacement for the well-established surgical principles and techniques that have been developed since the first gingivectomy was reported.[1] Because of the nontouch to light-touch requirements, the use of lasers is technique-sensitive, and due to the proximity of the irradiation to dental and bone tissues, proper training and understanding of basic laser physics is required. Appropriate laser parameters, such as power density, pulse duration, exposure time, and water irrigation, should be carefully considered. Although the laser treatments in this study have been successfully carried out, one cannot ignore an enormous contributing factor to success: the patient's compliance with respect to his or her daily bacterial plaque control. It is normal to expect a better treatment outcome, or at least better control of it, when we incorporate any new technology into our operatory. The object of this study was to document tissue responses to Er:YAG laser radiation use in surgical periodontal procedures. In particular, we wanted to evaluate whether it was safe and effective to operate the laser in close proximity to root and bone surfaces with less profound coagulation. In the present study, there were no reports of any postoperative hemorrhagic complications or side effects among the 60 patients, and the dental hard tissues that surrounded the target sites remained vital, functional, and asymptomatic. The average amount of anesthetics that were reported and the way the anesthetics were used seem to suggest that the demand for anesthetics was reduced. This may be related to the more confined and superficial surgical sites, which, in turn, reduced the possibility of bacteremia and the demand for antibiotics and analgesics. This was of benefit to some of the patients in this study who had significant medical history.

_Conclusion

This is an uncontrolled clinical study that has evolved from a private practice setting; however, the potential benefits of using an Er:YAG laser for periodontal surgery are quite evident. Based on the clinical observations collected, it is both safe and effective to use this laser wavelength in the manner described for periodontal surgery. Further investigation, ideally in the form of a randomized, controlled clinical study, will be required to validate these clinical results.

Disclosure: Dr. Yung lectures for the Institute for Laser Dentistry and receives honoraria as compensation.

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The Literature list can be requested from the editorial office.

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Finite Element Study on thermal effects in root canals

Lasertreatment with a surface absorbed laser

authors_Norbert Gutknecht, René Franzen, Friedrich Lampert, Germany

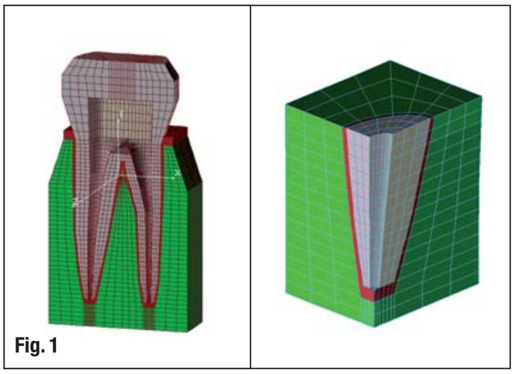


Fig. 1

Fig. 1_Illustration of the FEM model. On the left side is shown the whole model with the tooth in grey, the periodontal ligament in red, and the jaw bone in green. To the right the region of the apical third is shown enlarged.

_Introduction

For lasting therapy success on a chronically infected tooth the disinfection of the root canal is of utmost importance. In the conventional therapy the root canal is mechanically enlarged up to 1 mm close to up the physiological apex as can be seen on X-rays pictures. This is done by hand or by the use of an ultrasonic system.[1] The conventional canal preparation is supported by a lavage, primary by a NaOCl solution, which dissolves organic tissue and acts as a strong disinfection medium.[2] A smear layer is created by the mechanical preparation, which cannot be removed entirely by the NaOCl.[3] A modern approach to germ reduction in the root canal is the application of laser irradiance.[4] Numerous studies indicate that the smear layer in the root canal is removed by the laser light. Furthermore, the laser may seal off the root canal wall dentin.[5-9] Gutknecht et. al. could verify a germ reduction of about 99.91 % in vitro with a pulsed Nd:YAG laser[10] as did Hardee et. al.[11] Also for the Ho:YAG laser and the diode laser at 810 nm a large reduction of the germs could be found in vitro.[12,13]

The clinical application of a laser in the root canal is only possible if the neighboring periapical tissue does not suffer from thermal stress. The critical temperature for irreversible bone necrosis is 47 °C, 10 °C above the normal body temperature in the mouth.[14] The measured temperatures on the root surface of extracted human teeth were partially in this vicinity.[15] Aim of this study was to calculate the temperature distribution in the root canal and its neighboring tissue during a simulated laser treatment using a Finite-Elements-Model. For the calculations the tooth, the periodontal ligament, and the jaw bone were included in the model. The apical third is of specific interest in this region. Furthermore, the temperature influence due to heat conductance on other root canals was included in the model by simulating a tooth with two root canals. The amount of heat deposition per time, and the movement of this heat source can be obtained from the rules for laser treatment.

Material data of dentin	
Density	$r_{Dn} = 3 \times 10^3$ kg/m^3
Specific heat	$c_{Dn} = 1.34 \times 10^3$ J/kgK
Heat conductivity	$l_{Dn} = 0.6\text{-}2.2$ W/mK

Table 1

Material data of the periodontal ligament	
Density	$r_{Dn} = 0.98 \times 103$ kg/m^3
Specific heat	$c_{Dn} = 2.5\text{-}3.4 \times 10^3$ J/kgK
Heat conductivity	$l_{Dn} = 0.49$ W/mK

Table 2

Material data of the jaw bone	
Density	$r_{Dn} = 2.31 \times 103$ kg/m^3
Specific heat	$c_{Dn} = 2.65 \times 103$ J/kgK
Heat conductivity	$l_{Dn} = 0.38\text{-}2.3$ W/mK

Table 3

Table 1_Physical properties of dentin.
Table 2_Physical properties of the periodontal ligament.
Table 3_Physical properties of the jaw bone.

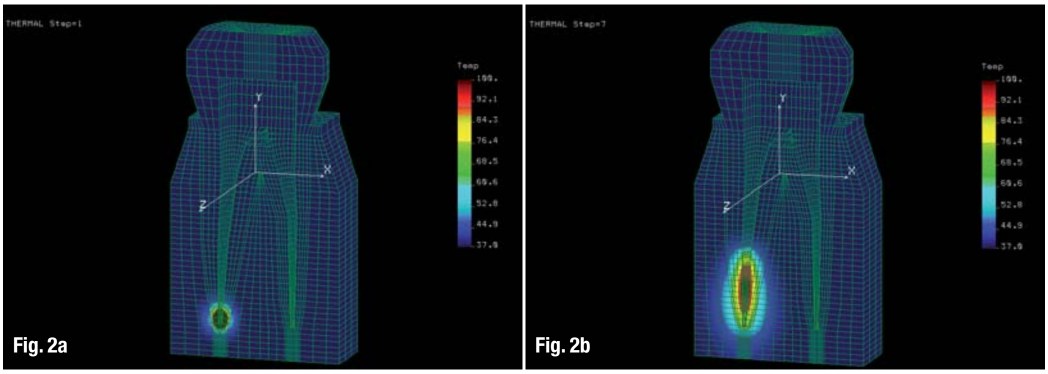


Fig. 2a

Fig. 2b

_Materials and Methods

Using data from literature[16] a computer model of a human lower molar was created and separated in many horizontal slices. The final FE-model was calculated from these slices in the FE-preprocessor of the COSMOS/M software as seen in Fig. 1. Material properties for the molar were also obtained from literature[17-20] as can be seen in Tables 1-3.

Regarding the quality of the literature data for the materials it can be said, that the data for the density is relatively exact (+/- 2% in the case of jaw bone, +/-5% for the desmondont). The data for heat conductivity, however, show a broad variety. For dentin, it can be from 0.6 to 2.2 W/mK. In our simulations c_{Dn} was set to 1.4 W/mK because a small heat conductivity means a slow heat transfer to neighboring tissue and therefore high local temperatures. This means choosing the average value for c_{Dn} represents the most supposable value for the a clinical treatment. The same consideration applies to the periodontal ligament and the jaw bone.

The FE-software COSMOS/M allows setting power-time-functions for single knots resp. groups of knots in the FE-grid. The heat deposition during laser treatment of the root canal is typically done with 1.5 W and a fiber related divergence cone of 25°. Laser energy absorption was assumed to take place at the surface of the corresponding finite element. Energy deposition was modeled close to the rules of treatment, which are as follows:

The fiber is inserted into the root canal to its full length, which is 15 mm in the FE-model. Immediately after switching on the laser, the fiber is retracted from the canal in a steady-going motion while performing circular movements inside the canal. The time of treatment should be approx. 20 seconds, which yields a lateral fiber velocity of

$$v_L = \frac{15\,\mathrm{mm}}{20\,\mathrm{s}} = 0.75\frac{\mathrm{mm}}{\mathrm{s}}.$$

Let x_L, y_L, z_L be the cartesian coordinates for the center of the tip of the fiber. Then the lateral position of the fiber tip is $y_L = y_0 + v_L t$ where (x_0, y_0, z_0) is the coordinate for the deepest point of the root canal. The actual position of the fiber tip in the horizontal plane is then given by

$$x_L = r_y \cos\omega t + x_0$$

$$z_L = r_y \sin\omega t + z_0$$

where r_y is the radius of the canal at the lateral position y_L. Therefore, the real movement is equivalent to a trajectory on a helix with increasing radius. Furthermore, it can be assumed that the horizontal spiral motion (angular speed v*t*) is much faster than the slow withdrawal of the fiber from the root canal, which leads to the simplification that the laser energy is evenly distributed into the corresponding area. The surface absorption was modeled by an absorption coefficient of a=`, where a is the Lambert-Beer coefficient for an irradiated medium according to

$$P(x) = P(x=0)e^{-\alpha x}.$$

Reflections, transmission, and scattering effects are not modeled in this case.

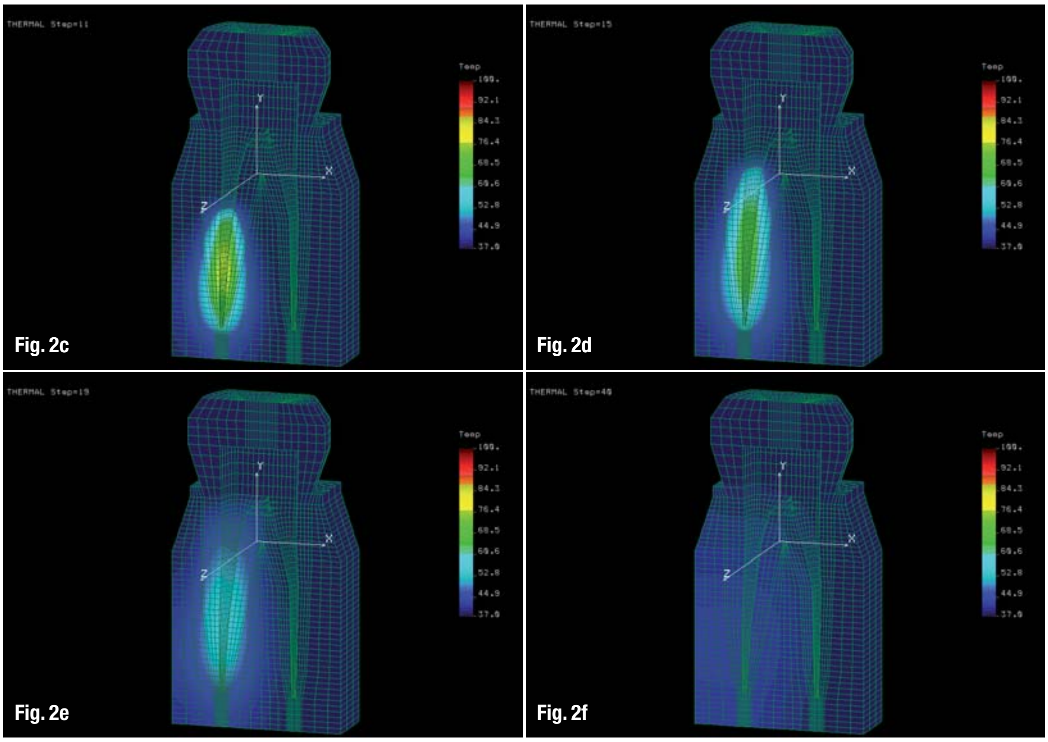
_Results

The FE-analysis of the numerical tooth model showed a strong heat concentration in the area of the apical third, especially on the root canal wall. However, the high temperatures diminished quickly as the fiber was retracted slowly from the root canal and did not move into the neighboring tissue. Solely in the area of the apical third, the heat overlapped to the periodontal ligament. The found temperatures of about 100 °C in this region wear off very fast during the treatment process and are not conveyed to the neighboring tissue. Temperatures of up to 40–52 °C were found on the root surface for a period of 8 seconds. The results are shown in the image sequence in Fig. 2.

_Discussion

In this study the temperature formation during a laser irradiation in a root canal was calculated. All previous clinical studies could not be used to study the interaction of the tooth, periodontal lig-

Fig. 2_Image sequence of a simulated laser treatment. The time after the beginning of the treatment is shown. The temperature is color-coded as indicated on the scale. The simulation itself was done with an internal time step of 0.05.
a_after 1 second
b_after 7 seconds
c_after 11 seconds
d_after 15 seconds
e_after 19 seconds
f_after 40 seconds



ament, and the jaw bone because the real temperature formation cannot be measured in a sufficient spatial and temporal resolution. At the utmost, animal experiments can supply histological cuts, which can be investigated for thermal damage zones.

The FE-model showed temperatures up to 100 °C in the apical third—these temperatures are not high enough to melt the root canal wall dentin and enforce a recrystallization. This does not correspond to the results of an electron microscope based study of the root canal wall dentin after Nd:YAG laser irradiation (1,064 nm) by Gutknecht et. al.[6] Microorganisms could be evidenced up to a depth of up to 1,150 µm in the tubules of the root canal wall dentin.[21] In contrast to the conventional lavage, the laser treatment with its high temperature concentration in this area can eliminate the germs much more effectively. NaOCl lavages can disinfect the tubules up to a depth of 100 µm[22] while for a laser treatment with a Nd:YAG-laser a germ reduction could be verified in a depth of 1,000 µm[23]. Furthermore, the high temperature ensures a germ reduction in the ramifications of the root canal, which cannot be achieved with the conventional preparation methods.[24] Microbiologic studies with a high surface absorbed laser (Er:YAG laser) showed a germ reduction of 53 % in a depth of 500 µm.[25]

The quick temperature diminishment at the root canal wall with proceeding treatment lets us anticipate that the neighboring tissue is not or not significantly affected by the heat. Behrens et. al. showed in a in vitro study a rise in temperature of 17 °C on the root canal surface on extracted teeth after 90 s of Nd:YAG laser irradiation (1,064 nm, 150 µs pulse length, 15 Hz repetition rate, 1.5 W, 25° divergence angle).[13] The length of the treatment in vivo is much shorter, namely 20 s. Furthermore, because of the good supply with blood of the periodontal ligament an additional cooling factor is present so that in clinical application it is not anticipated that critical temperatures may occur. For the root canal treatment with Nd:YAG lasers, a long term study by Gutknecht et. al.[4] has proven the above statement. For the simulated Er,Cr:YSGG laser we estimate out of our findings to get similar clinical results as they have been seen after Nd:YAG laser treatment._

The literature list can be requested from the editorial office.

_contact laser

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Dental lasers for soft tissue surgery and periodontics

What we know and what we've learned

author_Donald J. Coluzzi, USA

_**About 1975 medical surgeons** began using a new device that complemented and, in some cases, replaced the scalpel. That instrument was a laser, and during the 1980's a Carbon Dioxide model was a common component in the operating suite. In 1989 the first laser specifically designed for dental use became available. Today there are two dozen indications for use with various dental laser devices; and the clinical applications continue to increase, making the laser one of dentistry's most exciting advances with unique patient benefits. This article will attempt to summarize those laser applications for dental soft tissue and treatment of periodontal disease.

Surgical lasers produce energy that can be absorbed by a target tissue, and this absorption proceeds as a photo-thermal reaction; that is the radiation produces a thermal reaction in that tissue. While other effects are possible, including true photo-disruption where molecular bonds are broken without vaporization to very low level use of laser energy producing a bio-stimulatory or bio-modulation effect.[1] Depending on the instrument's parameters and the optical properties of the tissue, the temperature will rise and various effects will occur. In general, most non-sporulating bacteria, including anaerobes, are readily deactivated at temperatures of 50 °C.[2] Proteins begin to denature at temperatures of approximately 60 °C without any vaporization of the underlying tissue.[3] This is a clinically useful effect because, if the temperature can be controlled, diseased granulomatous tissue will be removed while the biologically healthy portion can remain intact. Coagulation, also occurring at this temperature, refers to the irreversible damage to tissue, congealing liquid into a soft semi-solid mass.[4] This process produces the desirable effect of hemostasis, by the contraction of the wall of the vessel. At 70 to 80 °C uniform heating will produce adherence of the layers because of stickiness due to the collagen molecule's helical unfolding and intertwining with adjacent segments, a process sometimes termed tissue welding.[5]

Laser excisional or incisional surgery is accomplished at 100 °C, where vaporization of intra- and extracellular water causes ablation or removal of biological tissue.[6] Thus excision of soft tissue can begin at this temperature, but the apatite crystals in dental hard tissue will not be ablated. However water molecules dispersed throughout mineral structure are vaporized and the resulting jet of steam expands and then explodes, removing the tooth structure. This water mediated explosive removal transfers minimal heat to the adjacent tissue.[7] Thus, cavity preparation, calculus removal, and osseous contouring can proceed.

Continued application of energy will raise the tissue temperature. At about 200 °C dehydration is complete and the tissue carbonizes. Carbon as the end product absorbs all wavelengths. Thus, if laser energy continues to be applied, the surface carbonized layer absorbs the incident beam, becom-

Fig. 1_Immediate post operative view of an Nd:YAG laser gingivectomy, using high power.
Fig. 2_Seven month post operative view with final restorations in place.
Fig. 3_Immediate post operative view of another gingivectomy using a newer laser with less power and better technique.
Fig. 4_One week post operative view at the restoration try-in appointment. Note tissue healing.


Fig. 1


Fig. 2


Fig. 3


Fig. 4

ing a heat sink. Collateral thermal damage can spread rapidly preventing normal tissue ablation and causing tissue necrosis.[8]

Some of the general benefits of the use of lasers in dental soft tissue include:

_Lasers reduce pathogens
_Lasers provide hemostasis
_Lasers can offer better post operative courses in healing
_Lasers can offer biostimulatory effects
_Lasers can have advantages over scalpels and electrosurgery.

For pathogen reduction several studies point out that every wavelength is effective, which is clearly a different effect than when a scalpel is used.[9-12] Moreover there is an advantage in reduce the need for prescription antimicrobials for a wide range of patients including children and pregnant women. Additionally, without medications, the patient will not experience allergic reactions, bacterial resistance or untoward side effects.

The ability to control bleeding during surgery enables much better visualization of the area. Some wavelengths achieve better hemostasis than others. The erbium family whose radiation is emitted in a free running pulse mode offers less sustained energy so soft tissue surgery may not be totally bloodless.[13-16] There are some conflicting results from studies comparing the post operative healing from lasers versus other modalities. Some authors point out that the healing can be faster, slower or the same as conventional instrumentation.[17-21] At the same time lasers have been shown to have offer bio-stimulatory effects. These are not clearly understood, but are clinically significant during and after treatment, adding to the value of health care.[22-23]

Other advantages include the lessening need for sutures[24], less painful treatment and reduced swelling post-operatively[25], less wound contraction[26], easier contouring of gingival tissues compared to a scalpel[27], safer around dental implants[28], and generally better patient acceptance of a procedure[29].

For treatment of periodontal disease, once again all wavelengths show usefulness. After scaling of the root surface with other instrumentation diode, Nd:YAG and Carbon Dioxide lasers are used can be used on the soft tissue side of the periodontal pocket to remove the inflamed soft tissue and to reduce the pathogens.[30-34] The erbium family of lasers can also be employed to remove calculus and other accretions on cementum with results similar or better than conventional scalers.[35-37]

The first twenty years of dental laser technology have been accompanied by sophistications in the instruments themselves, as well as improved surgical techniques. Figure 1 shows one of the author's first cases of gingival contouring in an immediate post-operative view and Figure 2 shows the restorations in place several months later with good tissue health. Retrospectively the soft tissue in the first figure received an excessive amount of laser power, as evidenced by the dark and almost charred areas; however, the healing progressed with a beneficial result. The immediate post-operative consequence of the author's use of a newer pulsed instrument with much more controlled thermal interaction is shown in Figure 3. Figure 4 illustrates the trial fitting of the restorations with the tissue practically healed. The conclusion to be drawn from these two cases is that the surgeon must observe the photothermal events carefully and employ proper instrument parameters.

In summary although lasers cannot totally replace conventional instrumentation, the overwhelming evidence from published studies and clinical cases provide assurance that lasers are a beneficial treatment modality for dentistry._

The literature list can be requested from the editorial office.

_contact | laser

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A Novel technique of laser-assisted blood coagulation for tissue regeneration in implant dentistry

author_Kenneth Luk, Hong Kong


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8

_Abstract

Various laser wavelengths have been demonstrated in assisting implant surgery such as uncovery of implant sites, flap incision, gingival management in restorative phase. Recently, researches in treatment of peri-implantitis and preparation of osteotomy sites with Erbium-doped:Yittrium-Aluminium-Garnet (Er:YAG) lasers have been reported. The Er:YAG laser is used for ablation of dental hard tissue and bone with the benefit in decontamination and removal of smear layer. Er:YAG laser also ablates soft tissue efficiently with low collateral thermal damage but poor in haemostasis. Haemostasis, coagulation and biostimulation in soft tissue management are major advantages in the use of diode laser with 810 nm wavelength. The aim of this case report is to demonstrate the effect of laser-assisted blood coagulation (LBC) on soft tissue regeneration in a space between opened flaps prepared by intentional flap-positioning around implant.

A combination of two lasers, digital pulse diode laser (DPL) 810 nm and Er:YAG laser 2,940 nm were employed for the LBC technique. Fibroblastic proliferation covering the entire wound was observed two days after treamtment. The increase in tissue bulk at the pontic areas improved the emergence profile and aesthetics of the bridge and soft tissue support. In this case, palatal connective tissue graft was avoided. The LBC technique is a useful adjunct to tissue/wound management and holds a promise for tissue regeneration.

_Case Outline

A 40-year-old lady attended the office for restorative phase of implant (Fig. 1). Three implants were placed on 11, 21 and 22 by her maxillofacial surgeon (Dr. Richie Yeung) five months ago. A removable acrylic denture was worn by the patient during the healing phase.

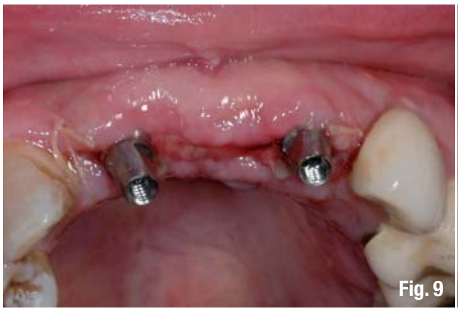
Fig. 9


Fig. 10


Fig. 11

_Treatment Plan

I. Incision with Er:YAG laser
II. Exposure of implants and placement of gingival former
III. Induce bleeding into open wound
IV. Haemostasis and coagulation with DPL.

_Treatment procedures

Elexxion Dental Laser (Delos) was used in this case report. This is a combination laser unit housing both Er:YAG 2,940 nm laser and DPL laser. Local anaesthetic was administered. Incision was made on the ridge of 11 to 22 sites by Er:YAG laser (2,940 nm) under water irrigation at 70 mJ/100 µsec pulse and 20 Hz using a 400 µm tapered sapphire tip (Fig. 2). Full thickness flap was raised with periosteal elevator. The flap was loosened along the buccal and palatal side of the ridge (Fig. 3). It was decided that only two implants were to be used as abutments. Gingival formers (3 mm in height by 4 mm diameter) were placed at 11 and 22 sites.

One suture was placed at each end of the flap. The flap was intentionally kept open supported by two gingival formers without sutures in between. Gingival mucosa of the flap was de-epithelialized by Er:YAG laser with water irrigation at 70 mJ/pulse and 20 Hz using a 400 µm tapered sapphire tip (Fig. 4). The periosteum was also ablated by Er:YAG laser to induce bleeding to fill up the open wound. Relieving incisions were also made with No.15 scalpel to induce sufficient blood volume. Blood was coagulated by DPL at 20 W, 16 µsec and 20,000 Hz in de-focused mode using a 600 µm fiber (non-initiated) (Fig. 5). Coagulation (pink in colour) may be observed while avoiding charring (black in colour) on the surface of the clot (Fig. 6).

_Post-operative Care

The patient was asked not to disturb the clot while wearing the removable denture at all times. Toothbrushing near the site should to be avoided.

Warm salt mouth bath was recommended. Patient was advised not to use antiseptic mouth rinse. No antibiotics or analgesics were prescribed.

_Result

Patient reported no adverse signs or symptoms. Fibrin mash covering the entire wound was observed two days after treatment (Fig. 7). The gingival former for 22 was covered by the newly laid fibrin while the remains of the clot was still covering the gingival former at 11. On day three, impression was taken for the fabrication of provisional bridgework (Fig. 8 & 9). Five weeks post-op showed the profile of the provisional bridgework (Fig 10). Three months (Fig. 11) and six months (Fig. 12) post-operative reviews showed complete keratinisation of the soft tissue (Fig 13). The patient was happy with the aesthetics of the screw-retained prostheses (Fig. 14).

_Conclusion

The increase in tissue bulk at the pontic areas improved the emergence profile and aesthetics of the bridge and soft tissue support. In this case, palatal connective tissue graft was avoided. The LBC technique was very effective for tissue regeneration with minimal side effects and complication. The LBC technique is a useful adjunct to tissue/wound management and holds a promise for tissue regeneration._

_contact laser

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Fig. 12


Fig. 13


Fig. 14

Using photobiostimulating lasers in the practice of pediatric dentistry

author_Lawrence A. Kotlow, USA

Fig. 1_ PBS laser desensitizing tooth.
Fig. 2_ Erbium:YAG laser desensitizing tooth.

_Discussion

There are many peer reviewed articles in the dental literature that have examined the of benefits of hard and soft tissue lasers.[1] The use of the Erbium:YAG laser, diodes[2] of various wavelengths, carbon[3] dioxide lasers as well as lasers used in the past such as the Argon[4] and holmium are well accepted through out the world.[5,6] Photobiostimulating lasers which are, non-surgical, non-invasive and use energy levels below .500 w. PBS lasers do not require tissue temperature elevation in the target tissue (photothermal effects), but rather create a photo-bio-stimulation (PBS) or modulation effect on the target tissue. PBS laser's benefits and usage are beginning to gain acceptance within the dental community, especially in the United States. These non-photo-thermal producing lasers are known by many different names, among the most common names are; cold lasers, healing lasers as well as low level lasers (LLLT) and produce their effects by a photobiological or photochemical effect on the target tissue. Low level lasers produce energy in a range of 50–500 mws. PBS lasers effects occur by producing both stimulation and or suppression of biological processes and allow the body to create an intracellular or biological response. The present understanding of PBS indicates one of its major effects is created within the cell mitochondria and results in an increase in ATP, the cell's fuel for energy and repair. PBS lasers are semiconductor diode lasers consisting of InGaAIP (Indium-Gallium-Aluminum-Phosphide) in the range of 630–700 nm. GaAIAs (Gallium-Aluminum-Arsenide) in the invisible therapeutic light range of 800–830 nm. Depending on the specific wavelength of each laser, PBS lasers are capable of penetrating soft tissue up to depths of approximately 2–3 cm. PBS lasers affect damaged cells and do not produce harmful or negative effects on healthy cells. In the United States, the Federal Drug Administration (FDA) recognizes and defines Photobiostimulating lasers *as NSR or posing no significant risk and are considered safe.* Outside of dentistry, the FDA has given approval for such procedures as pain control and carpel tunnel syndrome treatment. At this time, in the United States, all dental applications should be considered *off label* usage. The only suggested contraindications for use of PBS lasers are: Pregnancy, malignancies, use near the eye or in some cases over the thyroid gland. The effects of photobiostimulating laser therapy can be divided into three areas; primary, secondary or tertiary and are postulated to be effective locally and systemically, that is, producing bene-


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8


Fig. 9

ficial effects in areas of the body not being directly radiated. In the United States, per reviewed articles acceptable to the scientific community are few[7,8], due to the inability to produce good double blind studies determining whether the effects demonstrated are due to a therapeutic effect or a placebo effect, however, over 2,500 articles have been written and accepted world wide outside of the United States. PBS effects are not limited to cold lasers. Hard and soft tissue lasers also appear to produce PBS effects when used in a noncontact, defocused mode in tissue beyond the photo-thermal effected areas and therefore do not produce heat build up within the radiated tissue. Examples of PBS effects, which maybe attributed to the nonthermal effect of hard and soft tissue lasers, would be the reduction of post surgical discomfort, reduction of pain and swelling due to trauma, improved healing over conventional surgical techniques such as electro-surgery and maintaining vitality of injured teeth. PBS lasers used in this report consist of either in a (a,b) cluster containing LEDs and (c,d) Diodes or as a probe containing a single wavelength such as 660, 808, or 831 nm. Typically the cluster used for treatment provides between 4–12 mj externally and intraoral probes between 2–8 mj per minute.

_Suggested treatments

Dental analgesia[9,10]

PBS lasers reduce the need for a local anesthetic during restorative dental procedures by producing an analgesic effect. The tooth or teeth being treated are not numb, however, the ability of the body to recognize or feel pain appears to be significantly reduced.[9] Teeth exposed to laser therapy have lower levels of pain as compared to those with the placebo treatment. A Photobiostimulating effect can be accomplished by using (PBS) lasers that are limited to low level energy (a 660 nm probe) or by using a hard tissue laser (an Erbium:YAG laser 2,940 nm) in a defocused mode. The technique of achieving this effect is to place the tip of the (PBS) laser in a defocused mode (non-contact 1–3 mm off of the tooth surface) over the crown and roots of a tooth for one to two minutes using the 660 nm probe or when using the Er:YAG by keeping the laser tip defocused and in motion in order to prevent production of any thermal effects within a tooth. Using this technique, it is often possible to complete the tooth cavity preparations with the Erbium:YAG (2,940 nm) hard tissue laser. In many instances, when preparing primary teeth and many

Case 1

Fig. 3-4_ Trauma to upper centrals treated using laser.

Fig. 5-6_ 24 months post treatment.

Fig. 7_radiograph of extruded tooth # 9.

Fig. 8_repositioned tooth # 9 using a composite ribbon for stabilization.

Fig. 9_tooth # 9 , 23 months after treatment asymptomatic and vital.

Fig. 10_example of patient requiring PBS to reduce swelling.

Figs. 11a,b_(a) PBS probe using Q1000 660 nm probe intraorallly to treat TMJ discomfort.

(b) Q1000 led,laser cluster in mode 1 to treat TMJ discomfort externally.


Fig. 10


Fig. 11a

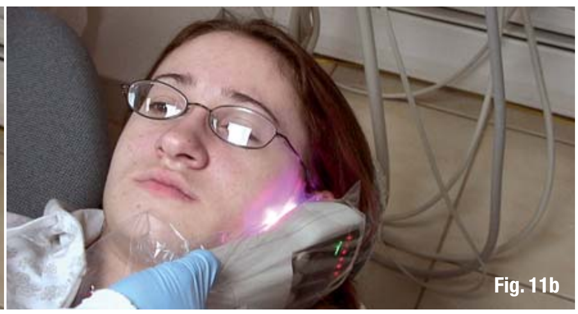
Fig. 11b

permanent teeth, it is possible to use a highspeed dental handpiece to complete the cavity preparation without causing the patient discomfort. (If the patient has not been previously introduced to the high speed or vibrations of the low speed there is no preconceived fear factor.) Whether you place a composite or an alloy, the patient is able to leave your office without the discomfort of a numb lip, tongue or cheek. In children, this eliminates the potential for developing a traumatic tongue or lip injury due to the child biting one of these areas. (Fig. 1 & 2)

Treatment of traumatized anterior teeth[11,12]

Trauma to maxillary or mandibular anterior primary teeth may result in pulpal death, tooth discoloration and possibly future infection or developmental damage to a developing permanent tooth. This usually develops within 2–6 weeks after a child has sustained an injury to the upper incisor teeth. Infants and toddlers, ranging from 7 months to 5 years of age, whom have had a traumatic dental injury, have had the involved tooth or teeth remained vital after treatment with a 660 nm laser probe. Cases where the front teeth were slightly mobile, partially avulsed or displaced and were treated within 24-48 hours after an injury, demonstrated through clinical evaluations, as long as 36 months post trauma, to be both clinically and radiographicly normal in color, vitality and asymptomatic. The treatment consists of placing a 660 nm PBS probe on the facial and palatal area of a traumatized tooth for one minute. In some instances it is advantageous to retreat the effected tooth or teeth similarly at 3- and 5-day intervals after the accident. Primary tooth trauma: Patient[1] seen immediately after upper front teeth received trauma and a second patient[2] who received trauma to the lower anterior teeth (Fig. 3 to 6).

Permanent tooth trauma (Fig. 7 to 9)

A 10 year old female child presented with tooth #9 partially avulsed. The tooth extruded out of the alveolus approximately 5 mm. The tooth was gently repositioned into the correct position, splinted and treated with the 660 probe for one minute facially and one minute palatally. This was repeated at three days and 7 days post trauma. At the end of 23 months the tooth remains vital and asymptomatic.

Treatment of Cellulitis and muscle trismis (Fig. 10)

Patients with oral infections may have a limited ability to open his or her mouth to allow an accurate examination of the oral cavity due to an abscessed tooth. This can limit the ability of a clinician to properly examine and diagnose an infected tooth and allow for drainage and relief of pain. Placing a PBS laser cluster containing both diodes and LEDs over the affected side of the upper or lower jaw for three minutes on mode 1 (approx 3 joules, Q1000) will often gave a patient enough relief of muscle trismis to allow for adequate opening and allow drainage of the infected tooth.

Treatment of Temporomandibular joint discomfort (TMJ)[13]

A 13-Year-old female presented with a history of ringing in the ears, jaw pain upon chewing and limited ability to open her mouth fully. The patient was treated using a combination laser LED cluster for five visits, on alternate days, extraorally and the 660 nm(2.2 joules) intra-orally probe for one minute on each TMJ area. The patient indicated she felt relieve immediately and after three days was essentially pain free (Figs. 11a, b).

Reducing the gag reflex[14,15,16]

An Acupuncture point on the inside area of the wrists, know as the P6 meridian, has the potential to reduce the nausea and gagging. Applying laser energy using the 660 (4 joules), or 830 nm wavelength using 4 joules to the P6 acupuncture can provide sufficient energy to alleviate the gag reflex. The P6 point is located on the undersurface of the wrist approximately 1 inch from the wrist crease; this is approximately the width of the distal thumb phalanx. Patients who in the past had gag reflexes strong enough to prevent taking of intra-oral radiographs, placement of rubber dam or and visualization and treatment of the most distally located molars can be successfully treated when the PBS laser placed on the P6 acupuncture point for one minute (Figs. 12 to 13).

Treatment of surgical procedures and injuries[17,18,19]

Patients undergoing surgical procedures benefit from pretreatment of the surgical site prior to

Fig. 12_Placement of laser.
Fig. 13_Two minutes of laser.

Fig. 12

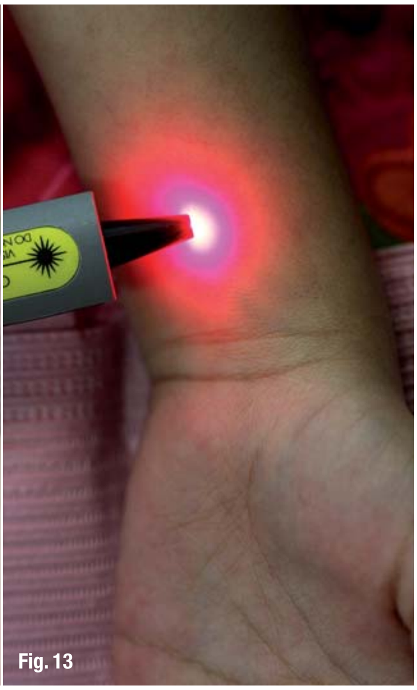

Fig. 13


Fig. 14


Fig. 15


Fig. 16


Fig. 17

Fig. 14_Facial trauma day 1.
Fig. 15_Day 2.5 after laser treatment.
Fig. 16 and 17_Day 6 after laser treatment externally and intraorally.
Fig. 18_treatment of patient who presented with multiple herpes like lesions.
Fig. 19_4 days post treatment.

treatment. This is effective in reducing post surgical pain and inflammation. Photobiostimulating lasers result in enhanced healing when measured by wound contraction. These effects are the result of laser action of (photons) light on both the cell membrane components within the nucleus of the cell. Stimulating healing in soft tissues, to resolve inflammation, give pain relief, improve the tensile strength of the wound, increase the speed at which it heals and stimulate the immune system to resolve infection. Rochkind et al. (1989) also found that the effect of irradiating one area was gleaned elsewhere on other wounds of the body, suggesting the systemic effects of LLLT. This appears to be a significant reason why it is difficult to create a study using the left and right side of the same patient. The systemic effects prevent the examiner from determining if there is a difference between a placebo effect and the laser's effect.

Facial injury: four year old child who received an injury to her upper teeth and soft tissue when falling against a table while playing at home (Q1000 mode 1, three minutes) (Figs. 14 to 17).


Fig. 18


Fig. 19

Treatment of intraoral primary herpes[20, 21, 22, 23, 24, 25] *(Fig. 18 & 19)*

A ten year old patient presented with multiple lesions intra orally and significant discomfort. Laser globe was placed extra orally for three minutes. Patient returned four days later with history of no discomfort and most lesions no longer present (Q1000 mode 1, three minutes).

_Conclusion

Photobiostimulating lasers are able to provide patients with many benefits among them are; reduced pain and duration of traumatic injuries, reduction of gag reflex and nausea, reduced healing durations, relief of muscle discomfort, The mechanism of these benefits is still undergoing investigation and needs more scientific studies to allow for proper understanding._

Photobiostimulating lasers

a: Aculaser: Laserex Technologies
PO Box 177, Unley, SA 5061, Australia
2 mm probe 660 nm 2.2 joules /minute

b: Q1000: 2035, inc., 520 Kansas City Street,
Ste 100 Rapid City, SD 57701
phone 605-342-5669

c: MEDX home unit distributed in the US by lasers4technology

d: DIOBEAM 830 distributed in Canada by laser light of Canada.

The Literature list can be requested from the editorial office.

_contact | laser

Lawrence Kotlow DDS
Private practice, 340 Fuller Road,
Albany, NY 12203, USA
Board Certified Pediatric Dentistry
Advanced Proficiency Erbium: YAG lasers, ALD
Standard Proficiency Nd: YAG & Diode lasers, ALD
Mastership in the Academy of Laser Dentistry
Recognized Standard Course Provider, ADL
Web site:www.kiddsteeth.com

Minimally Invasive Laser Decontamination MILD ®—A New Procedure for the Treatment of Marginal Periodontopathies and Periimplantitis

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_Even though the concept of photodynamic therapy had already been discovered and described for the first time in 1900 by Paul Ehrlich, the method became generally accepted only hesitantly. Hermann von Tappeiner, a dermatologist from Munich, had defined the clinical approach of the photodynamic therapy as early as 1904.

But it took almost a century until medical science recognized the usefulness of this form of therapy and tried to integrate it into their treatment.

Today, anti microbial photodynamic therapy is used primarily for the treatment of tumors and, since the beginning of the 1990s, also increasingly in dentistry.

Here, it is periodontal and periimplantitis treatments that are of particular interest for their use in photodynamic therapy.

Confusing are, however, the mere vast number of sensitizers, laser wavelengths and parameters, therefore the recommendations of the authors for these uses sometimes differ considerably. An Austrian company broke new ground, not only manufacturing the low-level laser itself but also offering the photo sensitizer still required.

That supplier goes even a step further and offers the aPDT as a "complete module" for the integration of this concept in dental practice. In comparison to the already mentioned "flood of sensitizers and laser parameters", in this case a strict protocol is specified.

After an initial euphoria, the interest in photodynamic therapy has considerably and quickly cooled off, and hopes for stimulating effect for the entire laser dentistry failed to materialize.

Aside from the still poor documentation of the method regarding the verification of effective results in dentistry, the relatively high price for the described "complete method" might also have contributed to this fact.

Despite this development, photodynamic therapy still commands a high appeal and interest for dental professionals, still offering an option for an actual minimally invasive procedure!

Accordingly, our goal was to develop a method, which

_ is based on detailed fundamental research
_ does not have an antimicrobial effect by the use of the sensitizer itself
_ does not leave sensitizer remains on teeth and implants
_ delivers long-lasting results.

This method, developed by a successful team is referred to as "MILD – Minimally Invasive Laser Decontamination" and will be introduced in the following text in detail.

_General information regarding the concept of antimicrobial photodynamic therapy

Idea and fundamentals of the PT concept

According to the underlying evidence-based periodontological data, the biofilm becomes the focus of interest in periodontology and therefore also in PT. The PT is based on the interaction between a stain (sensitizer), laser light, and pathogenic germs: Those pathogenic (mostly gram-negative anaerobic) bacteria are stained with a special photosensitizer, followed by laser light application in the low-level range (previously referred to as "soft laser"), and the singulett oxygen released in the process damages the membrane of the bacteria to such an extent that it is not compatible with the further survival of the germ.

Pretreatment

Almost all relevant working groups, which rendered outstanding services to the PT in the last several years like (Siegusch [Germany], Neugebauer [Germany], Bogaerts [Belgium], Sculean [Netherlands], and Frentzen [Germany] call for a thorough pretreatment prior to PT. This is both true for patients suffering from the periodontal disease, as well as for patients with periimplantitis having manifested itself on their artificial tooth posts. The following pretreatment steps are generally described in literature (independent of the sensitizer and the PT method favored):

a) Depuration and patient instructions
b) Findings, precision cleaning and subsequent utilization of PT
c) Checkup after seven days (if bleeding is persistent on probing: repeat PT)
d) Recall (the first one after six to eight weeks, after that in quarterly intervalls).

Present long-term observations in PT

The active principle of PT in dentistry has been described in many publications by Prof Dörtbudak (Vienna University, Austria) since the beginning of the 1990s (still with the photo sensitizer Toluidine Blue used at that time). With the rediscovery of PT, and most importantly based on the activities of Helbo Company, dental practices increasingly switch to this treatment option.

Initial long-term data—quite naturally—are reported primarily from the country this method originates from, Austria, and here, the study by Mrs. Schütze-Gössner (representative practice for Helbo Company in Salzkammergut, Austria) particularly deserves to be mentioned: In 2006, this Austrian dentist was able to report the following long-term observations regarding the benefits of PT achieved in her practice.

She presented a total of 20 female and male patients, who underwent PT (at Helbo also referred to as aPDT) and the subsequent recall in a time period of 29 to 54 months. Teeth, which could not be preserved, were extracted before the start of the therapy; germ tests were, however, only done on eleven from 20 patients. In two patients, despite the use of PT additional flap operations were required.

In short, Schütze-Gößner reports about positive clinical parameters following the completion of aDPT without secretion accumulation in the pockets and BOP persistence in only 1.7 % of all cases.

Regarding general guidelines and methodology this study does not meet general requirements for a systematic study leading to verifiable conclusions.

Other more recent bibliographical references also originate from Germany but those tend to cover shorter observation time periods (four weeks up to a year). The extraordinary clinical benefits of the method are always highlighted in those reports, leading to considerable improvement in the clinical (inflammation) reaction:

Siegusch

In several publications assistant professor Sigusch (Germany) could confirm the minimally invasive procedure of the photodynamic therapy, as well as a considerable improvement of all clinical parameters following recent PT in marginal periodontopathy. He attributes high importance and an enormous future potential to the method.

Neugebauer

The first German academic publications originated from the Cologne Working Group with Neugebauer and Zöller, who used PT alongside their "classic field" of periodontology within the scope of a periimplantar lesion for the improvement of wound healing, reporting unconditionally positive results.

Sculean

Professor Sculean (Netherlands) assesses the perceived value of the photodynamic therapy slightly more soberly when reporting at the annual AGLZ conference in Düsseldorf that PT can contribute to the improvement of periodontal health.

Bogaerts

At the ISLD 2006 in Berlin, a Belgian working group including Bogaerts and colleagues reported, among other things, a distinct germ-killing effect of photodynamic therapy following simultaneous low heating. This working group ruled out damage to the dental pulp caused by PT.

Eberhard

As a "master thesis" for obtaining the academic title of "M.Sc.—Master of Science", Eberhard presented a study to his colleagues, demonstrating the results of a long-term analysis of patients treated with PT.

With the predominant number of patients treated, one-time use of PT already led to treatment success. A small number of patients had to repeat treatment and sometimes additional medical aids were required.

Stoll, Bähr and Bach

This Freiburg working group confirmed a significant improvement of the clinical parameters following PT but pointed out a clearly verifiable bactericidal effect of photo sensitizer Phenotiazine (HelboBlue) and sensitizer remaining attached to implants and teeth with deep defects, which were not removable.

_Minimally invasive laser decontamination—MILD®

I—The philosophy of MILD procedure:

The goal of the MILD diode laser with a wavelength of 810 nm in combination with a sensitizer is the tackling of the biofilm and interruption of the QUORUM SENSING (cell-to-cell communication of bacteria starting at a certain number).

Precisely, the prevention of the last process is of a big importance according to the opinion of many periodontologists because the bacteria's cells divide every 20 minutes. According to the inaugurator of PT in dentistry, Austrian microbiologist Dörtbudak, the procedure leads to light-induced deactivation of cells, microorganisms and molecules. The mechanisms of this action would, in case it proves its value in periodontology and the treatment of periimplantitis, later make the application of MILD in the therapy of tumors and in endodontology appear even more meaningful at a later point in time.

II—Assumed side effects of MILD procedure:

MILD procedure must not be carried out on patients with iodine allergies because PS Indo Cyanine Green could trigger an allergic reaction in these patients.

Furthermore, a time-limited green coloring of the gingiva, which came into contact with the PS, is expected. Permeable filling edges must also to be paid close attention to because they could become colored permanently.

III—Documentation of the Basics

a) The wavelength

The goal was to develop a protocol for PT with the diode wavelength of 810 nm as established in dentistry. Diode lasers with 810 nm wavelengths are used in the hard laser field for soft tissue surgery since 1994 and for decontamination in periodontology and implantology. This wavelength has been well documented for long-term periods, amongst others, in the only 10-year study about the use of laser light decontamination in periimplantitis and in the treatment of marginal periodontopathies.

b) The sensitizer

INDOCYANINE GREEN is used as a photosensitizer, the pathogenic bacteria being stained and sensitized by this photosensitizer and subsequently totally eliminated by laser light. Indocyanine green is used in human medicine as an intra-venous infusion for checking the effectiveness of the blood circulation in the heart, for monitoring blood circulation, for assessing the function of the liver, and is available as a concentrate, which has to be diluted.

c) Absorption characteristics

At the NTA meeting in Isny, research regarding the absorption maximum of the potential sensitizer was performed by the study group with Professor Dr Donges. The tests showed an absorption maximum at approx. 800 nm. Therefore the sensitizer matches the wavelength of the used diode laser (810 nm).

d) Achieving an optimal active component concentration

In order to determine the optimal sensitizer concentration, two test runs in combination with microbiological examinations were performed. The first series of test runs were done with 1:10, 1:20, 1:30 and 1:40 dilutions.

Those dilutions produce a clearly dark-green sensitizer, which was applied on microbiological agar plates, which, in turn, were irradiated with laser light, following the rinsing and removing of excessive dye. The findings from those dilutions and the used laser parameters, however, did not generate positive results (see section microbiological examinations), there were effects associated with the inhibition of germinal growth caused by the senisitizer itself and also manifestations caused by heat damage, which were achieved by high sensitizer concentration in combination with laser light (high absorption). After evaluating these results and followed by a phase of reevaluation, another test run with using a 1:100 dilution was undertaken. This concentration in combination with the appropriate laser light parameters generated satisfactory microbiological results. Therefore the 1:100 dilution was determined to be the ideal concentration of the active component of the MILD sensitizer.

d) Testing for antimicrobial effects of the sensitizer itself

Following the evaluation of our own research with a sensitizer from a popular PT supplier, it had to be determined that an antimicrobial effect can already be achieved with that particular PS. This germ killing effect was confirmed by the German subsidiary of the manufacturer but is definitely inferior to the results achieved by simultaneous application of laser light and sensitizer. When diluting the sensitizer ICG used by us, a clearly germ killing and germ growth inhibiting effect could also be established in dilutions of up to 1:40 by applying the sensitizer alone. With higher dilutions starting from 1:100, those effects could not be observed any longer.

e) Avoidance of sensitizer residuals on the surfaces of teeth and implants following MILD procedure

In our own research we noticed sensitizer residuals on the roots of teeth and on implants, following previous treatment according to the PT principles of that manufacturer. Those sensitizer residuals could be observed in regions and in the area of the deepest defects of supporting tissue of tooth and implant parts not worth preserving. After an intensive discussion, the reduced metabolism in those regions causing an acidic environment with corresponding low re absorption and degradation turnover was considered to be the underlying factor. In the course of the research presented, patients, who had teeth not worth preserving or where artificial tooth posts were pending for explantation were asked if they would be agreeable to participate in MILD therapy for testing purposes. The therapy was performed following the guidelines of the respective protocol and was subsequently followed by the removal of non-rescueable teeth/implants. These teeth were evaluated clinically and were subsequently assessed using a raster electron microscope. In these cases, sensitizer residuals on the rough implant surfaces were observed in dilutions ranging from 1:10 to 1:50. With dilutions of 1:100 and higher (based on the basic, original solution) it was not possible to clinically detect sensitizer residuals on teeth or on implants or detecting them using a raster electron microscope neither.

f) Determining efficient dilutions for the base sensitizer solution

The ICG concentrate was used as an original solution 1:10 in water, exactly how it is used in human medicine.

Tested were

a) the change in ph
b) the change in oxygen concentration
c) the change in temperature in ICG solutions
I) original solution
II) 1:10 dilution
III) 1:100 dilution
IV) 1:1,000 dilution

In the basic solution and in the 1:10 and 1:100 dilutions, a significant change in the value of the ph, a significant reduction of oxygen concentration caused by the ascending oxygen following laser light application ($p = 1.0$ watts/$t = 20$ sec) could be determined.

In the original basic solution the increase in temperature in interaction with ICG and laser light was obvious with 3.2 degrees.

This increase dropped to approx. 1 °C in the1:10 and 1:100 dilutions.

With dilutions of 1:1,000 and less (only a very light green coloring of the solution could be observed), it was no longer possible to determine any verifiable effects any more.

Because of the high increase in temperature (and the results of the microbiological examinations performed at a later point in time (illegible)

g) Determination of suitable laser light parameters

A total of two test runs with different laser parameters were performed. In both test series the laser light was applied in cw-mode.

An initial analysis applying classic parameters (from the hard laser therapy) with a power output of 1.0 watts and a 20-second application of laser light did not generate any positive results in combination with sensitizer concentration dilutions ranging from 1:10 to 1:40. Either there were no actual effects of laser therapy caused by the excessive germ killing effects of the highly concentrated sensitizer alone or even—with the lowest dilutions—heat manifestations on the microbiological compounds could not be detected. Better results were only achieved only when changing to a dilution of 1:100 while at the same time the laser light was reduced to the LLLT range. The respectively best results were clearly achieved with laser light parameters of 75 mW and a duration of 15 seconds on of the application using a 1:100 dilution of the sensitizer. Longer irradiation times did not improve germ eliminating and reducing effects, shorter irradiation times, however, clearly lead to less favorable results.

Therefore, 75 mW with an application duration of 15 seconds were determined to be the ideal laser light parameters.

g) Microbiological examinations

Microbiological examinations were performed at the Institute for Hygiene and Microbiology at Freiburg im Breisgau University Hospital using four potentially periodontal pathogenic germs. These germs are

a) Actinobacillus actinomycetemcomitans (A.a.) (FR68/27-7)
b) Porphyromonas gingivalis (P.g.) (W381 AND Fr68/27-2))
c) Prevotella intermedia (P.i.) (016/16-2).

The germs were applied to fresh agar (yeast extract, cystein, blood agar, at A.a. also in 2 balanced sensitive test agars) using the three step streaking process (Phase I) and the flooding process (Phase II).

PHASE I:

The first part of the plates was further processed as an "empty sample" in the appropriate environment without additional manipulation.

Another part of the plates was additionally sprinkled in the center with a milliliter of ICG photosensitizer in a dilution of 1:10, rinsed with a sterile NaCL solution (0.9 % buffered) following a reaction time of one minute and subsequently dried/extracted.

In the following step, the therapy laser light was applied with the parameters:

p = 1.0 watt
t = 1 minute
Wavelength: 810 nm in cw-mode.

The other half of the plates, however, was processed following the same procedure until the extraction of the diluted photosensitizer solution and subsequently rinsed; laser light application was not applied here! The A. a. test sample was incubated at 36 °C and 5–10 % CO_2 for 24–48 hours, the anaerobic test samples (P.g. and P.i.), however, were further incubated under anaerobic conditions for a minimum of 48 hours.

Microbiological results of phase I

Both samples treated with sensitizer and laser light, and also the samples treated exclusively with sensitizer showed significantly slow germ growth in basically all tested germs strains, which, in terms of a quantified statement cannot be distinguished from each other.

Some of the samples had discrete lesions in terms of a heating damage in the area where the laser light fiber was placed.

There were no differences between the results in plates treated with the flooding process and between plates treated with the three step streaking process.

Conclusion phase I:

With the test set-up for phase I, no advantageous growth inhibiting effects caused by the interaction of laser light and sensitizer could be demonstrated convincingly for the bacteria tested; it could be clearly demonstrated, however, that both the laser light was overdosed and the sensitizer was concentrated too much thus causing slow growth!_

_contact laser

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Using a Soft Tissue Dental Laser to Remove a Venous Lake

author_Angie Mott, RDH, USA

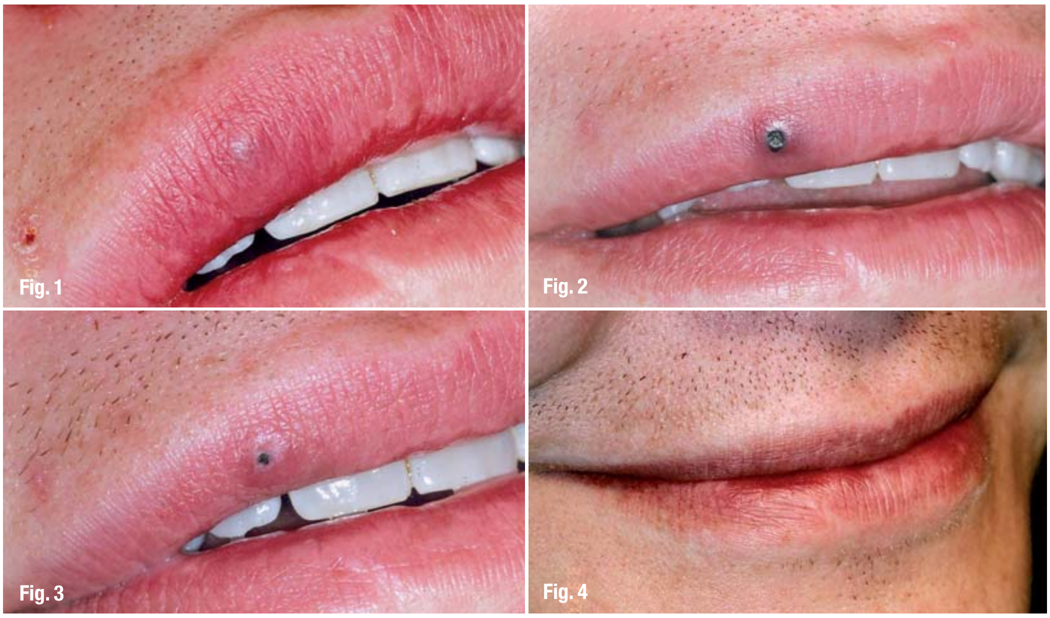

Fig. 1_Initial view of Venous Lake.
Fig. 2_View four days after lasering area, lesion "popped" open a few days after lasing and bled for a short time. Body is now able to heal itself.
Fig. 3_This view is four more days later, area continues to heal.
Fig. 4_Final view, notice that the lip is completely healed without any evidence of scarring.

_Venous lakes are common with many people and in dentistry we are always trying to help our patient's look and feel better about their appearances. Venous lakes manifest as dark blue-to-violaceous compressible papules caused by dilation of venules. They were first described in 1956 by Bean and Walsh, who noted how they can be easily compressed and their tendency to occur on sun-exposed skin, especially the ears of elderly patients. Although venous lakes may be considered clinically insignificant from a biological standpoint, they are important because of their mimicry of more ominous lesions, such as melanoma and pigmented basal cell carcinoma.

The development of venous lakes is believed to be exacerbated by solar exposure and damage. One theory is that chronic solar damage injures the vascular adventitia and the dermal elastic tissue, permitting dilatation of superficial venous structures. Vascular thrombosis also may play a role in the development of these lesions because it is commonly present in lesions of this type. Whether thrombosis is a primary or a secondary event in the development of these lesions is unclear. Although the exact incidence is unknown, venous lakes are common. Lesions typically are considered biologically harmless. Venous lakes are usually asymptomatic, although pain, tenderness, and excessive bleeding can occur once a lesion has been traumatized.

Bean and Walsh reported that 95% of venous lakes were observed in males. Another review of venous lakes confirmed the same gender distribution. It has been suggested that the disproportionately male distribution may be related to occupational sun exposure, hair length and hairstyles. Women comprised the majority of treated patients in a large study of laser therapy for venous lakes; however, this may be related to increased concern among women regarding cosmetic appearance rather than with true incidence. There is no racial predilection that has been documented.

Venous lakes occur most commonly in adults older than 50 years with a history of chronic sun exposure. The typical presentation is as an asymptomatic lesion. The average age of presentation has been reported to be 65 years.

Physical examination usually reveals a soft, compressible, purple colored papule, up to 1 cm in greatest diameter. The lesions usually are well demarcated with a smooth surface, and compression often causes a transient depression. Lesions typically are distributed on the sun-exposed surfaces of the face, neck and the ear. Another common site of involvement is the vermilion border of the lower lip

Avoidance of excess sun exposure is important in prevention of many skin disorders. Treatment of lip venous lake includes surgical excision, laser therapy, infrared coagulation and cryotherapy.

In all of the case studies I viewed, I was unable to locate information regarding if the procedures were completed in "contact mode" or "non-contact mode". As a hygienist, I knew that I couldn't use the laser in contact mode on these lesions, but I decided to see what I could do to eliminate these with a non-contact mode technique. Before beginning this procedure, please check with your regulations regarding treatment options.

The laser that was used for this procedure was the Ivoclar, Odyssey 2.4 G soft tissue Diode 810 nm laser, Non Contact modes were used for procedure and no topical or local anesthetic was used, but can be if needed. The patient was instructed that heat would be felt during procedure, but if there was any discomfort they were to raise their hand. High Volume Evacuation used for entire procedure to remove the plume from the area. It also helps to cool off the site.

Pre-op photos were taken to show case progress for documentation. The laser settings that were used were as follows, the laser tip was placed in non-contact mode approximately 2 mm away from area. Beginning with 0.5 W Continuous Wave (CW), point the laser tip towards the lesion, start by working around the borders of the lesion, circling around it several times, then "fill in" the lesion with overlapping strokes all in one direction. Then: reposition the laser tip 90° and go over entire lesion again creating a "cross-hatching" pattern, for a total time of 45–60 seconds. Continue to increase settings, example: 0.6 W, 0.7 W, 0.8 W and 0.9 W following above procedure until complete. Vitamin E was placed on lesion after laser treatment, because it helps to rehydrate the area and also to protect the lasered area. Additional vitamin E can be sent home with the patient for them to reapply as needed, this creates comfort for the patient as the area heals.

Typically, the area will look the same after the laser procedure has been completed. Occasionally, the area may appear to be smaller or change in color.

_Conclusion

In conclusion, your patients will love your ability to make these unsightly lesions disappear and this non-contact mode procedure could be a procedure that Doctors and Dental Hygienists can incorporate this into their list of soft tissue laser procedures with great success._

_contact | laser

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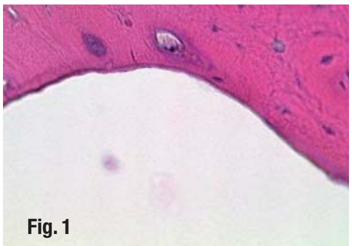
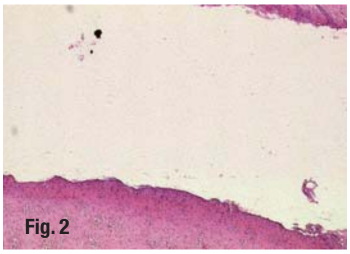
Laser Technique „Quo vadis?“

authors_Gerd Volland, Rudolf Walker, Germany





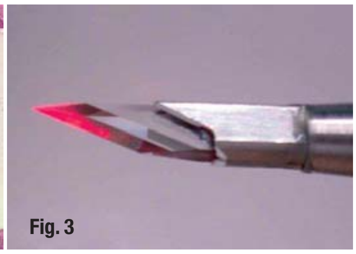


Fig. 1_Cut thru bone with the erbium laser.
Fig. 2_Cut in soft tissue.
Fig. 3_Sapphire knife (A.R.C. Laser GmbH).

_In Germany the Laser technique is very widely spread, with the help of Prof Gutknecht and Prof Lampert. Different wavelengths and more acceptances has been the key to the success of laser in Dentistry. Endodonty, Cavity preparation and Paradontology are only samples of the use of lasers in Dentistry.

Some of the highlights in the oral Surgery are the minimal growth of germs and the possibility not to use stitches after surgery. With all the hype the laser has triggered, one should not forget, that the use of lasers cannot replace basic dental care. In most of the cases the laser is used as an add on to the existing technology to enhance the the basic care. Therefore all the developments in this area should aim towards an improvement of the existing technology or help to establish a more atraumatic surgery in some basic dental technologies.

In the mouth water is present at a high percentage. Most of the laser however emit laser light in the near or even far infrared, which is not well absorbed in water. Therefore the danger of a thermal damage of underlying structures is very high. To qualify the lasers used in dental today should therefore not only qualified based on their wavelength, but also based on their principle of reaction with tissue. To understand all those issues the danger of using the laser is minimized. A classification of the different lasers is used worldwide as a standard, however I would like to even go a little further and use my own classification in addition to the existing ones:

A—Laser with a photo mechanical effect
B—Laser with a photo thermal effect

To the first group of A lasers like Erbium:YAG or the Er:YSGG can be counted. By using the higher absorption in water and pulse lengths in the region of 50 to 250 µsec. those parameters in conjunction with high peak powers of more than 5,000 Watts can be used to cut teeth substances and bones without much thermal effect. However this has to be done by using a water spray at the tissue to be cut. The width of the thermal damage is in the region of 10 to 20 µ in a "spongy" bone (Fig. 1). In case of cutting off the spray or an increased pulse length peripheral necrosis zones can be achieved in soft tissue depending on the pigmentation (Fig. 2). This however is not sufficient enough to cut without bleeding, or even in deeper layers to stop bleeding in smaller vessels. To achieve a bloodless cutting a wavelength with higher absorption in hemoglobin is required.

At the second d Group of B the thermal effect is dominant. Under this group you may find Diode lasers with different wavelengths. The mostly used Diode lasers are the 810 and the 980 nm lasers. Meanwhile KTP lasers with the wavelength of 532 nm and also 1,064 nm lasers are available on the market today. More lasers will enter the arena with different wavelengths.

Not to forget the traditional lasers like the Nd:YAG laser with it's principal wavelengths of 1,064 nm and also 1,320 nm. We also should mention the 2,100 nm Ho:YAG laser. Those pulsed lasers

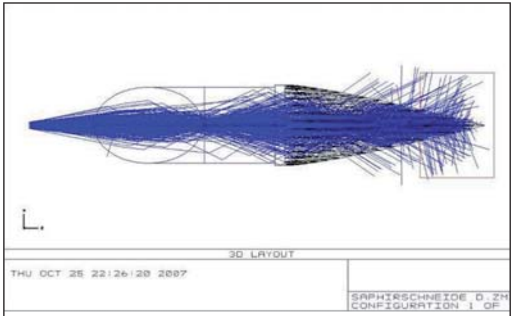


Fig. 4

can not be compared with the CW Diode lasers. Most of the pulsed lasers have peak powers in the KW range and also pulse lengths in µ seconds. The effect on tissue with those lasers is different compared to the Diode lasers. Water cooled argon lasers with their principal wavelength of 514 and 488 nm and also CO_2 lasers with their wavelength of 10,600 nm have lost their importance during the last years. Discussions about the different wavelengths, the comparison between those and the advantages, by using the absorption curves are more used by companies having a certain laser source available than having a major effect in Dentistry. More than the laser source is required to make a laser treatment successful.

_Lasers are the little helpers in your office

One thing however is important to realize. A laser treatment is much better tolerated by the patient and also by the physician then a conventional treatment. This is not the whole story yet. More important are the new accessories which can be used with the laser, to be more precise, more comfortable for the patient and consequently be more successful with this treatment. In cooperation with Universities those new modalities have to be checked and used and finally described to allow the practitioner to safely use the new technique and instrumentation.

Two additions to the laser and one more wavelength will be described below. The first studies and Protocols are available for these new devices.

1—The sapphire knife for Surgery
2—A new water jet (no spray) for Paradontology
3—A new (old) wavelength of 532nm

_The sapphire knife

The Diode laser is well established in Paradontology and Endodonty, by using the wavelength for germ reduction. However at Oral Surgery where bloodless cutting at a 10th of a millimeter a requirement for the Gingiva, those lasers are close to the limits. A disadvantage of the wavelength from 488 to 2,100 nm is the low absorption in water when cutting in the less pigmented area of tissue. As a result a slow removal of tissue will cause the edges of the wound to be folded in this will cause a less effective laser to tissue reaction. At higher power a sudden coupling of the laser energy will cause burns and as a result a large necrosis zone at the wound edges. A laser which is designed to coagulate can only cut by absorption in soft tissue. All tests have shown that a laser which is not well absorbed in water has a clear disadvantage compared to those lasers with higher water absorbance in cutting soft tissue.

Still today the golden standard in cutting soft tissue are the stainless steel scalpels or even diamonds and sapphire knifes which are used in Ophthalmology for many years. In the device described the advantages of the mechanical cutting of a knife and the coagulation of the laser is combined. The sapphire knife is attached to the laser via a Quartz fiber and therefore the laser beam is guides thru the sapphire and exits at the sharp edges.

The temperature reached at the edges is approx. 65 °C and therefore a coagulation is achieved, however the temperature is far away from the 100 °C to allow for vaporization. No tissue is removed and consequently no carbonization at the cut is seen. The cut is

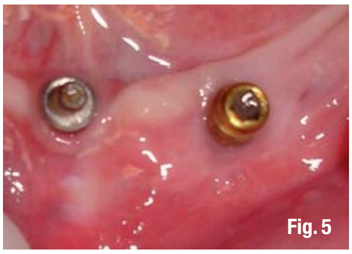


Fig. 5

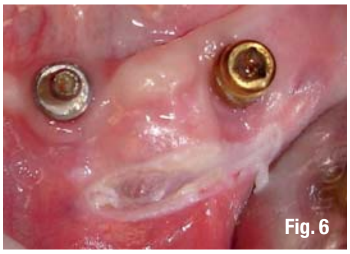


Fig. 6

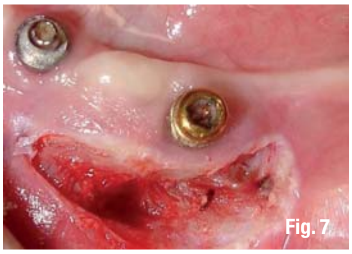


Fig. 7


Fig. 8


Fig.9

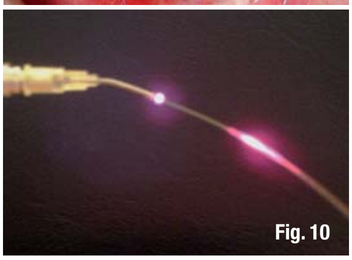
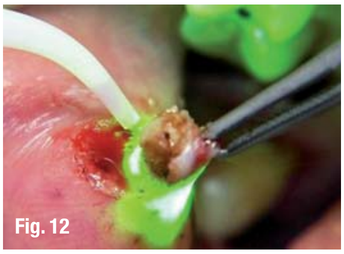


Fig. 10

Fig. 4_The laser beam is guider thru the sapphire and exits at the sharp edges.
Fig. 5_Initial situation Missing attached gingival at implant regio 33.
Fig. 6_Vestibulum plastic cuts with lateral denaturation.
Fig. 7_Deep cut: muscle cut in two and inlaying strands pre suturing.
Fig. 8_Three days post OP. Prosthesis was immediately prolonged at the edge. Fibrin eschar. Patient without pain and complains.
Fig. 9_Situation three weeks post OP.
Fig. 10_Jet water beam (A.R.C. Laser GmbH).



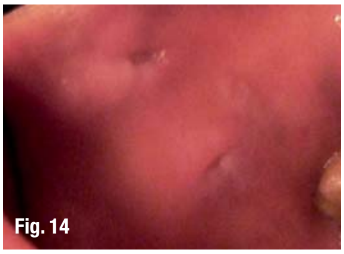


Fig. 11_Initial situation Cheek fibrome.
Fig. 12 and 13_Cut with the green diode laser, wavelenght 532 nm.
Fig. 14_Situation eight days post OP.

achieved only by the sharpness of the sapphire knife. The transmission of the knife at the edges has been calculated in a mathematical model and has been worked successfully at the first cuts, since 90 % of the energy exists at the front tip of the knife. From today on the precision of a mechanical knife can be combined with the advantage of the laser beam.

Since the surface of the knife is much bigger compared to an area of the bare fiber, Power settings could be as high as 7 Watts with a 810 nm laser Diode.

_Germ reduction

The germ reduction and the attachment are the key to success in Paradontology. The concept of of continuous recalls and germ reduction with the Diode laser as well as the removal of inflammatory tissue has been proven as very successful during the years. One has to differentiate the killing of the germs without removing tissue and the coagulation of inflammatory cells.

In both instances the necrotic material is still present in the pockets and is only removed by by the sulcus fluid or will be reabsorbed inside the pockets. Therefore an important point is the rinsing of the pockets. The fluid used to perform this is depending on many factors, however is the responsibility of the physician which fluid to be used. In any case this fluid has to be sterile. During this procedure one has to take special care not to get the fluid in contact with other tissue in the mouth, however the fluid has to be applied to the area where any particles are left. Based on this a rinsing with an injection needle becomes very difficult to perform. The idea to coaxially use a fluid along the laser fiber may present a solution.

A two level foot pedal may be used to trigger the laser in the first level but to allow fluid along the fiber when the pedal is pressed into level two. So the laser and the fluid is available at the time the surgeon would like to see it. By using a sterile infusions chamber the requirements of a sterile fluid is accomplished. It is important not to go to the max. power or even increase the power during treatment since this technique is not used to cool down the pocket, but only to clean the pocket during the treatment. At this technique it is important not to use a spray, but only a water jet which will take the laser along during the treatment (Fig. 10).

_The new (old) wavelength

The green Diode pumped laser is widely spread in Dermatology for treatment of vascular lesions. We have used the laser Nuvolas from A.R.C. Laser in Germany. Since the absorption of the green wavelength in Hemoglobin is excellent coagulation can be achieved at low power levels. Therefore it may be advantages to use this laser in the presence of vascular lesions which can be seen in the mouth during the excision of fibroblasts or removal of hemangiomes. The first surgeries at the University of Sevilla have shown excellent results comparing with the 980 nm control group. Less pain post OP was reported from the patients and similar healing has been seen.

Following parameters have been used: 532 nm laser at 1,5 Watts, 300 µ Fiber – 980 nm laser 1 Watt with 300 µ Fiber.

_Summery

Today's use of Diode lasers has become a routine surgery with many physicians around the world. An enhanced treatment with different wavelengths depending on the absorption is very nicely tolerated by the patients. Germ reduction and coagulation are the most important uses of the laser in Dentistry. The combination of the new Sapphire scalpel (A.R.C. Laser GmbH), rinsing of the pockets during treatment may even more improve the use of the diode lasers in Dental surgery. The laser in combination with the items mentioned will more widely spread among surgeons. An all in one laser treatment with just one wavelength is a dream which will never come true._

_contact laser

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Continuing Education Courses of AALZ

Part 2—Wavelength Workshops

In cooperation with the Clinic for Dental Conservation, Periodontology and Preventive Dentistry at the University of Excellence RWTH Aachen, the Aachen Center for Laser Dentistry (AALZ) has created the first dental laser education institute in Germany. Known for its research in laser-assisted dentistry, it cooperates nationally and internationally with major research facilities.

_Since its foundation in 1991, the AALZ has been the leading worldwide specialist in dental laser education. It offers recognized and accredited trainings and helps to meet the goal of becoming a laser specialist.

_Continuing education courses

1. Introduction to Laser Dentistry
2. Laser Safety Course
3. Wavelength-Workshops
4. Mastership Course "Lasers in Dentistry"
5. Master of Science (M.Sc.) in "Lasers in Dentistry"

_Introduction to Laser Dentistry

Over the course of three hours, we inform you neutrally and objectively about how the various laser systems work and are applied. Using practical demonstrations, we show the effect that different laser systems have on various types of tissue. A therapeutic overview of the individual wavelengths aims to help participants to decide on the appropriate system for their treatment emphasis.

_Laser Safety Course

One-day course with official certification as a Laser Safety Officer (LSO).

The innovative treatment methods of laser therapy include beside all well-known and evidenced-based advantages risks for both practitioners and their teams as well as for patients if fundamental technical, biological and physical information about the application and laser safety measures are not or insufficiently known. Therefore this course is a prerequisite for practical laser use.

We prepare you for safely using lasers by giving you an in-depth understanding of laser physics and laser-tissue interaction. With examples, we clarify the need for safety precautions in the use of lasers in everyday dental practice. The lecturers explain statutory regulations, demonstrate their implementation in practice and describe laser application fields.

After passing the examination the participants receive the "Laser Safety Officer" certificate.

Our laser safety courses meet the requirements of the trade associations for obtaining expertise as a Laser Safety Officer. They are officially recognized according to the guidelines of BGV B2 (orientated to EN 60825-1 and ANSI Z136.1) and State Radiation Protection Office.

_Wavelength-Workshops

Two-days clinical workshop gain participants an official certificate from the RWTH Aachen University Hospital.

Each wavelength-specific workshop gives you scientific-based knowledge on possible treatments using the appropriate laser:

Solid-state lasers: Nd:YAG, Er:YAG, Er,Cr:YSGG

Gas laser: CO_2

Diode lasers: 655 nm, 810 nm, 940 nm, 980 nm

_Presentation of the indications for and use of the respective laser systems with the help of a detailed treatment plan that includes all relevant power settings
_In vitro demonstrations with models
_Live operations on patients or live video presentations
_Clinical applications and demonstrations
_Guided self-learning of treatment processes with the laser.

The workshops and laser safety courses have been designed in a way that allows you to take all courses in two or three successive days. They include extensive course materials and catering (including lunch). All courses are taught in small groups.

Next dates:
16–18 September (English)
26–28 October (German)
14–16 December (German)_

_contact laser

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EMDOLA Official Awarding Ceremony in November

author_Dajana Klöckner, Germany

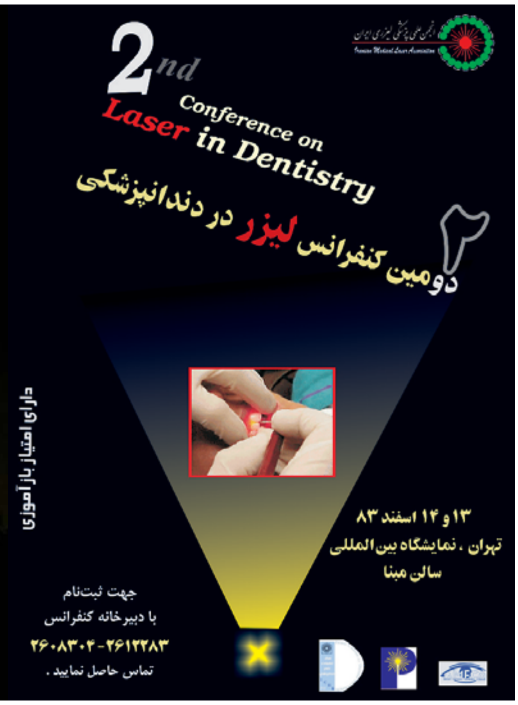
_All successful graduates of the postgraduate Master of Science programme "Lasers in Dentistry" (M.Sc.) will receive their certificates of the European Master Degree of Oral Laser Application (EMDOLA) in a joint ceremony on Thursday, 26 November 2009, in the Medical Faculty of RWTH Aachen University, Germany. This is the first and unique European bestowal in Dentistry and is another highlight in the professional carrier as well as an extraordinary appreciation of the performance of all Master Alumni from RWTH Aachen University (Germany) and from the Universities of Nice (France) and Liège (Belgium). Since 2004 more than 100 dentists have already achieved this outstanding degree in Aachen only. More than 170 expected guests will be welcomed by the initiator of the first Master programme in dentistry, the scientific director from the Aachen Master of Science Professor Dr Norbert Gutknecht.

The rector of RWTH Aachen University, Prof Dr Ernst Schmachtenberg, the Dean of the Medical Faculty of RWTH Aachen University, Prof Dr Johannes Noth as well as the Rectors und Deans of the Universities of Nize and Liège will also address all attendees.

Before Prof Dr Norbert Gutknecht, Prof Dr Samir Nammour (Liège) and Prof Dr Jean-Paul Rocca (Nice) personally present their successful graduates with the certificates, they will give entertaining and fascinating insights and aspects of history and development of the master programme "Lasers in Dentistry".

Following, six graduates of excellence will present their master theses in a scientific symposium to all guests.

The solemnly ceremony with accompanying family and friends will be continued with a festive Gala Dinner in the evening. The graduates, who have not seen each other for several years and arrive to Aachen just for this ceremony will celebrate and share their experience the whole night, for sure._



The Plan of Development and Advancement of Laser in Dentistry (PDALD)

authors_Reza Fekrazad*, Katayoun AM Kalhori**, Iran

(*) DDS, Ms—Periodontologist—Vice president of Iranian Medical Laser Association (IMLA) and Manager of National Committee of laser in Dentistry in Ministry of Health and Medical Education (PDALD), Department of Peridontology, Dental Faculty, Shahid Beheshti University of Medical Sciences, Tehran, Iran

(**) DDS, Ms—Oral and Maxillofacial Pathologist—Master in Laser in Dentistry, University of Aachen—Manager of Educational subgroup of PDALD

_The history of Iranian medicine goes back to thousands of years ago. Studying the history reveals the fact that some genius ancient doctors like Avicenna (Abu-Ali-Cina) attempted a lot to improve the health condition of people. Modern technology has provided a great chance for us to apply knowledge and technique to reduce pain and maintain health in human beings. Technology has empowered knowledgeable people to relieve pain and suffer from people.

Achieving the sacred goal of making a painless life for people has encouraged us to open minds and view the horizon a head, and keep going with our full strength.

Laser, one of the unique technologies, can empower human beings with it over whelming features and capabilities.

After two decades of hard working by active people in this field in educational workshops and researching projects along side with informing people in the country, the scientific community of Iran has finally concluded to recognize "LASER" as an absolute need for near future.

Educated people are fully aware of bitter consequences of prejudice and resistance against science. The least negative impact assumed for ignoring science is being deprived from services of modern technology.

Scientific communities of the country and the executive team have provided a determined plan called "PDALD" and have been presented to the Islamic Republic of Iran ministry of health and medical training, as the highest executive level of the country. The story of PDALD goes back to five years ago. Since 2005 then the first international Congress of Laser in Iran, outstanding activities in international scale were performed in our country. Some numerical information can reveal the fact in an easier way. Considering the scientific potentials and human resources, we decided to promote laser—knowledge training and research through out the country in Dentistry in a systematic way.

PDALD stands for the Plan of Development and Advancement of Laser in Dentistry. The plan has been designed, developed and performed academically to expand laser knowledge in Dentistry. The first round of the plan was for piloting purposes to figure out a more accurate model for applying laser in all medical fields in future.

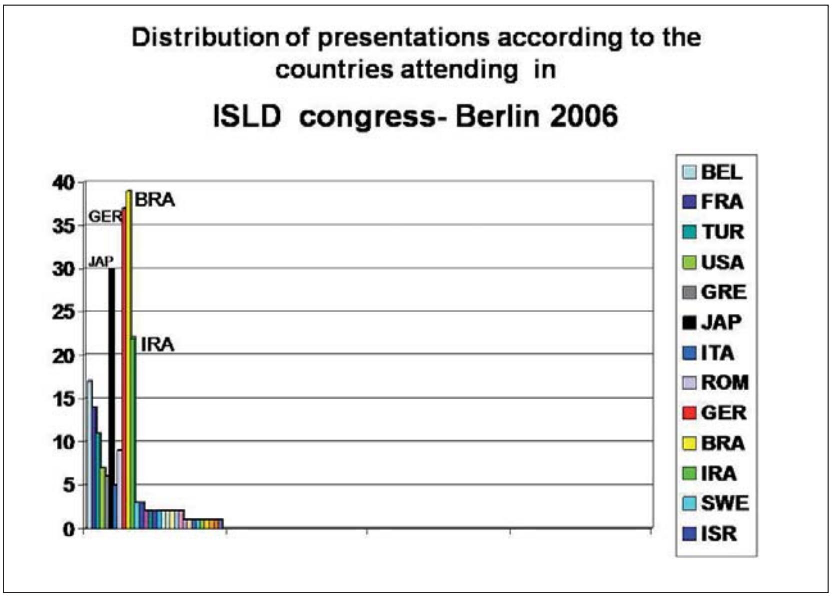
After a few months studying and considering all aspects of the plan and positive attitudes of the high-ranked officials of the ministry specially the Deputy of training in the ministry and the Secretary of dentistry educational council, Professor Fazel, the plan was approved. During the last few months some negotiations with international scientific communities have been under taken.

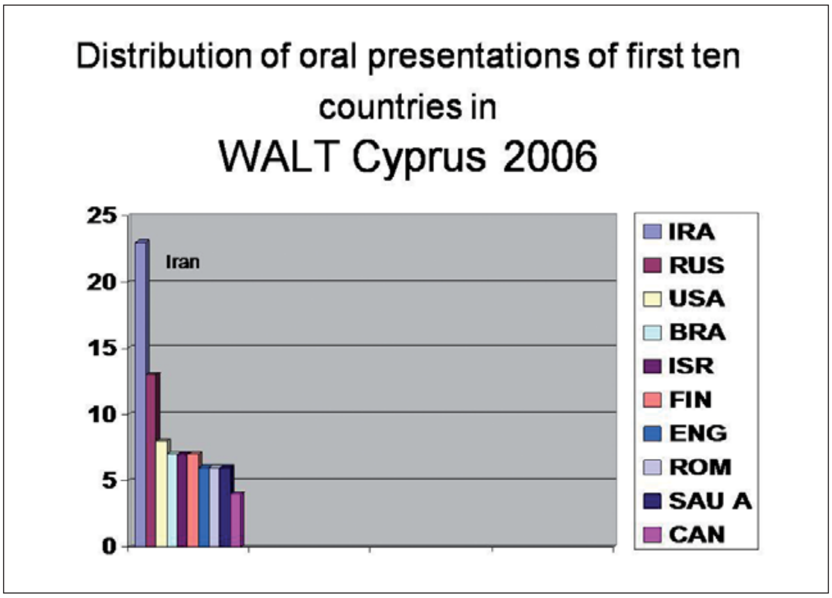
An organizational charter has been designed for the plan. The supreme policy-making council is on the top.

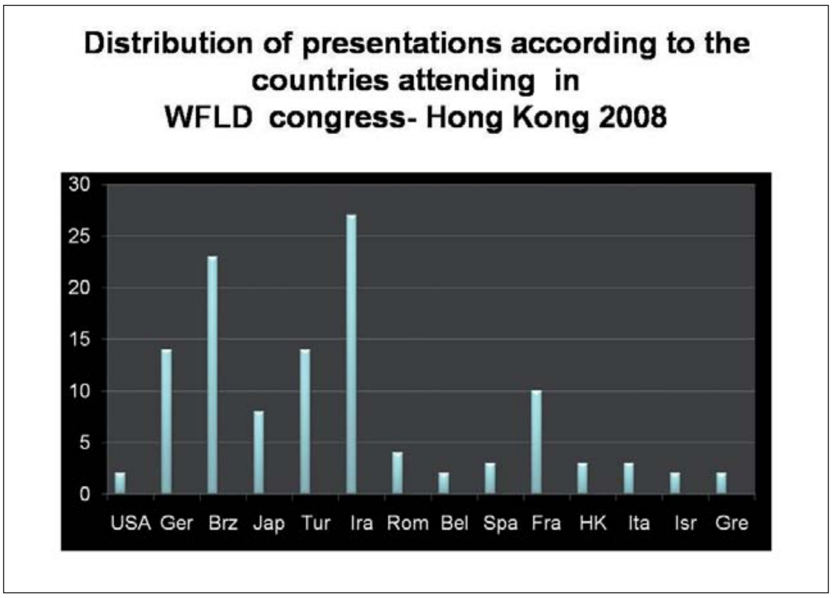
It consists of two major parts: Dentistry science specialists and physics experts in medical and dentistry branch of laser. We strongly believe that these two wings are both needed urgently to take this technology to a good end. The over-mentioned supreme council has six sub-branches:

A—Education. B—Research. C—International relations. D—Equipment, standards and controlling methods. E—Publications. F- Finance, budgeting and credits.

The person in charge of a group has some responsibilities which can differ upon domestic and international conditions.







Time management for activities make us to have some short-term plans, which have to be met in a two-year period, and some long-term plans, which have to be covered in a ten-year term.

The most outstanding aspect of the plan is the educational curriculum, which shows a strong basis with a great cohesion and coherence in the whole subject.

An under graduate and post graduate student in dentistry for special courses have to take laser as a two-unit course (34 hours of education). In the last terms the study the basics and principles of laser more over they learn how to use it practically.

There are some 18 dentistry schools in Iran and six of them have already been equipped with high-level and low-level lasers. The rest are getting equipped gradually.

Along side with our activities, we started negotiating with well-known and reputable international communities. Finally, we decided to work with the academic center of the University of Aachen to help us training the previously accepted instructors in a one-year time in a joint program with Tehran University which is the oldest and reputable one in Iran.

Although a lot of precious scientific activities have been done in Iran during the last years, still a long way has to be paved to get the summits. The number of articles presented in the congress of Berlin, Cyprus and Hong Kong show the existing potentials here in our country.

No other country has so far managed to do such a great thing in the world, but we do need ideas and suggestions of scientists and professors all around the world. Professor Gutknecht and Professor Nammour, ...from WFLD have already helped us a lot for high intensity laser therapy part of the plan.

Dr Tuner and Professor Bjordal,...from WALT supported us very much for Low intensity laser therapy part of the plan.

Hereby we would like to extend our heartiest thanks to all over mentioned people who have helped us so far and we would like to invite all reputable exports in the world to give us a hand to take a step towards a healthier and better world a way from religious, national or color prejudices.

We strongly believe that we can have a crucial role in promotion and expansion of laser in the world in the near future.

We hope this would be possible if pioneers and scientists help us on the way by their knowledge and experiences.

We Hope in near future Laser turn to be a successful technology in solving problems of both patients and practitioners._

_contact laser

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WFLD 2010 Dubai Congress in conjunction with AEEDC Dubai 2010

The 12th Congress of the World Federation for Laser Dentistry (WFLD) will be held in Dubai from 9–11 March 2010 at the Dubai International Convention and Exhibition Centre, parallel to AEEDC® Dubai 2010.

_The WFLD is a membership organisation representing the speciality of the laser-applied dentistry worldwide. It is structured into five major divisions, which are North American, South American, European, Middle East and Africa and the Asian Pacific division.

This biennial Congress will be hosted in Dubai for the first time and provides an excellent platform for the delegates from around the world to discuss and exchange scientific knowledge on the current trends and latest developments in laser dentistry. It supports the mission of the society: stimulating the research in the different fields of laser-applied dentistry, coordinating long-term clinical studies using lasers as main instrument during the treatment, and establishing an educational foundation for dentists who are intending to use or are already using lasers in their daily treatments.

Prof Dr Norbert Gutknecht, who was appointed as President of WFLD at the last Congress in Hong Kong in July 2008, is the Organizing Chairman of this Conference. More than 150 studies will be presented. Well-known experts will lecture the following subjects in order to provide an important sharing of knowledge:

_Physics of Laser and Biological Effects of Laser Light
_Laser Types in Dentistry
_Laser in Periodontics
_Laser in Endodontics
_Laser in Oral Surgery and Implantology
_Laser in Cariology
_Laser in Dental Laboratories
_Low-level Laser Therapy
_Laser in Pathology and Oncology
_Laser in Basic Sciences
_Laser in Pediatric Dentistry
_Laser in Neck and Head Dermatology
_Laser and Bleaching Teeth

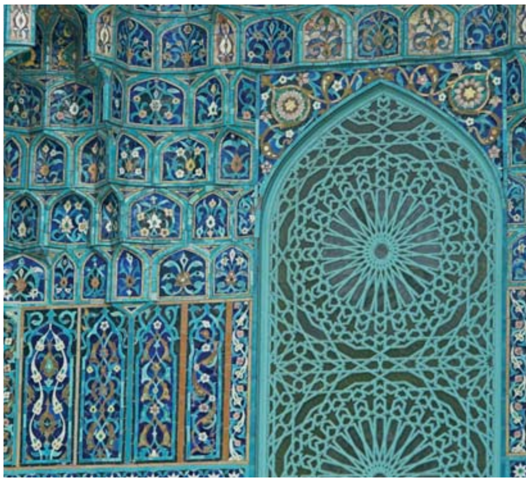
Additionally, the program consists of a Poster Presentation and Workshops.

A WFLD certification course aims to allow the participants to gain an understanding of the basic physics of lasers and laser tissue interaction. They will also become aware of special concerns and protective methods necessary when dental lasers are used.

The 14th UAE International Dental Conference & Arab Dental Exhibition—AEEDC® Dubai is held under the patronage of His Highness Sheikh Hamdan Bin Rashid Al





Maktoum, Deputy Ruler of Dubai, Minister of Finance, President of the Dubai Health Authority in cooperation with the Dubai Health Authority and in strategic partnership with the Ministry of Interior Naturalization and Residency Administration, Dubai United Arab Emirates.

Over the past years, it has witnessed a continuous growth of this ultimate dental gathering in the Middle East, which covers the whole region as well as North Africa. AEEDC® Dubai 2009 attracted 700 major companies from more than 65 countries, with over 6,000 dentists attending the conference and a record number of 20,000 professional visitors from 113 countries. The overall feedback from all the attendees was extremely outstanding and encouraging.

In addition, AEEDC® Dubai also offers highly specialised pre-conference courses—Dubai World Dental Meeting and conference focuses on the most-up-to-date researches and practices in the field of Dentistry, the researches are presented by prominent international and regional speakers. Poster Presentation and Free Communication are also open to all dental professionals who are interested to present their clinical research and experience.

Dubai, a city with fabulous infrastructure has changed dramatically over the last three decades, becoming a major business centre with a more dynamic and diversified economy. Dubai enjoys a strategic location and serves as the biggest re-exporting centre in the Middle East. It offers a kaleidoscope of attractions for visitors, from the timeless tranquillity of the desert to the lively bustle of the souk. In a single day, the tourist can experience everything from rugged mountains and awe-inspiring sand dunes to sandy beaches and lush green parks, from ancient houses with wind towers to ultra-modern shopping malls. These contrasts give Dubai its unique flavour and personality; a cosmopolitan society with an international lifestyle, yet with a culture deeply rooted in the Islamic traditions of Arabia. A tolerant society with world class hotels and entertainment facilities, excellent value shopping, enviable sports and leisure amenities all combine to make living and working in Dubai a pleasure._

_contact laser

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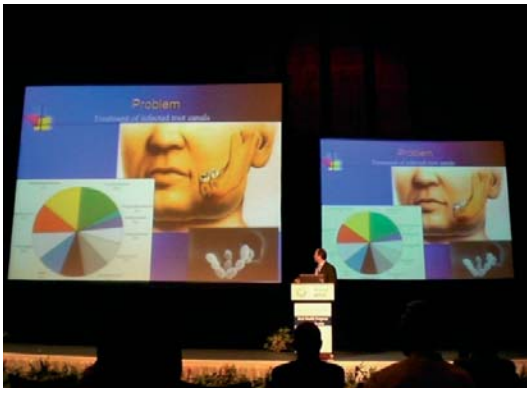
Call for papers:
E-Mail: contact@wfld-dubai2010.com

www.wfld-dubai2010.com

Lasers in dentistry introduction in Ajman, UAE very successful

author_ Asma Ahmed, UAE

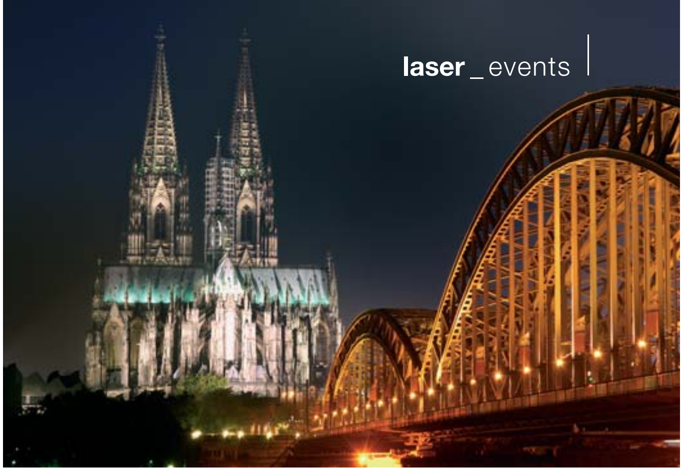
_A Lasers in dentistry introduction Seminar was held at the Ajman Kempinski Hotel in the United Arab Emirates on the 27th June 2009. This event was organized by the Aachen Dental Laser Center (AALZ), which is the world-renowned specialist in Dental Laser Education since 1991. It offers a number of continuing education courses and the postgraduate master program Lasers in Dentistry therefore helping the dentists to achieve their goal in becoming Specialists in the field of Laser Dentistry.



This Seminar interested a diverse audience from the Dental community of the United Arab Emirates including students, Professors, private dental practitioners and dentists from the Ministry of Health. The response was extraordinary to this new and most innovative field of dentistry which was not touched upon earlier in the region of Middle East. Mr Leon Vanweersch, General Manager of AALZ, opened the seminar ground with a note of welcome to almost one hundred attendees and stated that he was pleasantly surprised and very happy about the interest and motivation of the audience to achieve this highly specialized and technical education in the field of Laser Dentistry.

Professor Norbert Gutknecht is the Professor at the Clinic for Conservative, periodontology and preventive medicine at the Prestigious University of RWTH Aachen, Germany. He is the Director of AALZ and the Scientific Director of the post graduate Master of Science program in Lasers in Dentistry as well as the President of German Society for Lasers in Dentistry (DGL) and the President of World Federation for Laser Dentistry (WFLD). He enlightened the audience with profound information regarding the Biophysical interactions of Lasers and oral hard and soft tissues and gave the participants a better understanding of the concept of Lasers used in Dentistry. The Seminar ended with the presentations from two prominent speakers, Dr Asma Ahmed, MSc (UAE) and Dr Masoud Mojahedi, MSc (Iran) who completed their Master degree in Lasers in Dentistry from RWTH Aachen University and have been persuing flourishing careers in their field of Laser Dentistry. They are Scientific Co-workers for the AALZ in their respective countries. The ceremony ended by handing out the certificates of attendance to all participants.

The organization of this seminar addressed to need for a better understanding of the latest technology of lasers in the field of dentistry. It has become mandatory for the dentists in any region to keep pace with the newest advancements in the field of dentistry and this seminar opened up new horizons for the dentists of Middle East, to step into a world of Laser dentistry where patient care is given utmost importance keeping in mind ease for the dentist in carrying out different procedures almost pain free. Post graduate career in Lasers in dentistry is an outstanding opportunity and a rare event in the Middle East. The response from the dentists of this seminar expressed the extraordinary interest in having a career in this unique and extraordinary field of dentistry._



Selected Events 2009/2010

OCTOBER 2009

October, 23–24	*1st Meeting of the South American Division of the World Federation for Laser Dentistry* *5th Congress of the Brazilian Association in Laser Dentistry (ABLO)*	São Paulo, Brazil	Phone: +55-11 30 91-76 45 E-mail: acca@usp.br or pfreitas@usp.br

NOVEMBER 2009

November, 06–07	*Annual Congress of DGL*	Cologne, Germany	Phone: +49-3 41/4 84 74-3 08 Fax: +49-3 41/4 84 74-2 90 Web: www.dgl-jahrestagung.de
	LASER START UP 2009/ 13th Starters Congress in Lasers in Dentistry	Cologne, Germany	Phone: +49-3 41/4 84 74-3 08 Fax: +49-3 41/4 84 74-2 90 Web: www.startup-laser.de

MARCH 2010

March, 09–11	*Biannual WFLD World Congress in Conjunction with UAE International Dental Conference & Arab Dental Exhibition*	Dubai, UAE	Web: www.aeedc.com

Manufacturer News

Henry Schein

New Biolase distribution partner

Henry Schein and Biolase, manufacturer of the worldwide best-selling dental laser system, *Waterlase*, have expanded their successful distribution partnership to include the German market among other European countries. Henry Schein Dental Depot GmbH, the leading distributor of dental laser systems in Germany, can now offer a complete range of relevant dental laser systems to its customers. Over the past years, Henry Schein has continuously expanded its competency in dental laser products, today offering leading dental laser systems as well as a comprehensive laser education and training program. At the regional Henry Schein dental depots highly qualified and experienced laser specialists are ready to assist customers "with words and deeds." Whether newcomer or advanced laser user, Henry Schein provides comprehensive consulting, training and guidance to all laser users. Dental professionals interested in laser dentistry have the possibility to examine and test different laser systems in Henry Schein's depot showrooms and in clinical seminars offered by the company, and choose between the various systems to select the one best suited for their dental offices. The laser education and training program offered by Henry Schein comprises everything from basic courses to seminars on laser safety and individual wavelengths, quickly providing laser users with the knowledge and confidence necessary for the practical use of laser systems. Biolase developed its laser systems in over two decades and has been working with the Waterlase technology since 1996.

"By including the Biolase laser system products in our assortment, we are complementing our range of laser system lines and expanding our competence in the field of high-tech dental products. As our customers' needs and requirements grow and expand, so, of course, does our product and service offering," Heiko Wichmann, General Manager for Sales & Distribution of Henry Schein Dental Depot GmbH, comments the new German partnership with the world's leading dental laser company.

Henry Schein Dental Depot GmbH
Pittlerstr. 48–50
63225 Langen, Germany
E-mail: info@henryschein.de
Web: www.henryschein.de

Sirona

SIROLaser Advance sets new standards of user-friendliness and flexibility

Sirona's SIROLaser Advance combines state-of-the-art laser technology with outstanding user-friendliness. The color touchscreen, clearly structured menus and self-explanatory symbols provide the ideal basis for easy operation.

The SIROLaser Advance caters for a broad spectrum of applications. The pre-set programs ensure quick and effective therapy in the area of periodontics, endodontics, surgery and pain relief. If required the dentist can view additional information about each individual preset in a help menu.

The dentist is free to adapt the SIROLaser Advance to his or her individual mode of working. Up to 24 different applications can be programmed. In his role as system administrator the dentist can also configure profiles for five additional users. In addition, the SIROLaser Advance anonymously stores the parameter data of each treatment session. For patient documentation purposes this data can be easily transferred to a PC with the aid of a USB flash drive.

The SIROLaser Advance offers preset therapy programs for the most important laser applications in the field of periodontics, endodontics, surgery and pain relief.

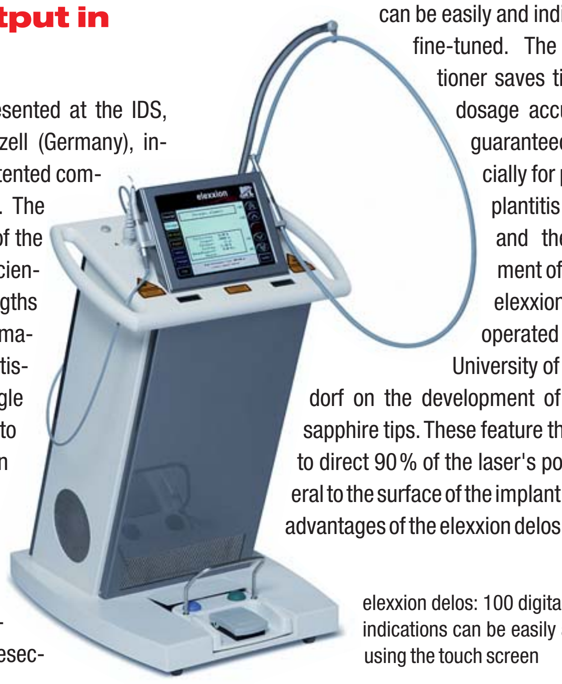
The SIROLaser Advance is operated via the light-touch finger switch or via the optional foot control. In combination with the high-power rechargeable battery pack the SIROLaser Advance can be deployed flexibly in the dental practice.

Sirona Dental Systems GmbH
Fabrikstraße 31
64625 Bensheim, Germany
E-mail: contact@sirona.de
Web: www.sirona.de

elexxion

Two wavelengths and 50 W pulse output in one machine

Among the products they presented at the IDS, elexxion AG, based in Radolfzell (Germany), included their internationally-patented combination laser elexxion delos. The elexxion delos combines two of the most frequently studied and scientifically recognised wavelengths (810 nm and 2,940 nm) in one machine so that both hard and soft tissue can be treated with one single machine. At present, according to elexxion, most applications can be reasonably treated with this combination system. For example, the elexxion delos can be used for the removal of concrements, decontamination, cavity preparation, root resection and bone ablation. Over 100 digitally stored indications can be accessed on a large touch screen and activated at a "touch". Output modifications can be easily and individually fine-tuned. The practitioner saves time, the dosage accuracy is guaranteed. Especially for peri-implantitis therapy and the treatment of biofilm, elexxion has co-operated with the University of Dusseldorf on the development of special sapphire tips. These feature the ability to direct 90 % of the laser's power lateral to the surface of the implant. Further advantages of the elexxion delos for soft-tissue applications are: Together with the ultra-short pulse durations of as little as 9 µs, the modern diode technology with its 50 W pulse output enables a gentle, efficient soft-tissue surgery at a speed which, according to elexxion, was previously unattainable. A flexible fibre guide is an additional relief for the dentist during treatment. At the same time, the newly developed fibre increases the output density thanks to an optimized beam profile. This means higher removal speed, for example in the tooth enamel. The machine can be connected comfortably to the internal compressed-air supply or to an external compressed-air supply. The external connection permits the water spray to be precisely adjusted and, thus, improves the removal performance. The elexxion delos combination laser can be purchased in Germany from the specialized distributor Pluradent.



elexxion delos: 100 digitally stored indications can be easily activated using the touch screen

elexxion AG
78315 Radolfzell, Germany
E-Mail: info@elexxion.com
Web: www.elexxion.com

KaVo

The reliable and comfortable detector of calculus in periodontal pockets

The KaVo DIAGNOdent pen is well-known and established, as a unique instrument for the detection of caries that can quickly and reliably identify healthy and unhealthy tooth substance by means of varying fluorescence. In addition to caries detection, the DIAGNOdent system can be used with a special Perio probe for reliable and comfortable detection of periodontitis. The Perio probe detects concrements in the deepest pockets reliably and without pain despite the presence of saliva or blood and is therefore an ideal control instrument after root cleaning. A gentler, more thorough cleaning of pockets is thereby enabled with substantially enhanced healing.

The DIAGNOdent pen's readings are communicated as a digital and acoustic signal. This confirms to the patient the need for treatment and increases compliance.

Clinical studies confirm that the use of the DIAGNOdent Perio probe for calculus detection and control of treatment improves the postoperative bleeding index and noticeably reduces pocket depth in comparison to the use of a conventional probe.

KaVo Dental GmbH
Bismarckring 39
88400 Biberach, Riß, Germany
E-mail: info@kavo.com
Web: www.kavo.com

A.R.C.

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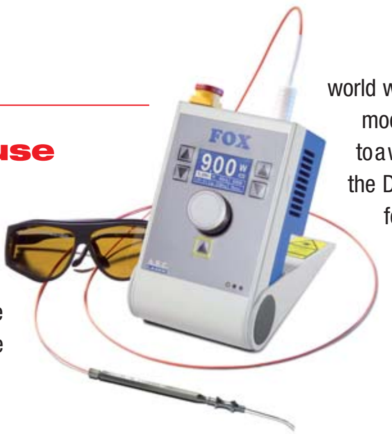

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